

Carbon Brushes and Brush Systems State-of-the-art Technology for Automotive Power net-fed Electric Motors

The Business Unit Automotive

The Automotive Field – the “Motor of Development”

The worldwide demand for and the quality requirements placed on carbon brushes and complete brush systems for the automotive industry has steadily increased in recent years. For the future, we anticipate more and more and higher and higher expectations in this field.

Technical challenges, such as continual improvement of comfort and safety, the introduction of the 42 volt power net, as well as higher and higher demands placed on the level of interference suppression in electrical motors used in automobiles, are also becoming a “motor of development” for the automotive industry in the area of carbon brushes and complete brush systems.

This applies to innovative materials and optimal design shapes for carbon brushes, carbon brushes with fittings or complete units with holders, as well as for complex systems for electrical standard features and safety equipment and comfort features in nearly all models of the leading automobile manufacturers worldwide.

Core Competency: Automotive Engineering

Through years of cooperation with our partners in the automotive industry, we know the special needs of this market.

To us, core competency in automotive engineering does not only mean working together with our customers in the area of design, rather it also means consistently producing top quality over long periods of time.

We accompany our customers through the entire development and production process. This includes:

- material recommendations
- support for the optimal design of components
- determination of the most efficient methods of production
- offers for individual logistic solutions.



Top Quality Through Synergy

Our goal is to achieve absolute top quality for our customers. Therefore, we have brought together a team of the most highly qualified specialists for carbon brush materials and component know-how at the Automotive Business Unit. Hence, in recent years five companies with special knowledge were merged into the Automotive Business Unit:

- Schunk Kohlenstofftechnik GmbH
- Hoffmann & Co. Elektrokohle AG
- Gerhard Präzisionspresstechnik GmbH
- Schunk Modultechnik GmbH, Schmitten
- Schunk Modultechnik GmbH, Ganderkesee

Member in an International Technology Group

The Schunk Automotive Business Unit is part of the multinational Schunk Group, which employs some 7,000 people worldwide and generates annual sales of 625 million Euro. The Schunk group is represented by 80 subsidiaries in 25 countries on 5 continents.

As a customer of the Automotive Business Unit, you will automatically profit from the innovations of the research and development projects of our other business units, such as carbon components for fuel cells, carbon pistons for combustion engines and CFC materials for high-performance brake discs, to name a few.



Your Development Partner

Continual Development up to the Production Stage

As the Automotive Business Unit, we have been working together with engineers, developers and product designers from the automotive supply industry for years. Together with our partners, we have taken part in many interesting projects from the first idea through to the production stage. We offer special know-how in the following areas:

- development of materials compliant with EC-Directive on End-of-Life Vehicles (2000/53/EC)
- noise reduction in commutative systems
- electromagnetic compatibility
- carbon brushes for 42 volt power nets
- module solutions with integrated interference elimination and speed controllers
- development of commutative systems.

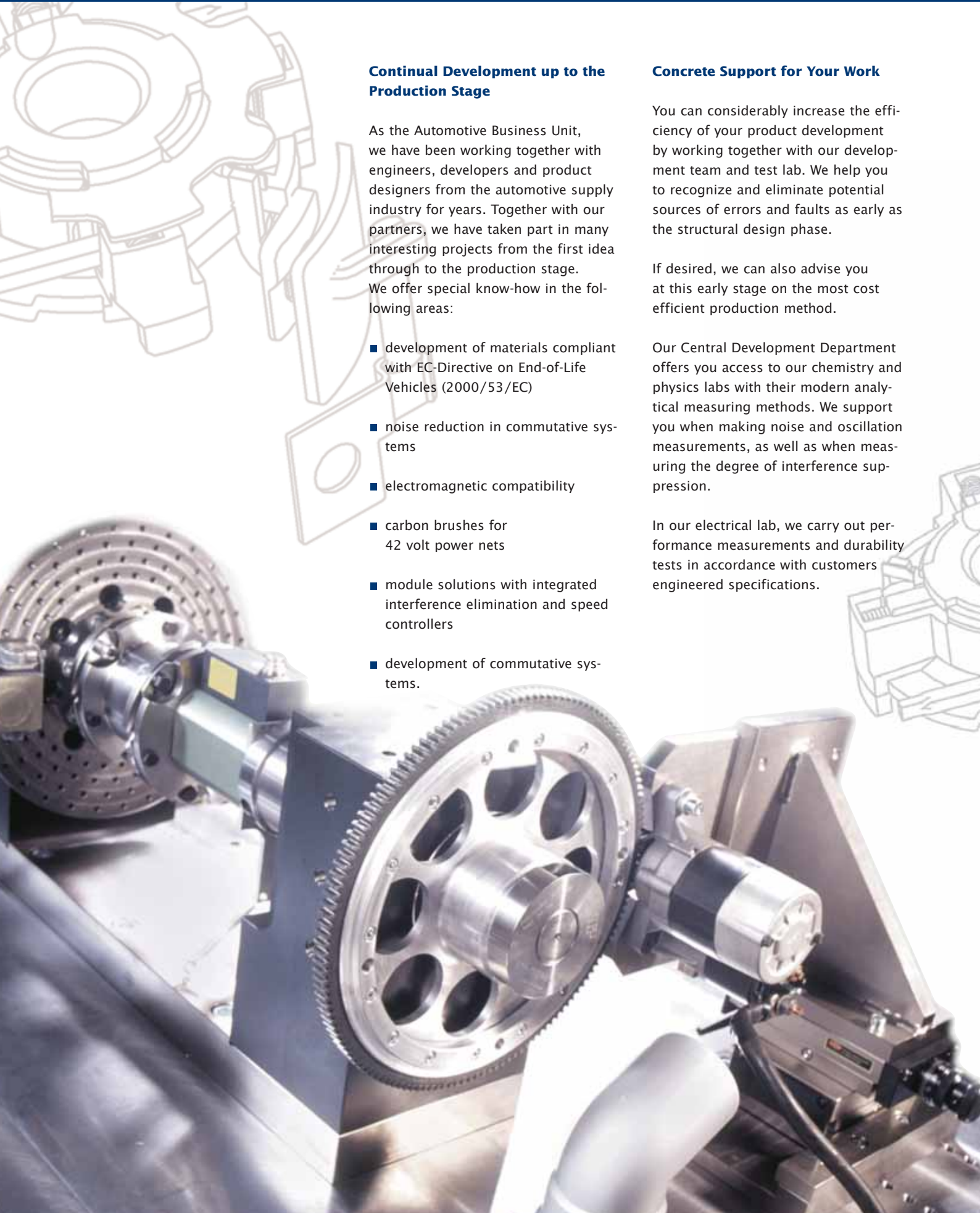
Concrete Support for Your Work

You can considerably increase the efficiency of your product development by working together with our development team and test lab. We help you to recognize and eliminate potential sources of errors and faults as early as the structural design phase.

If desired, we can also advise you at this early stage on the most cost efficient production method.

Our Central Development Department offers you access to our chemistry and physics labs with their modern analytical measuring methods. We support you when making noise and oscillation measurements, as well as when measuring the degree of interference suppression.

In our electrical lab, we carry out performance measurements and durability tests in accordance with customers engineered specifications.



Our Design Department works with Pro-Engineer, IDEAS and AutoCAD systems, among others.

Upon request, we can manufacture function samples on short notice.

Teamwork from the Word "Go"

The best teamwork begins as early as the idea phase, since this is where the paths are laid. In this early phase, we can give you a lot of tips and recommendations to optimize your plans. Ideally, teamwork should begin with the following steps:

- customer enquiry
- new parts meeting
- feasibility study
- feedback with the customer
- CAD/preliminary drawing
- submission of offer.

Starter test bench with integrated torque measurement, simulation of the start process of a combustion engine using an electronically controlled servomotor



Climatic chamber made by Weiss-Klimatechnik (Schunk Group). Regulation of humidity between 10% - 95% is possible, the temperature can be adjusted from -40 °C to +180 °C



Production, Process Security, Quality

As a Global Player, We Can Be on Location for You Worldwide

With 13 production sites worldwide, we are one of the global players in the production of carbon brushes for power net-fed electric motors and ready to install brush systems.

We strive to locate our production and logistics facilities to be as close as possible to the locations of our customers. We use semi- and fully-automated systems and can manufacture manually as well, if necessary.

Carbon Brushes and Brush Systems in Large-Series Production

For the standard electrical features, we produce components for the following electrical motors:

- starters
- alternators
- engine cooling fans (ECF)
- heating ventilation air condition (HVAC)
- windshield and rear window wipers
- fuel pumps
- water pumps.

For the safety features we produce components for:

- ABS/ASR/ESP
- seat belt tighteners
- headlight wipers
- electro-hydraulic brakes (EHB).

*hydraulic press,
power: 250kN, fully
automatic with twin
die for double layer
carbon brushes*



For the area of comfort, we develop and produce brushes with and without holders as well as brush systems for:

- window lift motors
- seat adjusters
- sun-roof drives
- electric clutch systems
- power steering
- electrical power locks
- side mirror adjusters
- power antennas.

For environmental protection, we develop and produce components for:

- catalytic converter fans
- throttle controls.

“Made by Schunk” Means Top Quality

In the entire Automotive Business Unit we have a clearly defined quality commitment and a solidly institutionalized quality management system.

Our individual companies are certified in accordance with ISO 9001 and some are also additionally certified with QS 9000 and VDA 6.1.

All standard quality planning, approval and release processes are carried out within the framework of a well established new parts project-management. These include, for example, Advanced Product Quality Planning (APQP), Failure Mode and Effect Analysis (FMEA) and Production Parts Approval Process (PPAP) in accordance with QS 9000 or Initial Samples Inspection Report (ISIR) in accordance with VDA.



servo fly press, accuracy 0.001 mm



production hall with modular automatic rotary tables



automatic linear grinder LIN NT 2 and rotary table, fully automatic machining of carbon brushes

High-Tech Products for Safe Current Transmission

At the Automotive Business Unit we supply the leading automotive suppliers worldwide with carbon brushes, holders and ready to install brush cards. A few product samples from our portfolio are portrayed below.



Assembly for Wet Running Fuel Pumps

carbon brushes and plastic holder complete with connector

Carbon Brush for Air Conditioning Fans

curved PTS-carbon brushes, for especially designed brush holders

Carbon Brush for Catalytic Converter Fans

axially pressed with pressed on head for spring centering, ground running surface and welded shunt end

Carbon Brush for Heating Fans

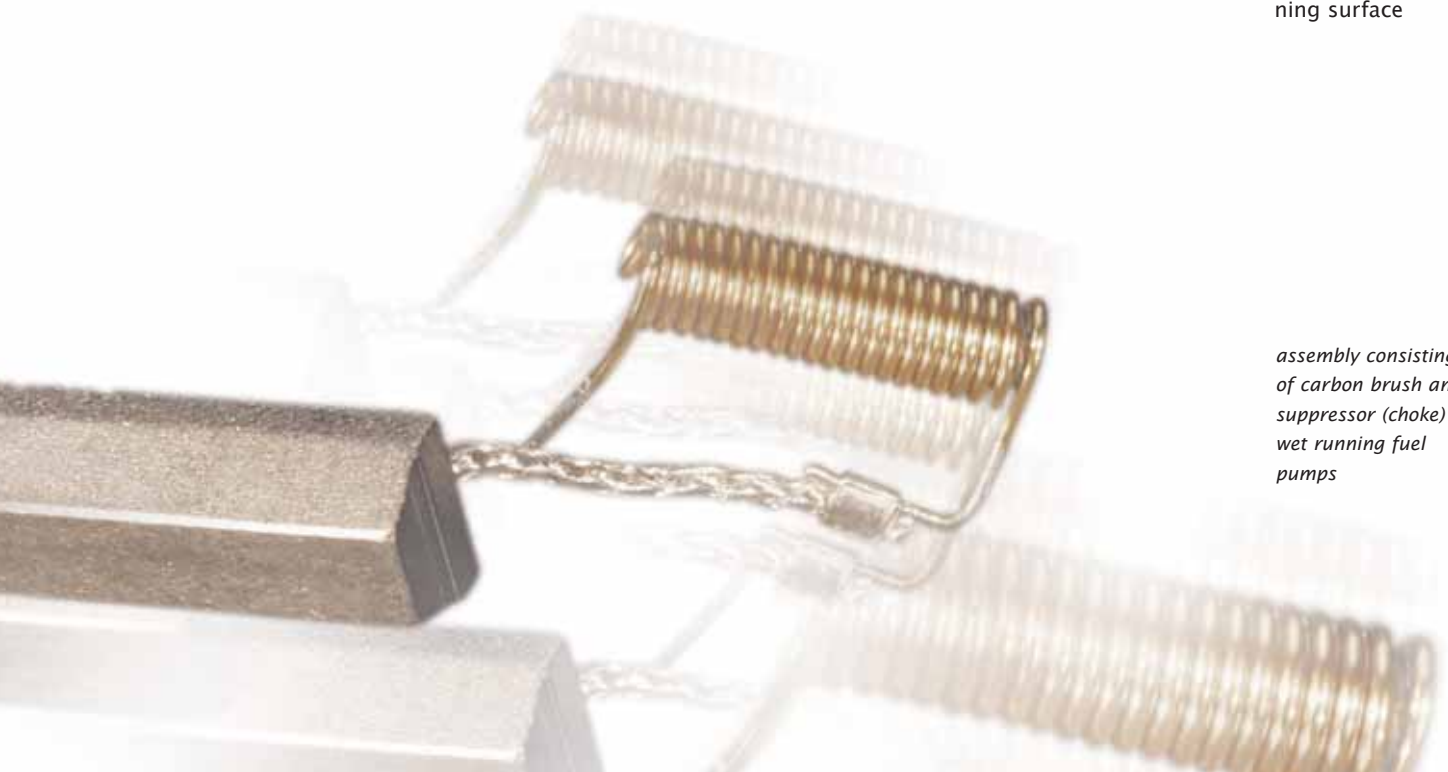
radially pressed, cross shaped head groove, cable end doubly welded, ground running surface

2-Component Starter Brush

for demanding commutation

Carbon Brush for Engine Cooling Fan

with an offset head for bipolar motors, special design for clamp fastening using a leaf spring, welded shunt end and ground running surface



assembly consisting of carbon brush and suppressor (choke) for wet running fuel pumps

EHD Brush System



As a component of the electrical power steering pump, the EHD brush system contributes directly to driving safety in car design. In order to optimally use resources, the current carrier is made of a single part which incorporates innovative shaping technology.

Brush System – Interference-Suppressed with Sensors



State-of-the-art injection technology, combined with electronics in the brush system. TPE sealing, injection molding and soldering fully automated. Temperature range between $-40^{\circ}\text{C}/+85^{\circ}\text{C}$. Due to a variable-basis system, use in several different types of vehicles is possible.

Module for Automatic Transmissions



Brush system with sensors, high durability of carbon brushes, temperature range between $-40^{\circ}\text{C}/+85^{\circ}\text{C}$. Use of the System contributes to the bypassing of the clutch function in vehicles and ensures output capacity when used directly in a motor.

Brush Systems for ABS Motors



Plastic composite part, base module made of polyamide 50% GF with silicone seal molding, fully automated manufacture of the basis module. New manufacturing method replaces the assembly method with ordinary O-rings previously used. Temperature range between $-40^{\circ}\text{C}/+120^{\circ}\text{C}$.

VVT Brush System



Extremely compactly built VVT brush system, in combination with other components forms the variable valve control. The VVT brush system proves its performance at acceleration of up to 40 g and temperatures of over 150°C .

L 100 Brush Rocker



Has proven itself a million times – the L100 brush rocker combines full automation with the highest degree of variability. Due to the intelligent, patented design, the support plate with the integrated plastic brush boxes, including the closure valves which are later needed, can be produced as one part. Due to the optimal forward resistance, a cost efficient control of the rotational speed can be realized.

Brush Systems with Circuit Board for Window Lift Motors



Plastic composite part, basis module made of polyamide 30% GF with Thermoplastic Elastomers (TPE) seal molding. Fully automated manufacture of the basis module. Automatic testing of the mobility of the carbon brush, spring force, Hall IC.

Logistics and Communication



*Schunk Automotive Business Unit:
We are here for you and we are glad
to answer your questions.*

We Have Everything under Control in the Area of Logistics Also

In the area of logistics and communications, we guarantee our customers a smooth and efficient flow of goods and information.

We offer our customers individual packaging solutions which best suit the respective assembly requirements: e.g. intelligent packaging alternatives such as rolled blister-foil packaging for automated, uncontaminated and precision placing of components. A packaging alternative from the electrical and semi-conductor industry for the placement of circuit boards using pick and place assembly units.

The designation of goods is ensured by using barcode labeling (VDA) product stickers.

If you would like to place your order online, Electronic Data Interchange is available at Schunk Automotive for your convenience.

Rolled blister-foil packaging for automated, uncontaminated and precise positioning of components. This method of packaging originated in the electrical and semi-conductor industries.



Schunk Kohlenstofftechnik GmbH

Rodheimer Strasse 59
35452 Heuchelheim
Germany
Telephone: +49 (641) 608-0
Telefax: +49 (641) 608-1223
e-Mail: infobox@schunk-group.com

Hoffmann & Co. Elektrokohle AG

Au 62
4832 Steeg
Austria
Telephone: +43 (6135) 400-0
Telefax: +43 (6135) 400-10 or -12
e-Mail: office@hoffmann.at
www.hoffmann.at

Gerhard Präzisionspresstechnik GmbH

Ringstrasse 23
91619 Oberzenn
Germany
Telephone: +49 (9844) 97 11-0
Telefax: +49 (9844) 97 11-50

Schunk Modultechnik GmbH

Seelenbergerstrasse 1a
D-61389 Schmitten
Telephone: +49 (60 84) 9 45-0
Telefax: +49 (60 84) 9 45-155
e-Mail: smt-info@schunk-group.com

Schunk Modultechnik GmbH

Industriepark 7
D-27777 Ganderkesee
Telephone: +49 (42 22) 43-0
Telefax: +49 (42 22) 43-21
e-Mail: smt-info@schunk-group.com



Schunk Business Unit Automotive GmbH

Rodheimer Straße 59
35452 Heuchelheim
Germany

Telephone: +49 (641) 608-0
Telefax: +49 (641) 608-1488

www.schunk-group.com