

List of stack component suppliers

VDMA

06.02.2021

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Chapter 1

Introduction

1.1 VDMA

The German Mechanical Engineering Industry Association (VDMA) represents around 3300 companies in the mechanical and plant engineering sector. The Fuel Cell Working Group supports around 70 leading manufacturers and suppliers of fuel cells in the expansion of the industrial network and in the political representation of interests. To this end, technical solutions for the optimization and cost reduction of fuel cell systems and components as well as for the establishment of series production are being developed in project groups.

1.2 Disclaimer

The contents of this supplier directory have been carefully researched and compiled. VDMA accepts no responsibility for the correctness and completeness of the information or for any changes that may occur in the meantime.

Chapter 2

BPP

2.1 Metallic BPP supplier

2.1.1 Borit NV

Company Name: Borit NV
Address: Lammerdries 18e
2440 Geel
Belgium
Telephone number: +32 491 90 46 60
Email: hendrik.geysen@borit.be
Website: www.borit.be
Responsible Person: Hendrik Geysen

Borit NV is an enterprise specialized in the industrial manufacturing of metal plates and assemblies for fuel cells and electrolyzers. Since 2010, technologies like Hydrogate™ forming, laser-cutting, laser-welding and many others have been developed in house in order to establish leading manufacturing processes for metal bipolar plates. We support customers from the early design phase over prototyping to series production. For this we use different technologies and capabilities throughout the ramp-up in order to offer the optimal balance between development flexibility, cost and time-to-market. Borit' array of technologies enables fast product development cycles combined with unique cost advantages. This to satisfy at best the customer needs and contribute to the green energy industry.

We offer the following:

- Metallic BPP

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer seal on BPP.

The maximum we can offer is: Current capacity: +2.5 mio PCS/yr, investments to increase largely ongoing.

Our minimum order is: Small orders possible (<100) , significant investments are however required.

2.1.2 Dana Incorporated - REINZ-Dichtungs-GmbH

Company Name: Dana Incorporated - REINZ-Dichtungs-GmbH
Adress: Reinzstrasse 3-7
89233 Neu-Ulm
Germany
Telephone number: +49 (0)731 7046 668
Email: robert.blersch@dana.com
Website: www.reinz.com/www.dana.com
Responsible Person: Robert Blersch

Dana is a world leader in providing power-conveyance and energy-management solutions that are engineered to improve the efficiency, performance, and sustainability of light vehicles, commercial vehicles, and off-highway equipment. Enabling the propulsion of conventional, hybrid, and electric-powered vehicles, Dana equips its customers with critical drive and motion systems; electrodynamic technologies; and thermal, sealing, and digital solutions.

Moreover, Dana is one of the pioneers in the research and development of fuel cell technology. Original equipment manufacturers around the world are already using Dana's bipolar plates in fuel-cell technology as an energy source or range extender in mobile applications.

We offer the following:

- Metallic BPP

We offer products for the following fuel cell types: LT-PEM. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer seal on BPP.

The maximum we can offer is: approx. 200x400.

Our minimum order is: 500 Parts.

2.2 Graphite based BPP supplier

2.2.1 Centroplast Engineering Plastics GmbH

Company Name: Centroplast Engineering Plastics GmbH
Address: Unterm Ohmberg 1
34431 Marsberg
Germany
Telephone number: +49 2992 9704 716 +49 171 2969621
Email: matthias.schlesies@centroplast.de
Website: www.centroplast.de
Responsible Person: Matthias Schlesies

- Main competence is extrusion of engineering plastics, machining and assembly
- development and production of compounds inhouse
- extrusion process of BPP for applications in Redox Flow Batteries established
- series production of BPP will start middle of 2021
- entire process chain is established: compounding, extrusion, machining, testing
- sub-assemblies, functional-integration possible on request
- cooperation with several institutes
- projects for production of NTPEM and HTPEM applications will be launched 2021
- project partners are welcome

We offer the following:

- BPP made of compound
- Compounds for making BPP

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our products are used in the following applications:

- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer seal on BPP.

The maximum we can offer is: Length3000mm X Width1200mm X Thickness8mm.

Our minimum order is: 1.

2.2.2 Eisenhuth GmbH & Co. KG

Company Name: Eisenhuth GmbH & Co. KG
Address: Friedrich-Ebert-Str. 203
37520 Osterode am Herz
Germany
Telephone number: +49 5522 90670
Email: info@eisenhuth.de
Website: www.eisenhuth.de
Responsible Person: Dr. Thorsten Hickmann

Eisenhuth is an innovative company that skilfully combines tradition with modernity. It has 3 core competences: Mould making, series production for thermoplastics, rubber, silicones and Fuel cell components. Eisenhuth is at the moment one large manufacturer of graphitic bipolar plates and Fuel cell gaskets in Europe. These products are not only distributed in Europe, but all over the world. Moreover, the company produces Components for Electrolyzers on alkaline and PEM-Basis

The products are suitable for LT PEM, HT PEM and Methanol Fuel cells.

The company has also extended facilities for testing and analysis. AND some test benches for fuel cells.

We offer the following:

- BPP made of compound
- BPP made of graphite
- Compounds for making BPP

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer seal on BPP.

The maximum we can offer is: 500x1500.

Our minimum order is: 1.

2.2.3 Ensinger GmbH

Company Name: Ensinger GmbH
Adress: Rudolf-Diesel-Strasse 8
71154 Nufringen
Germany
Telephone number: +49 7032 819 0
Email: info.de@ensingerplastics.com
Website: <https://www.ensingerplastics.com/de-de/ueber-uns>
Responsible Person: Mr. Joachim Reidenbach - Joachim.Reidenbach@ensingerplastics.com, Tel.:
+49 7032 819 238

The Ensinger Group is engaged in the development, manufacturing and sale of compounds, semi-finished materials, composites, technical parts and profiles made of engineering and high-performance plastics. Further development of proven production techniques, new applications and international expansion have earned this family-owned enterprise a place among the leaders in its field.

We have more than 10 years experience in the development and production of fuel cell material. With the Brand Name TECACOMP HTE we are able to sale PP and PPS Compounds. Depending on the polymer used, the degree of filling and the targeted component size, the formulas are suitable either for processing by injection moulding or compression moulding.

We offer the following:

- Compounds for making BPP

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

The maximum we can offer is: until 1000 Tonnen Compound .

Our minimum order is: 25 Kg Compound.

2.2.4 Schunk Kohlenstofftechnik GmbH

Company Name: Schunk Kohlenstofftechnik GmbH
Address: Rodheimer Straße 59
35452 Heuchelheim
Germany
Telephone number: +49 641 608 2308
Email: bipolarplates@schunk-group.com
Website: <https://www.schunk-carbontechnology.com/en/products/produkte-detail/bipolar-plates><https://www.schunk-carbontechnology.com/fileadmin/Redakteur/Mediathek/Broschueren/SchunkCarbonTechnology/HighTemperature/Schunk-Bipolarplatten-EN.pdf>
Responsible Person: Jens Völlner

Our graphite bipolar plates for fuel cells are being manufactured especially for the PEMFC and DMFC types. Through many years of development work (start in 1996), 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.

- 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

We offer the following:

- BPP made of compound
- On request

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer seal on BPP.

The maximum we can offer is: up to 600 x 415 mm blank plates (various thicknesses) other dim. on request.

Our minimum order is: On request (dependend on geometry & fabrication technique).

2.2.5 SGL Carbon GmbH

Company Name: SGL Carbon GmbH
Address: Werner von Siemensstrasse 18
86405 MEITINGEN
Germany
Telephone number: +49 8271 3360
Email: fuelcellcomponents@sglcarbon.com
Website: www.sglcarbon.com
Responsible Person: Nico Haak

SGL CARBON is active in the field of fuel cell components (bipolar plates and GDLs) since 1996. SGL introduced the first fully-treated GDL roll-to-roll material in 1999. Today Sigracet (R) GDLs are successfully used in various fields ranging from mobility & maritime applications, stationary fuel cells for CHP and UPS, HT-PEMFCs and electrolyzers. For BPP manufacturing SGL can offer graphite compounds as well as expanded graphite foils and screen printing technology.

We offer the following:

- BPP made of compound
- BPP made of graphite
- Compounds for making BPP
- screen printing

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

2.3 Other suppliers for BPP

Chapter 3

Catalyst suppliers

3.1 Catalyst suppliers

3.1.1 Heraeus Deutschland GmbH & Co. KG

Company Name: Heraeus Deutschland GmbH & Co. KG
Address: Heraeusstraß 12-14 63450 Hanau Germany
Telephone number: +49 6181 35-4232
Email: youn-chong.choi@heraeus.com
Website: www.heraeus.com
Responsible Person: Youn-Chong Choi

Heraeus has been committed to precious metals for more than 160 years, specializing in chemical process catalysts and offering a comprehensive line of homogeneous and heterogeneous catalysts. Utilizing our profound expertise in precious metal catalysts we are providing electrocatalysts for PEM electrolyzers and PEM fuel cells. We develop materials for various applications and needs. Our materials are tested on cell level internally. Additionally, we offer our service in precious metals price management as well in the recycling of the precious metals waste.

We offer the following types of materials:

- Platinum on carbon
- Binary platinum-alloy on carbon
- Oxygen evolution reaction catalysts as additive for anode electrodes

3.2 Other suppliers for catalysts

3.2.1 Heraeus Battery Technology GmbH

Company Name: Heraeus Battery Technology GmbH
Address: Heraeusstr. 12 - 14
63450 Hanau
Germany
Telephone number:
Email: porocarb@heraeus.com
Website: <http://www.heraeus-porocarb.com/>
Responsible Person: Michael Grimm

Heraeus Battery Technology GmbH has developed a porous carbon additive platform called Porocarb[®]. Our synthetic conductive carbon additives address various energy storage systems, in particular Lithium-Ion Batteries and Fuel Cells. Until now, the design of these systems was limited by the available conductive carbon material options. Imagine a functional carbon material that is designed to exactly fit the application: This is exactly where Porocarb[®] comes into play. The structural properties of the Porocarb[®] can be adjusted to the specific application requirements. Properties which can be influenced include electrical and thermal conductivity. Moreover, the carbon skeleton has high mechanical and chemical resistance.

We offer the following types of materials:

- Porocarb[®] is a synthetic porous carbon additive, which can serve as a catalyst support material and conductive additive.

Chapter 4

GDL

4.1 GDL supplier

4.1.1 Freudenberg Performance Materials SE & Co. KG

Company Name: Freudenberg Performance Materials SE & Co. KG
Address: Hoehnerweg 2-4
69469 Weinheim
Germany
Telephone number: +49 6201 80 3382
Email: fuelcell@freudenberg-pm.com / info@freudenberg-pm.de
Website: www.freudenberg-pm.com
Responsible Person: Dr. Volker Banhardt

Freudenberg Performance Materials (FPM) is one of the world's leading manufacturers of high-quality performance technical fabrics, nonwovens and textiles. Our solutions are used in many industry s and technical markets. Core competencies include high-performance nonwovens, fibers, spund-bound textiles, composites and technical textiles. These performance textiles, fabrics and nonwovens can be found in automotive, construction, clothing, energy, fuel cells, hygiene, interior design, medical, footwear, leather goods and other specialized applications.

FPM is the industry-leading developer of technical textiles, modern materials, nonwoven solutions and production processes. Together with international customers, Freudenberg manufactures with diverse teams on tailor-made solutions.

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our materials are available as role and sheet. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer the following types of GDL:

- Without MPL
- With MPL
- with and without hydrophobic treatment, customized MPL coating, lab or production material

The maxium size we offer is: max roll length about 1000lm, max roll width 1000mm.

Our minimum order is: 250 Euro is minimum order volume.

We offer costumized sizes.

4.1.2 SGL Carbon GmbH

Company Name: SGL Carbon GmbH
Address: Werner von Siemensstrasse 18
86405 MEITINGEN
Germany
Telephone number: +49 8271 83 3360
Email: fuelcellcomponents@sglcarbon.com
Website: www.sglcarbon.com
Responsible Person: Nico Haak

SGL CARBON is active in the field of fuel cell components (bipolar plates and GDLs) since 1996. SGL introduced the first fully-treated GDL roll-to-roll material in 1999. Today SIGRACET (R) GDLs are successfully used in various fields ranging from mobility & maritime applications, stationary fuel cells for CHP and UPS, HT-PEMFCs and electrolyzers.

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. Our materials are available as role. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer the following types of GDL:

- Carbon fibre paper
- With MPL

The maximum size we offer is: Roll width 480mm and 710mm.

Our minimum order is: 1500 EUR.

Chapter 5

MEA

5.1 MEA supplier

5.1.1 BASF New Business GmbH

Company Name: BASF New Business GmbH
Address: Benckiserplatz 1
67059 Ludwigshafen
Germany
Telephone number: +49 621 60 47866
Email: carsten.henschel@basf.com
Website: https://www.basf.com/de/en/company/about-us/companies/BASF_New-Business-GmbH/our-solutions.html
Responsible Person: Carsten Henschel

BASF New Business commercializes the Celtec products for more than 15 years. BASF has established a knowledge and production network with licensees, toll manufacturers and scientific partners. This MEA operates at temperatures between 120 and 180 °C, tolerating high concentrations of carbon monoxide and being able to run independently of humidification. This technology allows fuel cell systems to be simpler and more cost effective.

Membrane: Polybenzimidazole and phosphoric acid.

7-layer MEA: Membrane, GDE with Pt and Pt/Ni catalysts, internal sealing.

BASF offers cost effective standard MEA designs as well as tailored, customized MEAs.

- Celtec®-P MEA 45 cm²
- Celtec®-P MEA 165 cm²
- Celtec®-P MEA 300 cm²
- Celtec®-P MEA 605 cm²

We offer products for the following fuel cell types: HT-PEM. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer the following types of materials:

- 7-Layer MEA (CCM + GDL + Subgasket)
- 7-Layer + Sealing

The maximum size we offer is: Active area of 1100 cm².

Our minimum order is: 10 MEA.

Chapter 6

Membrane

6.1 Membrane supplier

6.1.1 BASF New Business GmbH

Company Name: BASF New Business GmbH
Address: Benckiserplatz 1
67059 Ludwigshafen
Germany
Telephone number: +49 621 60 47866
Email: carsten.henschel@basf.com
Website: https://www.basf.com/de/en/company/about-us/companies/BASF_New-Business-GmbH/our-solutions.html
Responsible Person: Carsten Henschel

BASF New Business commercializes the Celtec products for more than 15 years. BASF has established a knowledge and production network with licensees, toll manufacturers and scientific partners. This MEA operates at temperatures between 120 and 180 °C, tolerating high concentrations of carbon monoxide and being able to run independently of humidification. This technology allows fuel cell systems to be simpler and more cost effective.

The Celtec membrane consists of Polybenzimidazole and phosphoric acid.

The membrane is produced by a sol-gel process.

The customer receives the product with a Certificate of Analysis.

We offer products for the following fuel cell types: HT-PEM. Our materials are available as role and sheet. Our products are used in the following applications:

- Automotive
- Heavy Duty
- Material Handling
- Portable
- Stationary

We offer the following types of materials:

- Non-Reinforced
- PBI based

Our minimum membrane thickness is 350. Our maximum membrane thickness is 450. The maximum size we offer is: Roll width 31 cm, length appr. 70 m (appr. 20 m²).

Our minimum order is: One roll (appr. 20 m²) - 10 Sheets (DinA4) for testing.

Chapter 7

Sealing

7.1 Sealing supplier

7.1.1 Eisenhuth GmbH & Co. KG

Company Name: Eisenhuth GmbH & Co. KG
Address: Friedrich-Ebert-Str. 203
37520 Osterode am Herz
Germany
Telephone number: +49 5522 90670
Email: info@eisenhuth.de
Website: www.eisenhuth.de
Responsible Person: Dr. Thorsten Hickmann

Eisenhuth is an innovative company that skilfully combines tradition with modernity. It has 3 core competences: Mould making, series production for thermoplastics, rubber, silicones and Fuel cell components. Eisenhuth is at the moment one large manufacturer of graphitic bipolar plates and Fuel cell gaskets in Europe. These products are not only distributed in Europe, but all over the world. Moreover, the company produces Components for Electrolyzers on alkaline and PEM-Basis

The products are suitable for LT PEM, HT PEM and Methanol Fuel cells.

The company has also extended facilities for testing and analysis. AND some test benches for fuel cells.

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. We offer products made of the following materials:

- Silicon
- FKM
- FFKM
- EPDM
- NBR / HNBR / SBR etc.

We offer the following types of products:

- Plate
- Ready seal
- Seal on BPP
- Seal on GDL
- Seal on MEA / CCM

We offer customer geometry.

The maximum size we offer is: 500 x500.

Our minimum order is: 1.

7.1.2 Freudenberg FST GmbH

Company Name: Freudenberg FST GmbH
Adress: Hoehnerweg 2-4
69469 Weinheim
Germany
Telephone number: +49 (0) 6201 80-66 66
Email: info@fst.com
Website: www.fst.com
Responsible Person: Jürgen Emig - Division Gaskets

The Freudenberg Group is already since early 2000 active in the segment Fuel Cells and this with a wide range of products. This starts with GDLs, filters, humidifier and of course various sealing solutions.

With regards to sealing solutions is Freudenberg FST offering material, design and manufacturing competence combined with a global footprint.

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. We offer products made of the following materials:

- Silicon
- FKM
- FFKM
- EPDM
- FCPO (Fuel Cell Polyolefin)

We offer the following types of products:

- Ready seal
- Seal on BPP
- Seal on GDL
- Seal on MEA / CCM

We offer costumer geometry.

The maxium size we offer is: to be defined and agreed on customer requirements and business potential.

Our minimum order is: subject of product type (standard or customized).

7.1.3 RAMPF Polymer Solutions GmbH & Co. KG

Company Name: RAMPF Polymer Solutions GmbH & Co. KG
Adress: Robert-Bosch-Str. 8-10
72661 Grafenberg
Germany
Telephone number: +49 7123 9342 1718
Email: sebastian.kaercher@rampf-group.com
Website: www.rampf-group.com
Responsible Person: Sebastian Kärcher

RAMPF Polymer Solutions is a leading developer and manufacturer of reactive resin systems based on polyurethane, epoxy, and silicone. The product portfolio includes liquid and thixotropic sealing systems, electro and engineering casting resins, edge and filter casting resins, adhesive systems, and hotmelt adhesives.

We offer products for the following fuel cell types: LT-PEM and DMFC. We offer products made of the following materials:

- Silicon

We offer the following types of products:

- Raw material, e.g. for dispensing

We offer customer geometry.

The maximum size we offer is: Available in different viscosities for different gasket dimensions. .

Our minimum order is: 500 kg per Component (2C-System).

7.2 Other suppliers for sealings

7.2.1 RAMPF Production Systems GmbH & Co. KG

Company Name: RAMPF Production Systems GmbH & Co. KG
Adress: Römerallee 14
78658 Zimmern o.R.
Germany
Telephone number: +49 741 2902 0
Email: alexander.huttenlocher@rampf-group.com
Website: www.rampf-group.com
Responsible Person: Alexander Huttenlocher

RAMPF Production Systems is a leading manufacturer of dosing and mixing machines for reactive resins based on polyurethane, epoxy and silicone.

In the field of Fuel Cell production we offer automated systems to apply sealings and/or adhesives on GDL including quality control, testing, assembling due to customer requirements.

Testing in our lab is offered in an early stage for sample production up to smaller series.

We offer products for the following fuel cell types: LT-PEM, HT-PEM and DMFC. We offer products made of the following materials:

- Mixing- and dosing equipment to apply the sealing material

We offer costumer geometry.

The maxium size we offer is: no limitation.

Our minimum order is: 1.

Chapter 8

Appendix

8.1 BPP business

Supplier	Application					Usage			Material				
	<i>Automotive</i>	<i>Heavy Duty</i>	<i>Material Handling</i>	<i>Portable</i>	<i>Stationary</i>	<i>LT-PEM</i>	<i>HT-PEM</i>	<i>DMFC</i>	<i>Metallic BPP</i>	<i>BPP made of compound</i>	<i>BPP made of graphite</i>	<i>Compounds for making BPP</i>	<i>Others</i>
2.1.1 Borit NV	X	X	X	X	X	X	X	X	X	-	-	-	-
2.2.1 Centroplast Engineering Plastics GmbH	-	X	X	X	X	X	X	X	-	X	-	X	-
2.1.2 Dana Incorporated - REINZ-Dichtungs-GmbH	X	X	X	X	X	X	-	-	X	-	-	-	-
2.2.2 Eisenhuth GmbH & Co. KG	X	X	X	X	X	X	X	X	-	X	X	X	-
2.2.3 Ensinger GmbH	X	X	X	X	X	X	X	X	-	-	-	X	-
2.2.5 SGL Carbon GmbH	X	X	X	X	X	X	X	X	-	X	X	X	X
2.2.4 Schunk Kohlenstofftechnik GmbH	X	X	X	X	X	X	X	X	-	X	-	-	X

8.2 Catalyst business

Supplier	Application					Usage			Material				
	<i>Automotive</i>	<i>Heavy Duty</i>	<i>Material Handling</i>	<i>Portable</i>	<i>Stationary</i>	<i>LT-PEM</i>	<i>HT-PEM</i>	<i>DMFC</i>	<i>Platinum on carbon</i>	<i>Binary platinum-alloy on carbon</i>	<i>Ternary platinum-alloy on carbon</i>	<i>Non-precious metal catalyst</i>	<i>Others</i>
3.2.1 Heraeus Battery Technology GmbH	-	-	-	-	-	-	-	-	-	-	-	-	X
3.1.1 Heraeus Deutschland GmbH & Co. KG	-	-	-	-	-	-	-	-	X	X	-	-	X

8.3 GDL business

Supplier	Application					Usage			Material					
	<i>Automotive</i>	<i>Heavy Duty</i>	<i>Material Handling</i>	<i>Portable</i>	<i>Stationary</i>	<i>LT-PEM</i>	<i>HT-PEM</i>	<i>DMFC</i>	<i>Carbon fibre paper</i>	<i>Dry laid paper</i>	<i>Carbon cloth</i>	<i>Without MPL</i>	<i>With MPL</i>	<i>Others</i>
4.1.1 Freudenberg Performance Materials SE & Co. KG	X	X	X	X	X	X	X	X	-	-	-	X	X	X
4.1.2 SGL Carbon GmbH	X	X	X	X	X	X	X	X	X	-	-	-	X	-

8.4 MEA business

Supplier	Application					Usage			Material				
	<i>Automotive</i>	<i>Heavy Duty</i>	<i>Material Handling</i>	<i>Portable</i>	<i>Stationary</i>	<i>LT-PEM</i>	<i>HT-PEM</i>	<i>DMFC</i>	<i>3-Layer MEA (CCM)</i>	<i>5-Layer MEA (CCM + GDL/MPL)</i>	<i>7-Layer MEA (CCM + GDL + Subgasket)</i>	<i>7-Layer + Sealing</i>	
5.1.1 BASF New Business GmbH	X	X	X	X	X	-	X	-	-	-	X	X	

8.5 Membrane business

Supplier	Application					Usage			Material						
	<i>Automotive</i>	<i>Heavy Duty</i>	<i>Material Handling</i>	<i>Portable</i>	<i>Stationary</i>	<i>LT-PEM</i>	<i>HT-PEM</i>	<i>DMFC</i>	<i>Reinforced</i>	<i>Non-Reinforced</i>	<i>Chemically stabilized</i>	<i>Nafion based</i>	<i>Hydrocarbon</i>	<i>PBI based</i>	<i>Others</i>
6.1.1 BASF New Business GmbH	X	X	X	X	X	-	X	-	-	X	-	-	-	X	-

8.6 Sealing business

Supplier	Usage			Material					
	<i>LT-PEM</i>	<i>HT-PEM</i>	<i>DMFC</i>	<i>Silicon</i>	<i>FKM</i>	<i>FFKM</i>	<i>EPDM</i>	<i>Other</i>	
7.1.1 Eisenhuth GmbH & Co. KG	X	X	X	X	X	X	X	X	
7.1.2 Freudenberg FST GmbH	X	X	X	X	X	X	X	X	
7.1.3 RAMPF Polymer Solutions GmbH & Co. KG	X	-	X	X	-	-	-	-	
7.2.1 RAMPF Production Systems GmbH & Co. KG	X	X	X	-	-	-	-	X	