Corrosion Inhibitor Selection Guide

INDUSTRIAL LUBRICANTS

what is precious to you?
Clariant is one of the leading suppliers of high-performance additives and components for metal working fluids, offering a comprehensive range of specialties. As a key supplier to metal working formulators, we understand our customers’ problems and needs. Clariant knows that the only guarantee of long-term success is to deliver products that provide the required benefits to your formulation.

Our corrosion inhibitor portfolio comprises water-soluble and water-dispersible products for formulating synthetic, semi-synthetic and milky emulsions. Effective corrosion inhibitors that protect steel and/or aluminium while reducing copper and cobalt leaching and at the same time deliver additional functionalities such as lubrication and EP/AW properties, help metal working fluid formulators to address today’s formulation challenges. Excellent anticorrosion results can be achieved with Clariant products, even under difficult conditions.

Clariant’s corrosion inhibitors have been evaluated according to the following performance screening test:

<table>
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<tr>
<th>PERFORMANCE CRITERIA</th>
<th>DESCRIPTION OF TEST PROCEDURE</th>
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</table>
| Electrolyte & Hard Water Stability   | Step 1: Titration in water, add TEA to the acid to adjust to pH 8.5 and assure buffering  
Step 2: dissolve TEA-salts in 20° dH water  
Step 3: check formation of lime soaps |
| Steel Corrosion Protection           | Step 4: determine corrosion protection properties for ferrous metals (chip filter test)                                                                    |
| Aluminium Corrosion Inhibition       | Step 5: store 4 aluminium strips half immersed in inhibitor solution at 40°C / 24 h and monitor corrosion and staining for liquid phase  
Step 6: in case strips are blank, lower concentrations are used until corrosion or staining occurs  
Step 7: raise pH to 9 by adding aqueous KOH |
| Protective Layer                     | Step 8: store aluminium strip (6082) fully immersed in inhibitor solution at 40°C / 24 h  
Step 9: take strips out, rinse with water & acetone and store again half immersed in 20° dH hard water at 40°C / 24 h  
Step 10: evaluate corrosion & staining in liquid and atmospheric phase according to rating scheme |
| Copper and Cobalt Leaching           | Step 11: insert 1g copper/cobalt powder in 100 mL demineralized water emulsion and keeping for 14 days at room temperature (shaking once a day). Determine metal concentration via AAS (atomic absorption spectroscopy). |
| Foam Behaviour                       | Step 12: SITA foam test in 20 °dH water at 40 °C                                                                                                           |
| Lubrication                          | Step 13: monitoring of lubricant properties for alloy 6082: Reichert friction & wear tester and Tapping torque tester                                           |
| Magic Drop*                          | Step 14: 1-5 % of the product is added to the test concentrate and – if necessary - coupling agent (TOFA) to render the concentrate clear again  
Step 15: a 5 % emulsion in 20 °dH water is made (pH: 9.3 - 9.5) and checked for aluminium corrosion protection (24 H/40°C) and emulsion quality |

* Addition of corrosion inhibitor to an existing steel metal working fluid to upgrade formulation to aluminum protection
## Clariant corrosion inhibitor selection guide

### PHYSICAL CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>CORROSION INHIBITOR</th>
<th>APPLICATION</th>
<th>PHYSICAL PROPERTY</th>
<th>TOXICITY</th>
<th>HAZARD</th>
<th>HRS WAT</th>
<th>PMFTC</th>
<th>HSL</th>
<th>HSL</th>
<th>ENGLISH</th>
<th>CHINESE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hostacor® 100</td>
<td>Benzothiazol-2-ylthio</td>
<td>Clear, yellowish liquid</td>
<td>63°C</td>
<td>6-8</td>
<td>230</td>
<td>2.3</td>
<td>75-85</td>
<td>3</td>
<td>6°C</td>
<td>209-30°C</td>
</tr>
<tr>
<td>Hostacor® AL</td>
<td>Phosphoric acid ester</td>
<td>Clear, yellowish liquid</td>
<td>210°C</td>
<td>2</td>
<td>250</td>
<td>2.5</td>
<td>75-85</td>
<td>3</td>
<td>6°C</td>
<td>230°C</td>
</tr>
<tr>
<td>Hostacor® AL Polymerized fatty acid</td>
<td>Clear brown liquid</td>
<td>120°C</td>
<td>2-3</td>
<td>425</td>
<td>2.5</td>
<td>75-85</td>
<td>3</td>
<td>6°C</td>
<td>210°C</td>
<td>10°C</td>
</tr>
<tr>
<td>Hordaphos® I</td>
<td>Phosphoric acid ester</td>
<td>Clear, colourless to solid/powder</td>
<td>190°C</td>
<td>2-3</td>
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### REGISTRATION/CHIMICAL MONITORS

- **Hostacor® 100**
  - **Benzothiazol-2-ylthio**: Clear, yellowish liquid
  - **Temperature**: 63°C
  - **Flash Point**: 6-8
  - **Vapour Pressure**: 230
  - **Boiling Point**: 2-3
  - **Melting Point**: 75-85
  - **Density**: 3
  - **Acute Oral**: 120
  - **Acute Inhaling**: 210

- **Hostacor® AL**
  - **Phosphoric acid ester**: Clear, yellowish liquid
  - **Temperature**: 120
  - **Flash Point**: 2-3
  - **Vapour Pressure**: 425
  - **Boiling Point**: 2.5
  - **Melting Point**: 75-85
  - **Density**: 3
  - **Acute Oral**: 210
  - **Acute Inhaling**: 230

- **Hordaphos® I**
  - **Phosphoric acid ester**: Clear, colourless to solid/powder
  - **Temperature**: 190
  - **Flash Point**: 2-3
  - **Vapour Pressure**: 425
  - **Boiling Point**: 2.5
  - **Melting Point**: 75-85
  - **Density**: 3
  - **Acute Oral**: 230
  - **Acute Inhaling**: 210

- **Hordaphos® MDIT**
  - **Phosphoric acid ester**: Clear, yellowish liquid
  - **Temperature**: 190
  - **Flash Point**: 2-3
  - **Vapour Pressure**: 425
  - **Boiling Point**: 2.5
  - **Melting Point**: 75-85
  - **Density**: 3
  - **Acute Oral**: 230
  - **Acute Inhaling**: 210

- **Hordaphos® MDAH**
  - **Phosphoric acid ester**: Clear, yellowish liquid
  - **Temperature**: 190
  - **Flash Point**: 2-3
  - **Vapour Pressure**: 425
  - **Boiling Point**: 2.5
  - **Melting Point**: 75-85
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  - **Acute Oral**: 230
  - **Acute Inhaling**: 210

- **Hordaphos® MeOH**
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  - **Melting Point**: 75-85
  - **Density**: 3
  - **Acute Oral**: 230
  - **Acute Inhaling**: 210

Legend:
- **R38**: Harmful if inhaled
- **R39**: Irritating to eyes and respiratory system
- **R40**: Strong irritant on the skin
- **R62**: Causes damage to organs through long-term exposure
- **R63**: May cause harm with long-lasting effects
- **R64**: Harmful in contact with skin
- **R65**: Harmful in case of absorption
- **R66**: Harmful in case of chronic exposure
- **R67**: Harmful in case of ingestion
- **R68**: Harmful in case of ingestion and absorption

Please ask your local Clariant representative for the latest Material Safety Data Sheet (MSDS).
<table>
<thead>
<tr>
<th>CORROSION INHIBITOR (CI)</th>
<th>APAC</th>
<th>EMEA</th>
<th>LATAM</th>
<th>NORAM</th>
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**REGIONAL AVAILABILITY**

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<tr>
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<td>Hicor® EKC 100</td>
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**HEADQUARTERS**

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