SCHÖCK
Dependable by design

SCHÖCK COMBAR®

When steel reaches its limits.

Composite fibreglass as a superior alternative to reinforcement made from reinforcing steel for special applications.

PROPERTIES

An extraordinary material.

Schöck Combar® is a reinforcement rod made from corrosion-resistant glass fibres, bound with a vinyl ester resin. The high-quality materials and unique processing workflow help to create an extraordinary material.

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

Superior to steel

In unusual application areas, such as corrosive and electromagnetic environments, the material properties of steel reinforcement are unable to satisfy requirements. In situations like these, the composite fibreglass Schöck Combar® opens up a range of new possibilities thanks to outstanding properties:

- Durability
- Tensile strength
- Corrosion resistance
- Non-magnetic, not magnetisable
- Lack of electrical and thermal conductivity
- Ease of machining
- Lightweight nature when compared to steel

Reinforcing steel and Combar®: A direct comparison

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

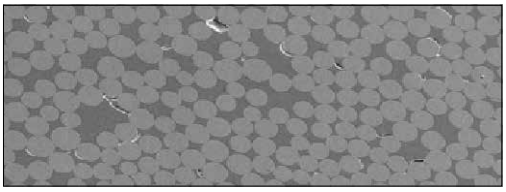
*According to the fire protection classification

Roving spools and fibre guide for pultrusion (©Fiberline Composites A/S)

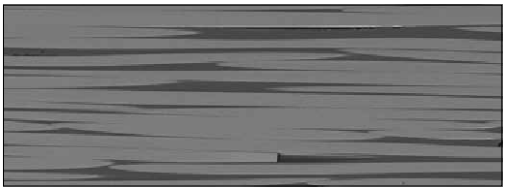
Own manufacturing processes

Schöck Combar® undergoes a unique two-part manufacturing process that has been optimised to the requirements of reinforcement rods. As a first step, pultrusion, a continuous process bundles high-strength glass fibres as densely as possible before drawing them through a tool in which they are coated with a liquid synthetic resin. In the second step, profiling, the ribs are cut into the hardened rods. The rods are then painted.

Permanently high strength



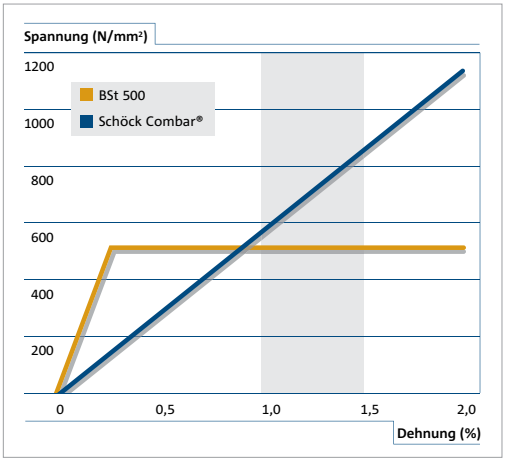
Transverse section



Longitudinal section

The high fibre content of Combar® (approx. 88% weight) and the linear, parallel layout of the fibres gives rise to a maximum strength stiffness on the materials. The vinyl ester resin is impermeable. Each glass fibre is fully enclosed by resin, thus helping to achieve a maximum durability of up to 100 years in concrete.

Stress/strain diagram



In contrast to steel, Schöck Combar® has linear elastic behaviour until the point at which it breaks.
The measured modulus of elasticity is more than 60,000 N/mm² when compared to reinforcing steel at 200,000 N/mm². This helps to a achieve a short-term tensile strength of more than 1000 N/mm² for the composite fibreglass.

APPLICATION

No electromagnetic interference.

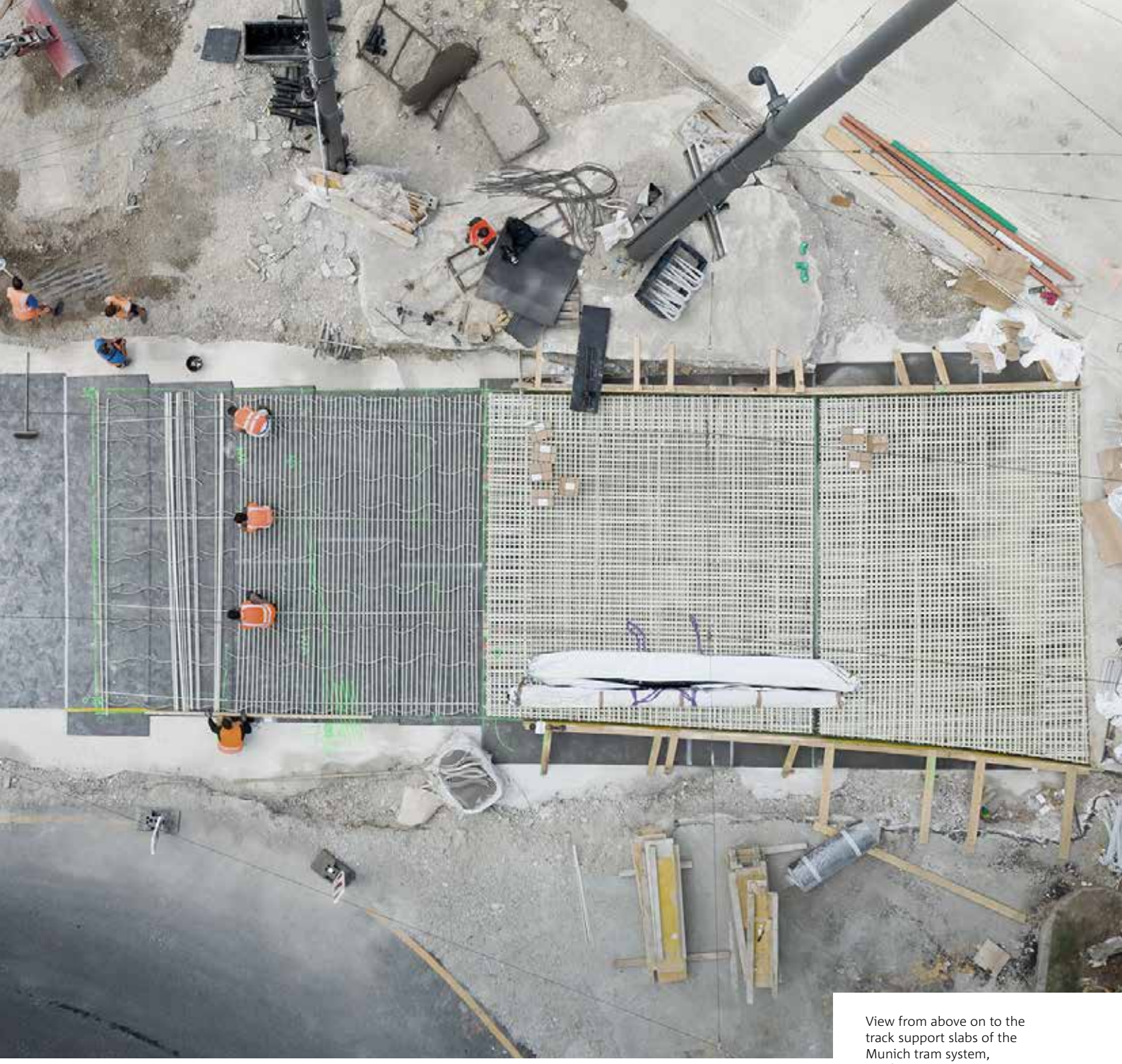
Schöck Combar® is not electrically conductive, which makes it ideal for the construction of tram systems and for use in electricity infrastructure.

Zürich Airport, Switzerland (©Thomas Entzeroth)

Foundation reinforcement in the transformer house of Peiner Träger GmbH, Peine

Solutions for foundations, walls and ceilings

Point blocking circuits, runways, and taxiways at airports contain sensitive safety systems to control traffic. The non-electrically conductive Combar® offers the ideal reinforcement solution for these areas, ensuring no effect on signalling. Inductive high-voltage systems operate with high electrical currents and generate powerful magnetic fields. Energy is lost through induction and reinforcing steel can heat up to such an extent that the bond with the concrete is lost. Combar® allows foundations, walls, and ceilings to be built in the vicinity of inductive elements with high space and energy efficiency.



View from above on to the track support slabs of the Munich tram system, reinforced with Combar® (©Moritz Bernoully)

non-conductive

Areas of application:

- Track support slabs
- Transformer stations
- Switchgear
- Concrete support layers (fixed track)
- Airfields
- Heavy industrial systems

APPLICATION

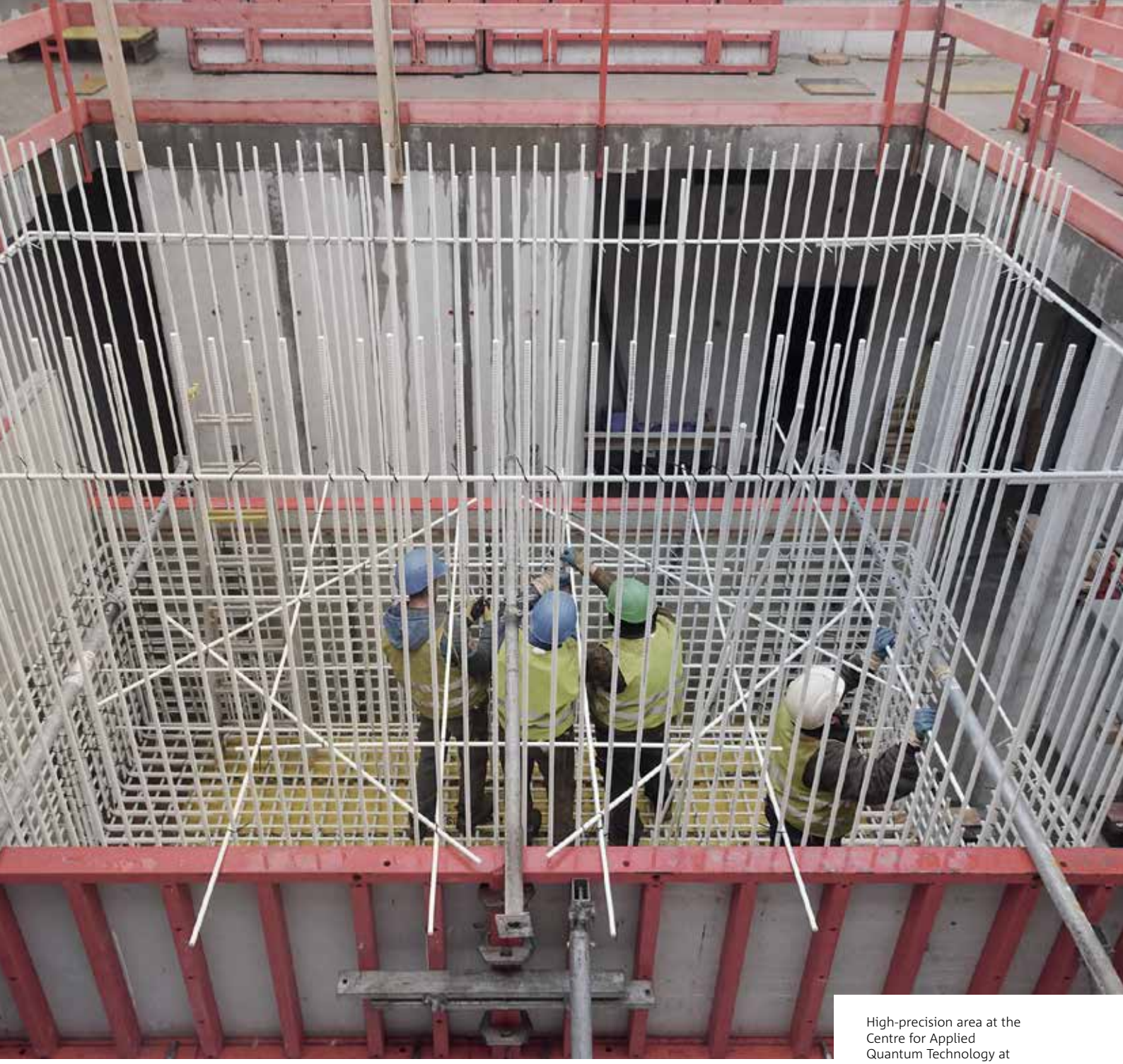
No magnetic interference.

Schöck Combar® is not magnetic and can be used in areas with highly sensitive measurement and control equipment, e.g. in research institutions and hospitals.

Centre for Applied Quantum Technology, Stuttgart

Max-Planck Institute for Solid State Research, Stuttgart

Solution for research
Research laboratories for scanning electron microscopy, magnetic spin tomography, and magnetic resonance tomography (MRT) are highly sensitive environments. Due to its magnetic properties, reinforcing steel can impair the functionality and accuracy of the research equipment being used. Schöck Combar® allows research to be conducted in a fully non-metallic and non-magnetic environment.



High-precision area at the Centre for Applied Quantum Technology at the University of Stuttgart (©hammeskrause architekten bda)

non-magnetic

Areas of application:

- Research facilities
- Hospitals (MRT)
- Microscope laboratories
- Floor plates for industrial buildings with automated transport systems

APPLICATION

No corrosion problems.

Schöck Combar® is resistant to chloride, which also makes it resistant to corrosion. The material can satisfy the highest of quality standards and has a resistance of 100 years in highly alkaline concrete.

Finished parts along the seaside promenade in Blackpool, UK

Reinforcement of the bridge coping at Canal Bridge, Canada

Solution for extremes
The most common cause of damage in structures made from reinforced concrete is corrosion of the reinforcement itself. This occurs on components that are exposed to the effects of weather or highly chemically aggressive environments, e.g. water containing chloride. Even with minimal concrete cover, floor slabs with corrosion-resistant Schöck Combar® can be designed to be maintenance and renovation-free. This helps to lower repair costs considerably.

Parking level at VEGA
Grieshaber KG, Schiltach

Fe0
non-corrosive

Areas of application:

- Shoreline reinforcement
- Façade elements
- Multi-storey car parks (without floor coating)
- Industrial floorings
- Swimming pools
- Sewage treatment plants
- Ports and canal constructions
- Dams
- Bridge coping

APPLICATION

Minimizing problems in tunnel construction.

Schöck Combar® comprises glass fibres aligned in parallel in fibre bundles. Schöck Combar® exhibits high strength in the longitudinal direction of the fibres. The fibres can absorb significantly less force under transverse pressure. This means good machinability, which is of great benefit in applications such as tunnel construction in particular.

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

Solutions for underground projects
Urban tunnels for underground systems, sewer tunnels, and other infrastructure facilities are typically realized with the aid of tunnel boring machines (TBM). But TBMs cannot pass through shaft walls reinforced with reinforcing steel. Instead, the TBM needs to be stopped and the walls demolished manually. If the pass-through area is reinforced with Combar®, the TBM will be able to pass through the wall seamlessly. This helps to reduce both construction time and costs and safeguard the safety of employees.

Line 15 of the Paris Metro, France

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

Areas of application:

- Soft-eyes for shaft walls in tunnel construction
- Slotted walls
- Foundation piles
- Temporary concrete structures

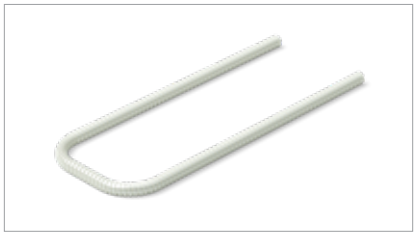
PRODUCT AND SUPPLY RANGE

Versatility and flexibility.

Product range

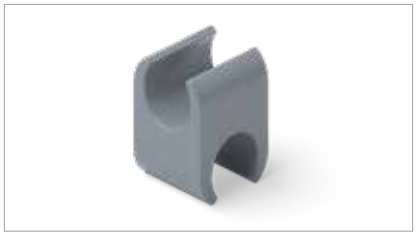
Straight rods
As bearing reinforcement for the absorption of tensile forces in concrete

Rod with head bolt anchoring
As shear reinforcement for panels and beams exposed to shear loads, to reduce the anchoring length of straight rods



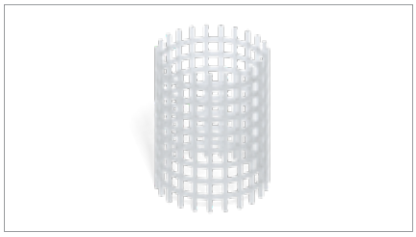
Curved rods
As shear force reinforcement or structural reinforcement (e.g. edging)

For non-metallic installation



Clips
For connecting the rods

Clips are available for connection of 8 mm with 8 mm and 12 mm with 12 mm rods.



Grid tubes
As spacers

The grid tube is supplied to the site with a standard length of 2 m.

Product range

Type	Diameter	Standard lengths
Straight rods	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
Rod with head 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
Curved rods, rod lengths up to 6.5 m (unrolled length), external dimensions up to 2.0 x 3.2 m	12 mm	to 6.5 m
	16 mm	to 6.5 m
	20 mm	to 6.5 m

Other lengths on request

SERVICE

Customized.

With Combar®, Schöck develops sophisticated, innovative, and economical solutions for challenging reinforcement tasks. The scope of services is tailored to the special requirements of every project. Schöck's expert team can fall back on many years of expertise when it comes to finding solutions to individual challenges.

Project-related service

- **Statics and reinforcement plans**
  At the request of the customer, Schöck can perform measurements of the concrete elements reinforced with Combar®. Measurements are carried out in accordance with international standards and directives. In addition, we also supply reinforcement and execution plans accompanied by detailed drawings.

- **Customised technical solutions**
  Our focus is on creating economically efficient standard solutions with Combar®. Our experts can develop customised solutions, if required.

- **Execution**
  Schöck supervises proper execution of the reinforcement details and instructs contractors in the correct handling of Combar®.

- **Quality Assurance**
  Schöck has the benefit of a fully equipped material testing laboratory. The requisite quality checks are coordinated with the customer's Quality Assurance programme. Combar® is ISO 9001 certified and has general building approval from the DIBt.

COMPREHENSIVE COMPETENCE

Reliably the right solution

With future-focussed product solutions and systems, we satisfy all building physics, static, and structural requirements of the respective applications in new-build and existing construction. We focus on reducing thermal bridges, impact noise insulation, and reinforcement technology in particular.

Balcony, pergola Canopy

Wall, supports

Roof structures

Façade

Ceiling

Stairs

SCHÖCK
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