GEOMET® 321 is applied to protect fasteners and many type of metallic parts from corrosion and is used in many industries. It can be combined with PLUS®, DACROLUB® or GEOKOTE® topcoats to provide a very broad range of friction coefficients. It is the most widely used product in zinc flake technology.

Characteristics and performance
- The coefficient of friction can be adjusted to targeted values ranging from 0.06 to 0.20 (ISO 16047) with NOF METAL COATING GROUP’s selected topcoats
- It can be used with or without topcoat
- No hydrogen embrittlement
- Excellent assembly and multi-tightening behavior (with lubricated topcoat)
- Good mechanical damage (test method D24 1312, USCAR 32) and chemical (test VDA 621-412) resistance
- Performance maintained at elevated temperatures (up to 300°C)
- Paintable coating
- Electrical conductivity for most application processes
- Bimetallic compatibility with aluminum
- Thin dry-film, non-electrolytic
- Water-based chemistry
- Passivated zinc and aluminium flakes in a binder, patented chemistry
- Chrome free alternative to DACROMET® 320
- Metallic silver appearance

High corrosion resistance

<table>
<thead>
<tr>
<th>Coating Weight</th>
<th>Salt Spray Test (ISO 9227/ASTM B117)</th>
<th>Cyclic Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRADE A</td>
<td>&gt; 240 hours without white rust</td>
<td>-</td>
</tr>
<tr>
<td>&gt; 720 hours without red rust</td>
<td></td>
<td>4 cycles ACT</td>
</tr>
<tr>
<td>GRADE A</td>
<td>&gt; 720 hours without red rust</td>
<td>60 cycles GMW 14872</td>
</tr>
<tr>
<td>&gt; 24 g/m²+ topcoat</td>
<td></td>
<td>60 cycles SAE J2334</td>
</tr>
<tr>
<td>GRADE B</td>
<td>m2 &gt; 1000 hours without red rust</td>
<td>-</td>
</tr>
<tr>
<td>&gt; 36 g/m²</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Results may vary depending on substrate, geometry of parts and type ok application processes.

Application process
GEOMET® 321 can be applied by Dip-Spin, Spray, Dip-Drain-Spin using bulk or rack

Health and Safety
- Aqueous dispersion
- Complies with REACh
- Complies with the 2000/53/CE and 2002/95/CE directives

International standards:
- **EN ISO 10683** - Fasteners: non-electrolytic zinc flake coatings
- **EN 13858** - Non-electrolytic zinc flake coatings on iron and steel parts
- **ASTM F1136 / F1136 M** - Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ZINC FLAKE COATING

GEOMET® 500 is applied to fasteners and many type of metallic parts to protect from corrosion, and it is used in many industries:
- Thin dry-film, non-electrolytic, self-lubricated
- Water-based chemistry
- Passivated zinc and aluminium flakes in a binder, patented chemistry
- Chrome free alternative to DACROMET® 500
- Metallic silver appearance

**Characteristics and performance**
- Coefficient of friction: 0.15 ± 0.03 (ISO 16047)
- No topcoat required
- No hydrogen embrittlement
- Excellent assembly and multi-tightening behavior
- Good mechanical damage (test method D24 1312, USCAR 32) and chemical (test VDA 621-412) resistance
- Performance maintained at elevated temperatures (up to 300°C)
- Paintable coating
- Electrical conductivity for most application
- Bimetallic compatibility with aluminum
- Application cost savings

**High corrosion resistance**

<table>
<thead>
<tr>
<th>Coating Weight</th>
<th>Salt Spray Test (ISO 9227 / ASTM B117)</th>
<th>Cyclic Test</th>
</tr>
</thead>
<tbody>
<tr>
<td>(GRADE A)</td>
<td>&gt; 240 hours without white rust</td>
<td>25 cycles APGE</td>
</tr>
<tr>
<td>&gt; 24 g/m²</td>
<td>&gt; 720 hours without red rust</td>
<td></td>
</tr>
<tr>
<td>(GRADE B)</td>
<td>&gt; 240 hours without white rust</td>
<td>6 cycles ACT</td>
</tr>
<tr>
<td>&gt; 36 g/m²</td>
<td>&gt; 1000 hours without red rust</td>
<td>50 cycles APGE</td>
</tr>
</tbody>
</table>

*Results may vary depending on substrate, geometry of parts and type of application process.*

**Application process:**
GEOMET® 500 can be applied by Dip-Spin, Spray, Dip-Drain-Spin using bulk or rack.

**Health and Safety**
- Aqueous dispersion
- Complies with REACh
- Complies with the 2000/53/CE and 2002/95/CE directives

**International standards:**
- **EN ISO 10683** - Fasteners: non-electrolytic zinc flake coatings
- **EN 13858** - non-electrolytic zinc flake coatings on iron and steel parts
- **ASTM F1136 / F1136 M** - Zinc/Aluminum Corrosion Protective Coatings for Fasteners
ZINC FLAKE COATING

GEOBLACK®

<table>
<thead>
<tr>
<th>GEOBLACK® 180 BLACK-ON-BLACK</th>
<th>GEOBLACK® M BLACK-ON-BLACK</th>
<th>GEOBLACK® 500M BLACK ON SILVER</th>
<th>GEOBLACK® ML BLACK ON SILVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOMET® 430 + PLUS® VLh Black Black basecoat + black topcoat Even, consistent black color after handling and damage Coefficient of friction: 0.09 – 0.14</td>
<td>GEOMET® 430 + PLUS® ML Black Black basecoat + black topcoat Even, consistent black color after handling and damage Coefficient of friction: 0.12 – 0.18</td>
<td>GEOMET® 500 + PLUS® Black 500 M Silver basecoat + black topcoat Coefficient of friction: 0.11 – 0.17</td>
<td>GEOMET® 321 + PLUS® ML Black Silver basecoat + black topcoat Coefficient of friction: 0.10 – 0.16</td>
</tr>
</tbody>
</table>

Characteristics and Performance

- Thin dry-film, non electrolytic
- Strong resistance to chemical attack: solvents, fuels, brake fluids (VDA 621 412)
- Possibility of extremely high chemical resistance, including wheel cleaning solutions, with GEOKOTE black topcoat
- Water-based chemistry
- No hydrogen embrittlement

High resistance to corrosion

Salt Spray Test (ISO 9227 / ASTM B117)

> 1000 hours without red rust

*Results may vary depending on substrate, geometry of parts and type ok application processes.

Application process

GEOBLACK® can be applied by Dip-Spin, Dip-Drain-Spin, using bulk or rack.

Health and Safety

- Aqueous dispersion
- Complies with REACh
- Complies with the 2000/53/CE and 2002/95/CE directives

International standards

ISO 10683 - Fasteners: non-electrolytically applied zinc-flake coatings

EN 13858 - Non-electrolytically applied zinc-flake coatings on iron or steel parts

ASTM F1136 / F1136 M - Zinc/Aluminum Corrosion Protective Coatings for Fasteners.
ZINC FLAKE COATING

DACROLUB® 10

DACROLUB® 10 is an organic topcoat made from water-based chemicals. This topcoat can be applied to GEOMET® and DACROMET® coatings, whereby the friction coefficient of threaded parts can be reduced and controlled.

Characteristics and performance*

- Dry lubrication film
- Friction coefficient: 0.08 – 0.14 on parts with GEOMET® or DACROMET® measured according to EN ISO 16047
- DACROLUB® 10 gives freedom from possible stick-slip problems when tightening (VDA 235-203)
- No induced hydrogen embrittlement
- Appearance: clear
- Salt Spray Test according to ISO 9227: No effect on the corrosion resistance of the GEOMET® base-coat
- The combination GEOMET® / DACROLUB® 10 is particularly suited to fasteners since it provides them with optimal protection and assembly properties
- Being easy to apply, the DACROLUB® 10 can be coloured to be used for part identification (green or blue in standard)
- Competitive coating cost

Application process

DACROLUB® 10 can be applied in one single thin coat by Dip-Spin or spray.

Environmental safety

- Aqueous dispersion
- Complies with REACH
- Complies with the 2000/53/CE and 2011/65/CE directives

*Results may vary depending on substrate, geometry of parts and type of application processes.

DACROLUB® 15

DACROLUB® 15 is an organic topcoat made from water-based chemicals. This topcoat can be applied to GEOMET® and DACROMET® coatings, whereby the friction coefficient of threaded parts can be reduced and controlled.

Characteristics and performance*

- Dry lubrication film
- Friction coefficient: 0.12 – 0.18 on parts with GEOMET® 321 or DACROMET® 320 measured according to EN ISO 16047
- No induced hydrogen embrittlement
- Appearance: clear
- Salt Spray Test according to ISO 9227: No effect on the corrosion resistance of the GEOMET® base-coat
- The combination GEOMET® / DACROLUB® 15 is particularly suited to fasteners since it provides them with optimal protection and assembly properties
- Competitive coating cost

Application process

DACROLUB® 15 can be applied in one single thin coat by Dip-Spin or spray.

Environmental safety

- Aqueous dispersion
- Complies with REACH
- Complies with the 2000/53/CE and 2011/65/CE directives

*Results may vary depending on substrate, geometry of parts and type of application processes.
ZINC FLAKE COATING

Resistance to chemicals and abrasion, improved control of the friction coefficients are requirements increasingly demanded by markets. The combination of the GEOMET® coating with the GEOKOTE® topcoats can respond to new expectations in many industrial sectors.

**Characteristics and performance***
- Strong resistance to hydrochloric, phosphoric, sulfuric acids, automobile fluids and other chemical agents
- Stronger resistance to repetitive abrasions
- No hydrogen embrittlement
- The black, clear or other shades of GEOKOTE® gives freedom from possible stick-slip problems when tightening (VDA 235-203)
- The GEOMET® / GEOKOTE® combination is particularly suited to fasteners since it provides them with optimal protection and assembly properties
- Salt Spray Test according to ISO 9227

**Alta resistenza alla corrosione***

<table>
<thead>
<tr>
<th>GEOMET® 321/500+GEOKOTE®</th>
<th>Salt Spray Test (ISO 9227 / ASTM B117)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&gt;720 ORE SENZA RUGGINE ROSSA</td>
</tr>
</tbody>
</table>

*Results may vary depending on substrate, geometry of parts and type of application processes.

**Application processes**
These water-based organic topcoats can be applied in one single thin coat by Dip-Spin, Spray, Dip-Drain-Spin using bulk or rack processes.

**Environmental safety**
- Aqueous dispersion
- Complies with REACh
- Complies with the 2000/53/CE and 2011/65/CE directives
PLUS® VLh is a clear water-based topcoat. It can be applied to GEOMET® 321 coating and has similar parameters to PLUS® VL. It has been developed to radically improve the friction performance for cases of difficult tightening (i.e. with aluminium or cataphoretic paint) and complies with new automotive industry expectations (i.e. VW 01131-1/2).

**Characteristics and performance**
- Friction coefficient on GEOMET® 321 base-coat grade A (>24g/m²) PLUS® VLh: \(\mu_{\text{tot}} = 0.09 - 0.14\)
- Salt Spray Test according to ISO 9227 / ASTM B117 GEOMET® 321 + PLUS® VLh > 720 hours without red rust
- Coating weight of PLUS VLh: 5 g/m² minimum
- Same IMDS as for PLUS® VL
- No induced hydrogen embrittlement
- Improvement of friction performance on and in aluminium (double tightening within elastic limit on aluminium according to VW 01131-1)
- Improvement of friction performance regarding multitightening (5x) onto cataphoretic paint while avoiding stick-slip problems for cases of difficult tightening
- Excellent behaviour in tests of loosening at high temperatures (VDA 235/203 ; VW 01131-2)
- Excellent resistance to solvents, fuels and brake fluids (VDA 621 412)

**Application process**
These water-based inorganic products can be applied in one single thin coat by Dip-Spin or spray, using bulk or rack coating process.

**Health and safety**
- Aqueous dispersion
- Complies with REACh
- Complies with the 2000/53/CE and 2011/65/CE directives

**International standards:**
- **ISO 10683** - Fasteners: non-electrolytic zinc flake coatings
- **EN 13858** - Non-electrolytic zinc flake coatings on iron and steel parts

*Results may vary depending on substrate, geometry of parts and type of application processes.*
The PLUS® brand of topcoats are lubricated sealers. When applied to DACROMET® or GEOMET® base-coats, they provide controlled friction coefficient of threaded parts and increase the resistance to corrosion. The controlled sacrificial corrosion protection mechanism of DACROMET® and GEOMET® is improved further with the PLUS® topcoats.

**Characteristics and performance***

*FRICION COEFFICIENT ON GEOMET® 321 BASE-COAT (ISO 16047)*

<table>
<thead>
<tr>
<th>TRATTAMENT</th>
<th>FRICTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLUS® XL</td>
<td>0.06-0.09</td>
</tr>
<tr>
<td>PLUS® L</td>
<td>0.08-0.14</td>
</tr>
<tr>
<td>PLUS® VL</td>
<td>0.09-0.14</td>
</tr>
<tr>
<td>PLUS® ML</td>
<td>0.10-0.16</td>
</tr>
<tr>
<td>PLUS® M</td>
<td>0.12-0.18</td>
</tr>
<tr>
<td>PLUS® M-10</td>
<td>0.14-0.20</td>
</tr>
</tbody>
</table>

Appearance: matte metallic silver (clear topcoats)
Salt Spray Test according to ISO 9227 / ASTM B117 GEOMET® 321/500 + PLUS® XL, L, VL, M, ML, 10 > 720 hours without red rust (with a GEOMET® 321/500 coating weight > 24 g/m²)
Increased field performance of parts
Improved contact corrosion resistance (to magnesium, rubber, aluminum, etc)
Excellent resistance to solvents, fuels and brake fluids (VDA 621 412)
Competitive production cost

**Application process**
These water-based inorganic products can be applied by Dip-Spin, Spray, Dip-Drain-Spin, using bulk or rack

**Health and Safety**
Aqueous dispersion
Complies with REACH
Complies with the 2000/53/CE and 2002/95/CE directives

**International standards:**
**EN ISO 10683** - Fasteners: non-electrolytic zinc flake coatings
**EN 13858** - Non-electrolytic zinc flake coatings on iron and steel parts

Results may vary depending on substrate, geometry of parts and type of application processes.