The following surgical instrument staining chart is intended to use as a guide. Always refer to your surgical instrument manufacturer’s instructions for use (IFUs) and your instrument-repair specialist for visual clarification and confirmation on each instrument stain in question.

Following the surgical instrument, detergent, ultrasonic cleaner, and sterilizer IFUs is critical for the longevity of your surgical instruments. Water and steam quality should be periodically monitored to eliminate any impurities. Steam sterilizers should be checked often and maintained according to the sterilizer IFUs to ensure a well-functioning drying cycle.

Stains can be removed with stain removers or buffed out, although true rust will cause permanent damage to surgical instruments if not addressed in a timely manner. Protect your investment. By incorporating the proper care and handling, and using a staining guide in your department, your surgical instruments may last for many years to come.
<table>
<thead>
<tr>
<th>Color/Type of Stain</th>
<th>Origin</th>
<th>Solution</th>
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</thead>
<tbody>
<tr>
<td>Orange/Brown (may appear as rust)</td>
<td>The problem is often due to a phosphate layer on the instrument, which may develop as a result of any of the following: • Dried blood or debris • Iodine or Betadine residue • Detergent residue • High-alkaline detergents • Surgical wraps • Cold sterilization solutions</td>
<td>Perform an eraser test: If the discoloration is removed with the eraser and the metal underneath is smooth and clean, the stain usually points to dried blood/debris. If pitting is observed (i.e., small divets in the metal under the discoloration), this can contribute to rust.</td>
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| True Rust          | A combination of any of the following:  
• Mixing dissimilar metals  
• Dried blood or debris  
• Improper cleaning  
• High-alkaline detergents  
• Detergent residue  
• Water quality (high iron content)  
• Surgical wraps  
• Cold sterilization solutions | Do not mix dissimilar metals. Separate instruments by metal type: non-anodized aluminums, brass, copper, chrome-plated, and single-use instruments. A plating reaction may occur. This reaction can result in permanent damage and staining.  
In addition:  
• Do not allow instruments to soak in blood or moisture for extended lengths of time  
• Check water quality  
• Use a neutral pH detergent  
• Remove all debris from lock areas, teeth, crevices, and serrations  
• Rinse thoroughly with distilled/demineralized water  
• Dry all instruments thoroughly |
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| Blue/Gray          | Usually occurs from improper use of cold sterilization. A cold sterilant is a chemical agent that can destroy all microbial life, including highly resistant bacterial endospores, when used according to the directions on the product label. Prolonged immersion in disinfecting or sterilizing solutions can damage surgical instruments. Surgical instruments should not soak longer than the recommended 20 minutes. | - Follow solution manufacturer’s IFUs for temperature and soak times  
- Use distilled or demineralized water  
- Change solution per manufacturer’s IFUs  
Due to the inherent limitations of using liquid chemical sterilants, their use should be restricted to reprocessing critical devices that are heat-sensitive and incompatible with other sterilization methods. |
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| Black              | The most common black stains are due to an acid reaction. Black stains may result from:  
- High pH in detergents  
- Exposure to ammonia |  
- Check detergent pH  
- Do not use harsh chemicals |
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| Blue/Black | These are usually a result of plating and may be difficult to remove from the surface. The cause of this stain is the mixing of dissimilar metals in ultrasonic cleaners and during autoclaving. | Do not mix dissimilar metals. Separate instruments by metal type: non-anodized aluminum, brass, copper, chrome-plated, single-use instruments, etc. A plating reaction may occur. This reaction *can result* in permanent damage and staining.  
- Separate instruments by metal types prior to ultrasonic cleaning and sterilization  
- The surface beneath the stain is usually smooth, although the instrument may have to be refinished |
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| Pitting           | Damage to the oxide layer. Pitting can be caused by the instrument being exposed to saline solutions, blood, debris, improper chemicals, damage, etc. Pitting removes part of the passivation layer, which leads to trapped bioburden, biofilm, and eventually rust. | • Eliminate excessive soaking  
• Do not use saline on instruments  
• Clean blood and debris immediately at point of use and immediately after use  
• The instrument may be refinished (depending on the area where pitting resides), but in some instances replacement is needed |
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| Rainbow or Multicolor | Multicolor stains are most often due to excessive heat or hot spots in the autoclave. When the instrument displays these heat stains, it may have lost part of its original hardness and may not perform as well. | • Check autoclave for proper temperature performance  
• Maintain or deep clean autoclave according to autoclave manufacturer’s IFUs to avoid or remove buildup deposits  
• Instruments can usually be refinished; stain may be polished off |
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| Light or Dark Spots | Spots are often the result of slow evaporation of water on the instrument. The mineral deposit, related to the mineral content of the water, may remain on the instrument. Contributing factors:  
• Steam impurities  
• Residual detergents  
• Reusable wrappers and surgical towels also contribute to spotting | • Do not allow instruments to air dry  
• Dry instruments in a timely manner  
• Check steam/water quality  
• Use distilled or demineralized water  
• Perform adequate rinsing of laundry detergents and surgical towels |
Chemicals/Solutions to Avoid

Saline
Prolonged exposure to sterile water
Betadine
Iodine
Sodium hypochlorite (bleach)
Aluminum chloride
Barium chloride
Calcium chloride
Carbolic acid
Hydrochloric acid

Chlorinated lime
Dakin’s solution (antiseptic)
Ferrous chloride
Mercury bichloride
Phenol
Mercury salts
Potassium thiocyanate
Prolonges exposure to cold sterilization
Summary

Per AAMI guidelines, instruments and devices should not be treated with any additional chemical unless such treatment is specifically recommended in the manufacturer’s written IFUs.

AAMI ST79
Water quality is crucial to the care of surgical instruments. Always rinse with a water type that is specified by the device manufacturer. When the water quality is not specified by the manufacturer, refer to AAMI TIR34.

Some facilities believe that once their instruments show signs of stains they should be discarded; however, it is important to note that if the damage is caught in time, quality stainless steel surgical instruments may be brought back to life and last for many years.

Proper care and handling is imperative to the longevity of your investment.

References
http://www.storm2k.com/surgicalinstrumentation.pdf