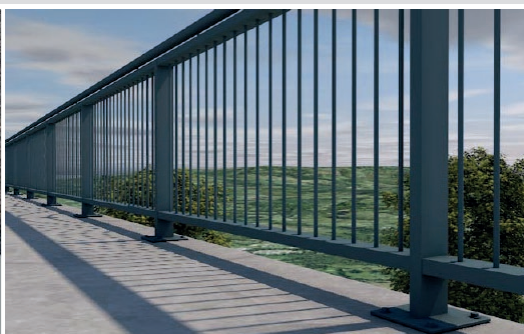




# fischer

## Fixing solutions for bridges



**fischer**   
innovative solutions



## A brand and its promise to perform



Customers who choose fischer get more than just a range of secure fixing products. Our goal is to ensure that we always offer our customers the best solutions with real added value.

## Global presence

With more than 40 national subsidiaries and more than 100 importers, fischer has a global network with a strong presence. The advantages for you as a project customer

## Customer advice

Our technical support service provides cost-effective, legally compliant advice for all questions relating to fastening systems. Services that you can access include test installations, pull-out tests, individual designs, comparative calculations,



## Products

We offer you a wide range of fastening solutions from the fields of chemical resins, steel and plastics. We cover a very broad application spectrum with our standard products as well as project-based solutions and customer-specific special developments. All of these are based on our know-how and

In addition to innovative and outstanding products, this primarily includes user-oriented advice and benefit-oriented services. fischer is a leading brand in which engineering experts throughout the world place their trust.



are clear. There'll always be a competent technical or sales partner in your vicinity and a high level of product availability is also guaranteed.

and the development of special solutions. Around the world, more than 130 engineers support you with their concentrated fastening expertise. We're happy to give you advice – at our fischer Academy, at your office or at the construction site itself.



experience gleaned over more than 60 years in anchoring technology. You can depend on it.



# Services for bridge construction.

## Research & development



We have our own research and development teams for chemical resins, steel and plastics. This allows our own research results, market trends and customer require-

ments to be quickly embraced and converted into market-ready products. In addition to the capability and quality of our products, safe and fast installation is also vital. This pays off by saving you time, money and labour.

## Production

With research and development, tool-making, special machine construction and production facilities for chemicals, steel and plastics, the entire production process of our products takes place in-house. Our quality management system is certified in accordance with DIN EN ISO 9001.



Through the fischer Process System (FPS), we continuously optimise our processes and adapt flexibly to customer requirements. In this way, we ensure that you can rely on innovative products with a constantly high level of quality.



## Design software



Our new modular design software suite is called „Fixperience“. It offers safe and reliable design along with top processing comfort. The relevant design standards (ETAG 001 and EC2, such as

EC1, EC3 and EC5), national application documents and extensive choice of all conventional load and measurement units make the software suitable for international use. A free „live update“ is available at all times at: [www.fischer.de/fixperience](http://www.fischer.de/fixperience)

## Certifications

We don't compromise on the safety of our products. We take part in the leading international, standard-setting councils in the fastening technology sector, thus contributing our knowledge

to their work. Many of our products are characterised by thorough, up-to-date, international approvals, technical certifications and expert reports. For you, this means safety that you can rely on.



## The environment

We actively consider the aspect of sustainable construction. Our environmental management system is certified in accordance with DIN EN ISO 14001. A growing number of our products have an Environmental Product Declaration

(EPD) from the Bauen und Umwelt e.v.

(IBU) institute, which constitutes the data basis for an ecological building evaluation. And our greenline product range is already based on more than 50% sustainable raw materials – certified in accordance with DIN CERTCO/TÜV Rheinland.



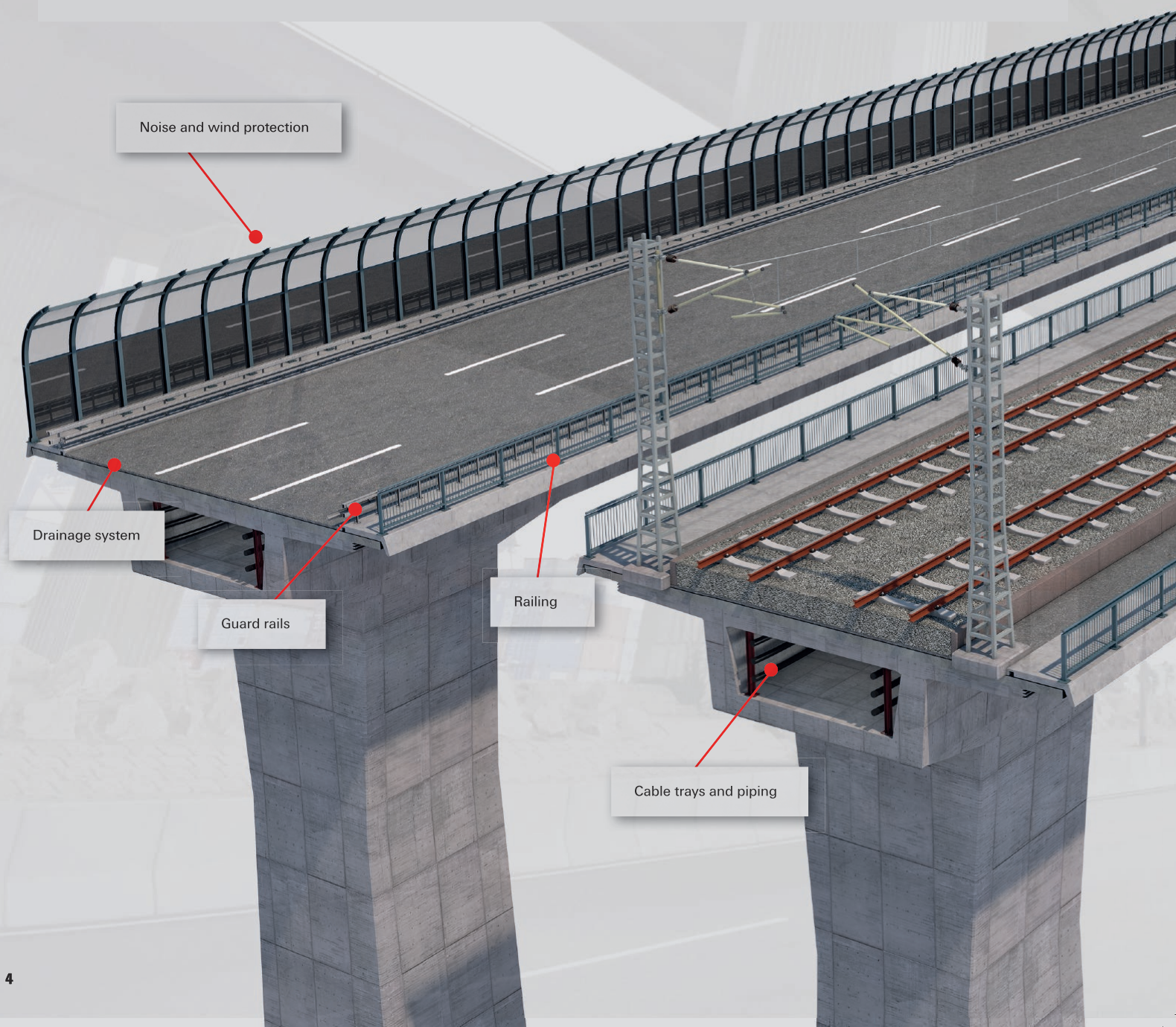
# Solutions for rail and road bridges.

## Special requirements on bridges

- Long maintenance-free design life
- Safety even under seismic influences

## fischer offers:

- Long-life products and systems made of materials such as stainless steel and high-corrosion steel
- Products which are able to resist, seismic, dynamic or shock loads

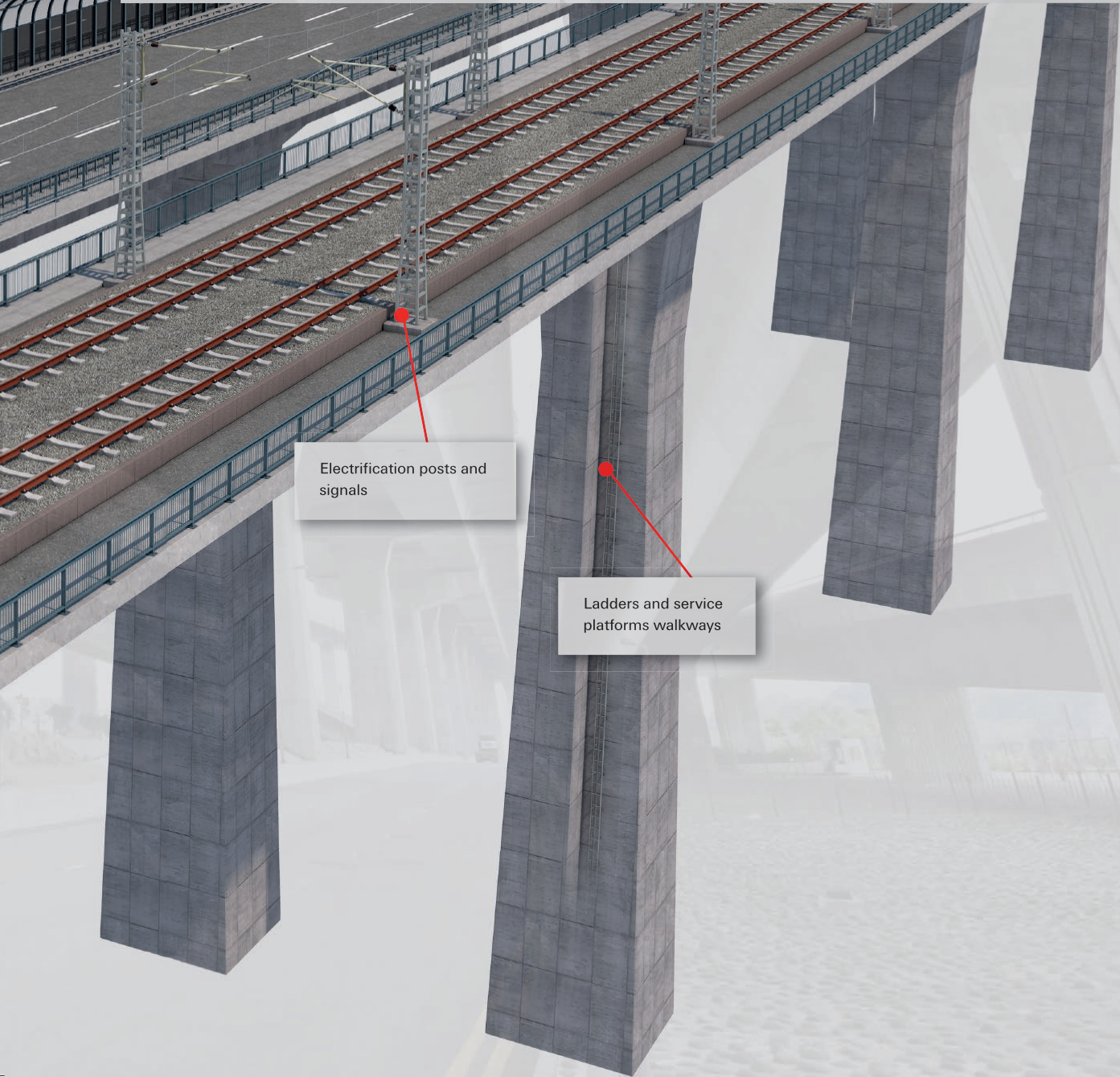




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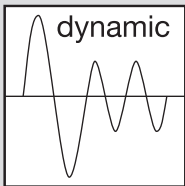


# Basic knowledge.



## Cracked concrete

When anchoring in concrete, it is generally presumed that cracks are present in the anchoring area that influences the bearing capacity of the fixings. It is difficult to define all temporary and permanent load cases and to determine if the concrete is cracked or non-cracked. For safety reasons, the use of fixings suitable for cracked concrete is generally recommended for engineers, designers and specifiers. Fixings with an approval according to ETAG 001 for cracked concrete have proved their suitability in cracks and may be used without any restriction in the tensile and compressive zones of concrete members. Fixings suitable for cracked concrete are also checked and approved according to American standards. These "evaluation reports" are prepared according to ACI 318.



## Dynamic/fatigue behaviour

The general building authority approved by the German Institute of Construction Engineering in Berlin (DIBt) and the European Technical Approvals (ETA) are generally for anchoring static and pre-dominantly static

loads. However, in contrast to these current approvals, in practice a number of dynamic effects occur, e.g. increasing and alternating stresses in many applications in a road tunnel. The main focus in this case is on noise and wind protection, etc. The applications are influenced by heavy traffic and wind generating compression and suction action on exterior components.

The fischer Highbond anchor FHB dyn is approved for dynamic loads. The approval applies to anchoring of dynamic loads with unlimited numbers of load cycles, in tension and shear. In addition, the FHB dyn is manufactured in anchor size M16 of high corrosion-resistant steel, material no. 1.4529.

Tests have shown that this material (in contrast to the usual standard stainless steel types in the corrosion resistance class III, e.g. A4, steel grade AISI 316) is suitable not only for use in humid internal and external conditions but also for dynamic loads.

## Corrosion

Corrosion is a chemical reaction in which metal is oxidized. The lower the quality of the metal ("electrochemical potential"), the more the material will be damaged. In this process it is either converted into flaking rust or worn away in places. These types of corrosions can be differentiated here. The most frequent types of corrosion in fixings and anchors include:

In this case, the metal corrodes relatively uniformly over the entire surface or over a part of the surface. An example of this is the invisible rusting due to condensation between a fixing and the clearance hole in the anchor plate not of a screw in the transition area from anchor plate to hole. The result: The connection which appears completely intact from the outside fails abruptly.

## Contact corrosion

If metals with different qualities contact each other in a conductive medium, the less noble metal always corrodes (the anode). As a consequence, stainless steel is not usually effected. What is decisive, are the surface ratios of the two types of metal: the greater the surface area of the higher quality metal in comparison to the lower quality materials is, the greater the corrosion.

For example, if large stainless steel sheets are screwed with galvanised screws, the screws will be highly attacked within a very short time. In contrast, using stainless steel screws for galvanised sheets is not critical.

## Stress corrosion cracking

In case of sustained tensile loads, also A4, grade 316 material can be attacked by stress corrosion cracking. In this process, a crack develops due to mechanical stresses and chemical processes (chromium depletion), which increases under sustained tensile loads in aggressive conditions and thus prepares a path for progressive corrosion.

For example, it occurs with A4 steel in an atmosphere with chemical pollution like bridges with deicing materials, etc. Generally stress corrosion cracking is not visible with fixings and usually leads to sudden failure of the anchoring and the construction.

## Water tightness

The fixings are the most effective component of the water-proofing system as they are the only passage through the water-proofing layer. For example in structures under intensive chloride attack such as bridges, tunnels etc., the chloride penetration is the most effective property in determining the service life of the concrete lining which can be eliminated only by increasing the cover thickness to rebar. The corroded steel which is inside the concrete will induce the water penetration inside the structure and cause leakage through the cracks.

This situation also reduces the service life of the structure as the water penetrates some centimetres through the concrete cover and contacts the rebar earlier than expected or calculated which would cause structural corrosion and failure. The water tightness of the structure should always be considered when choosing a fixing.



# References.

## Saint Cloud (FR)



### Challenge

The project for the renovation of the Viaduct de Saint Cloud consists in lifting old concrete cornice for substitution.

fischer had to find the right anchor to support the weight of each part of the concrete cornice.

### Solution

Each part of concrete cornice was lifted through fischer injection system FIS V 360 S and FIS A M20 anchor rod.

This economic solution was only possible by successful realisation of pull-out tests in hardly effected concrete capping.

## Bridge Strengthening (AT)



### Challenge

Due to increased traffic, there was a need to strengthen 4 bridges on the A2 highway. The strengthening was made by adding an additional concrete layer and a build up of new edge beams. The new concrete layer had to be connected to old construction via concrete connectors. It was required to deliver a large quantity of anchors in a very short time. The biggest challenge was to replace the expensive solution, the designer proposed and the edge beam fixings as cast in anchor channels, with a post installed solution.

### Solution

fischer was able to deliver more than 25.000 pcs. of the concrete-concrete connector FCC-H and FCC-A in various diameters within one month. The edge beam fixing was changed to a post installed solution. fischer delivered more than 8.000 pcs. of fischer bridge anchor FBA in various lengths, in order to offer the best possible and optimal solution for anchoring high traffic impact loads.

## Bridge Rehabilitation Kraków (PL)



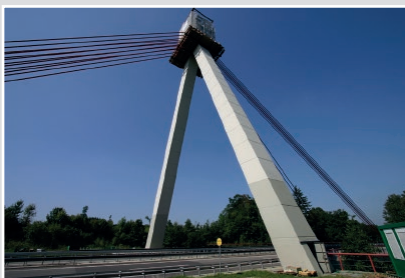
### Challenge

In 2008 the south Kraków ring road was completely renovated and enlarged. Maintenance of bridges and viaducts, meant an increase of the load capacity and safety. In total 13 motorway bridges and 20 viaducts were under construction. This was for Mota Engil in Poland.

### Solution

For anchoring of more than 18.000 post-installed rebars, fischer hybrid mortars FIS EM and FCS Liquid were used. Existing pillars have been reinforced by extending the rebar which also contributed to an improvement of the permissible loads. For the anchoring of thermal expansion profiles FHB dyn in M16 was used.

## Platform & Antenna Systems (DE)



### Challenge

On top of the existing pylon, a maintenance platform and antenna systems had to be installed. Beside high wind loads, extraordinary atmospheric conditions with low temperatures, de-icing salt and vehicle exhaust emissions had to be taken into consideration.

### Solution

With the FHB II in different sizes fischer covered all the requirements and offered an easy to install and economic anchoring solution for this extraordinary construction site between Munich and lake Constance.

# Temporary fixings during construction.



## Shuttering



### FBS



### FH II



### FBN II



### EA II



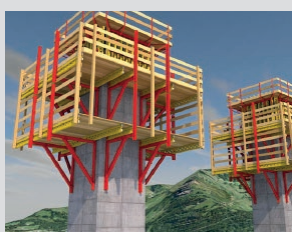
### RGM +R or FIS V



### Application:

Fixing of shuttering supports and shuttering on an existing concrete base, with fast and reliable temporary fixing solutions we can offer the perfect economic fixing for your application.

## Scaffolding and safety systems



### FBS



### FH II



### FBN II



### FHB II



### RGM + RSB



### Application:

With high shear and tension forces, our anchors allow economic solutions with fewer fixing points and lower drilling costs.

We offer approved solutions for horizontal and vertical lifeline systems, ladders, nets and guard rails.



# Rails and protective walls.



## Guard Rails



### RGM + RSB



### RGM + R



### FIS SB + FIS A



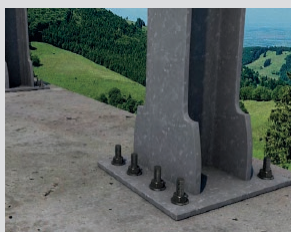
### Superrail set



### Application:

Guard rails on bridges are necessary to prevent vehicles from falling off the bridge. This is done by absorbing the kinetic energy by deformation of the steel profiles. The anchor plate and the anchors have to reliably resist these forces. There are different requirements and standards of impact load resistance. Additionally the anchors are exposed to high concentrations of de-icing salt. We are also able to provide certificated solutions for waterproofed fixings.

## Noise and wind protection



### FHB II



### FRA + FIS EM



### FIS SB + FIS A / RGM + RSB



### FHB dyn



### Application:

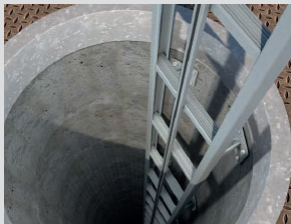
Noise barriers are exposed to high wind pressure forces due to crosswinds and can also be required to absorb impact loads caused by accidents. They are often fixed to thin building substrates like rim beams with small axial spacings and edge distances. Therefore expansion-free systems are required. In some cases these fixings have to be designed according to dynamic regulations.

# Ladders and service platforms.

Quelle: KRAUSE-Werk GmbH & Co. KG



## Ladders



### FAZ II



### FH II



### FZA



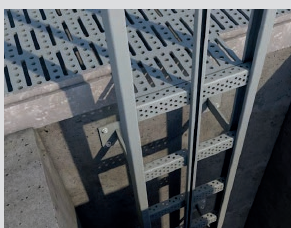
### FIS SB & RSB + RGM



### Application:

Ladders inside and outside of pylons have to be installed with fixings, approved to ETA option 1, if cracked concrete has to be taken into account. With a wide assortment fischer can cover all requirements, from under-cut to mechanical to bonded solutions.

## Service platforms



### FAZ II



### FH II



### FHB II



### FIS SB & RSB + RGM

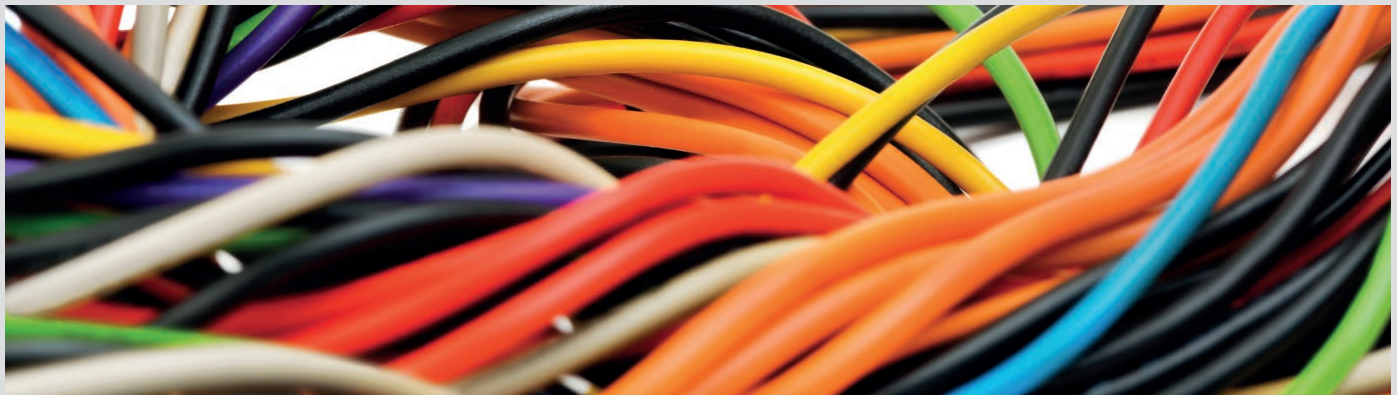


### Application:

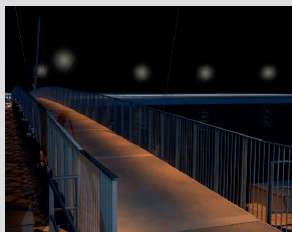
Service and maintenance platforms are occasionally misused as storage areas. Thus unforeseen high loads are transferred from the steel structure via the anchor system to the concrete. Therefore an anchoring system with high internal reserves has to be preferred.



# Electric installations, pipes and drains



## Electrical installations



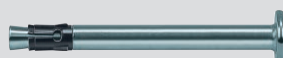
**FAZ II**



**FBN II**



**FNA II**



**EA II**



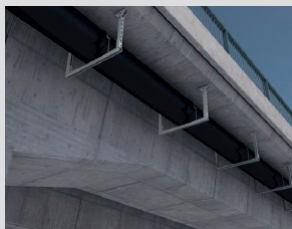
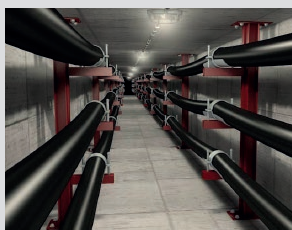
**RGM + RM / FIS V**



### Application:

Electrical installations in the superstructure of a bridge or outside at the pylons, light and economic fixing solutions are available in different steel grades. With an adapted electrical fixing range fischer offers everything from one source.

## Pipes and drains



**FBS**



**FAZ II**



**EA II**



**RGM / RGM I + FIS SB / RSB**



**FHB II**








### Application:

Even if not permanently in use, the load requirements on systems and fixing points are high. A combination of customised steel supports with economic standard fixings is best practice.



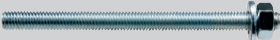


# Reconstruction, retrofit.



Bridge edge beam fixing

	<b>FBA</b> 	<b>Application:</b> In most cases of strengthening, reconstructing and retrofitting of bridges it is necessary to remove old edge beams and build new ones. In these cases, a post installed anchorage of edge beams is the most common way of connecting the edge beam to the bridge load bearing construction. A post-installed connection of an edge beam is of course also a way of installation when a new bridge is built.
	<b>FIS EM</b> 	
	<b>FIS SB</b> 	
	<b>FIS V</b> 	

Top concrete layer

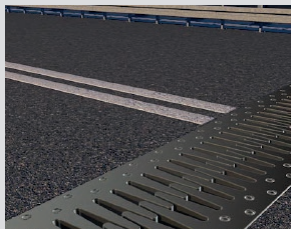
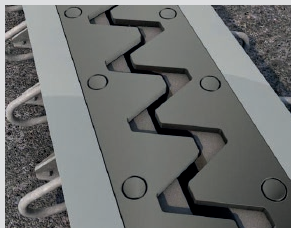
	<b>FCC</b> 	<b>Application:</b> By removing damaged layers and retrospectively reinforcing the supporting structure by increasing the effective depth with additional site-mixed concrete, new requirements can generally be fulfilled.  With the shear connector FCC, fischer provides a suitable system for creating a force-fit connection between the old concrete-bearing layer and the new additional site-mixed concrete. The FCC anchor is glued with injection mortar so that the load can be directed to the old bearing layer.
	<b>FCC-A</b> 	
	<b>FIS EM</b> 	
	<b>FIS SB</b> 	



# Dilatation joints and bearings.



## Expansion joints



### FIS EM / SB / RSB + RGM + RGM I



### FH II



### FHB dyn + FIS HB



### Application:

While expansion joints in new bridges are often installed with cast-in internal threaded sockets, post installed or replaced expansion joints have to be fixed with post-installed internal threaded sockets. Using bonding agents like FIS EM or the new Superbond (capsule or cartridge system), the annular gap between socket and concrete is sealed. Critical conditions caused by freeze-thaw cycles are prevented.

## Bearings



### FIS EM + FRA



### RGM + FIS SB / RSB



### FH II



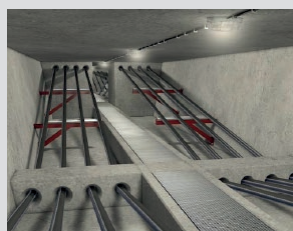
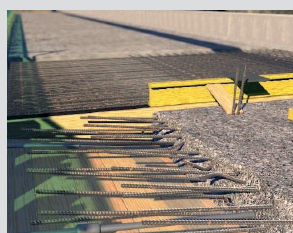
### Application:

By replacing existing bearings, often the fixing points are changed. These fixing solutions are the perfect way to solve these requirements. In some cases also anchors like the FH II in stainless steel can fulfil the requirements, if the risk of freezing water in the drill-hole is not considered.

# Other equipment and installations.



## Structural applications and pre-stressing



### FIS EM / Rebar case



### FIS V / Rebar case



### FIS SB / RSB + RGM / RGM I



### FRA + FIS EM

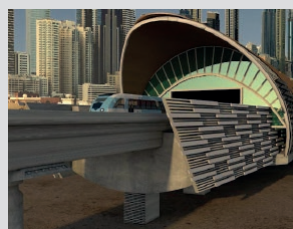


### Application:

Post-installed rebar works for bridge widening or just to replace a miss-positioned rebar, with its approved systems, fischer offers chemical mortars with high bond strength, corrosion protection of the rebar similar to concrete and a range of accessories to install postinstalled rebar quickly and easily.

If temporary fix points to pull exterior pre-stressing cables or additional supports for subsequent installed pre-stressing systems are needed, with high performance chemical fixings, fischer offers the right economic solution.

## Steel structures



### FZA



### FH II / FH II-H



### RSB



### FSB / RSB + RGM / RGM I



### RGM + RM / FIS V



### Application:

A high number of steel structures were to be installed including bridges, elevated metro systems, signal posts to complete metro stations, the base-plates had to be fixed but not all cast-in elements are at the right position. Chemical fixings solutions with curing times of 20 sec. at 20 °C offer the same advantage, of immediate loading, as mechanical anchors. In addition to this the drill hole is sealed from moisture.

Mechanical, internal threaded anchors and sockets provide the benefit of easy removal without cutting and grinding. Such a fixing point can even be reused at a later stage.



# Product specifications and accessories.

Product overview	connection thread	material			method of operation			type of installation			relevant approvals						dynamic
		galvanized steel	stainless steel e.g. A4	high corrosion resistant steel e.g. 1.4529	interlocking	adhesive	friction type	push-through installation	pre - positioned	internal thread	CE	UL	ES	Shock approval by Technical Center for Civil Engineers, Bonn	ES	ES	
	M																
Zykon anchor FZA	6-16																
Zykon hammer-set anchor FZEA II	8-12																
EAI	6-20																
Anchor Bolt FAZ II	8-24																
High performance anchor FH II	6-24																
Bolt FBN II	6-20																
Nail anchor FNA II	6-8																
Highbond anchor FHB II	8-24																
Dynamic highbond anchor FHB dyn	12-24																
FIS EM with FIS A	8-30																
FIS EM with F.R.A	12-20																
Superbond - System FSB + RSB	8-30																
FIS V	6-30																
Resin Anchor R + RGM	8-30																
FBA	12-20																
FBS	8-14																

## Helpful accessories



Clips



Electrically isolated fixing points

### Clips for overhead installation

Clip	Anchor rod	Drilling diameter [mm]	Length of anchor rod [mm]	Material
8-16	M8, M12, M16	12-18	up to 1000	PBT
20-24	M20, M22, M24	24-28	up to 1000	PBT
27-30	M27, M30	30-35	up to 1000	spring steel

### Accessories for electrically isolated fixing points

Article	Anchor rod	Drilling diameter [mm]	Box qty [pz]	Art.-No
ACD M 8-12	M8, M10, M12	14-18	500	071359, 071360, 557240
ACD M 16-24	M16, M20, M24	22-30	500	571093, 071094, 557241
ACD M 27	M27	32	200	571095
ACD M 30	M30	35	200	071096
ACD M 33	M33	40	100	071097

## fischer FIXPERIENCE. The design and information software suite.



- The modular design program includes engineering software and application modules.
- The software is based on international design standards (ETAG 001 and EC2, such as EC1, EC3 and EC5), including the national application documents. All common force and measurement units are available.
- Incorrect input will be recognized and the software gives tips to get a correct result. This ensures a safe and reliable design every time.
- The graphical display can easily be rotated through 360°, panned, tilted or zoomed as required.
- The 3D display gives a detailed and realistic image.
- The "live update" feature helps to keep the program up to date ensuring you are always working with the latest version.
- Free download and updates at [www.fischer.de/fixperience-en](http://www.fischer.de/fixperience-en)

## Our service to you.



We are available to you at any time as a reliable partner to offer technical support and advice:

- Our products range from chemical resin systems to steel anchors through to nylon anchors.
- Competence and innovation through own research, development and production.
- Global presence and active sales service in over 100 countries.
- Qualified technical consulting for economical and compliant fastening solutions. Also on-site at the construction site if requested.
- Training sessions, some with accreditation, at your premises or at the fischer ACADEMY.
- Design and construction software for demanding applications.

## Regional Presence

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