

DIY Citric-Citrate Rust-Removal Solution

An excellent rust-remover recipe that's safe for Ultrasonic cleaners (304 SS) & Septic Systems

STOCK SUPPLIES

| Ingredient | Weight | Purpose |
|---------------------------------|--------------------------|--|
| Citric acid (food-grade) | 5 lb (\approx 2.3 kg) | Rust dissolver / chelator |
| Sodium carbonate (washing soda) | 2 lb (\approx 0.9 kg) | Neutralizer \rightarrow forms sodium citrate |
| Dish soap | few tsp | Surfactant / wetting aid |
| (Optional) Sodium percarbonate | — | Degreasing / brightening booster |

FULL-STRENGTH MIXING RATIO

Per liter: 100 g citric + 40 g washing soda (\approx 0.22 lb + 0.09 lb per L, or \approx 1 lb acid + 0.4 lb soda per US gal)

Your total 5 lb + 2 lb supply makes \approx 23–25 liters (\approx 6–6.5 US gallons) of full-strength solution.

HOW TO MIX

- Add warm water (\sim 50 °C / 120 °F).
- Stir in citric acid until dissolved.
- Slowly add washing soda \rightarrow fizzing stops when neutral.
- Add 1–2 tsp dish soap / 10 L (2.6 gal).
- Ready for use or storage (closed lid).

OPERATING NOTES

- Working pH: \approx 6 – 7 (neutral)
- Safe for: iron, steel, brass, copper, aluminum, plastics, PCBs (short runs)
- Avoid long soaks: magnesium / zinc die cast
- Best temp: 50 – 60 °C (120 – 140 °F) · 40 °C for electronics
- Ultrasonic time: 10 – 60 min (light) · up to 2 h (heavy)
- Passive soak: overnight OK (check periodically)
- Rust capacity: \sim 10–15 g rust absorbed per 100 g citric acid
- Storage: 3–5 days in tank / weeks in sealed jug
- Tank safety: 304 SS safe · avoid iron on tank floor
- Disposal: biodegradable / septic-safe \rightarrow drain or gravel OK

BEFORE & AFTER TREATMENT

Before: Degrease (soap or solvent).

After: Rinse \rightarrow distilled rinse \rightarrow dry immediately (air, heat gun, alcohol rinse). Then apply light oil / WD-40 / wax to prevent flash rust.

GEL VERSION (for Spot / Vertical Use)

| Ingredient | Amount |
|----------------------|--------------------|
| Citric acid | 120–150 g (4–5 oz) |
| Washing soda | 45–60 g (1.5–2 oz) |
| Corn starch | 20–30 g (0.7–1 oz) |
| Water | 1 L (1 qt) |
| Dish soap (optional) | 1 tsp |

Directions:

- Dissolve citric acid in ~700 mL hot water (~60 °C / 140 °F).
- Add washing soda slowly → wait for fizz to stop.
- Mix corn starch with cold water (slurry).
- Stir into hot solution → heat gently (~75 °C / 165 °F) until gel forms.
- Cool → store in jar.

Use: Brush 2–3 mm layer · cover with plastic · wait 1–6 h · wipe / rinse / dry / oil.

SAFETY QUICKLIST

- Gloves & eye protection.
- Avoid breathing powder dust.
- Ventilate when heating (steam only).
- Neutral pH but can sting eyes / cuts.
- Never mix with bleach or strong acids.

SUMMARY

- Ratio: ~2 parts citric : 1 part washing soda (by weight)
- Yield: ≈ 25 L (6.5 US gal) full-strength solution
- Safe, effective, non-toxic, ultrasonic-compatible
- Always dry and oil after cleaning