

BONDERITE®

PROCESSING SOLUTIONS FOR AUTOMOTIVE COMPONENTS

METAL FORMING



MACHINING



CLEANING



SURFACE TREATMENT



Henkel

Henkel, your **trusted** **Solutions Partner**

Innovative technologies for metal forming, machining, cleaning and surface treatment, to meet lightweighting, cost efficiency, and sustainability goals.

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Henkel's aim is to provide **sustainable solutions to our customer's challenges and needs ...**

1. MACHINING AND CLEANING

Our environmentally-friendly range of machining fluids offers extended tool life, part cleanliness and long sump life. Henkel provides a broad cleaner portfolio that includes neutral and alkaline cleaners for customized solutions.

2. METAL FORMING

Within its range of BONDERITE® Metal Forming products, Henkel offers an extensive line of casting, forging and cold forming lubricants. Oil- and water-based high-pressure die casting lubricants are made for conventional and micro-spray applications.

Advanced forging lubricants are formulated leveraging Henkel's more than 100 years' experience in graphite processing. The portfolio covers oil- and water-based graphite lubricants, as well as graphite-free forging lubricants made for excellent performance under extreme pressure and temperature conditions.

3. SURFACE TREATMENT SOLUTIONS

Henkel is the global market leader in pretreatment technologies for multi-metal substrates and innovative chrome-free passivation processes for light metal components. BONDERITE® pretreatment products are the industry standard for applications such as frames, steel wheels, aluminum wheels, axles, suspensions and seat frames, as well as structural parts and EV elements like battery boxes and battery coolers.



... and to support them
**with collaborative partnerships
and comprehensive solutions.**

Henkel is committed to engineering excellence and your commercial success, achieved through:

1. UNMATCHED TECHNOLOGY PORTFOLIO

Henkel leads the market with advanced thermal interface materials, adhesives and sealants, lubricants, cleaners and surface treatment solutions. Tapping into this complementary toolbox of materials together with our strong R&D competencies, Henkel works to solve customers' engineering challenges.

2. PROCESS EXPERTISE

With over 60 years' experience in the automotive industry, Henkel's global team of solution engineers has unparalleled application and process knowledge. Our team offers dedicated support to co-develop sustainable production processes that meet large-scale manufacturing requirements.

3. EQUIPMENT SUPPORT

Automatic dosing and process monitoring systems for Henkel surface treatment, cleaner and lubricant solutions enable our customers to execute more efficient processes. Henkel-branded solutions alongside partnerships with leading equipment suppliers deliver broad resources for high-yield manufacturing outcomes.

Henkel's technical expertise combined with our market-leading formulations provide end-to-end success across the value chain, from liquid metal to the final component.



ENABLING CHEMISTRIES FOR **METAL FORMING**

BONDERITE® lubricants facilitate numerous metal forming applications including casting, forging and cold forming, and are designed to support robust processes with short cycle times and excellent tool life.

The innovative PULS technology for cold forming helps customers significantly reduce processing time, avoid the use of hazardous material, and extend tool life – all of which contribute to reduced processing costs.

CASTING LUBRICANTS

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FORGING LUBRICANTS

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COLD-FORMING LUBRICANTS

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SUCCESS IS OUR AMBITION

Henkel technology solutions are designed to create value for our customers, helping them secure a competitive advantage.

CASTING LUBRICANTS

Features and Benefits:

- > High wetting temperatures and release properties to reduce cooling time, ensure optimal die protection and enable efficient production rates
- > Concentrated products to reach high dilution ratios up to 250:1; lower cost per part and reduced packing, handling and transport costs.
- > Specific formulations to be applied pure or diluted through standard, minimal or micro-spray applications
- > Cleaner surfaces for enhanced performance in painting or bonding applications
- > Low build-up on dies, reducing maintenance operations

BONDERITE®	Dilution	Features and Benefits
L-CA CP 1002	1 – 120 or pure	Wax-free formulation, wide temperature range; suitable for conventional and micro-spray.
L-CA CP 1020 N	40 – 120	Oil-wax mixture, very good migrating properties into deep cavities; suitable for a range of casting parts.
L-CA CP 579 N	40 – 120	Low wax product, no build-up, very good release and clean part surfaces.
L-CA CP 798	40 – 120	High release properties for all types of aluminum parts.
L-CA CP 1030N	40 – 120	High release performance and excellent bacteria protection (biostability); suitable for all types of aluminum parts.
L-CA 791 L-CA 791 C	100 – 160	Low wax product for hot dies and castings with large dimensions. Universal and robust product, offering reduced part porosity over a wide range of temperatures. C-version offers additional biostability and corrosion protection for the die.
L-CA CP 503 RANGE	140 – 200	140 – 200 Various formulations for structural parts, low-Fe and sticky Al alloys, as well as magnesium casting.
L-CA CP 593HM	160 – 300	Excellent metal flow for large and complex components. Castings on big presses with automatic application, particularly on hot dies. Suitable for heavy section castings.
L-CA CP 799	40 – 150	Special development for self-curing alloys. No interference with subsequent processes such as bonding, welding and/or painting.
L-CA CP 786	Ready for use	Oil-based, high-performance lubricant, suitable for micro-spray application.



FORGING LUBRICANTS

	BONDERITE®	Features and Benefits
GRAPHITE DISPERSIONS	L-FG F 31	Recognized as the industry benchmark. Finest graphite particle size available. Excellent metal flow, productivity and die life. Wide application range for an easy and robust forging process.
	L-FG F 581C	High-solids forging lubricant, optimized for process cost control.
	L-FG F 568	Excellent film formation; state-of-the-art forging die lubricant supplied in concentrated form.
	L-FG F 550	Versatile and reliable forging die lubricant to reduce die wear and optimize material flow in the forging of complex steel parts.
	L-FG F 592	Ammonia-free, graphite dispersion ensures excellent performance and cost-efficiency.
GRAPHITE-FREE, SYNTHETIC FORGING LUBRICANTS	L-FG 1105M	Recognized as the industry benchmark for non-graphite forging die lubricants. Suitable for a wide range of forging applications.
	L-FG 497	Broad field for hot forging of ferrous metals on presses and hammers.
	L-FG F 605	Next-generation lubricant for medium- to heavy-duty forgings; promotes a cleaner working environment.
HEAVY DUTY, EXTRUSION	L-FGF 144/S	Supports extreme metal flow, especially backward extrusion of gas cylinders, rail wheels.
	L-FGF 344/2	Heavy forging, enhanced metal flow, especially well-suited for hot steel extrusion of gas cylinders and rail wheels.
ALUMINUM FORGING LUBRICANTS	L-FG 593 AL	Water-based lubricant for complex forming operations; has high biostability.
	L-FG 599 AL	Graphite in oil/water emulsion, suited for multi stage, warm forming of aluminium parts on orbital forging presses.
	L-FG 522	Graphite in oil dispersion for isothermal and non-isothermal forging operations.

COLD-FORMING LUBRICANTS

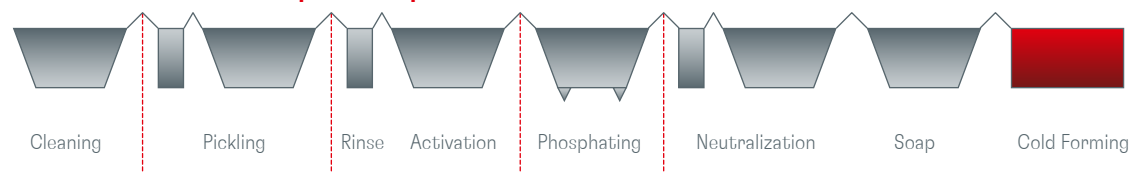
POLYMER-BASED LUBRICANTS

Features and Benefits:

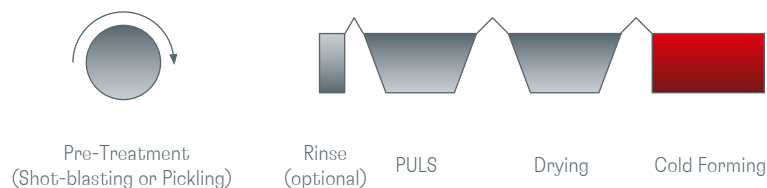
- > Extended tool life
- > No production stops for bath maintenance
- > No disposal of reactive soap & phosphate sludge
- > Lower bath disposal cost
- > Leanest cold forming process in the market

Process set-up:

TRADITIONAL PROCESS: Up to 10 steps



PULS* (POLYMER-BASED LUBRICANT) PROCESS: Reduce number of steps from 10 to 3



	BONDERITE®	Performance	Contains Boron	Contains Zinc Phosphate	Applications	Removable with Alkaline Cleaner
POLYMER-BASED COLD FORMING LUBRICANTS	L-FM FL 744	Medium	Yes	Yes	Bolts, powertrain, wire, bars	Yes
	L-FM FL 735	High	Yes	Yes	Bolts, wire, bars	Yes
	L-FM FL 835	High	Yes	Yes	Powertrain, bars	Yes
	L-FM FL 623	High	No	No	Tubes, fittings, galvanized wire	Tubes, fittings, galvanized wire
	L-FM FL 2020	High	No	No	Powertrain, bars	Yes
	L-FM FL 2021	High	No	No	Bolts	Yes

*Parker Ultimate Lubrication System Licensed Technology from Nihon Parkerizing, Japan



SOLUTIONS FOR **MACHINING AND CLEANING**

The innovative BONDERITE® line of machining fluids reduces coolant consumption by up to 70%, improves tool life, and ensures part cleanliness. Prioritizing sustainability, Henkel's portfolio of coolants – including boron-free solutions – meets ever-increasing environmental standards.

Neutral and alkaline cleaners offer temporary corrosion protection, long-term biostability, excellent cleaning performance, and low foaming – even under high pressure. With an exceptionally broad range of products and chemistry platforms, Henkel is uniquely positioned to develop customized and highly-efficient cleaning solutions.

MACHINING AND GRINDING FLUIDS

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PART CLEANERS

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SAFETY IS OUR AMBITION

Henkel machining, grinding and cleaning fluids deliver best-in-class results, while ensuring worker safety.

MACHINING AND GRINDING FLUIDS

Features and Benefits:

- > Best-in-class biostability
- > Up to 70% less consumption
- > Promotes shop cleanliness
- > Long sump life
- > High level of corrosion inhibition
- > Excellent heat transfer

BONDERITE®	Description	Compatible with
L-MR 11424	Fully synthetic (oil-free) coolant for grinding applications only.	Steel/Cast/(AL)
L-MR 21718	Comprehensive semi-synthetic for most applications.	Steel/Cast/AL
L-MR 21165	Semi-synthetic for use with non-ferrous applications.	Brass/Copper, Mg/Zn
L-MR 21909	Semi-synthetic aviation product, 100% VOC-free.	Steel/Stainless Steel/AL/Titanium
L-MR B-204	Comprehensive semi-synthetic for light to medium duty.	Steel/Cast/AL
L-MR B-400	Comprehensive semi-synthetic for medium to heavy duty.	Steel/Cast/AL/Stainless Steel/Ti
L-MR B-236	Comprehensive semi-synthetic for light to medium duty for soft water applications.	Steel/Cast
L-MR B-415	Comprehensive semi-synthetic for medium to heavy duty for soft water applications.	Steel/Cast/AL
DualCys	Semi-synthetic with recyclable cleaner system, providing the most sustainable process.	Stainless Steel/AL

PART CLEANERS

Features and Benefits:

- > Excellent cleaning performance
- > Temporary corrosion protection
- > Foam-free even under high pressure
- > Extended bath life and less wastewater

BONDERITE®	Description	Compatible with	Features
C-NE 5088	Neutral spray cleaner at high temperatures (> 50°C), salt free.	All ferrous alloys	Excellent removal of MQL machining lubricants
C-NE 10330	Neutral spray cleaner after MQL operations. (MQL = Minimum Quantity Lubrication)	All metals (35–65°C)	Best cleaning performance when MQL lubricants used before cleaning
C-NE 5225	Neutral spray cleaner for high and low temperatures (35 – 70°C), salt-containing.	Ferrous and aluminum alloys	Best cleaning performance for particles
C-NE 10300	Neutral spray cleaner at low temperatures (> 20 – 60°C), salt-free.	All metals	Best demulsifying properties for longer bath lifetime
C-NE 400	Neutral spray cleaner at low temperatures (> 20°C), salt-free.	All metals	Best temporary corrosion protection for interoperation storage
C-NE 270	Neutral spray cleaner (> 20°C), salt-free.	Demulsifying non-ferrous metal cleaner, with lightening properties at AL-alloys	Best before liquid gasketing
C-NE 320BF	Residue- and Boron-free neutral cleaner, with no foam formed, formulated to run between through a wide temperature range – ambient to 82°C	Steel/Cast/AL	Best cleaning performance where residue-free is critical, excellent for vacuum drying applications



SOLUTIONS FOR SURFACE TREATMENT

Our surface treatment solutions yield high-end corrosion protection, from classical zinc phosphate to sustainable thin films conversion coatings. Neutral descaler our Thin Film Processes use less energy and reduce both waste and water usage when compared to traditional Zinc Phosphate applications. We offer specialized light metal pretreatment solutions applied to aluminum wheels, passivation of battery elements and other multiple light-metal components.

ZINC PHOSPHATE

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THIN FILM PROCESS

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LIGHT METAL PROCESS

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ANODIZING SEALING

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MPP PROCESS

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LINEGUARDX & LINEGUARD PROCESS CONTROL EQUIPMENT

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RELIABILITY IS OUR AMBITION

All Henkel solutions are engineered to optimize safety, reliability and efficiency of surface treatment processes.

ZINC PHOSPHATE

Features and Benefits:

- > Highest performance in corrosion protection
- > Suitable for steel, aluminum and galvanized surfaces
- > Low process temperature at 48 – 55°C
- > Up to 20% aluminum content is achievable
- > Full range of neutral descalers and etchants for steel and galvanized substrates

Key products:

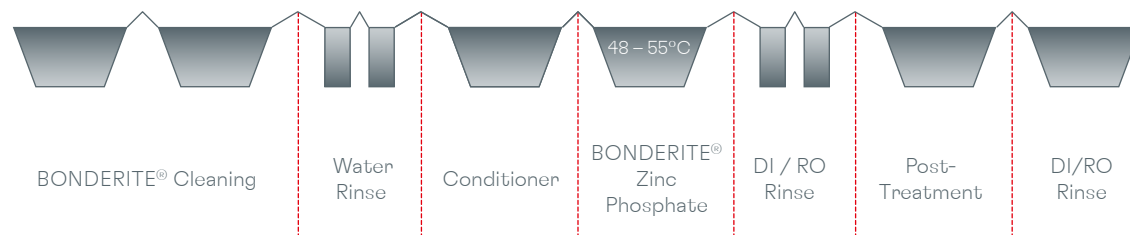
BONDERITE® M-AC AL2000

- > Liquid-based conditioner with enhanced shelf life and bath life which creates greater process efficiency

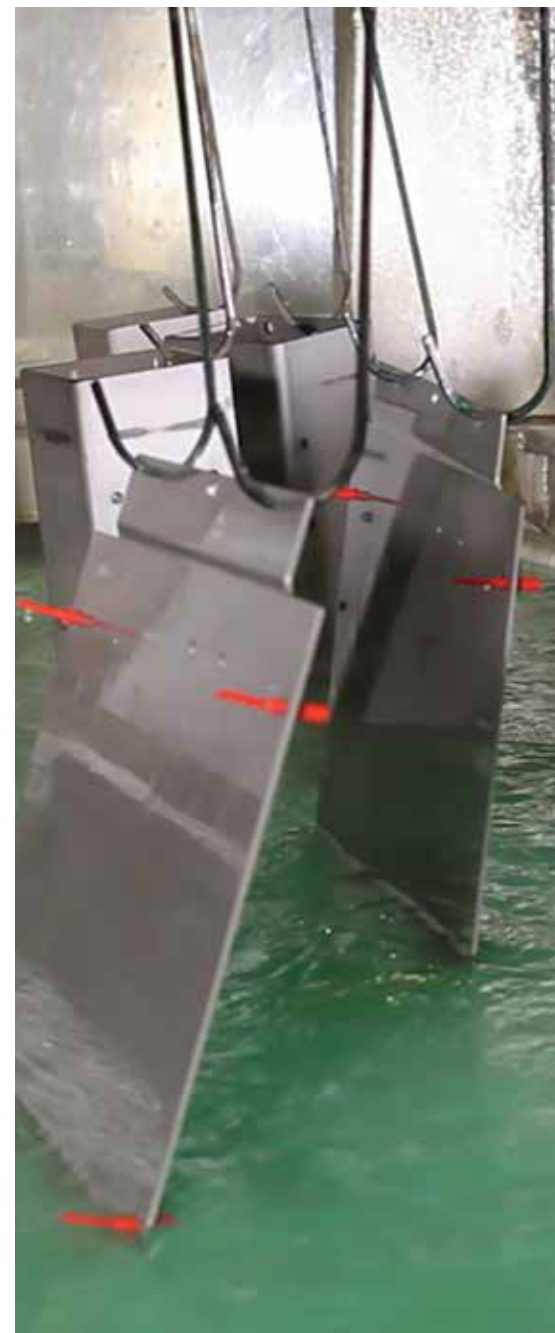
Neutral Descaler:

- > BONDERITE® C-NE N
- > BONDERITE® C-AD N5 additive
- > BONDERITE® C-IC 182

Process set-up:



7 key steps – up to 20% aluminum is achievable



ZINC PHOSPHATE

HENKEL FLEX- OR "TWO-STEP"-TECHNOLOGY

Features and Benefits:

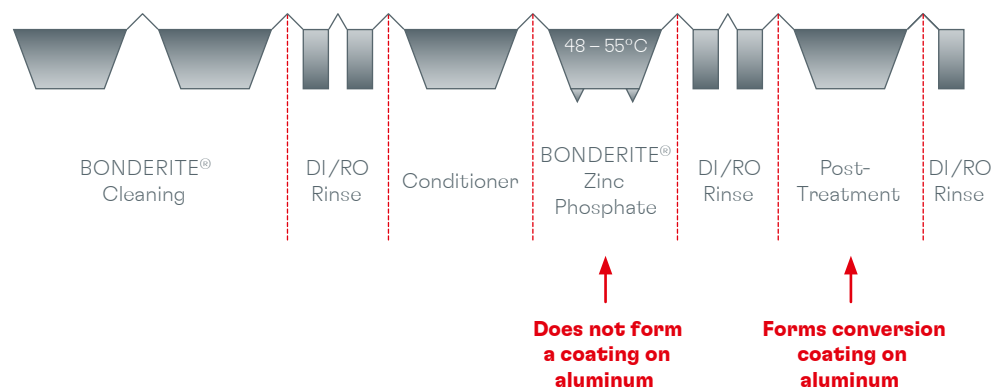
- > Up to 100% aluminum content in the metal mix
- > 50% less hazardous sludge generation
- > Less maintenance, less chemical cleanings
- > 50% less free fluoride usage in phosphate stage
- > Reduced cost from the first m² of aluminum in the metal mix

Key products:

BONDERITE® M-ZN 2798

BONDERITE® M-ZN 2792

Process set-up:



THIN FILM PROCESS

BONDERITE® TECTALIS*

Features and Benefits:

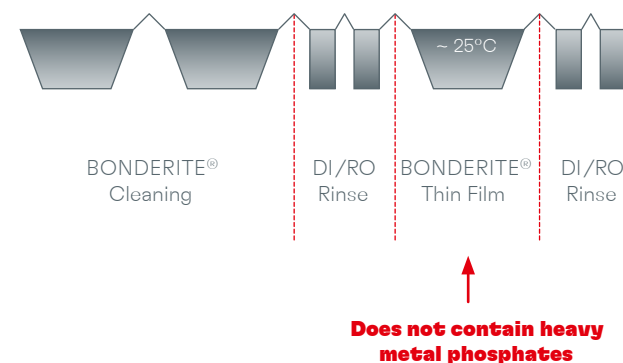
- > Free of hazardous heavy metals
- > Ambient temperature processing reduces energy consumption
- > Zero sludge production lowers maintenance resource requirements
- > Facilitates a streamlined process with fewer stages
- > Reduced water use yields less wastewater
- > Suitable for all metals

Key products:

BONDERITE® M-NT 1820

BONDERITE® M-NT 1850

Process set-up:



* Greenfield site

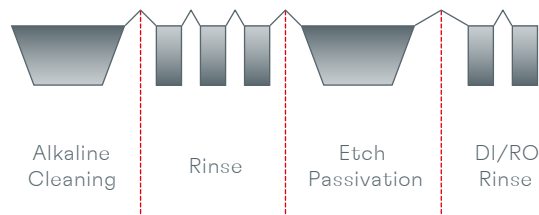
LIGHT METAL PROCESS

ETCH PASSIVATION PROCESS

Features and Benefits:

- > Simple, ultra-short process set-up
- > Etch-passivation of aluminum components
- > Flexible process for cleaning and Ti-based passivation
- > Stable surface conditions and resistance for up to 6 months
- > Excellent welding and adhesive bonding of components, even after extended storage periods
- > OEM-approved

Process set-up:



Key products:

Degreaser:

- > BONDERITE® C-AK 1563-1

Surfactant:

- > BONDERITE® C-AD 5003

Etch-Passivation:

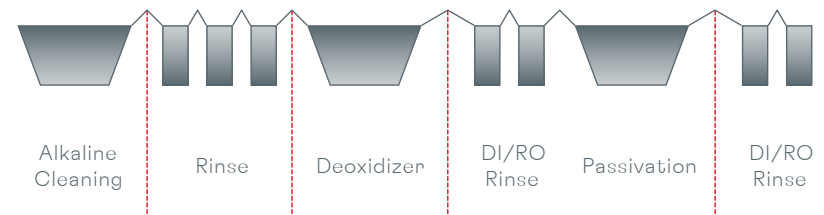
- > BONDERITE® M-NT 2040 (R2)

LIGHT METAL PASSIVATION PROCESS

Features and Benefits:

- > Flexible process layout
- > Best-in-class corrosion performance
- > Excellent paint adhesion
- > Robust, easy-to-control process
- > Automated process control and dosing with Henkel Lineguard system
- > Titanium- or Titanium/Zirconium-based + Polymer for adhesion

Process set-up:



Key products:

Degreaser:

- > BONDERITE® C-AK 1563-1 / C-AD 5003
- > BONDERITE® C-AK G414

Deoxidizer:

- > BONDERITE® C-IC 4902
- > BONDERITE® M-NT 2040
- > BONDERITE® C-IC HX-357

Passivation:

- > BONDERITE® M-NT 400
- > BONDERITE® M-NT 4850-2
- > BONDERITE® M-NT 4595 R5
- > BONDERITE® M-NT 5200

ANODIZING SEALING

TWO-STEP SEALING PROCESS

Unique sealing technology for anodized aluminum protects automotive exterior aluminum parts that are exposed to harsh environments. Typical applications are exterior trim parts and interior decorative elements.

Features and Benefits:

- > Improved anti-corrosion performance against alkaline media and as observed in salt spray testing
- > Highly-effective sealing process
- > No impact on anodizing oxide thickness

Key products:

BONDERITE® M-ED 11053

- > Nickel complex used at sealing step 1

BONDERITE® M-ED 11036

- > Organic polymer used at sealing step 2

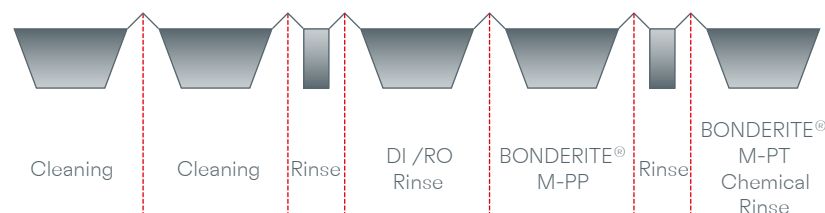
MPP PROCESS

AUTOPHORETIC COATING PROCESS

Features and Benefits:

- > Low cure temperature for processing of fully-assembled components
- > Flexible and impact-resistant coating
- > Functional UV protection
- > Unlimited throwing power
- > Inside and outside part protection
- > Uniform low-gloss appearance

Process set-up:



Key products:

BONDERITE® M-PP 930™

- > Excellent corrosion protection for demanding application such as vehicle frames and chassis parts
- > Co-cure compatible (M-PP-coating and topcoat in ONE oven cure)
- > No application limitation for part size, shape, density or complexity
- > Cure profile at 185 – 210°C

BONDERITE® M-PP 942™

- > High gloss
- > Low cure temperature
- > Enhanced corrosion performance

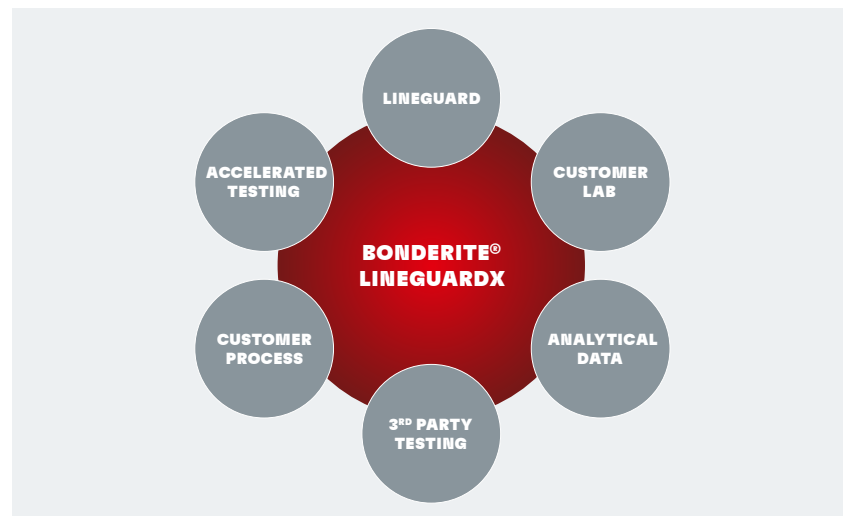
LINEGUARDX

SMART MANUFACTURING SYSTEM

BONDERITE® LineguardX is an innovative smart manufacturing execution system (MES) for remote monitoring and predictive maintenance. It can help improve manufacturing operations by allowing better control and continuous monitoring of coating systems.

Features and Benefits:

- > Early warning of pending danger
- > Increased quality
- > Reduced scrap rate
- > Reduced downtime
- > Ongoing customer support



LINEGUARD PROCESS CONTROL EQUIPMENT

Henkel's Lineguard equipment and systems incorporate over 40 years of experience in the design, building, and maintaining of metal treatment operations.

Features and Benefits:

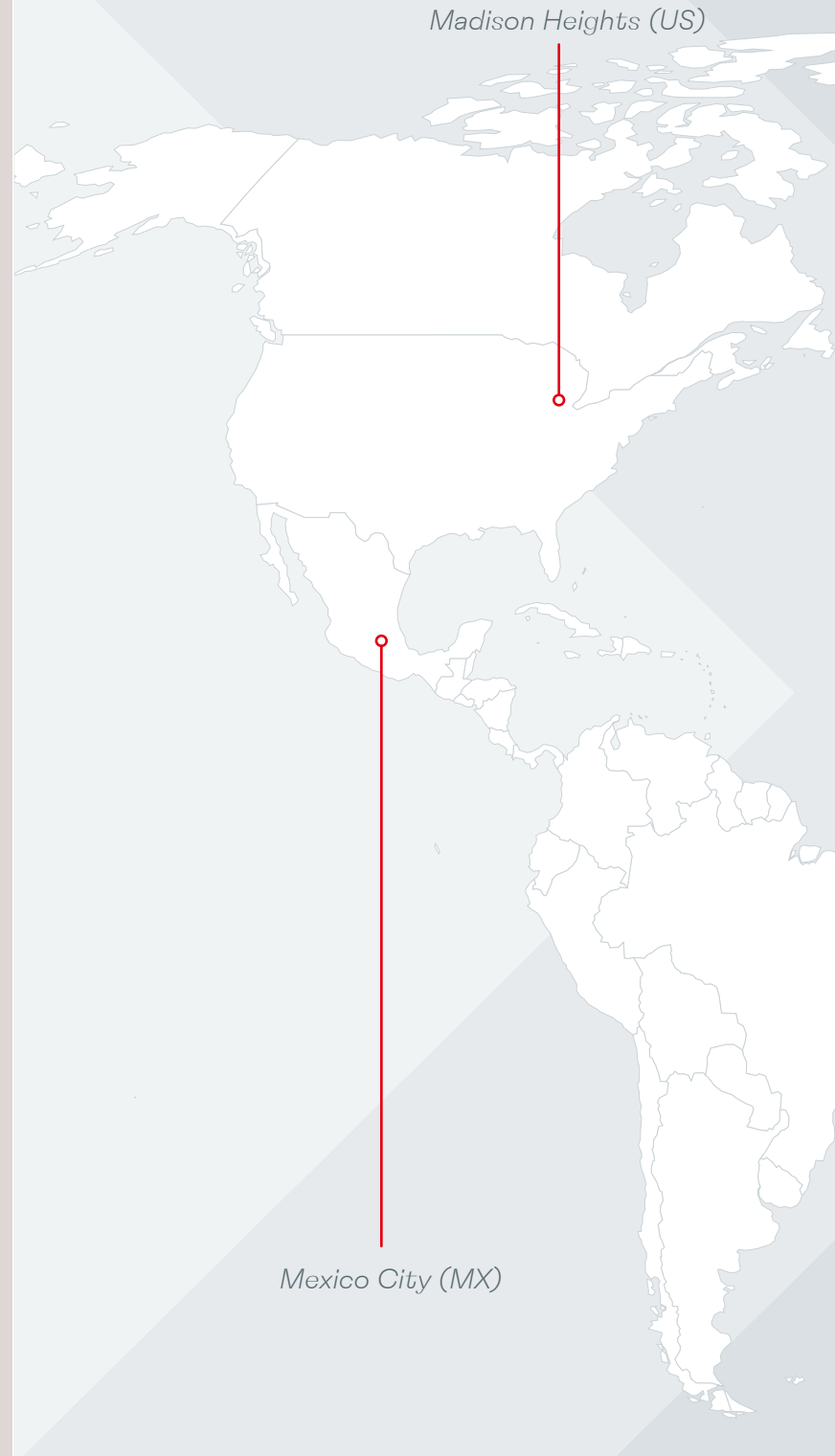
- > Versatile, modular system
- > Automated bath control & product dosing
- > Accurate dosing & enhanced process control
- > Higher process quality
- > Reduced consumption of water & chemicals
- > Data-logging of all relevant bath parameters
- > Ready for IoT 4.0 – remote access and data analysis

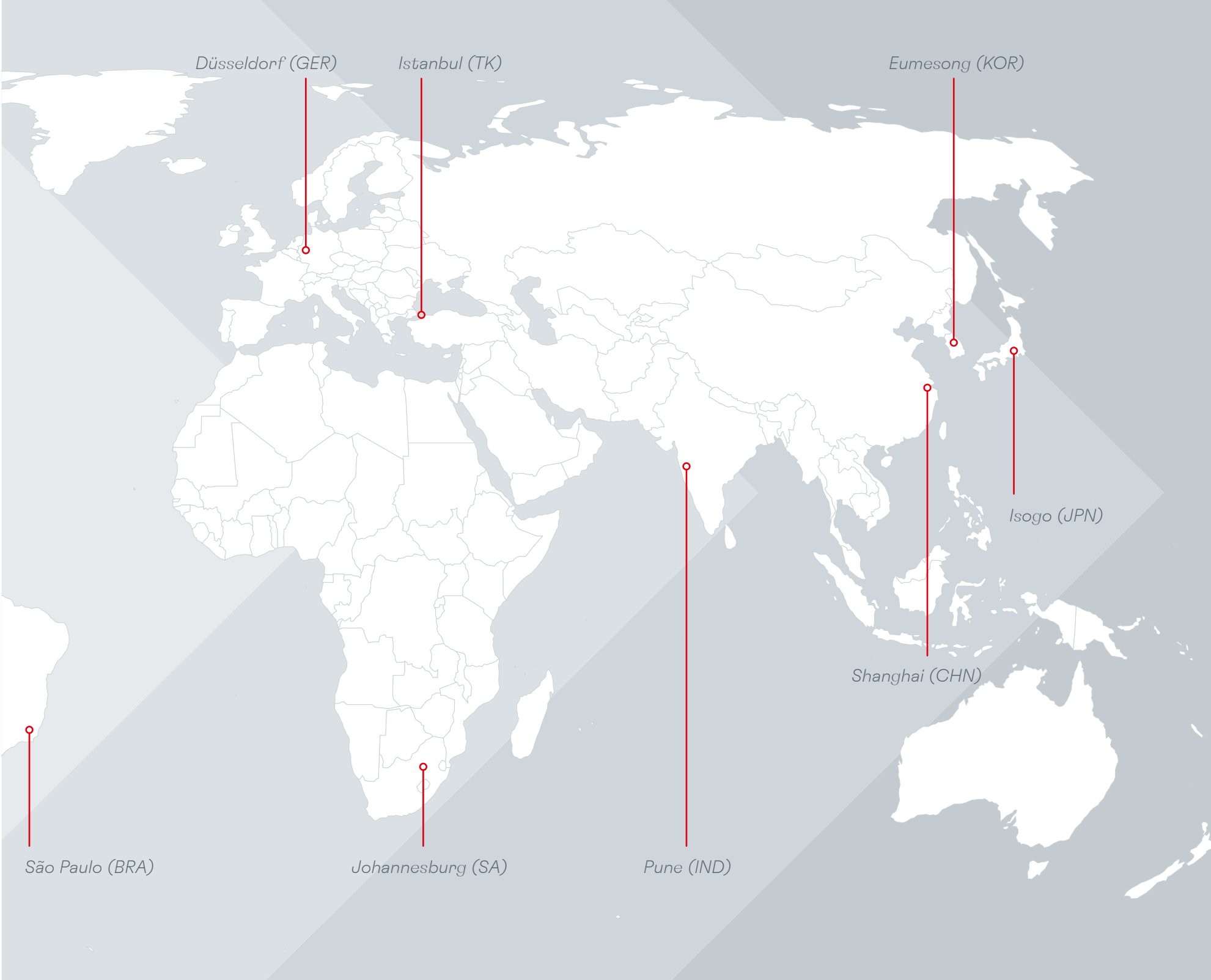




Get in Touch with our Global Team of Technology Experts

Henkel, your trusted solution partner.





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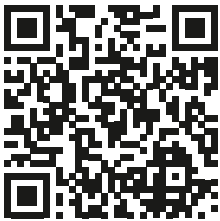
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SHAPE | DEFINE | PROTECT

THE FUTURE

VISIT US ONLINE



BONDERITE[®]

**Automotive Component
Processing Solutions**

The information provided herein, especially recommendations for the usage and the application of our products, is based upon our knowledge and experience. Due to different materials used as well as to varying working conditions beyond our control we strictly recommend to carry out intensive trials to test the suitability of our products with regard to the required processes and applications. We do not accept any liability with regard to the above information or with regard to any verbal recommendation, except for cases where we are liable of gross negligence or false intention. The information is protected by copyright. In particular, any reproductions, adaptations, translations, storage and processing in other media, including storage or processing by electronic means, enjoy copyright protection. Any exploitation in whole or in part thereof shall require the prior written consent of Henkel AG & Co. KGaA. Except as otherwise noted, all marks used in this document are trademarks and/or registered trademarks of Henkel and/or its affiliates in the US, Germany, and elsewhere.

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