BASF combines economic success and innovation leadership with environmental protection and social responsibility. More than 115,000 BASF employees around the world contribute to the success of their customers in nearly all chemistry sectors. Therefore, BASF has extraordinary expert knowledge when it comes to processing materials of any sorts, especially plastics. The global network of BASF experts and facilities allows holistic approaches and services worldwide. Around 10,000 employees are involved in research and development. Because for BASF, innovation is the key to successfully stand out from the crowd in a challenging market environment.

Who we are

A Solid Basis: The BASF Group

The Dynamic Business Unit: BASF 3D Printing Solutions

Located in Heidelberg, Germany, BASF 3D Printing Solutions GmbH focuses on high-quality materials, innovative system solutions, state-of-the-art components and excellent services in the field of 3D printing. With its start-up-like structure, the company is set up to react quickly and flexibly to customers demands in the dynamic 3D printing market. The collaboration with global research platforms and application centers of various departments at BASF is very close. Furthermore, partnerships and cooperation with research institutes, universities, startups and industrial partners from several fields throughout the value chain help BASF 3D Printing Solutions to provide cutting-edge products and services.
BASF 3D Printing Solutions: We are the global experts for 3D printing solutions and enabling value, competence and benefits for the market.

Innovation: We are BASF’s dedicated 3D competence unit creating new raw materials, formulations & services. We leverage BASF’s know how for materials, applications, customer needs and scale-up possibilities. This leads to accelerated & tailored solutions for our customers.

What our stakeholders get

- Constantly improved broad product & service portfolio
- Support for long-term success: Our partners can truly rely on us to support them throughout the entire life cycle of their products
- The combined strength of the best team with our technical and commercial expertise. Our customers benefit from our industry network. We enable our customers to be first movers.

We provide all technologies from SLA/DLP, LS/HSS, FFF, metal solutions and services (simulation, design, coating, printing)

Our Solutions

Additive Manufacturing and Powder Bed Fusion

The innovative technology of powder bed fusion opens up new possibilities in part production. This type of additive manufacturing enables the creation of three-dimensional solid objects in any shape imaginable directly from digital CAD data. Thin layers of powder particles are locally fused, e.g. by a laser, and built up layer by layer into the desired shape.

Process of powder bed fusion

01 A thin layer (typically 0.1 mm thick) of powder is deposited in the workspace.

02 The powder is heated up and locally fused by a laser

03 The powder bed is lowered by one layer thickness and the process repeats until the parts are finished.
With additive manufacturing objects in virtually any shape are possible. Therefore, this production method is particularly suitable for industries that require individual products or fast and functional prototypes such as the automotive, aviation and transportation industries in general as well as high-class customer goods.

Functional Parts for the Automobile and Aerospace Industry
Laser Sintering is also ideal for complex geometries that would be impossible to produce using other processes, or where the time and cost of tooling becomes prohibitive. It is the best choice for engineers looking for functional parts and prototypes in the sectors of automotive, aerospace, consumer electronics, surgical instruments and shop floor manufacturing. Laser Sintering is the ultimate 3D printing technology for thermoplastic parts, without compromise.

Individualized Lifestyle Items
Lifestyle products reflect individual’s way of life and resonate with personal identity. Some examples of lifestyle products include home décor, sports equipment, music instruments and fashion. With up-and-coming companies offering 3D modelling and printing services, consumers can easily access 3D printers to incorporate creativity and personalize touches into individual lifestyles.

Advantages of 3D Printing
- Direct production from CAD data
- Freedom of design
- Complexity for free
- Functional integration (e.g. hinges, clips)
- No tooling
- Maximum material use
- Production cost independent from batch size
- New manufacturing processes, e.g. in repair and materials
- Speed to market
- No warehousing
- Decentralized, global production
- Decentralized spare parts

Key advantages with BASF 3D Printing Solutions
- Control of the entire value chain
- R&D and application competence
- Processing guidelines to provide initial printing parameters
- Access to global supplier network
- Production competence
- Quality management
- Own printing center
- Backing from the mother company
- Open business model
- Competence in all major additive manufacturing technologies
An Innovation by BASF: In Particle Fillers

The new reinforced BASF Ultrasint® powders enable higher stiffness, strength and toughness as well as heat deflection temperature. Fillers are embedded into the polymer particles, thus ensuring easy handling and more isotropic part properties. The Ultrasint® PA6 range sets new standards in 3D powders and opens up new possibilities for advanced applications and functional prototyping in midsize quantities.

Further benefits are: improved filler homogeneity, no demixing, easy recycling, better isotropy of part properties.

PA6 for PBF Technologies is Now a Suitable Alternative to Injection Molding

The BASF Ultrasint® PA6 range offers several benefits

- **Light-weight designs and resiliency in metal plating process**
  Possible applications are radar case, wing shapes, lattice structures, antenna and galvanization.

- **Temperature resistance and toughness**
  Possible applications are engine covers, manifolds, heat shields, oil pan covers, air ducts, brake ducts, connectors and brackets (e.g. for engine controller).

- **High burst resistance at temperature**
  Possible applications are oil separator, air intake systems, environmental control ducting, plenums, housing for (brake) fluids, fuel filling pipelines or fuel valves

- **Flame retardant applications**
  Possible applications are customized cabin components, connectors and switches, terminal strips, circuit breakers and easy metal plating
## Our Portfolio

For the production of robust functional prototypes and end-use parts, we offer you the very best production-grade materials. BASF materials are designed to give you the full range of capabilities and nearly isotropic properties, from rigid to elastomeric, high elongation, high impact strength and high-temperature resistance. BASF powders for laser sintering provide best performance, unique quality and high batch consistency as well as excellent mechanical properties. The product portfolio includes ten high-quality powders for every desirable application.

### BASF Material Portfolio for Powder Bed Fusion

<table>
<thead>
<tr>
<th></th>
<th>Ultrasint®</th>
<th>Adsint</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>PA6</td>
<td>PA6 MF</td>
</tr>
<tr>
<td><strong>Tensile Strength / MPa</strong></td>
<td>61/54*</td>
<td>91/62*</td>
</tr>
<tr>
<td><strong>Young’s Modulus / GPa</strong></td>
<td>3.5/1.6*</td>
<td>6.2/3.3*</td>
</tr>
<tr>
<td><strong>Elongation at break / %</strong></td>
<td>2/51*</td>
<td>2/7*</td>
</tr>
<tr>
<td><strong>Charpy impact strength, unnotched / kJ/m²</strong></td>
<td>7/13*</td>
<td>13/28*</td>
</tr>
<tr>
<td><strong>HDT A / °C</strong></td>
<td>98</td>
<td>121</td>
</tr>
<tr>
<td><strong>HDT B / °C</strong></td>
<td>194</td>
<td>209</td>
</tr>
<tr>
<td><strong>Shore A hardness</strong></td>
<td>90</td>
<td></td>
</tr>
<tr>
<td><strong>Available color(s)</strong></td>
<td>natural, black**</td>
<td>black</td>
</tr>
<tr>
<td><strong>Special properties</strong></td>
<td>strength, tightness</td>
<td>in-particle filler</td>
</tr>
<tr>
<td><strong>Stiffness</strong></td>
<td>***</td>
<td>*****</td>
</tr>
<tr>
<td><strong>Strength</strong></td>
<td>*****</td>
<td>*****</td>
</tr>
<tr>
<td><strong>Ductility</strong></td>
<td>****</td>
<td>*****</td>
</tr>
<tr>
<td><strong>Toughness</strong></td>
<td>*****</td>
<td>*****</td>
</tr>
<tr>
<td><strong>Temperature resistance</strong></td>
<td>****</td>
<td>*****</td>
</tr>
</tbody>
</table>

Contact: 3d-printing@basf-3dps.com

Typical, preliminary values. All values shown are measured in x-direction
*) dry/conditioned **) technical data shown here is based on this color

---

... Printer processing guidelines including parameters are available
... Onsite training  with BASF technical experts
... Global technical support
Media resistance of PA6

Highly resistant: empirical value from numerous applications under their typical conditions

- **Aliphatic hydrocarbons**: natural gas, fuels (Otto, diesel), paraffin oil, motor oils, technical greases and lubricants
- **Aromatic hydrocarbons**: benzene, toluene
- **Alkalis**: ordinary soap, washing solutions, alkaline concrete
- **Ethers**: THF, anti-knock agents for fuels (TBME, ETBE)
- **Esters**: greases, cooking oils, motor oils, surfactants
- **Aliphatic alcohols** (<60°C [<140 °F]): ethanol, methanol, isopropanol, anti-freeze agents for windshield washing systems, spirits, fuels (E10, E50, E90)
- **Organic acids**: in the solid state: citric acid, benzoic acid
- **Oxidants**: ozone as a component of air

Limited resistant: known applications, thorough testing and case-to-case evaluations necessary

- **Alkalis**: strength, tightness
- **Esters**: sodium hydroxide solution, ammonia solution, urea solution, amines
- **Aliphatic alcohols**: transmission oils, biodiesel
- **Water and aqueous solutions**: > 60 °C [> 140 °F]
  - Ethanol, methanol, isopropanol, anti-freeze agents for windshield washing systems, spirits, fuels
- **Organic acids**: as an aqueous solution: acetic acid, citric acid, formic acid, benzoic acid
- **Oxidants**: traces of ozone, chlorine or nitrous gases

Disclaimer: The statements made here are of a general nature and do not claim to be complete or universally valid. The consequences of exposing a polymeric material to various types of media can depend on many factors that sometimes interact in a complex way. When clearing the use of the material, especially for components subject to high stresses and possible exposure to corrosive chemicals, its chemical suitability should be verified. This may be done based on experience with similar parts made of the same material in the same medium under comparable conditions or by testing parts under practical conditions.

---

**The Ultrasint® Range for Highest Demands**

All Ultrasint® powders for laser sintering are based on engineering plastics for advanced industrial and functional applications. The Ultrasint® portfolio features several PA6 and polypropylene based grades, which are commonly used and well-known from injection molding. Therefore, they show best modulus, high strength and excellent thermal distortion stability. These characteristics ensure precise feature control, very good mechanical properties and simple surface reprocessing of 3D printed parts.

---

**Ultrasint® PA6**

- High modulus
- High strength
- Excellent thermal distortion and heat ageing stability
- Gas and media tightness as printed
- Already known from injection molding
- High heat deflection temperatures
- Can be combined with traditionally manufactured parts by welding or gluing

**Benefits**

PA6 ensures precise feature control, very good mechanical properties, simple surface reprocessing of 3D printed parts, in particular for complex shapes or structures. Parts built of this material have similar properties to those of injection molded PA6. Ultrasint® PA6 fulfills the requirements of functional applications regarding high accuracy and mechanical strength as well as a high heat distortion temperature – properties, where other 3D printing powders often show limitations.

**Higher HDT compared to PA12**

![Graph showing higher HDT for PA6 compared to PA12](image)
Ultrasint® PA6 MF
- High tensile modulus
- High stiffness
- High strength
- Enhanced impact strength
- Excellent powder homogeneity
- No phase separation during transport
- No filler variations in printed parts
- Easy handling and recycling
- First choice material for stiff and load-bearing parts in automobile

Benefits
In contrast to simple dry blends, the ‘mineral filled’ reinforcement is embedded within the particles, leading to improved powder homogeneity, better spreading and easier recycling. Ultrasint® PA6 MF black lends itself for applications where high stiffness and strength are the most important requirements, while not sacrificing other properties of the unfilled material. A material suitable for parts with demanding mechanical property combinations.

Ultrasint® PA6 FR
- High modulus
- High tensile strength
- Excellent thermal distortion stability
- Halogen – free
- In particle flame-retardant
- V2 rating (UL 94V) (0.8-3 mm)
- Ideally suited for public transportation applications (buses etc.)

Benefits
Parts made of Ultrasint® PA6 FR black reach a V2 rating (UL 94). This material is perfectly suitable for prototyping and small series production in automotive, transportation, E&E and aerospace applications. Ultrasint® PA6 FR black fulfils the requirements of functional applications regarding high accuracy and mechanical strength as well as a high heat distortion temperature.

Increased strength and stiffness through mineral filler

Highest HDT and stiffness of flame retardant polyamide powders
Ultrasint® PA6 LM

- Balanced mechanical properties
- Balanced thermal properties
- Low melting temperature
- Ideally suited for standard temperature LS machines
- High heat stability

Benefits
It offers lower melting temperatures compared to other Ultrasint® PA6 powders and enables the processing on standard Laser Sintering equipment. The processing temperature is 175-185°C. The material is suitable for manufacturing functional prototypes and small series parts i.e. for industrial or automotive applications.

Ultrasint® PP

- Excellent plasticity
- High elongation
- Low moisture absorption
- High durability

Benefits
Ultrasint® PP is a polypropylene powder specially developed for the Laser Sintering process. The fields of application vary widely from automotive, electrical and sport industries, to health care and Orthopedic products. It allows post processing like thermoforming or sealing. Ultrasint PP is resistant to most acids and bases and has a slightly translucent appearance.

Maintaining high HDT despite lower processing temperature

High elongation and ductility
The Adsint Range for Special Applications

With the Adsint range BASF 3D Printing Solutions offers polyamide powders in best quality with excellent properties for perfect laser sintering. Filled Adsint grades are powder dry-blends.

**Adsint PA11**
- High elongation
- High elasticity
- High impact resistance

**Adsint PA11 CF**
- PA11 powder reinforced with carbon fibers
- High tensile and impact strength
- End parts are exceptionally rigid
- Mechanical properties may be influenced by the direction of carbon fiber
- Excellent surface quality (very smooth)
- Color black

**Adsint PA11 GB30**
- PA11 powder filled with glass beads
- High rigidity by increasing the tensile modulus
- Excellent surface quality (very smooth)

**Benefits**
Typical applications are in environments where high deformations (e.g. hinges) and/or exposure to special surroundings (e.g. chemical, detergents and oil) may occur. Due to its high ductility, it does not splinter in crash situations. Adsint PA11 can be used for medical and food applications and is processable on most common LS printers.

**Benefits**
Can be used in demanding surroundings (e.g. high pollution, chemical exposure) and withstands high mechanical loads. It is ideal for light weight and conductive applications. It is a famous material for motor-sports applications.

**Benefits**
Can be used in challenging environments (e.g. higher temperature) combined with very good wear resistance (e.g. housings). Adsint PA11 GB30 is a cost-effective alternative to pure polyamide.

**Very high ductility & toughness**

**Increased strength and stiffness through carbon fibers**

**Increased stiffness & rigidity**
Adsint PA12

- Multi-purpose material
- Balanced property profile
- Very smooth part surface
- Detailed prints
- Functional components of highest quality
- Sophisticated design accessories

Benefits
Parts produced with this material provide a balanced property profile with a very smooth part surface and excellent results for detailed prints. Typical applications are prototypes and small series functional parts.

Adsint TPU 90 flex

- High elongation
- Excellent physical properties
- Rubber like elasticity
- Good abrasive properties
- Good chemical resistance

Benefits
Typical applications are hard-soft systems, sport footwear, orthopedic models, hoses and tubes sealings and wheels. Due to its low printing temperature (below 130° C), energy and time savings are possible. The recycling rate of up to 100% implies a high cost advantage. Adsint TPU 90 flex is also available in black and can be perfectly used on machines of all sizes.

Detailed and smooth prints due to small particles

Very high elongation

Advanced Services, Part Testing, Design, Simulation and Coating

Technology consulting and evaluation
Coating: visual and chemical
Print services
Ultrasim® is BASF’s tool for numerical modelling of plastic materials and expanding from Injection Moulding to 3D Printing
3D Printing Material models are available
Topology optimization enables full Powder Bed Fusion potential for advanced applications
Services and Support

Product development
If certain material properties are needed BASF 3D Printing Solutions supports its customers by offering material and part testing.

Printing support
To ensure the success of the printing right from the start a list of detailed process parameters and recommendations for the application are provided. Furthermore BASF 3D Printing Solution provides on-site assistance, if needed. In close cooperation with its customers BASF 3D Printing Solutions defines optimized parameters for the used machine to achieve optimal printing results.

Service hotline
BASF 3D Printing Solutions offers its customers direct contact to its technical team via service hotline or e-mail. Thus help during the process is provided promptly and effectively.

Contact
BASF 3D Printing Solutions GmbH
Speyerer Str. 4 | 69115 Heidelberg | Germany
3d-printing@basf-3dps.com

The data contained in this publication are based on our current knowledge and experience. They do not constitute the agreed contractual quality of the product and, in view of the many factors that may affect processing and application of our products, do not relieve processors from carrying out their own investigations and tests. The agreed contractual quality of the product at the time of transfer of risk is based solely on the data in the specification data sheet. Any descriptions, drawings, photographs, data, proportions, weights, etc. given in this publication may change without prior information. It is the responsibility of the recipient of our product to ensure that any proprietary rights and existing laws and legislation are observed (02/2014).

® = registered trademark of BASF group in many countries.