

Water Quality Guidance

XEN Water Quality Guidance

Water quality, particularly hardness, can significantly affect the performance of detergents used in instrument reprocessing. Hard water forms when groundwater absorbs minerals from rocks, most commonly calcium and magnesium. Other substances such as iron, manganese, and silica¹ may also be present.

To simplify measurement, water hardness is usually expressed as calcium carbonate (CaCO₃) concentration.

Table 1. Water Hardness Categories²

Hardness Category	Calcium carbonate (mg/L CaCO ₃)	Calcium carbonate (mmol/L CaCO ₃)	Grain per gallon (gpg)	General hardness/ German degree (dGH/°dH)
Soft	0-60	0-0.60	0-3.50	0-3.37
Moderately Hard	61-120	0.61-1.20	3.56-7.01	3.38-6.74
Hard	121-180	1.21-1.80	7.06-10.51	6.75-10.10
Very Hard	≥ 180	≥ 1.81	≥ 10.57	≥ 10.12

All XEN manual and automated cleaning chemistries contain chelating agents which are special ingredients that bind to metal ions in water (such as calcium and magnesium) preventing them from interfering with cleaning. By forming water-soluble complexes, chelating agents help maintain detergent effectiveness and protect instruments from scale, rust, and pitting.

Suggested Detergent Dose Ranges by Water Hardness

Use the table below as a starting point for dosing XEN detergents based on water hardness.

Table 2a. Recommended Dose Ranges (ml/L)

Hardness Category	Neutral	Neutral+	Enzymatic (machine use)	Enzymatic (manual or sonic use)	Enzymatic+ (machine use)	Enzymatic+ (manual or sonic use)	Universal	Universal+
Soft	1-4	0.2-1	0.5-2	2-2.5	0.2-0.5	2-2.5	1-1.5	0.2-0.5
Moderately Hard	4-8	1-2	2-4	2.5-3	0.5-1	2.5-3	1.5-2	0.5-1
Hard	8-12	2-3	4-6	3-3.5	1-1.5	3-3.5	2-3	1-1.5
Very Hard	12-16	3-4	6-8	3.5-4	1.5-2	3.5-4	3-4	1.5-2

Table 2b. Recommended Dose Ranges (oz./gal)

Hardness Category	Neutral	Neutral+	Enzymatic (machine use)	Enzymatic (manual or sonic use)	Enzymatic+ (machine use)	Enzymatic+ (manual or sonic use)	Universal	Universal+
Soft	0.13-0.51	0.03-0.13	0.06-0.26	0.26-0.32	0.03-0.06	0.26-0.32	0.13-0.19	0.03-0.06
Moderately Hard	0.51-1.02	0.13-0.26	0.26-0.51	0.32-0.38	0.06-0.13	0.32-0.38	0.19-0.26	0.06-0.13
Hard	1.02-1.54	0.26-0.38	0.51-0.77	0.38-0.45	0.13-0.19	0.38-0.45	0.26-0.38	0.13-0.19
Very Hard	1.54-2.05	0.38-0.51	0.77-1.02	0.45-0.51	0.19-0.26	0.45-0.51	0.38-0.51	0.19-0.26

Other Considerations

When determining detergent dose, also consider:

- Instrument complexity (e.g., lumens, hinges)
- Type of surgical soil (e.g., orthopedic soils are often more tenacious)
- Soil load (heavier loads may require more detergent)

By adjusting doses appropriately, XEN cleaning chemistries deliver effective cleaning across a wide range of water qualities and use conditions.

Conclusion

XEN Cleaning Chemistries are designed to perform effectively across a wide range of water qualities, thanks to the inclusion of chelating agents that help neutralize the negative effects of hard water. By selecting the appropriate dose based on water hardness and taking into account additional factors such as soil type and load complexity, users can ensure consistent cleaning performance and help protect their instruments from long-term damage. Proper water quality management, combined with tailored detergent use, plays a critical role in achieving reliable and safe instrument reprocessing outcomes.

Reference

1. <https://wellowner.org/resources/water-quality/groundwater-quality-basics/>
2. <https://www.usgs.gov/water-science-school/science/hardness-water#overview>