

FIBERNOX® V-ROD

GRP reinforcement for corrosion-free and sustainable structures





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We are always there
for you.
We will be wherever you are.



FIBERNOX® V-ROD

GRP-REINFORCEMENT

THE PRODUCT

FIBERNOX® V-ROD is a composite fire material produced by using the pultrusion process. Glass fire strands are impregnated with a synthetic resin and are brought into the desired shape in forming stations. The synthetic resin is cured by applying heat.

The FIBERNOX® V-ROD reinforcement bar behaves as a monolithic material. In addition, the bar surfaces are sanded in order to increase the bonding with the concrete.

FIBERNOX® V-ROD is therefore an interesting alternative to stainless or galvanized reinforcing steel.

FIBERNOX® V-ROD reinforcement bars have been tried and tested worldwide and are successfully employed.

ADVANTAGES

- Corrosion and alkali resistant
- Extended lifetime, in particular in structures exposed to aggressive environmental conditions
- High tensile strength for low weight
- Permeable to magnetic fields and wireless frequencies
- Electrically and thermally insulating
- Dimensionally stable even on high-temperature service
- Good cutability
- High bond stress thanks to coarse sand coating

PRODUCT RANGE

FIBERNOX® V-ROD is available with the following specifications:

- Straight bars: dia. 10, 12, 16, 20, 22, 25, 32 mm
- Bent bars: dia. 10, 12, 16, 20, 25 mm



FIELDS OF APPLICATIONS

GENERAL

Based on the described properties and advantages, FIBERNOX® V-ROD is available for the following reinforced concrete applications, for example:

- FIBERNOX® V-ROD can be used in structural elements exposed to a higher corrosion hazard as a result of carbonation or chlorides – i.e. wherever steel or galvanized steel is used, for example in structural elements which are exposed to deicing or sea salt.
- In structural elements which are exposed to chemical and biological attack, such as in referies or water treatment plants.
- In concrete elements with small cross-sections, where a sufficient concrete cover cannot be achieved for steel, for example in thin curtain panels.

- In concrete elements which have to contain non-conducting reinforcing materials due to electromagnetic impacts.
- In tunnel engineering, where it is necessary to cut the concrete and where a steel reinforcement damages the cutting tools (soft eye).

However, it is not always possible to replace the reinforcing steel by FIBERNOX® V-ROD, because the mechanical properties of the two materials are very different. For example, E-modulus and shear strength are lower, but the tensile strength is higher than that of steel. Nevertheless, the applicabilities of the FIBERNOX® V-ROD reinforced elements are greater than their planning restrictions compared to steel reinforced elements.

APPLICATION EXAMPLES



Montague bridge, Canada



Montague bridge, Canada



Victoria bridge, Canada



Hall's Harbour, Canada

GENERAL

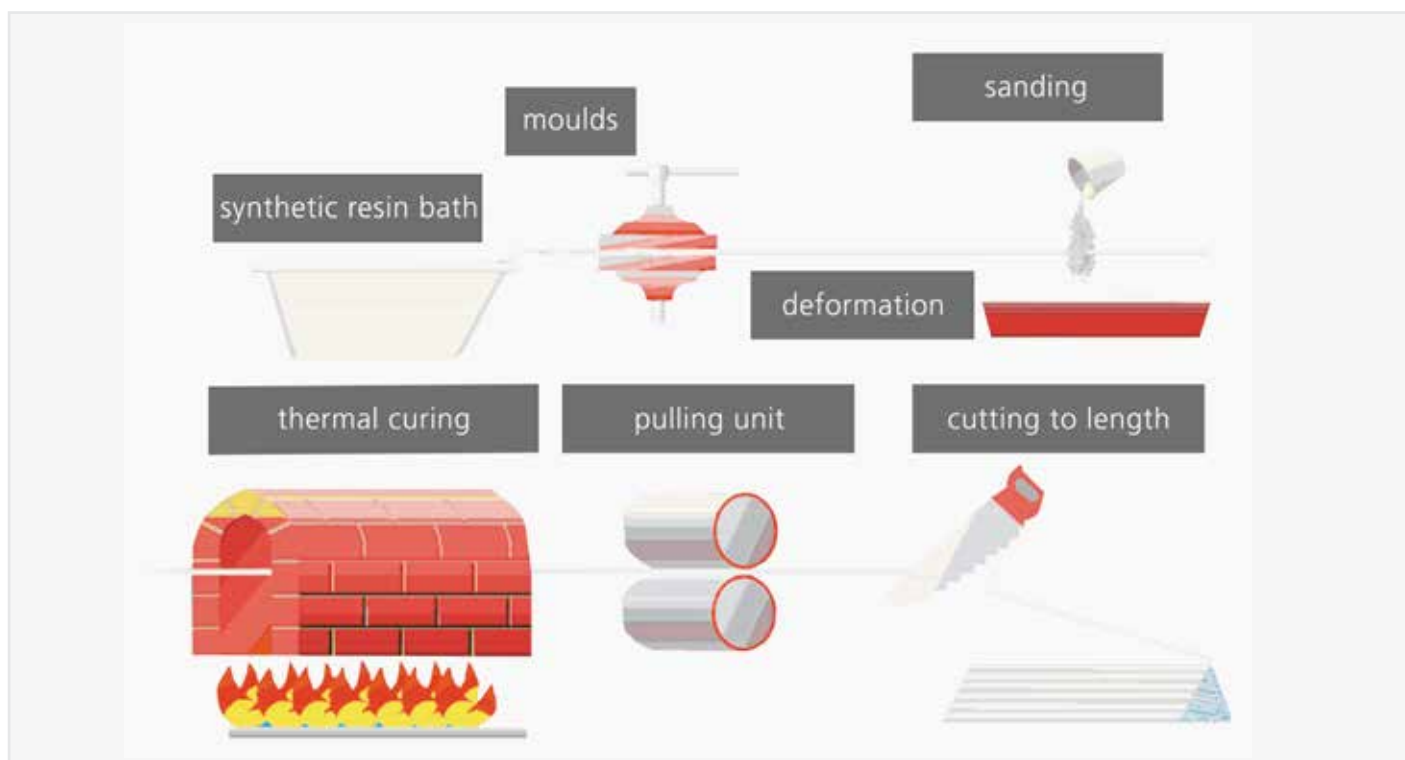
FIBERNOX® V-ROD MANUFACTURER

The Canadian company PULTRALL, established more than 20 years ago, takes a leading position in the production of composite materials. The company is characterised by its dynamism, the high quality of its products and its continuous research of improved materials and production methods. PULTRALL and H-BAU are ISO 9001 certified. FIBERNOX® V-ROD is certified to CAN CSA S807-10 in Canada.

THE PRODUCTION METHOD

The FIBERNOX® V-ROD manufacturing process, known as the pultrusion or extrusion process, is shown schematically below:

First, the glass fibres are pulled through a synthetic resin bath directly from the reel stand and are then formed into the required diameter with the aid of moulds. The surface of the glass fibre bar is then sanded, after which the bar is immediately transferred to the curing furnace. The on-the-fl cutting machine immediately follows the pulling unit. The FIBERNOX® V-ROD glass fibre bars are continuously produced.

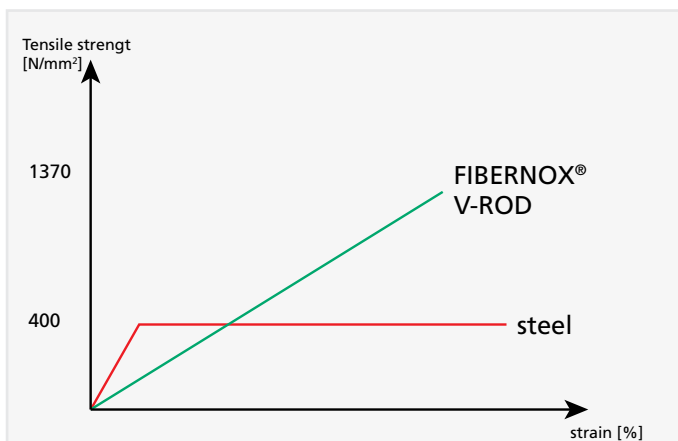


TECHNICAL INFORMATION

SPECIFICATION FIBERNOX® V-ROD HM

Type	HM 3/10	HM 4/12	HM 5/16	HM 6/20	HM 7/22	HM 8/25	HM 10/32
Nominal diameter [mm]	10	12	16	20	22	25	32
Outside diameter [mm]	14.7	15.8	19.2	22.4	26.5	29.3	36.2
Total cross-section (including sanding) [mm ²]	170.0	197.0	291.0	394.0	396.0	674.0	1028.0
Nominal cross-section [mm ²]	71.3	126.7	197.9	285.0	388.0	506.7	791.7
Min. guaranteed tensile strength [N/mm ²]	1372	1312	1184	1105	1059	1000	1093
Nominal E-modulus [1000 N/mm ²]	+65.1 / -2.5	+65.6 / -2.5	+62.6 / -2.5	+64.7 / -2.5	+62.6 / -2.5	+66.4 / -2.5	+65.1 / -2.5
Tensile strength [%]	2.11	2	1.89	1.71	1.69	1.51	1.68
Poisson's ratio μ	0.25	0.26	0.25	0.25	0.26	0.28	0.28
Nominal bending strength [N/mm ²]	1734	1377	1239	1196	1005	1064	1105
Nominal bending module [1000 N/mm ²]	65.5	64.9	63.5	60.2	60	65,4	65.8
Bending strain [%]	2.65	2.12	1.95	1.99	1.68	1.63	1.68
Nominal bond strength (adhesion) [N/mm ²]	14						
Bond coefficient	0.8						
Linear thermal expansion coefficient [°C] · 10 ⁻⁶	6.2						
Lateral thermal expansion coefficient [°C] · 10 ⁻⁶	23.8						
Moisture absorption [%]	0.25	0.38	0.44	0.38	0.21	0.29	0.29
Glass percentage [Vol. %]	65						
Glass percentage [weight %]	83						
Weight [kg/m]	0.243	0.380	0.558	0.811	1.156	1.524	2.488

BEMESSUNG



Stress-strain graph

- Compared to the concrete and stainless steel design stress, FIBERNOX® V-ROD tensile stresses are up to two to three times higher, depending on diameter.
- However, the E-modulus is three times less than that of concrete and stainless steel.
- The thermal conductivity is $\lambda < 0,5 \text{ W/mK}$.

BENDING JIGS

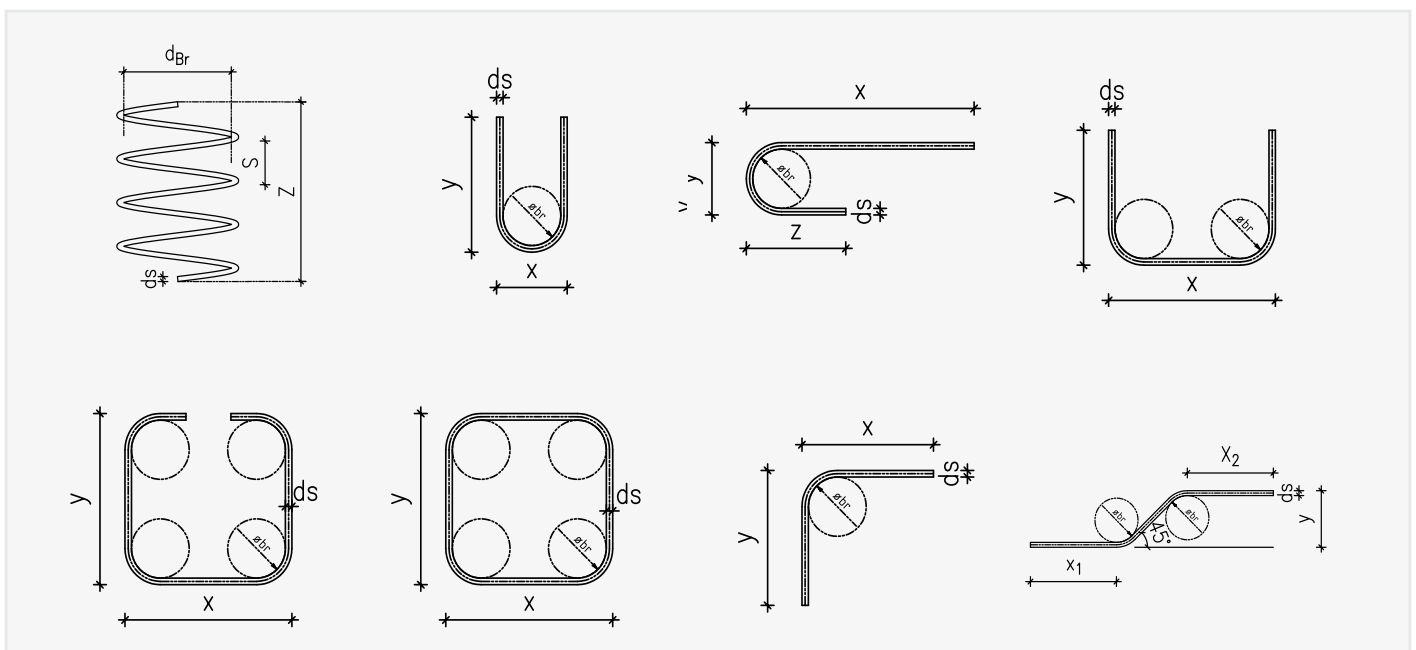
BENDING JIG DESIGN

- The tensile strength of a 90° bend bar is approximately 45% of the tensile strength of a straight bar.
- The bending roller radii are 4 ds for 90° and 180° bending jigs.
- Bending jigs and dimensions must be specified when ordering.

FIBERNOX® V-ROD HM BENT BAR SPECIFICATIONS

Type	B 3/10	B 4/12	B 5/16	B 6/20	B 8/25
Nominal diameter [mm]	10	12	16	20	25
Min. guaranteed tensile strength of the straight bar [N/mm ²]	1029	1052	1051	953	870
Nominal E-modulus [1000 N/mm ²]	50	50	50	50	50
Min. guaranteed tensile strength of the bent bar using ACI test method B5 [N/mm ²]	463	473	473	429	392
Glass percentage [weight %]	77.6	78.8	77.5	76.4	76.1
Weight [kg/m]	0.167	0.292	0.443	0.651	1.136
Nominal cross-section [mm ²]	81.6	155.4	219.6	328.3	582.7
Bending roller radius [mm]	40	48	64	80	102

POSSIBLE BENDING JIG SHAPES



NOTE

A sketch of the required bending jig is necessary for placing an order.

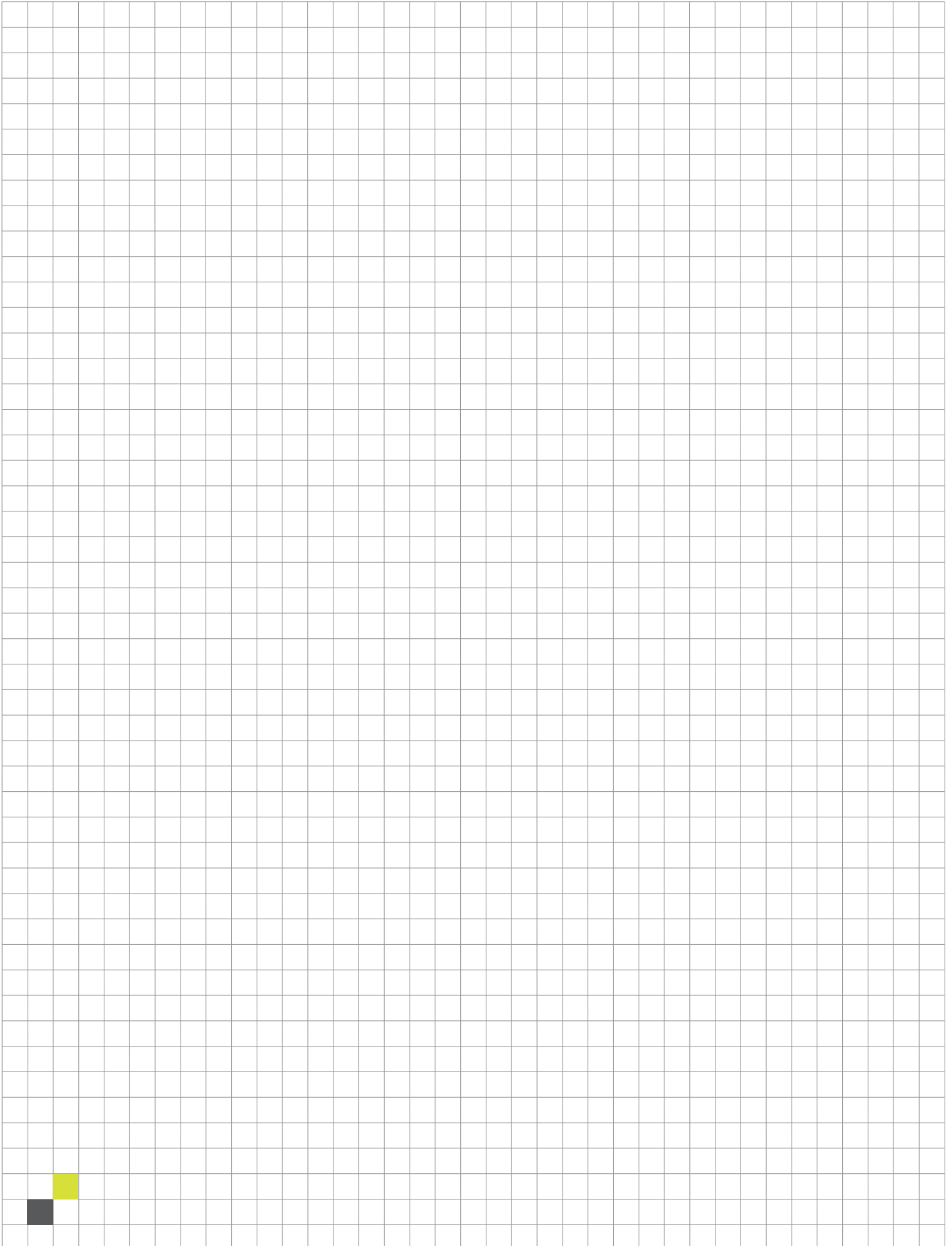
END ANCHOR

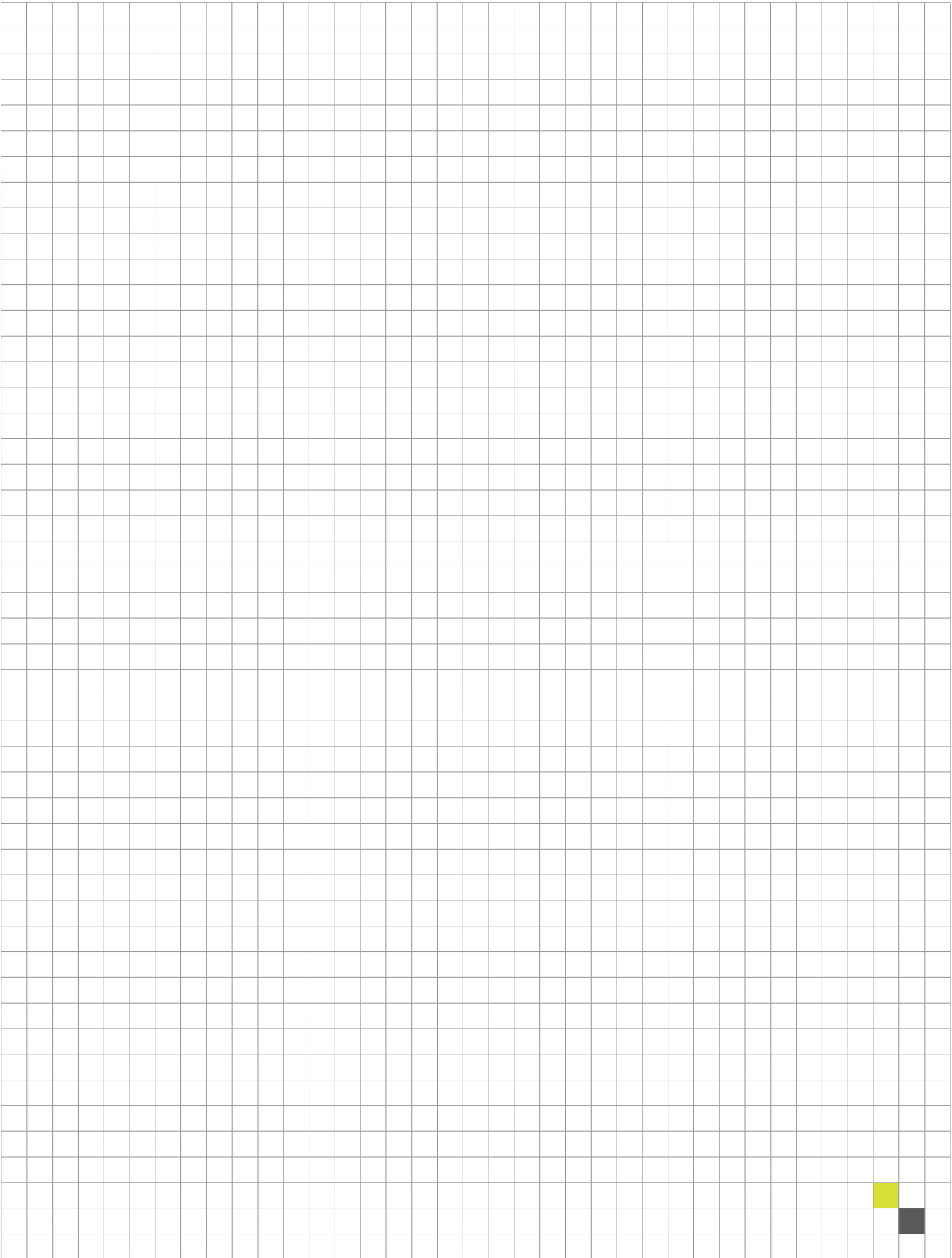
12 to 25 mm diameter FIBERNOX® V-Rod can be provided with additional end anchors.



Type	Diameter [mm]
E 4/12	12
E 5/16	16
E 6/20	20
E 7/22	22
E 8/25	25

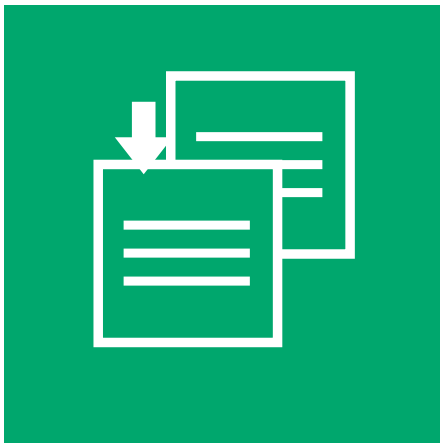
End anchor FIBERNOX® V-ROD





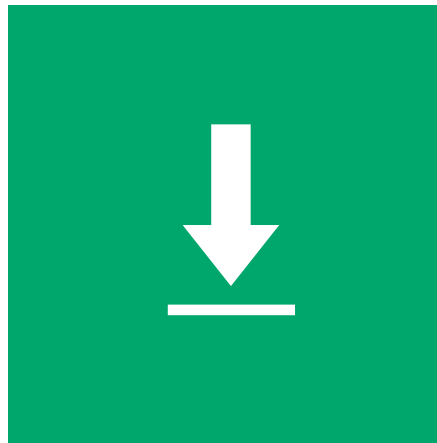
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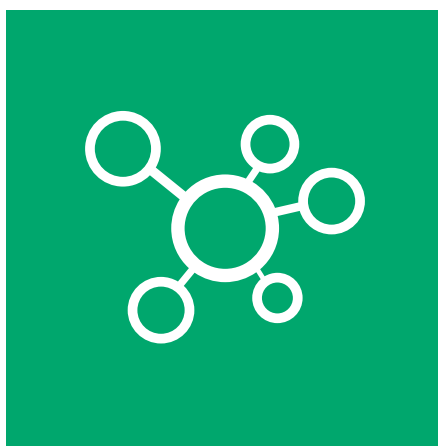
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