SCHÖCK
Dependable by design

SCHÖCK COMBAR®

Where steel reaches its limits.

Glass fibre composite material as a superior alternative to steel as reinforcement for special fields of application.

PROPERTIES

An exceptional material.

Schöck Combar® is a reinforcing bar made of corrosion-resistant glass fibres bonded with a vinyl ester resin. The high-quality materials and the unique production process result in an exceptional material.

The sustainability of Combar® has been certified with the Environmental Product Declaration (EPD).

Superior to steel

In special applications, such as in corrosive and electromagnetic environments, the material properties of reinforcing steel do not meet the given requirements. In such cases, the Schöck Combar® glass fibre composite material opens up completely new possibilities thanks to its outstanding properties:

- Durability
- High tensile strength
- Resistance to corrosion
- Chemical resistance
- Non-magnetic or non-magnetisable
- Electrically and thermally non-conductive
- Easily machinable
- Considerably lighter than steel

Reinforcing steel and Combar®: the direct comparison

Material properties (straight bars)		Reinforcing steel DIN EN ISO 15630 DIN 488	Schöck Combar® in accordance with EC2
Characteristic yield strength f_{yk} (N/mm²)		500	≥ 1000
Design value for the yield strength f_{yk} (N/mm²)		435	≥ 445
Tensile Young's modulus (N/mm²)		200,000	60,000
Design value for the bond stress f_{bd}	C20/25 (N/mm²)	2.3	2.03
	C30/37 (N/mm²)	3.0	2.33
Concrete cover c_{nom} (mm)*		according to EC2	d_s + 10
Specific resistance (µΩcm)		1-2 x 10^{-5}	> 10^{12}

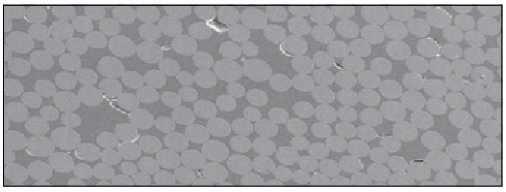
*depending on the fire protection classification

Pultrusion process at the Schöck production hall in Halle, Germany (©Heiko Winkler)

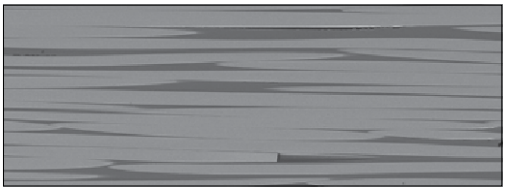
In-house production

The feature which makes Schöck Combar® special is a two-stage manufacturing process that is optimised to meet the demands of reinforcing bars. In the first step, the pultrusion, high-strength glass fibres are bundled as tightly as possible in a continuous process and drawn through a die where they are impregnated with liquid synthetic resin. In the second step, the profiling, the ribs are cut into the cured bars. The bars are subsequently lacquered.

Permanent high strength



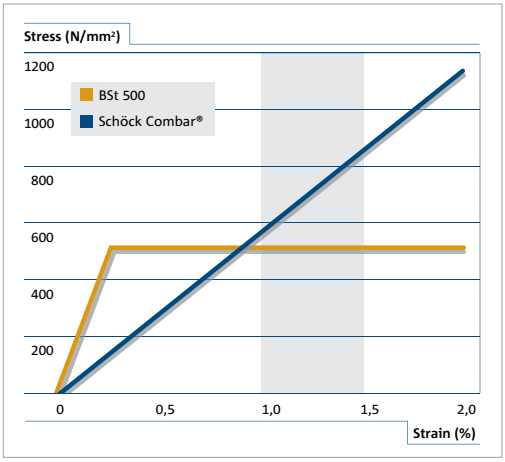
Cross-section



Longitudinal section

The high fibre content of Combar® (approx. 88% by weight) and the linear, parallel arrangement of the fibres result in maximum strength and rigidity of the material. The vinyl ester resin is impermeable. Every glass fibre is completely surrounded by resin. This means maximum durability in concrete of up to 100 years.

Stress-strain diagram



Unlike steel, Schöck Combar® has a linear elasticity until it breaks. The measured Young's modulus is over 60,000 N/mm² by contrast with that of reinforcing steel with 200,000 N/mm². The characteristic short-term tensile strength of the glass fibre composite material is over 1000 N/mm².

APPLICATION

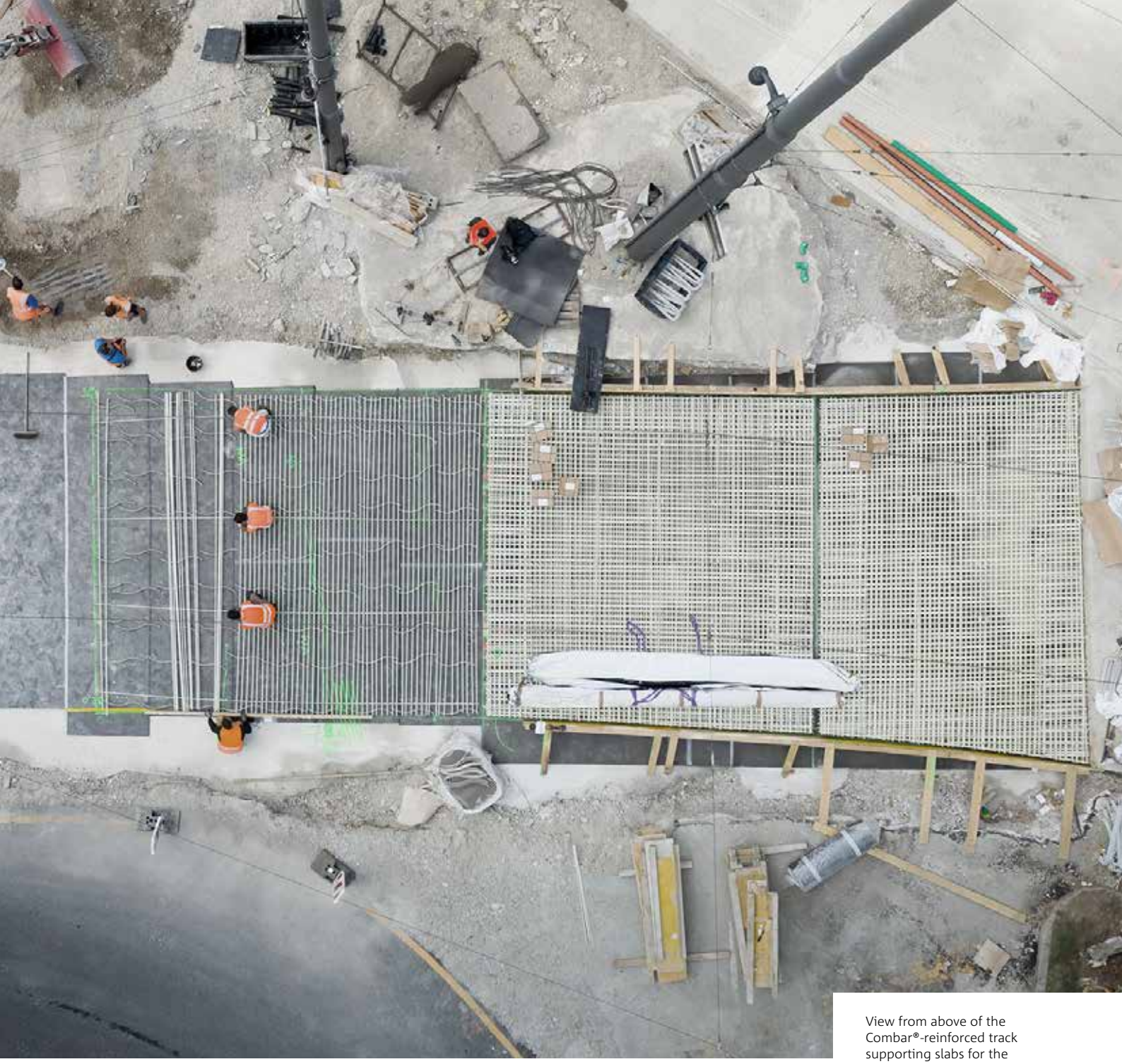
No electromagnetic interference.

Schöck Combar® is not electrically conductive and therefore ideally suited for the construction of tram systems as well as for use in power infrastructures.

Zurich Airport, Switzerland (©Thomas Entzeroth)

Foundation reinforcement in the switchgear house at Peiner Träger GmbH, Peine, Germany

Solution for foundations, walls and floors
Sensitive safety systems that regulate traffic are located in point-blocking circuits or runways and taxiways at airports. The electrically non-conductive Combar® is the optimum reinforcement in these areas in order not to influence their signalling function.
Inductive high-voltage systems operate with high electrical currents and generate strong magnetic fields. Energy is lost through induction and the reinforcing steel can then heat up so much that the bond with the concrete is lost. Combar® allows foundations, walls and floors to be built close to the inductive elements, saving both space and energy.



View from above of the Combar®-reinforced track supporting slabs for the tram in Munich, Germany (©Moritz Bernoully)

non-conductive

Fields of application:

- Track supporting slabs
- Transformer substations
- Switchgears
- Concrete wearing layers (Solid Track)
- Airfields
- Heavy industrial plants

APPLICATION

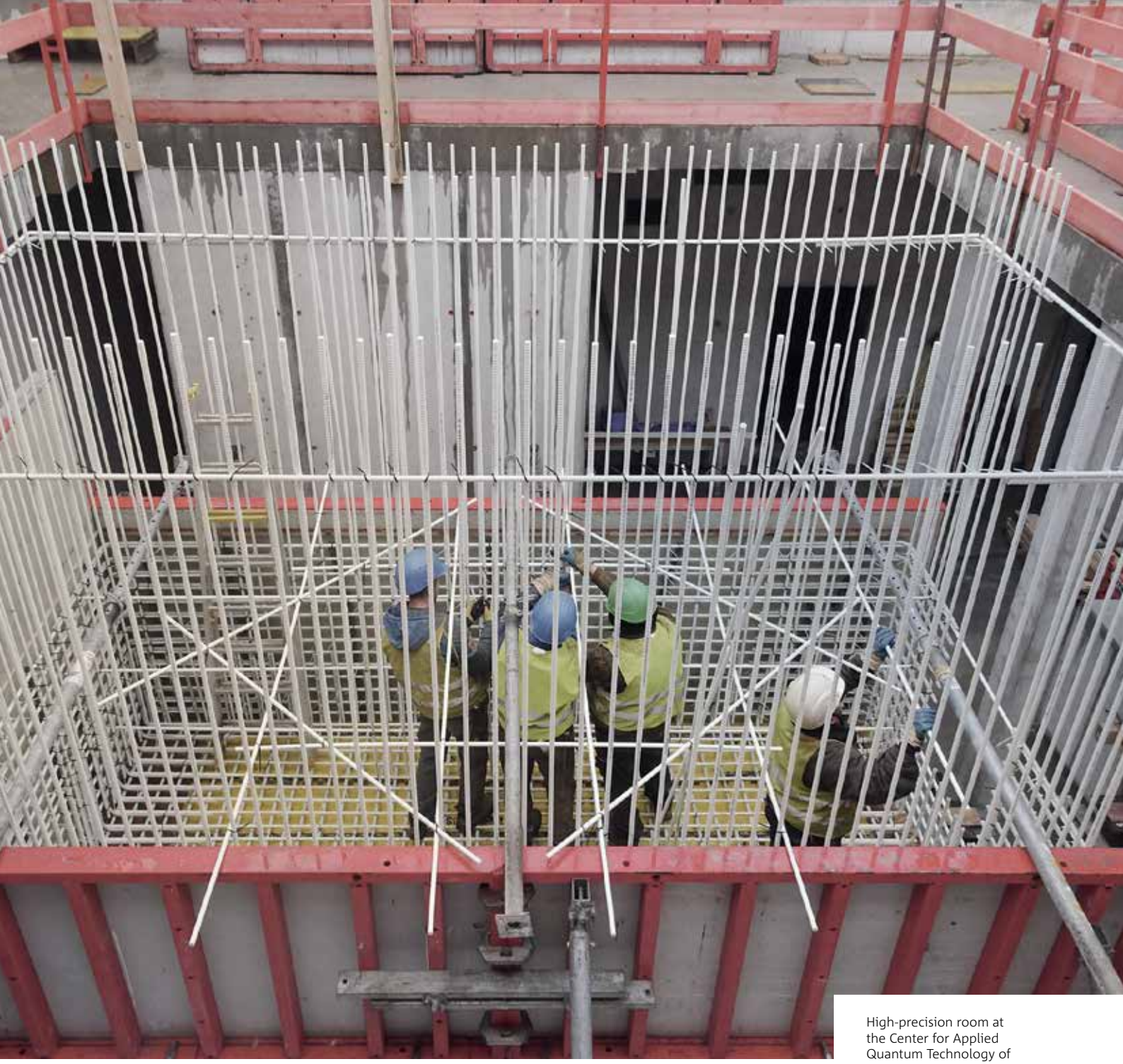
No magnetic interference.

Schöck Combar® is non-magnetic and can therefore be used in areas with highly sensitive measuring and control equipment, such as in research facilities and hospitals.

Center for Applied Quantum Technology, Stuttgart, Germany

Max Planck Institute for Solid State Research, Stuttgart, Germany

Solution for research
Research laboratories for scanning electron microscopy and magnetic resonance imaging (MRI) are highly sensitive facilities. Due to its magnetic properties, reinforcing steel interferes with the function and accuracy of the research equipment used. The use of Schöck Combar® enables research to be carried out in a completely non-metallic and non-magnetic environment.



High-precision room at the Center for Applied Quantum Technology of the University of Stuttgart, Germany (©hammesk-rause architekten bda)

non-magnetic

Fields of application:

- Research facilities
- Hospitals (MRI)
- Microscopy laboratories
- Floor slabs of industrial buildings with driverless transport systems

APPLICATION

No corrosion problems.

Schöck Combar® is chloride-resistant and therefore resistant to corrosion. The material meets the highest quality standards and allows a durability of 100 years in highly alkaline concrete.

Precast elements along the beach promenade in Blackpool, UK

Reinforcement of the bridge cap of the Canal Bridge, Canada

Solution for extreme situations
The most common cause of damage in reinforced concrete structures is corrosion of the reinforcement. This applies to components exposed to the weather or to particularly aggressive chemical environments, such as chlorine-rich water. Even with minimum concrete cover, floor slabs can be constructed to be maintenance and renovation-free through the use of the corrosion-resistant Schöck Combar®. As a result, maintenance costs are significantly reduced.

Reinforcement with the non-corrosive Schöck Combar® (© Moritz Bernoully)

Fe0
non-corrosive

Fields of application:

- Embankments and quay walls
- Façade elements
- Car parks (without floor coating)
- Industrial floors
- Swimming pools
- Sewage treatment plants
- Harbours and canal constructions
- Dams
- Bridge caps

APPLICATION

No problem with tunnel construction.

Schöck Combar® consists of glass fibres aligned in parallel in fibre bundles. In the longitudinal direction of the fibres, Schöck Combar® has high strength. Under lateral pressure, the fibres can absorb significantly lower forces. This results in good machinability – a great advantage, particularly in tunnel construction.

2nd S-Bahn main line, Munich, Germany (©Moritz Bernoully)

Solution for underground construction
Inner city tunnels for subways, sewers and other infrastructure facilities are usually built using a tunnel boring machine (TBM), but the TBM cannot drill directly through the steel reinforced shaft walls. The TBM has to be stopped and the walls opened up manually. If the header area is reinforced with Combar®, the TBM can drive straight through the wall. This reduces construction time and costs and increases safety for the workers.

Metro Line 15, Paris, France

Tunnel opening on line 15 of the Paris metro, France (© Société du Grand Paris / David Delaporte)

Fields of application:

- Soft-eyes for shaft walls in tunnel construction projects
- Diaphragm walls
- Piles
- Temporary concrete constructions

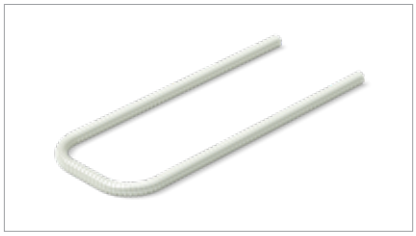
PRODUCT LINE AND DELIVERY PROGRAMME

Variability and flexibility.

Product portfolio

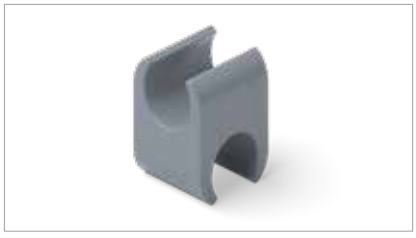
Straight bars
as a load bearing reinforcement to absorb tensile forces in concrete

Bar with anchorage head
as a shear reinforcement for slabs and beams exposed to shear stress, for reducing the anchoring length of straight bars



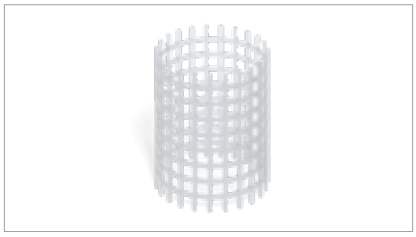
Bent bars
as shear force reinforcement or constructive reinforcement (e.g. edging)

For non-metallic installation



Clips
for joining the bars

The clips are available for joining 8 mm to 8 mm and 12 mm to 12 mm bars.



Lattice tubes
as spacers

The lattice tube is delivered to the building site in standard 2 m lengths.

Product range

Type	Diameter	Standard lengths
Straight bars	8 mm	10 m
	12 mm	11.80 m
	16 mm	11.80 m
	20 mm	11.80 m
	25 mm	14.5 m
	32 mm	14.5 m
Bar with headed bolt anchoring	12 mm	0.25 to 4.0 m
	16 mm	0.25 to 4.0 m
	20 mm	0.25 to 4.0 m
	25 mm	0.25 to 4.0 m
	32 mm	0.25 to 4.0 m
Bent bars, bar lengths up to 6.5 m (straight length), overall dimensions up to 2.0 x 3.2 m	12 mm	up to 6.5 m
	16 mm	up to 6.5 m
	20 mm	up to 6.5 m

Other lengths on demand

SERVICE

Individually tailored.

Schöck develops sophisticated, innovative and economical solutions for difficult reinforcing tasks using Combar®. The scope of services is tailored to fit the special needs of every project. When it comes to overcoming individual challenges, Schöck's team of experts draws on many years of expertise as a reliable partner.

Project-specific services

- **Structural analysis and reinforcement plans**
  At the client's request, Schöck designs the concrete elements reinforced with Combar®. The design is carried out in accordance with international standards and guidelines. In addition, reinforcement and construction plans are supplied together with detail drawings.

- **Special technical solutions**
  The focus is on the elaboration of cost-efficient standard solutions with Combar®. If necessary, our experts can also develop customised special solutions.

- **Installation support**
  Schöck supervises the proper installation of the reinforcement and instructs the personnel on site in the correct handling of Combar®.

- **Quality assurance**
  Schöck has a fully equipped materials testing laboratory. The necessary quality controls are coordinated with the client's quality assurance programme. Combar® is certified to ISO 9001 and holds the general building approval of the German Institute for Structural Engineering (DIBt).

COMPREHENSIVE EXPERTISE

Dependably the right solution.

Using forward-looking product solutions and systems, we fulfill the physical, static and design requirements for various applications in new-build and existing projects. The main focus of our activities is on reducing thermal bridges and impact sound as well as reinforcement technology.

Balcony, access balcony, canopy

Wall, column

Parapet, roof superstructure

Façade

Slab

Stairs

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