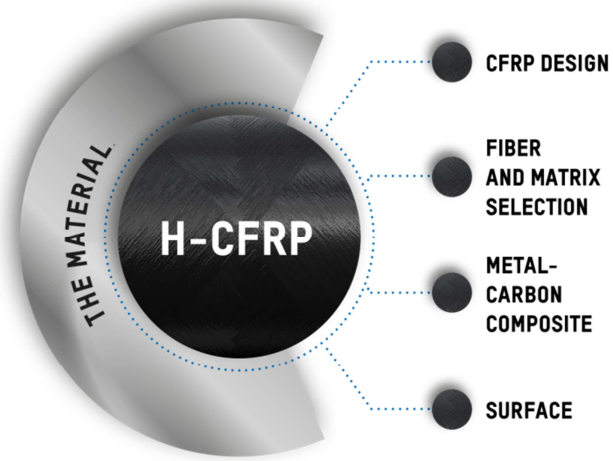
Technical information

H-CFRP rods and tubes

- ✓ Loadable with retracting and extending forces
- ✓ Designable bending stiffness, from low to high
- ✓ Pressure-resistant and liquid-tight
- ✓ H-CFRP surface inside and outside



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1 Use

Developed by Hänchen, H-CFRP is a high load capacity composite made of carbon fiber and other components, refined to form a construction material.

This material is basically different from conventional CFRP due to three points, the variable design of the laminate, the embedment of its metal ends and of its hard, pressure-resistant and liquid-tight surface-sealing. The bond between CFRP and metal in high load capacity components is not adhesive – the materials are solidly embedded.

This applies to components exposed to very high loads, as p.e. for hydraulic cylinders, force-transmitting rods, and conduit pipes.

1.1 Production

Hänchen produces round Carbon-components using a winding process, the so-called filament-winding method. Further developed by Hänchen, this method makes it possible to design carbon-metal components in small batches.

A body specifically designed for your application case is formed out of continuous fibers placed closely together:

- For high load capacity round components.
- With pressure-resistant and liquid-tight H-CFRP surface.
- With high-tensile bond between CFRP and metal.

The force-transmitting element applies to metal-components embedded into the anisotropic Carbon-material directly in this process.

1.2 Advantages

The special design of the components provides the following advantages:

- ✓ H-CRFP is lightweight
- ✓ H-CFRP does not corrode
- ✓ H-CFRP does not expand
- ✓ H-CFRP is non-magnetic
- ✓ H-CFRP is energy-efficient
- ✓ H-CFRP has a high load capacity

2 Carbon rods

H-CFRP rods with threaded metal ends, developed as **force-transmitting rods** for longitudinal forces, are characterized by their high capacity to resist retracting and extending forces. When carbon rods are not exposed to high loads, the solid bond between CFRP and metal is not necessary – an adhesive bond may be sufficient.

The surface of these rods can be simply be realized as a winding surface, or turned to fit for accurate feedthroughs. The special H-CFRP surface provides excellent protection against environmental influences, and allows the rods to be honed.

2.1 Properties

Properties of carbon rods made of H-CFRP:

- High-tensile bond between embedded threaded metal ends and CFRP body.
- Loadable with retracting and extending longitudinal forces.
- High load capacity in three dimensions.
- Designable bending stiffness, from low to high.
- Resistant to mineral oils, Skydrol®, water, basic fluids, and various acids.

2.2 Designs

Appearance	Rod surface	Threaded ends	Special properties
	**H-CFRP surface** special coating honed surface Rz 1	Solidly embedded ends made of heat-treated steel. Available on request: • other materials (aluminium, stainless steel) • adhesive bond for low loads	• pressure-resistant, hard • liquid-tight • fit size exterior • high-tensile bond between CFRP and metal
	**Mechanically machined** without coating turned surface Rz 10*		• fit size exterior • high-tensile bond between CFRP and metal
	**Winding structure** without coating unsmoothed winding surface		• high-tensile bond between CFRP and metal

*Available on request honed Rz 4

2.3 Technical data

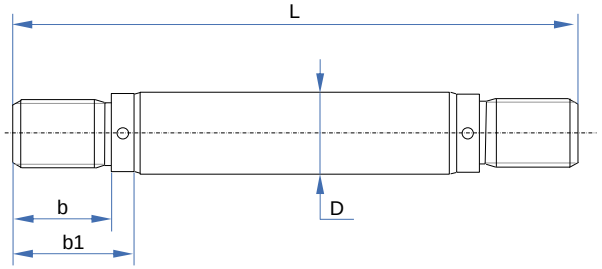

Figure 1: Drawing of carbon rod

D	a	b	b1	F max. retr./ext. [kN]	L min.	L max.	Weight L min [g]	Weight Elongation* [g/100mm]	Order no. H-CFRP surface	Order no. Turned surface	Order no. Winding structure
30	M 28x1,5	30	39	15	400	1,000	890	105	55537174	55537183	55537178
40	M 35x1,5	40	50	26	500	1,500	1,960	219	55537001	55537184	55537179
50	M 45x1,5	50	62	52	500	1,500	3,500	343	55537175	55537185	55537180
63	M 56x2	60	72	75	600	2,000	6,200	462	55537176	55537186	55537181
80	M 72x2	80	92	100	600	2,000	10,700	592	55537177	55537187	55537182

*Only to be added for rods larger than L min.

3 Carbon tubes

Pressure-resistant and liquid-tight **conduit pipes** with H-CFRP surfaces developed for process technology or hydraulic systems are characterized by their high resistance to interior pressure.

The special H-CFRP surface on the inside makes the tubes pressure-resistant and liquid-tight. The H-CFRP surface can be applied to the outside, for example for protection against environmental influences. For carbon tubes which are not used pressurized such an H-CFRP surface is not necessary.

3.1 Properties

Properties of carbon tubes with H-CFRP surface:

- High resistance to interior pressure.
- The mass of a carbon tube is less than 80 % of that of a steel tube.
- The H-CFRP surface is hard and suitable for machining therefore no metallic liners are necessary.
- Resistant to mineral oils, Skydrol®, water, basic fluids, and various acids.
- High concentricity from inside to outside-diameter by honing.

3.2 Designs

Appearance	Tube surface	Special properties
	**H-CFRP surface inside and outside** inside: special coating honed surface quality Rz 1 outside: special coating honed surface Rz 1	• pressure-resistant, hard • liquid-tight • protection against environmental influences • fit size exterior
	**H-CFRP surface inside, winding structure outside** inside: special coating honed surface quality Rz 1 outside: without coating unsmoothed winding surface*	• pressure-resistant, hard • liquid-tight
	**Winding structure inside and outside** inside: without coating smooth surface Rz 10 outside: without coating unsmoothed winding surface*	

*Available on request turned Rz10 or honed Rz 4

3.3 Technical data

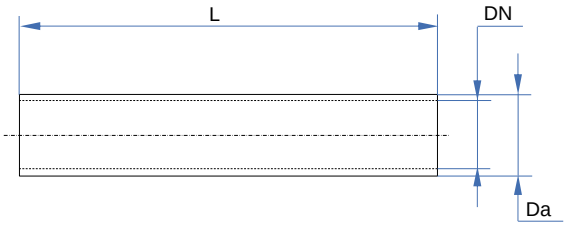

Figure 2: Drawing of carbon tube

DN	Da	p max.* [bar]	p test* [bar]	L max.	Weight [g/100mm]	Order no. H-CFRP surface inside and outside	Order no. H-CFRP surface inside, winding structure outside	Order no. Winding structure inside and outside
20	28	350	500	1,000	49.1	55563367	55537146	55563389
25	32	350	500	1,000	54.0	55563368	55537152	55563391
30	38	350	500	1,200	69.6	55563369	55537153	55539225
40	48	350	500	1,500	90.2	55563370	55537154	55563393
50	58	350	500	2,000	111	55563371	55537155	55563395
60	70	350	500	2,000	177	55563372	55537156	55563397
80	90	350	500	2,000	232	55563373	55537157	55563399
100	112	350	500	2,000	342	55563374	55537158	55563401

*Tubes without H-CFRP surface are not liquid-tight, but have the same tenacity properties.

4 Fittings

Special clip-on fittings, made of heat-treated steel, equipped with a suitable pipe thread and screwed to the floor, can be used for mounting the conduit pipes. Push bars are used for transmitting the axial forces, the sealing element is an elastomer. Carbon pipes for conduits with fittings are used as hydraulic tubes, or in process engineering applications.

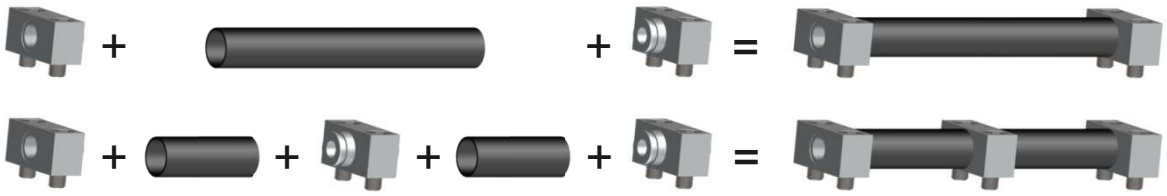

Figure 3: Fittings as connecting elements for carbon tubes

4.1 Technical data

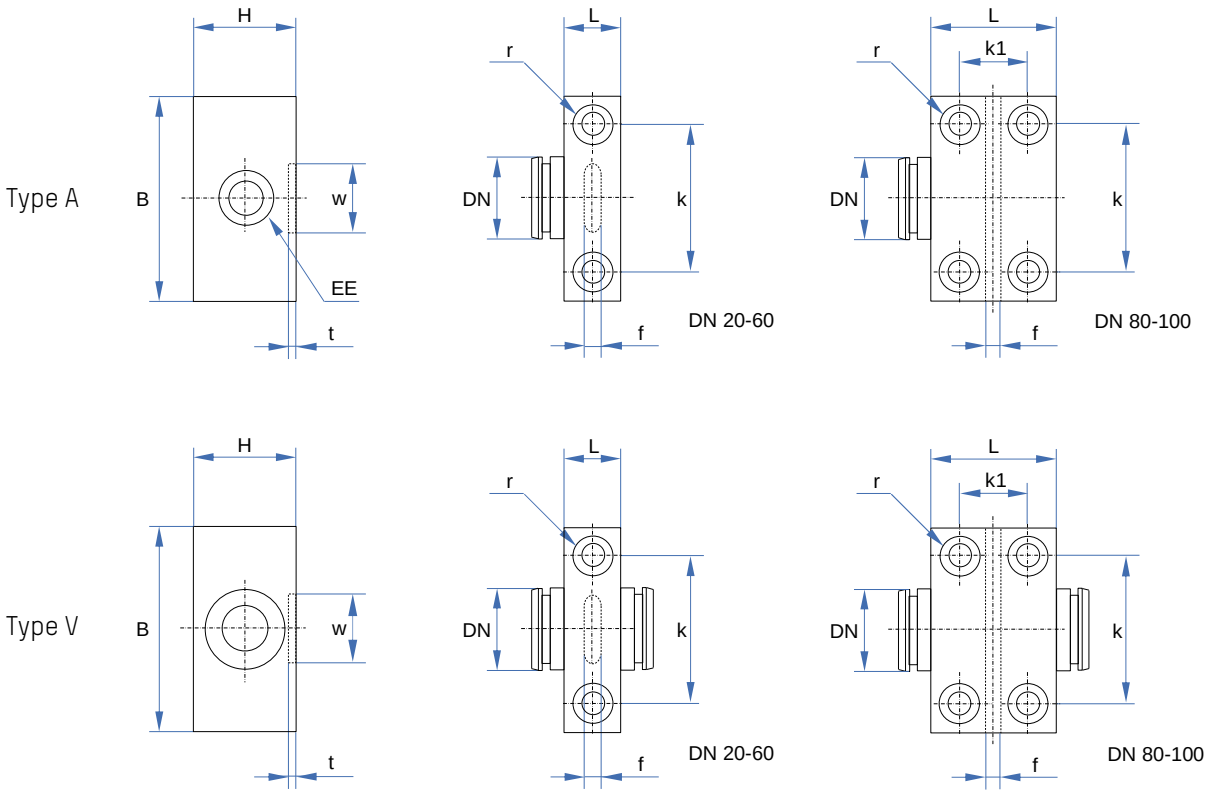

Figure 4: Drawing of fittings

DN	L	B	H	EE	r	k	k1	w	f	t	Weight [g]	Order no. Type A	Order no. Type V
20	25	50	36	G 3/8	für 2x M 8	33	--	20	6	3.5	380	55537094	55537120
25	35	60	45	G 1/2	für 2x M 10	40	--	25	8	4	700	55537095	55537121
30	40	75	55	G 3/4	für 2x M 12	50	--	28	8	4	900	55537096	55537122
40	45	90	60	G 1	für 2x M 16	61	--	40	10	4.5	1,400	55537097	55537123
50	55	110	70	G 1 1/2	für 2x M 16	78	--	40	10	4.5	2,700	55537098	55537124
60	90	190	120	SAE 2	für 2x M 20	145	--	40	14	5	6,200	55537099	55537125
80	100	215	160	SAE 2 1/2	für 4x M 20	175	60	56	16	6	20,000	55537100	55537126
100	120	270	180	SAE 3	für 4x M 24	215	70	63	18	6	33,500	55537101	55537127

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