Our world is in motion. Today, people spend more time moving from one place to another than ever before. With our transmission systems and components in innovative automobiles we, at PMG, make sure that future mobility will feature more efficiency, safety and sustainability.

More than 50 years of innovations
What had started in 1960 with a local sintered steel production in Füssen, Germany, has become the leading global expertise in powder metal solutions. Today, we manufacture on 3 continents in 7 production sites for our customers worldwide. With our leading technologies, an innovative driving force and a seamless workflow from design to serial production, we create complete solutions that meet technical, economical and ecological requirements.

Global expertise on the spot
Our regional proximity and a short time-to-market make us a dependable partner for the future-oriented automotive industry. They rely on our R&D capabilities, testing and validating as well as our versatile production range with its outstanding quality management. Together, we keep the world in motion.

Company
MOVING SOLUTIONS

Quality is our profession
- ISO 9001
- ISO 14001
- ISO/TS 16949
- ISO 50001
- OHSAS 18001

Latest Awards
2015
- JIPM Award of Excellence in Consistent TPM Commitment
- American Showa Inc. Cost Improvement Award

2014
- GM Supplier Quality Excellence Award

2013
- Magna Powertrain International Strategic Supplier
- GM Supplier Quality Excellence Award
- SCHAEFFLER Best Quality Award
FROM FIRST IDEA TO MARKET SUCCESS

As an experienced manufacturer of powder metal transmission systems and components we provide you overall solutions that perfectly meet your requirements in terms of innovative strength and cost efficiency. We have made it our objective to work as close as possible with our customers in order to always create customized solutions. Therefore, we give you support within each step of the process chain according to the time-to-market-horizon.

Seamless workflow
From research & design, over product development, to serial production of complete systems, the PMG group is your reliable partner. Thereby we simplify your logistics and stock management. You benefit from a turn-key system solution and save your investments.

In-house product design, testing and validation
Our state-of-the-art in-house testing facilities help us provide you optimal product quality. PMG has a long tradition of manufacturing automotive components for high torque applications by converting wrought steel or high strength cast steel components into powder metallurgy components. The conversion process is based on solid in-house analysis and design capabilities (FEA) as well as complete system or component testing and validation capabilities.

Complete process chain
- Powder metal competence
- Application know-how
- Prototyping
- In-house testing
- Magnetic flux simulation
- Product optimization
- Tool design & Tooling
- Serial production
- Validation

OUR DRIVING FOCUS

With our own technologies and our intention of continuous technological improvement we create innovative solutions for future mobility. This specific PMG high-tech focus made us what we are today: a global acting powder metallurgy partner of the automotive industry. Find out more about our outstanding material and process know-how.

Powder Metallurgy
PMG powder metal technologies enable us to develop and produce robust systems and components with perfect performance and durability even in challenging environments. Powder metal technology aligns itself with long term material and energy constraints. With its minimal material losses and energy consumption, the powder metal process is increasingly more competitive with traditional production technologies.

- Cost effectiveness: (near-) net-shape production/less process steps, lower energy consumption and higher material utilization
- Environmental friendliness: resource conservation (raw material, energy)
- Product uniqueness: individual combinations of materials, shapes and further product features with outstanding properties of the end product

DensiForm®
DensiForm® is a unique technology developed by PMG to produce highly loaded steel components with solid steel equivalent density and properties on the surface, and significantly increased core density. Components produced by DensiForm® have improved dimensional precision as well as high surface quality.

- Inherent productivity advantage in comparison with traditional densification methods
- Enables complex shapes
- Higher core density
- Deep root densification with no risk for material overlap in the transitional area between tooth root and tooth flank
- High dimensional precision
- Comparable quality as machined solid steel products
- Superior surface finish

RadiForm®
The specific forming process RadiForm®, developed by PMG, forms geometries in radial direction for heavy-duty parts of powder metal components.

- Inherent productivity advantage in comparison with traditional forming/machining processes
- Enables the forming of complex features in the splines
- High dimensional precision and low spline errors
- High local densification effects
- High roughness quality
- No formation of burrs
- Comparable or even better quality than machined or formed solid steel products
Efficiency is one of the key advantages of manual transmissions – and one of the reasons, why MT systems will continue to be an important part of future mobility. Our MT/DCT solutions comprise decades of engineering experience with own technologies and patents well-proven over many years. Based on our philosophy of continuous innovation, they are designed to exactly meet your needs including both, technical and economical benefits.

System solutions from a single source
As a highly flexible and competent partner we cover the whole process chain from design, testing and validating up to serial production of complete synchronizer systems. Additional boost to your competitive advantage right from the start.

PMG’s in-house testing capabilities
- Hydropuls and pulsation torsion testing machines for fatigue analysis
- Test equipment for evaluation of wet friction materials and synchronizer ring systems

PMG solutions from gear to gear synchronizer systems and helical gears

Hubs
- More than 20 years’ experience
- Specialized production lines
- About 25 million hubs produced per year
- Complex geometries with numerous patented features

Synchronizer rings
- More than 30 years’ experience
- Specialized production lines
- About 10 million rings produced per year
- Multiple geometries for different applications
- Application specific friction materials

Sliding sleeves
- More than 3 million sleeves produced per year
- Several geometries in serial production
- Complex spline shapes
- Different tooth geometries within one part are possible

Struts
- Torsion strut for the reduction of the geometrical notch effect in the synchronizer hub (PMG patented)
- Traditional axial strut
- Encapsulated strut
- Different geometries possible according to function

Clutch cones, clutch dogs
- Various geometries
- Multiple possibilities for different assembly conditions according to customers needs
- Supplied to customer as hardened or soft part (intermediate product)

- Excellent tribological properties
- Considerable weight reduction of PM sleeves compared with other technologies
- Different PMG patented features
- Low costs for initial tool set and eventual modifications
Systems & Components

GEARS

DensiForm® gears
The application of DensiForm® technology to transmission gears opens a promising perspective for extending the use of powder metallurgy components into heavy duty applications requiring high fatigue strength and wear resistance, which were exclusively covered by solid steel parts until recently.

Surface densification of helical gears directly in the powder metal production process is a unique technology developed only by PMG in the PM industry. In addition to improved productivity, this method has the added benefit of producing components with higher core density and improved dimensional precision.

PMG transmission helical gear under test
The PMG transmission helical gear and a conventional solid steel gear were tested under gear box conditions. The PMG gear passed all tests successfully:
- Back-to-Back Test / Shaft Back-to-Back Test
- Gear Run-Time Test
- Sound Emission Test

DensiForm® ring gears
- Reduced machining steps by near-net-shape production
- PMG patented selective surface densification – DensiForm®
- Higher core density of PMG DensiForm® gears compared to conventional surface densified gears
- High dimensional precision and a quality equivalent to that of machined solid steel gears
- Superior surface finish
Today, an automatic transmission is one of the most complex systems in a modern car. PMG accepts the challenge by designing automatic transmission solutions that meet the most demanding requirements. With our longstanding experience, a global manufacturing & technical support footprint and a highly efficient production we are able to provide individually tailored and cost-effective system solutions.

Automatic transmissions with one-way clutch (OWC) solutions
All modern passenger car automatic transmissions use one or more one-way clutches. The fundamental operating principle of one-way clutches is to prevent rotation in one direction and to permit freewheel in the reverse direction. Critical OWC requirements are high contact fatigue resistance at the roller contact and high tensile strength.

PMG’s experiences and capabilities
• Customized design with 2 and 3 D modeling
• Automated production of parts
• Automated lines for full system assembly
• MPIF Design Excellence Award in 2006 and 2010
• Full testing and validation capabilities

• PMG’s in-house testing capabilities
  • Stroker testing machine
  • Overrun testing machine
  • Drag torque testing equipment

Advantages of PMG’s DensiForm® one-way clutch solutions
• High dimensional precision due to our DensiForm® process. Manufacturing of PM components with properties equivalent to wrought steel
• Better performance of PMG’s DensiForm® based roller design compared with sprag designs made of solid steel and roller designs made of forged powder metal parts
Systems & Components

**SHOCK ABSORBER**

With PMG solutions for shock absorbers our customers are on the road to the next level of comfort and safety. For us as powder metal experts - with an annual production volume of more than 300 million shock absorber parts - meeting the stringent industry requirements, accuracy and repeatability batch to batch is of the utmost importance.

**Fully automated line production**
According to our shock absorber business unit concept we have developed fully automated line production cells, which enable us to provide consistent technology and process quality in each of our production sites in Asia, North America and Europe. On a local level our customers benefit from our one-stop-shop capabilities as a global acting solution partner.

**High quality testings**
Our R&D and testing facilities, close to our PMG Polmetasa S.A.U. plant, are equipped to perform endurance and performance shock absorber testing. This allows us to support our customers in the validation process in case of process or product changes as well as continuously improve our own technology.

**Rod guides**
- Specialized production lines with integrated operations
- Complex rod guide geometries
- Additional machining operations if needed
- DU bushing insertion

**Base valves/cylinder ends**
- High volume base valve production lines
- Complex shapes

**Pistons**
- Individual piston design according to requirements
- Application specific secondary operations in-house like turning, axial drilling, angle drilling
- In-house PTFE-banding
- Integrated assembly operations allow PMG to supply banded pistons under complete control of the process while saving logistic cost
Future mobility visions become true. While the demand for electric and hybrid drives is continually growing, we give support to electrical motor designers by providing high-performance Soft Magnetic Composites (SMC). With our powder metallurgy expertise, we cover the full range from concept to serial production of sintered parts from soft magnetic materials. Our own research, prototyping and testings guarantee the high reliability of our SMC solutions.

**Soft Magnetic Composites (SMC)**
Our Soft Magnetic Composites are made of insulated iron powder. Because of its isotropic structure and high electrical resistance, our SMC have a number of excellent properties. Whereas conventional electric drives using electrical steels often do not meet the high requirements of ambitious motor designers, our SMC solutions provide boost to your e-mobility visions.

**Automotive Applications**
- Hybrid Drives
- Traction Motors
- Active Engine Mounts
- Turbo Charging

**Industrial and Domestic Applications**
- Direct Drives

**Advantages**
- High power density by 3D magnetic flux conductivity
- Low eddy current losses at high frequencies
- Ideal to complex design shapes
MILESTONES

1960
- Founded as Sinterstahl by Plansee and Thyssen in Füssen (Germany)

1991
- PMG Polmetasa (Spain) is acquired

1996
- PMG Asturias (Spain) is built and starts series production of hubs

2003
- PMG Pennsylvania (USA) is built
- Teflon banding operation starts at PMG Polmetasa

2005
- New company brand PMG for Powder Metal Group (result of a Joint Venture with Mitsubishi Materials)
- First application chromium containing material (SIRON® P820)
- DensiForm® series production starts

2007
- Sliding sleeve in series production

2009
- PMG takes over the plant in Indiana (USA) from Mitsubishi Materials

2010
- PMG Shanghai Fengxian (China) is built

2011
- New owner: Vermögensverwaltung Erben Dr. Karl Goldschmidt GmbH (VVG)

2013
- Representations in Korea & Japan are opened
- New manufacturing building in Füssen

2014
- Representations in India & Mexico are opened
- PMG acquires the former Riken España and creates PMG Constantí

2015
- RadiForm® patent on sliding sleeve production process

Today
- PMG is a global acting group with 7 production facilities on 3 continents
As a global acting market partner we locate our production plants and sales representatives close to our customers. That always ensures the short distance to a smart solution process.

**Local Values on a Global Scale**

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