



The Chemical Company

Solutions for tunneling and mining

# Injection

Expanding Horizons

Underground





# Introduction

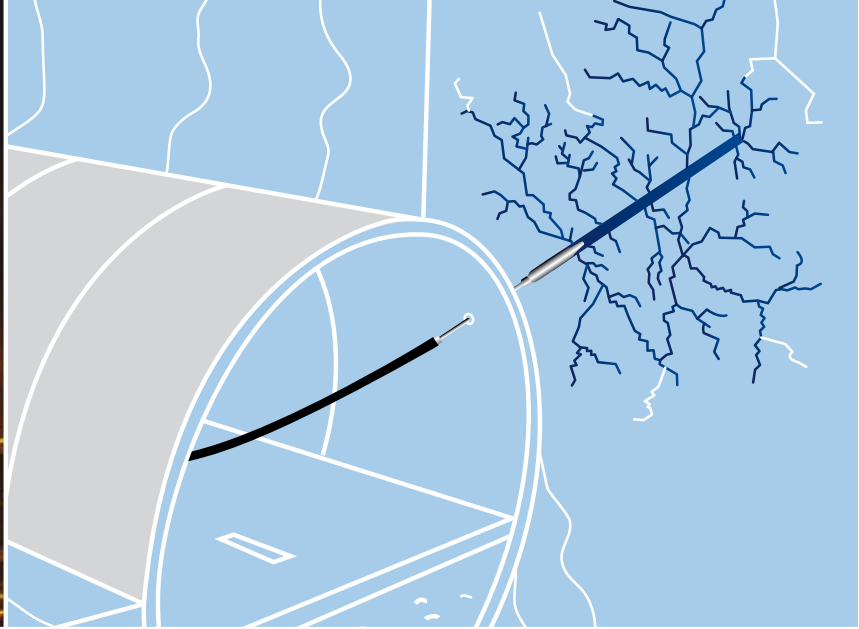
## Avoid the Unexpected

Unexpected water ingress and poor ground conditions during underground construction and mining usually escalate costs, can severely influence the environment, and inevitably cause significant delays. To counteract these risks, an economical approach is to pre-inject the ground ahead of the advancing face with microcements, or use post-injection techniques where a broad range of products and technologies are normally required. In light of the modern world's focus on stricter legislation covering the environment and workers' health and safety, stabilization of sands and soils requires both durable and safe mineral grouts and microcements.

MEYCO® Global Underground Construction (MEYCO) offers a complete range of injection products suitable for all projects, including new and existing tunnels, mines and large civil engineering projects such as dams:

- The RHEOCEM® range of microcements represents a significant technological advantage in cementitious injection. Its unique feature is rapid and controlled setting allowing uninterrupted blasting rounds or continued injection sequences, thereby enhancing productivity considerably.
- The unique MEYCO MP 320 series of mineral-based grouts composed of colloidal silica is stable and consists only of natural ingredients, making products non-hazardous and ecologically friendly. Due to their very low viscosity, they penetrate finer fissures than any cement based products and ensure unrivalled penetration and permanent stabilization of fine, silty sands.
- The MEYCO MP 350 series of polyurethanes and the fire resistant MEYCO MP 360 series of urea silicate resins are designed for water stopping and sealing, strata stabilization and cavity filling in mining and tunneling applications.
- The MEYCO MP 300 series of high performance acrylate gels for durable structural concrete crack injection.





### **Water Ingress Reduction and Ground Consolidation**

### **Rapid Ground Consolidation**

### **Rapid Water Ingress Reduction**

### **Rehabilitation of Tunnel Linings**

Pre-injection method: solving difficult problems ahead of the tunnel face; simple and cost-effective approach.  
Allows for the use of cost-effective injection material technology: improved working safety; minimal environmental consequences.

Rapid reacting injection systems for: immediate stabilizing of poor ground; void filling of cave-ins.  
Approval for use in coal mining, for civil underground construction, non-flammable urea silica systems.

Tailored method with proper drilling, injection system and equipment.  
For difficult cases: combination of drainage and the injection of a rapid reacting foaming resin.

- Detailed methods for rehabilitation injections
- Selection of the right resin properties: flexibility, bonding mechanical strength, expanding, viscosity, long-term durability
- Environmentally friendly





# Microcement

## Fast Setting, Fast Cycle

RHEOCEM microcements are a range of superfine Portland cements specially made for injection into rock and soils. Due to their fineness they provide extremely effective penetration into fine cracks in rock and fine grained soils to give efficient water tightness, stability and durability in most injection situations.

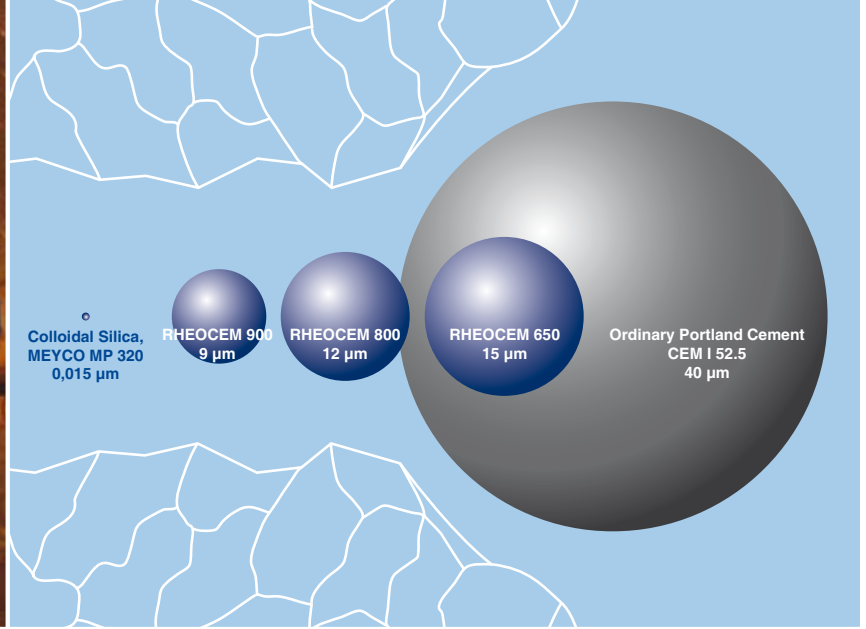
RHEOCEM microcements are also available as sulphate resisting versions and different grades relating to the maximum particle size as given by the D95 values defined below.

Features and benefits:

## Stable Penetrating Grout

- RHEOCEM microcements have a much faster setting time than standard cements and other microcements, offering:
  - Reduced time for a given result – less drilling and less pumping, with no waiting time for the cement to set
  - Improved quality of work due to fast grout without bleeding (w/c=1)
  - Setting can be reduced further with the in-line addition of alkali-free set accelerators
- Excellent grout stability under high pumping pressure ensuring efficient penetration into rock and soils
- Very good penetration into small cracks and inter-granular spaces
- Better working environment as RHEOCEM contains no toxic products
- High durability
- Economical solution
- Standard cement injection technology and equipment can be used





### Controlled Accelerated Setting of Microcement Suspensions

The setting of grout suspensions based on RHEOCEM microcements can be accelerated with a controlled dosage of alkali-free accelerator. Using this method, the open time of the grout suspension can be controlled from 1-2 minutes up to approximately 20 minutes, before it sets and becomes solid.

The main technical properties which can be achieved with this injection technology are:

- Controlled injection with limitation of grout spread in very permeable rock masses and soils.
- Controllable injection with fast setting in cold groundwater conditions, where conventional cements and microcements would only cure over a very long timeframe (several days).





## Polyurethane and Urea Silicates

### Water Stopping

- The MEYCO MP 350 and MP 360 series of polyurethanes and urea silicates resins meet the modern day demands of the tunneling and mining industry.
- The range varies from a convenient 1 component PU for small water sealing jobs to specialist robust 2 component systems to effectively stop massive water ingress problems.

### Consolidation and Cavity Filling

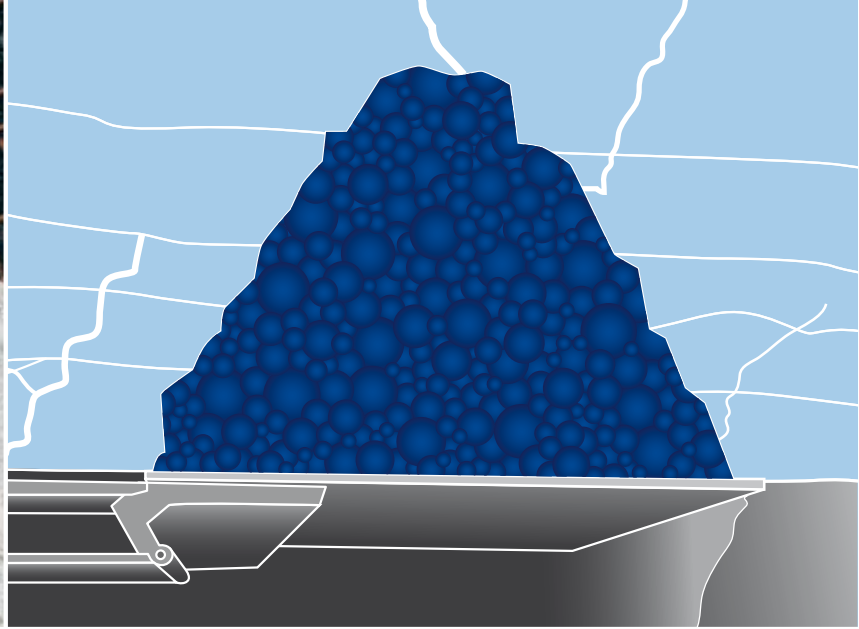
- MEYCO also provides advanced tailor-made resins for cavity filling and ground consolidation in the demanding coal mine industry.

### Tailor Made for Underground Use

Features and benefits of MEYCO injection resins:

- All PU and urea silicate products are solvent free and build closed cell foams.
- Many of the products for preventing water ingress in tunneling can be adjusted on site to give varying performance properties to suit the conditions using different accelerators.
- The urea silicate range has been developed to provide improved fire resistance properties for increased safety underground with better performance.
- All MEYCO PU and urea silicate resins have been tested and certified by external institutes relating to technical properties and health and safety aspects.





Product	Reaction time	Foam factor	Applications	Equipment
<ul style="list-style-type: none"> <li>MEYCO MP 350</li> <li>1 component PU + accelerator</li> </ul>	<ul style="list-style-type: none"> <li>30 ~ 100s</li> </ul>	<ul style="list-style-type: none"> <li>to 8</li> </ul>	<ul style="list-style-type: none"> <li>For permanent structural crack sealing of concrete and masonry structures, filling of dry and water bearing fissures.</li> </ul>	<ul style="list-style-type: none"> <li>1 component pump</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 355 1K</li> <li>1 component PU + accelerator</li> </ul>	<ul style="list-style-type: none"> <li>10 ~ 120s. Separate accelerator provided to adjust reaction time</li> </ul>	<ul style="list-style-type: none"> <li>20 to 30</li> </ul>	<ul style="list-style-type: none"> <li>To stop water ingress in tunnels. Consolidation of gravels. Sealing cracks in concrete structures.</li> </ul>	<ul style="list-style-type: none"> <li>1 component pump</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 355 1K DW</li> <li>1 component PU + accelerator</li> </ul>	<ul style="list-style-type: none"> <li>15 ~ 130s. Separate accelerator provided to adjust reaction time</li> </ul>	<ul style="list-style-type: none"> <li>20 to 30</li> </ul>	<ul style="list-style-type: none"> <li>To stop water ingress in tunnels. Consolidation of gravels. Sealing cracks in concrete structures. DW=Potable Water approval.</li> </ul>	<ul style="list-style-type: none"> <li>1 component pump</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 355 A3</li> <li>2 component PU</li> </ul>	<ul style="list-style-type: none"> <li>No Accelerator 60 ~ 70s.</li> <li>Accelerator 10 40 ~ 60s.</li> <li>Accelerator 15 30 ~ 50s.</li> </ul>	<ul style="list-style-type: none"> <li>to 10</li> <li>10 to 20</li> <li>to 8</li> </ul>	<ul style="list-style-type: none"> <li>Ground consolidation and rapid water stopping in underground structures. Should not be used in coal mines due to too high reaction temperatures. Reacts with and without water.</li> <li>Use of Accelerator 10 allows increased foam factor and faster reactions to deal with major water ingress situations.</li> <li>Use of Accelerator 15 provides stiffer foam allowing more effective ground improvement properties.</li> </ul>	<ul style="list-style-type: none"> <li>2 component pump and static mixer</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 355 A3 THIX</li> <li>Highly reactive 2 component PU</li> </ul>	<ul style="list-style-type: none"> <li>Accelerator 25 20 ~ 60s</li> </ul>	<ul style="list-style-type: none"> <li>to 15</li> </ul>	<ul style="list-style-type: none"> <li>This fast reacting, thixotropic PU resin is used for very demanding water stopping conditions and dilution of PU is likely. The resin provides immediate structural strength.</li> </ul>	<ul style="list-style-type: none"> <li>2 component pump and static mixer</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 357 GS</li> <li>2 component PU</li> </ul>	<ul style="list-style-type: none"> <li>30 ~ 70s</li> </ul>	<ul style="list-style-type: none"> <li>to 3</li> </ul>	<ul style="list-style-type: none"> <li>High quality foam for ground consolidation (GS) in coal mines and civil projects can react with stronger expansion in presence of water from strata.</li> </ul>	<ul style="list-style-type: none"> <li>2 component pump and static mixer</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 364 Flex</li> <li>2 component solvent free urea silicate, fire resistant resin</li> </ul>	<ul style="list-style-type: none"> <li>90 ~ 120s</li> </ul>	<ul style="list-style-type: none"> <li>1</li> </ul>	<ul style="list-style-type: none"> <li>Dense glue-like resin, with good penetration properties for very effective ground consolidation of coal measures, fractured rock and gravels. No foaming in contact with water. Can be used for injections under water.</li> </ul>	<ul style="list-style-type: none"> <li>2 component pump and static mixer</li> </ul>
<ul style="list-style-type: none"> <li>MEYCO MP 367 Foam</li> <li>2 component solvent free urea silicate, fire resistant resin</li> </ul>	<ul style="list-style-type: none"> <li>10 ~ 60s</li> </ul>	<ul style="list-style-type: none"> <li>2 to 30</li> </ul>	<ul style="list-style-type: none"> <li>Cavity filling in tunnelling and mining with beneficial fire resistant properties. Expands without water.</li> </ul>	<ul style="list-style-type: none"> <li>2 component pump and static mixer</li> </ul>



# Colloidal Silica

## Environmentally Safe

MEYCO MP 320 Series (MP 320, 320 T, 325) products are colloidal gels, referred to as a “mineral grouts”. These are not chemical grouts. The MEYCO MP 320 Series is a stable liquid dispersion of discrete, nanometric spherical particles composed of 100% amorphous silicone dioxide, and is completely environmentally safe.

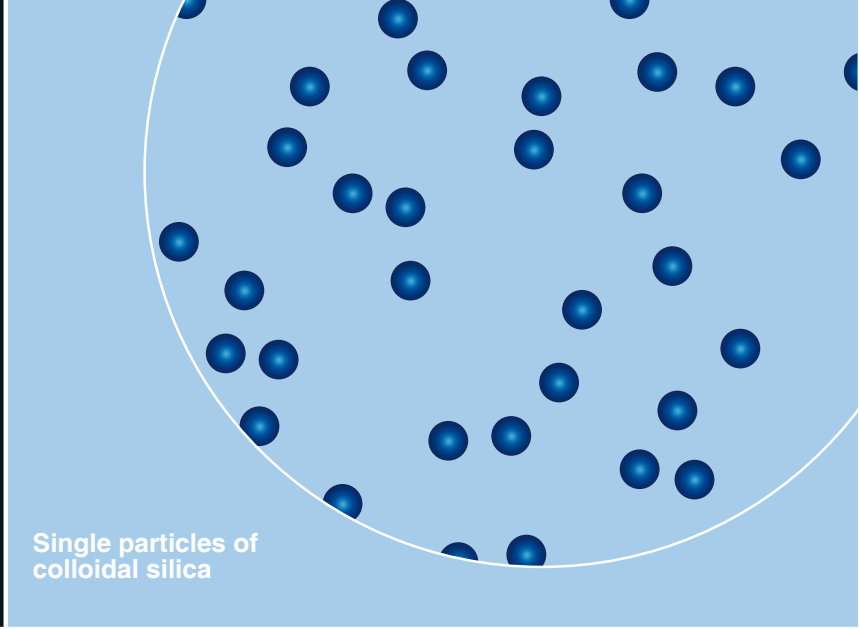
The MEYCO MP 320 Series is used in jointed rock and fine grained soils as a supplement to microcement injections to achieve the final required result and where durable long-term solutions for water sealing and ground stabilization are required.

Features and benefits:

## Extreme Penetration

- It is environmentally friendly and durable, as it is simply composed of quartz sand, water and salt!
- Having a viscosity similar to water, it penetrates soils and fine rock fissures very easily.
- The gel time can be adjusted with the addition of salt water. The gel time can be controlled to between 10 minutes and 2 hours.
- Unlike waterglass (sodium silicate) based products, colloidal silica is durable and continually gains strength over time.
- It is extremely user-friendly as standard cement grout equipment can be used and cleaned with water.
- More cost-effective solution than chemical grouts.

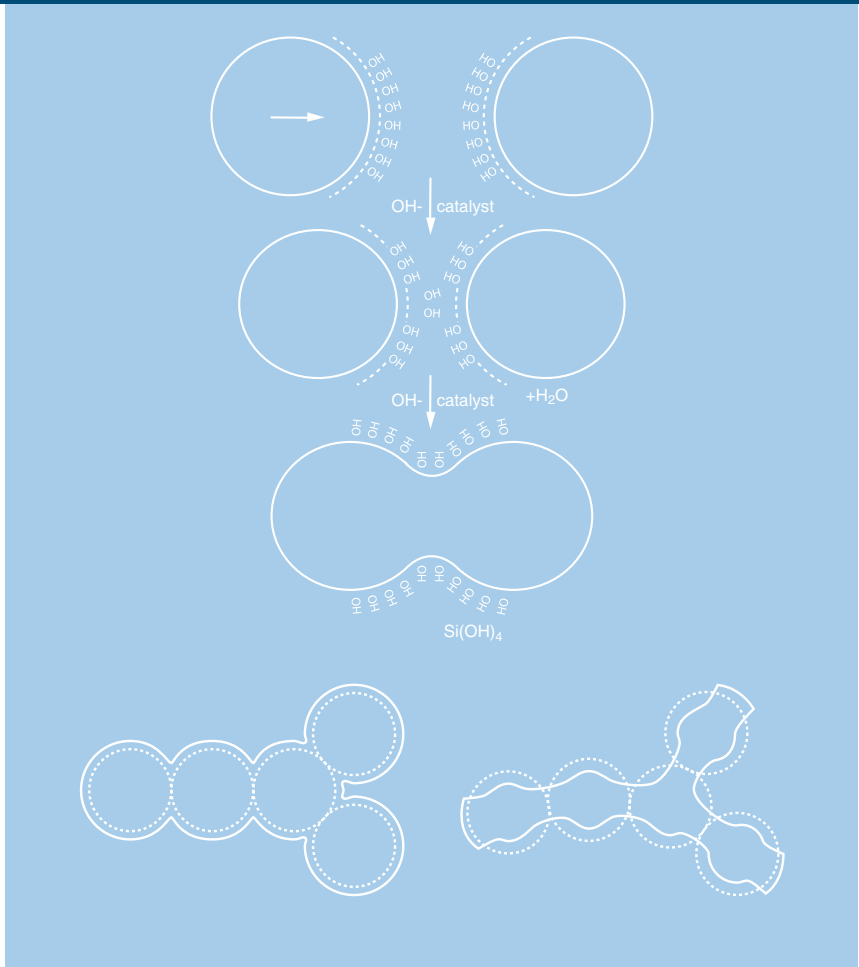


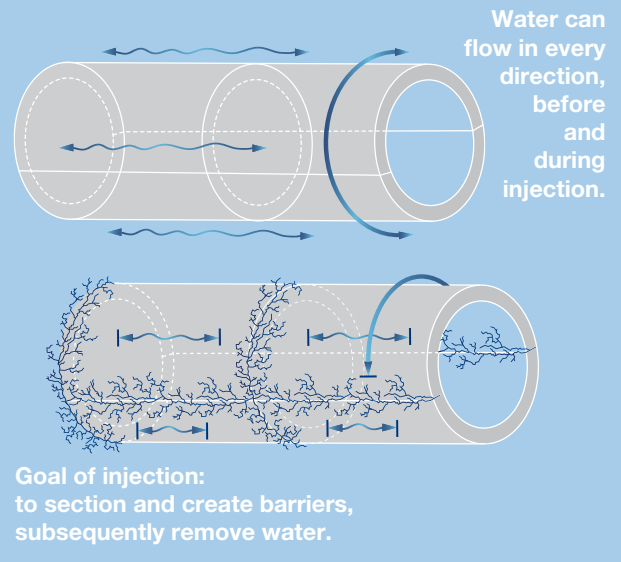


### Coalescence

### Bond Formation Between Silica Particles

### Setting Takes Place with a Physical Reaction





# Acrylates

## Strong Durable Gels

The MEYCO MP 300 series is a range of acrylate resins for underground use. They can strengthen weak soil and sand immediately and seal off water. Where water ingress is not permitted they can permanently seal the finest cracks instantly and even accommodate limited movement due to their swelling capability. This makes them ideal products for curtain injection behind leaking tunnel linings and diaphragm walls. They are also widely used in major infrastructure projects such as power stations' generator housings for the permanent waterproofing of concrete defects.

Features and benefits:

## Permanent Crack Sealing

- Extremely low viscosity allowing unrivalled penetration into cracks
- Controlled gel time from 1 to 40 minutes
- Workable between 0°C and +40°C
- Adjustable gel strength – flexible to stiff
- High early strength compared to other injection gels
- Can be used for damp and wet cracks with excellent bonding
- Continues to seal widening cracks by swelling
- Environmentally friendly containing no acrylamide
- Equipment easily cleaned with water – no solvents required
- Ideal products for construction joint injection hoses
- NSF drinking water certificates





## Know-how and Service

### Training and Education

MEYCO Underground provides technical injection training courses on a frequent basis centrally located in the Hagerbach underground facility in Switzerland. In addition, tailored training is organized on large projects for customers when required.

Technical training is organized both as demonstration workshops in realistic underground settings and as practical injection operators' training.

The demonstration workshops are organized as practical "show-and-tell" sessions and aim to visualize and explain the possible types of application and the technical performance of our injection systems.

The practical injection operators' training is offered exclusively to injection customers who are working with BASF injection systems. At this training the participants are given the chance to work in small groups, taking part in hands-on exercises under the supervision of experienced instructors. The main objective is to gain practical skills for the correct application and execution of injection works.

### Technical Services

MEYCO Underground provides more than simply supplying the products. Assisting customers in selecting the right injection system and setting out the injection method, as well as providing initial supervision and site training of the customer's personnel, is an essential part of our concept.

MEYCO Underground works together with suppliers of equipment and injection accessories to provide the possibly best, most cost-effective and complete technology solution.



**Headquarters**  
**BASF Construction Chemicals Europe AG**  
**MEYCO Global Underground Construction**

Vulkanstrasse 110  
8048 Zurich, Switzerland  
Phone +41 58 958 22 11  
E-mail meyco.ugc@basf.com

**BASF Construction Chemicals**

23700 Chagrin Boulevard  
Cleveland, OH 44122-5554, USA  
Phone +1-216-839 7500  
Fax +1-216-839 8821  
E-mail admixtures@basf.com

**BASF Construction Chemicals Australia**  
**Pty Ltd**

11 Stanton Road  
Seven Hills NSW 2147, Australia  
Phone +61 2 8811 4200  
Fax +61 2 8811 3299

**BASF Construction Chemicals Europe AG**  
**MEYCO Equipment**

Hegmattenstrasse 24  
8404 Winterthur, Switzerland  
Phone +41 58 958 27 00  
E-mail meyco@basf.com

**BASF SA**

Av. Brigadeiro Faria Lima, 3600  
Andares do 8º ao 14º  
04538-132 São Paulo – SP, Brazil  
Phone +55 11 2718 5507  
E-mail vendas-eb@basf.com

**BASF Construction Chemicals Asia Pacific**

14/F, Harbour Ring Plaza  
18 Xizang Road M.  
Shanghai, 200001, P.R. China  
Phone +8621 2320 3000  
E-mail infotmc-ap@basf.com

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**Documentation available on request:**

- Reference list
- Project reports
- Design guidelines
- Method statements
- And more

**Certified quality**

Product Development Process  
is certified according to



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