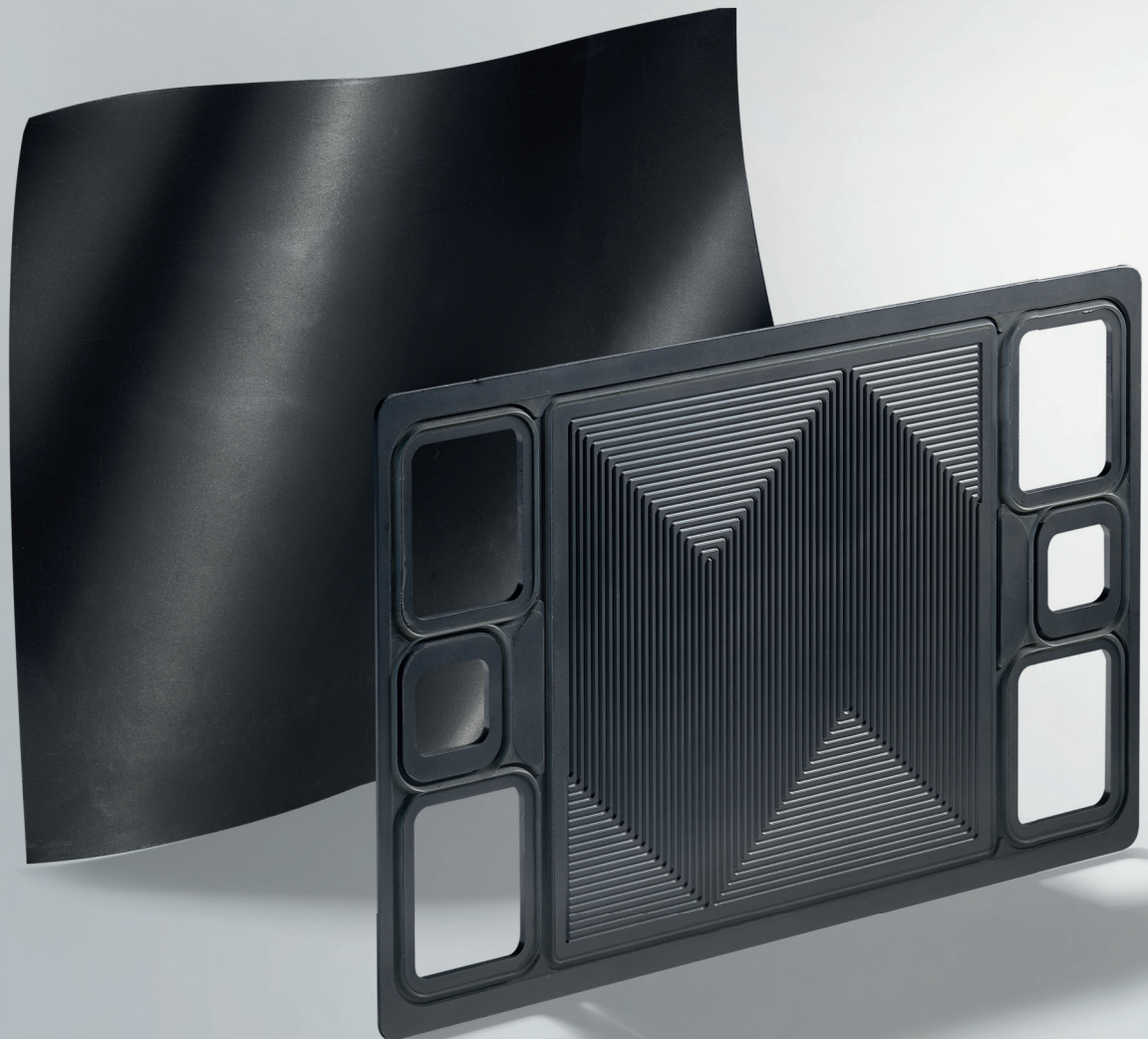




Graphite Bipolar Plates

for fuel cells and redox flow batteries

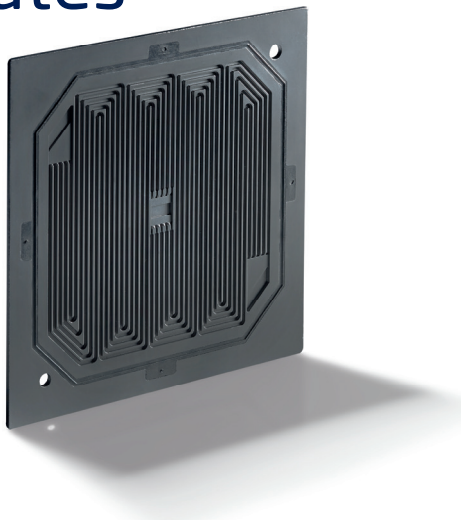


Compression-molded bipolar plates

For PEMFC, DMFC and redox flow batteries

Our graphite bipolar plates for fuel cells are being manufactured especially for the PEMFC* and DMFC** types. Through many years of development work, we have succeeded in transforming the outstanding material properties of our materials into cost-effective production for high volumes. Our compression molded bipolar plates with integrated flow field are first choice for use in mobile and stationary applications, wherever extreme durability, reliability, high cycle stability and power density are required. In addition, our bipolar plates are used in redox flow batteries made by leading manufacturers. We are available as a development partner from the prototype stage to large volume series production. Please contact us if you are interested.

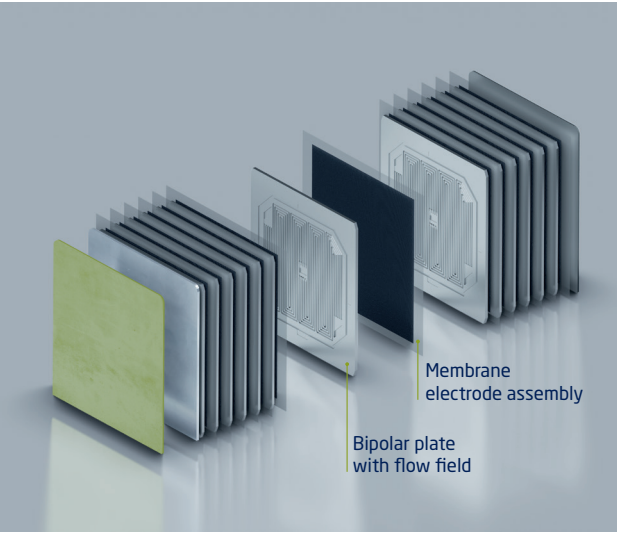
*) PEMFC: Proton Exchange Membrane Fuel Cell;
**) DMFC: Direct Methanol Fuel Cell



Take advantage of these benefits:

- ↪ Excellent corrosion resistance
- ↪ High electrical conductivity
- ↪ Very good mechanical strength
- ↪ Gas tight
- ↪ Customer-specific compound formulations on request
- ↪ Own tool design and own toolmaking shop
- ↪ Prototypes made according to customer requirements from blanks, milled or compression-molded
- ↪ Joining and sealing solutions on request
- ↪ Standard plates for fast material qualification
- ↪ Complete value creation at Schunk from the raw material to the finished product

Material SP4369		
Bulk density	(g/cm³)	1.90
Flexural strength	(MPa)	40
Compressive strength	(MPa)	50
Modulus of elasticity		
Dynamic	(GPa)	24
Static		10
Rockwell hardness HR10/40		100
Thermal conductivity	(W/mK)	55
coefficient of thermal expansion	(10 ⁻⁶ /K)	
α 68-284 °F		15
x y in plane		38
z through plane		
Specific electric resistance	(μΩm)	
x y in plane		90
z through plane		190
Heat deflection temperature	(°C / °F)	190 °C / 374 °F

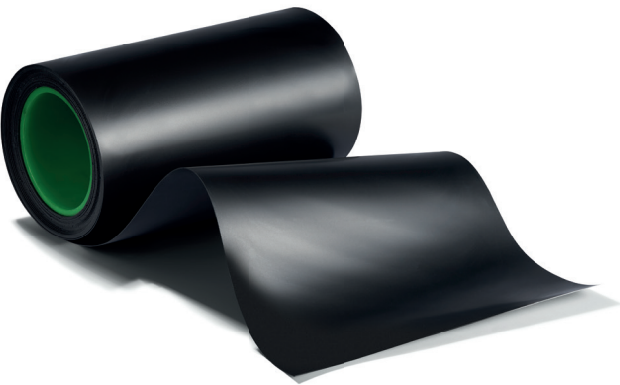
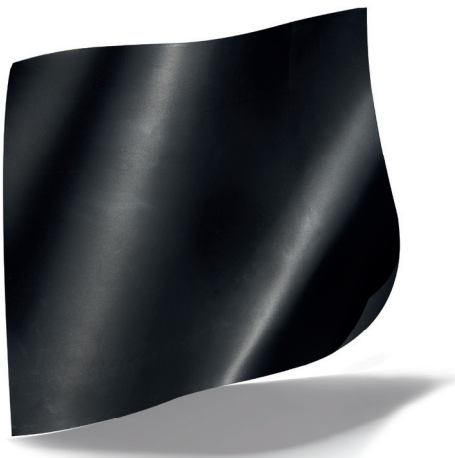


Extruded bipolar plates

For redox flow batteries and for manufacturing flexible electrodes

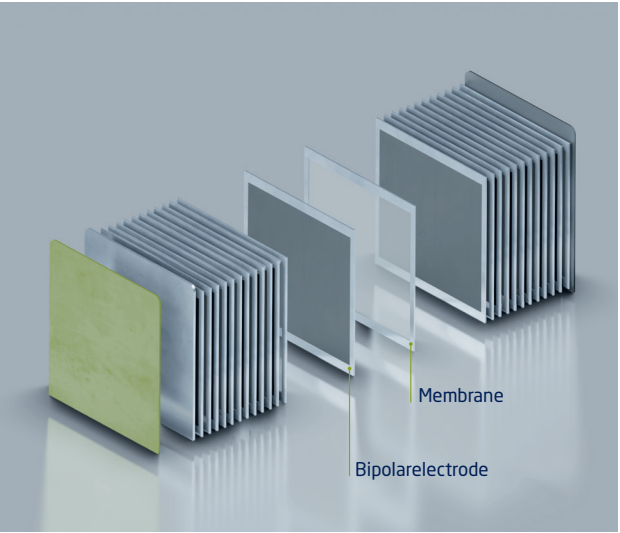
Our extruded foils with a high graphite filling ratio are being developed especially for use as bipolar plates in redox flow batteries. The manufacturing process uses the continuous extrusion method, making cost advantages possible while maintaining tight thickness tolerances.

Another advantage of the thermoplastic material is that the flexible bipolar plate can be welded directly to the frame of the battery stack. This replaces conventional seal solutions and ensures an extremely compact design. We can precisely fine-tune the electrical, mechanical and thermal properties by optimizing our formulations.



Take advantage of these benefits:

- ↪ Cost advantages due to inline production of thin films
- ↪ Can be welded to thermoplastic frame without seals
- ↪ Good mechanical strength
- ↪ High corrosion resistance
- ↪ Gas tight
- ↪ Complete value creation at Schunk from the raw material to the finished product
- ↪ Customer-specific consultation and production from prototypes to large volume series
- ↪ Additional value creation steps on request (compression-molded structuring & coating)



Material SP10165		
Bulk density	(g/cm³)	1.62
Tensile strength	(MPa)	5
Strain to failure	(%)	5
Specific electric resistance through plane***	(μΩm)	7,500
Maximum operating temperature	(°C / °F)	50 °C / 120 °F

*** Our experience has shown that for thin bipolar plates, losses caused by the volume resistance are negligible compared to contact and transition resistances in the battery cell.

We have decades of experience in the production of graphite bipolar plates

- ↪ Use in mobile and stationary applications
- ↪ More than 800,000 bipolar plates produced in different applications
- ↪ Own compound production and continuous further development of the materials
- ↪ Benchmark in the industry and with many research institutes

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Schunk is the world leader in the development, production, and application of carbon, ceramic, quartz and sinter metals solutions. Like no other, Schunk combines innovative strength and technological know-how with an extraordinary service orientation to supply a range of performances unique to the market. Schunk is a partner who offers you all the technological possibilities of a globally active company and can implement your ideas pragmatically and tailor-made to your requirements - whether these are for industrial large-volume markets or highly specialized niche markets.

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Empowering, idea-driven, collaborative - this is how the Schunk Group has made a name for itself as a globally-active technology group since 1913. Empowering, because we build bridges for our customers to help them develop better products and conquer new markets with innovative technologies. Idea-driven, because innovations are a significant aspect of our company culture. Collaborative, because every employee of the Schunk Group is focused on the customer.

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