

GENERAL WATER TECHNOLOGIES | ennpure

USP20 Performance Report

General Water Technologies USP20 Tankless Reverse Osmosis System:
Water Efficiency Report, March 2023

Inspection Item			Criteria Parameter	Test Result	Qualify
Total Purified Water Volume			Grade 1: ≥4000L Grade 2: ≥3000L Grade 3: ≥2000L	4000.2L	Pass
Purified Water Production Rate			Grade 1: ≥65% Grade 2: ≥55% Grade 3: ≥45%	65.6%	Pass
The purified water volume reaches the rated total purified water volume in sequence	0%	Purified Water Flow	No less than the nominal value of 1.5L/min	1.70L/min	Pass
		Total Hardness (as $CaCO_3$)	Reverse Osmosis Water Purifier≥90%	96.9%	Pass
		Conductivity	Reverse Osmosis Water Purifier≥85%	93.5%	Pass
	25%	Purified Water Flow	No less than the nominal value of 1.5L/min	1.69L/min	Pass
		Total Hardness (as $CaCO_3$)	Reverse Osmosis Water Purifier≥90%	96.2%	Pass
		Conductivity	Reverse Osmosis Water Purifier≥85%	92.7%	Pass
	50%	Purified Water Flow	No less than the nominal value of 1.5L/min	1.68L/min	Pass
		Total Hardness (as $CaCO_3$)	Reverse Osmosis Water Purifier≥90%	96%	Pass
		Conductivity	Reverse Osmosis Water Purifier≥85%	92.1%	Pass
	75%	Purified Water Flow	No less than the nominal value of 1.5L/min	1.68L/min	Pass
		Total Hardness (as $CaCO_3$)	Reverse Osmosis Water Purifier≥90%	95.6%	Pass
		Conductivity	Reverse Osmosis Water Purifier≥85%	91.9%	Pass
	100%	Purified Water Flow	No less than the nominal value of 1.5L/min	1.66L/min	Pass
		Total Hardness (as $CaCO_3$)	Reverse Osmosis Water Purifier≥90%	95.5%	Pass
		Conductivity	Reverse Osmosis Water Purifier≥85%	91.8%	Pass

*Tested for GB 34914-2021 (equivalent to NSF/ANSI 58), Report Number: EWCjs-23-195, March 10, 2023

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report, Dec 2022

Inspection Item	Test Result	Criteria Parameter	Qualify
Color	<5	≤5	Pass
Turbidity	0.07	≤1	Pass
Odor and Taste	None	None	Pass
Visible Particles	None	None	Pass
Oxygen Consumption (as O2)	0.28mg/L	≤2mg/L	Pass
Lead	<0.0007mg/L	≤0.001mg/L	Pass
Cadmium	<0.0001mg/L	≤0.0005mg/L	Pass
Mercury	<0.0001mg/L	≤0.0002mg/L	Pass
Chromium (Hexavalent)	<0.004mg/L	≤0.005mg/L	Pass
Arsenic	<0.001mg/L	≤0.001mg/L	Pass
Volatile Phenols (as Phenol)	<0.002mg/L	≤0.002mg/L	Pass
Total Bacterial Count	Not Detected	≤100CFU/ml	Pass
Total Coliforms	Not Detected	Not Detected	Pass
Thermo-tolerant Coliforms	Not Detected	Not Detected	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221379, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Overall Performance Test, 0m3 Start of Flow), Dec 2022

Inspection Item	Before Filtration	After Filtration	Criteria Parameter	Qualify
Color	<5	<5	≤5	Pass
Turbidity	0.16	0.07	≤5	Pass
Odor and Taste	None	None	None	Pass
Visible Particles	None	None	None	Pass
pH	7.72	6.51	≥5.0	Pass
Total Hardness (as CaCO3)	133mg/L	<1.0mg/L	≤450mg/L	Pass
Aluminum	0.04mg/L	<0.01mg/L	≤0.2mg/L	Pass
Iron	0.05mg/L	<0.01mg/L	≤0.3mg/L	Pass
Manganese	<0.001mg/L	<0.001mg/L	≤0.1mg/L	Pass
Copper	<0.005mg/L	<0.005mg/L	≤1.0mg/L	Pass
Zinc	<0.01mg/L	<0.01mg/L	≤1.0mg/L	Pass
Volatile Phenols (as Phenol)	<0.002mg/L	<0.002mg/L	≤0.002mg/L	Pass
Sulfate	38.3mg/L	<0.5mg/L	≤250mg/L	Pass
Chloride	23.7mg/L	<0.5mg/L	≤250mg/L	Pass
Total Dissolved Solids (TDS)	210mg/L	<4mg/L	≤1000mg/L	Pass
Oxygen Consumption	0.68mg/L	0.28mg/L	≤1.0mg/L	Pass
Arsenic	<0.001mg/L	<0.001mg/L	≤0.01mg/L	Pass
Cadmium	<0.0001mg/L	<0.0001mg/L	≤0.005mg/L	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221380, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Overall Performance Test, 0m3 Start of Flow, Continued), Dec 2022

Inspection Item	Before Filtration	After Filtration	Criteria Parameter	Grade
Chromium (Hexavalent)	<0.004mg/L	<0.004mg/L	≤0.05mg/L	Pass
Cyanide	<0.002mg/L	<0.002mg/L	≤0.05mg/L	Pass
Fluoride	0.37mg/L	<0.05mg/L	≤1.0mg/L	Pass
Lead	<0.0007mg/L	<0.0007mg/L	≤0.01mg/L	Pass
Mercury	<0.0001mg/L	<0.0001mg/L	≤0.001mg/L	Pass
Nitrate Nitrogen	2.10mg/L	<0.5mg/L	≤10mg/L	Pass
Selenium	<0.0004mg/L	<0.0004mg/L	≤0.01mg/L	Pass
Trichloromethane	0.0083mg/L	<0.0002mg/L	≤0.015mg/L	Pass
Carbon Tetrachloride	<0.0001mg/L	<0.0001mg/L	≤0.0018mg/L	Pass
Residual Chlorine	0.05mg/L	<0.005mg/L	/	Pass
Total Bacterial Count	Not Detected	Not Detected	≤20CFU/ml	Pass
Total Coliforms	Not Detected	Not Detected	Not Detected	Pass
Thermo-tolerant Coliforms	Not Detected	Not Detected	Not Detected	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221380, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Overall Performance Test, 4m3 End of Flow), Dec 2022

Inspection Item	Before Filtration	After Filtration	Criteria Parameter	Qualify
Color	<5	<5	≤5	Pass
Turbidity	0.17	0.09	≤5	Pass
Odor and Taste	None	None	None	Pass
Visible Particles	None	None	None	Pass
pH	7.75	6.68	≥5.0	Pass
Total Hardness (as CaCO3)	134mg/L	<1.0mg/L	≤450mg/L	Pass
Aluminum	0.04mg/L	<0.01mg/L	≤0.2mg/L	Pass
Iron	0.05mg/L	<0.01mg/L	≤0.3mg/L	Pass
Manganese	<0.001mg/L	<0.001mg/L	≤0.1mg/L	Pass
Copper	<0.005mg/L	<0.005mg/L	≤1.0mg/L	Pass
Zinc	<0.01mg/L	<0.01mg/L	≤1.0mg/L	Pass
Volatile Phenols (as Phenol)	<0.002mg/L	<0.002mg/L	≤0.002mg/L	Pass
Sulfate	38.1mg/L	<0.5mg/L	≤250mg/L	Pass
Chloride	23.5mg/L	<0.5mg/L	≤250mg/L	Pass
Total Dissolved Solids (TDS)	210mg/L	6mg/L	≤1000mg/L	Pass
Oxygen Consumption	0.68mg/L	0.33mg/L	≤1.0mg/L	Pass
Arsenic	<0.001mg/L	<0.001mg/L	≤0.01mg/L	Pass
Cadmium	<0.0001mg/L	<0.0001mg/L	≤0.005mg/L	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221380, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Overall Performance Test, 4m3 End of Flow, Continued), Dec 2022

Inspection Item	Before Filtration	After Filtration	Criteria Parameter	Grade
Chromium (Hexavalent)	<0.004mg/L	<0.004mg/L	≤0.05mg/L	Pass
Cyanide	<0.002mg/L	<0.002mg/L	≤0.05mg/L	Pass
Fluoride	0.37mg/L	<0.05mg/L	≤1.0mg/L	Pass
Lead	<0.0007mg/L	<0.0007mg/L	≤0.01mg/L	Pass
Mercury	<0.0001mg/L	<0.0001mg/L	≤0.001mg/L	Pass
Nitrate Nitrogen	2.09mg/L	<0.5mg/L	≤10mg/L	Pass
Selenium	<0.0004mg/L	<0.0004mg/L	≤0.01mg/L	Pass
Trichloromethane	0.0084mg/L	<0.0002mg/L	≤0.015mg/L	Pass
Carbon Tetrachloride	<0.0001mg/L	<0.0001mg/L	≤0.0018mg/L	Pass
Residual Chlorine	0.05mg/L	<0.005mg/L	/	Pass
Total Bacterial Count	Not Detected	Not Detected	≤20CFU/ml	Pass
Total Coliforms	Not Detected	Not Detected	Not Detected	Pass
Thermo-tolerant Coliforms	Not Detected	Not Detected	Not Detected	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221380, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Spiking Test, 0m3 Start of Flow), Dec 2022

Inspection Item	Spiked Raw Water	Filtered Water	Removal Rate	Criteria Parameter	Qualify
Arsenic	0.309mg/L	<0.001mg/L	100%	≥83%	Pass
Cadmium	0.0265mg/L	<0.0001mg/L	100%	≥83%	Pass
Chromium (Hexavalent)	0.154mg/L	<0.004mg/L	100%	≥67%	Pass
Fluoride	7.36mg/L	<0.05mg/L	100%	≥75%	Pass
Lead	0.1532mg/L	<0.0007mg/L	100%	≥90%	Pass
Nitrate Nitrogen	29.86mg/L	<0.5mg/L	100%	≥67%	Pass
Tricholoromethane	0.2788mg/L	<0.0002mg/L	100%	≥95%	Pass
Carbon Tetrachloride	0.0795mg/L	<0.0001mg/L	100%	≥98%	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221381, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Spiking Test, 1m3 Start of Flow), Dec 2022

Inspection Item	Spiked Raw Water	Filtered Water	Removal Rate	Criteria Parameter	Qualify
Arsenic	0.301mg/L	<0.001mg/L	100%	≥83%	Pass
Cadmium	0.0261mg/L	<0.0001mg/L	100%	≥83%	Pass
Chromium (Hexavalent)	0.150mg/L	<0.004mg/L	100%	≥67%	Pass
Fluoride	7.80mg/L	<0.05mg/L	100%	≥75%	Pass
Lead	0.1509mg/L	<0.0007mg/L	100%	≥90%	Pass
Nitrate Nitrogen	29.78mg/L	<0.5mg/L	100%	≥67%	Pass
Tricholoromethane	0.3031mg/L	<0.0002mg/L	100%	≥95%	Pass
Carbon Tetrachloride	0.0828mg/L	<0.0001mg/L	100%	≥98%	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221381, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Spiking Test, 2m3 Start of Flow), Dec 2022

Inspection Item	Spiked Raw Water	Filtered Water	Removal Rate	Criteria Parameter	Qualify
Arsenic	0.310mg/L	<0.001mg/L	100%	≥83%	Pass
Cadmium	0.0263mg/L	<0.0001mg/L	100%	≥83%	Pass
Chromium (Hexavalent)	0.148mg/L	<0.004mg/L	100%	≥67%	Pass
Fluoride	7.78mg/L	<0.05mg/L	100%	≥75%	Pass
Lead	0.1516mg/L	<0.0007mg/L	100%	≥90%	Pass
Nitrate Nitrogen	29.50mg/L	<0.5mg/L	100%	≥67%	Pass
Tricholoromethane	0.2979mg/L	<0.0002mg/L	100%	≥95%	Pass
Carbon Tetrachloride	0.0809mg/L	<0.0001mg/L	100%	≥98%	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221381, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Spiking Test, 3m3 Start of Flow), Dec 2022

Inspection Item	Spiked Raw Water	Filtered Water	Removal Rate	Criteria Parameter	Qualify
Arsenic	0.308mg/L	<0.001mg/L	100%	≥83%	Pass
Cadmium	0.0262mg/L	<0.0001mg/L	100%	≥83%	Pass
Chromium (Hexavalent)	0.151mg/L	<0.004mg/L	100%	≥67%	Pass
Fluoride	7.24mg/L	<0.05mg/L	100%	≥75%	Pass
Lead	0.1512mg/L	<0.0007mg/L	100%	≥90%	Pass
Nitrate Nitrogen	30.52mg/L	<0.5mg/L	100%	≥67%	Pass
Tricholoromethane	0.2780mg/L	<0.0002mg/L	100%	≥95%	Pass
Carbon Tetrachloride	0.0739mg/L	<0.0001mg/L	100%	≥98%	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221381, December 21, 2022

General Water Technologies USP20 Tankless Reverse Osmosis System:
Material Safety Report (Spiking Test, 4m3 Start of Flow), Dec 2022

Inspection Item	Spiked Raw Water	Filtered Water	Removal Rate	Criteria Parameter	Qualify
Arsenic	0.313mg/L	<0.001mg/L	100%	≥83%	Pass
Cadmium	0.0267mg/L	<0.0001mg/L	100%	≥83%	Pass
Chromium (Hexavalent)	0.150mg/L	<0.004mg/L	100%	≥67%	Pass
Fluoride	7.50mg/L	<0.05mg/L	100%	≥75%	Pass
Lead	0.1518mg/L	<0.0007mg/L	100%	≥90%	Pass
Nitrate Nitrogen	30.54mg/L	<0.5mg/L	100%	≥67%	Pass
Tricholoromethane	0.2957mg/L	<0.0002mg/L	100%	≥95%	Pass
Carbon Tetrachloride	0.0792mg/L	<0.0001mg/L	100%	≥98%	Pass

*Tested for GB/T 5750-2006 (equivalent to NSF/ANSI 42), Report Number: (Env-Water) 20221381, December 21, 2022

PFAS Filtration Performance

US EPA reports provide insight into RO system capability in rejecting PFAS. Many peer-reviewed studies indicate over 99% PFAS rejection for PFOA and PFOS, as well as other PFAS compounds. And, studies conclude that unlike granular activated carbon (GAC), RO systems do not demonstrate breakthrough behavior, indicating that "removal efficiency tends to be steady state and does not vary over time".

Technologies and Cost for Removing Per- and Polyfluoroalkyl Substances (PFAS) from Drinking Water
March 2024

Table 4-2. Studies of RO/NF Treatment for Carboxylate PFAS

PFAS Compound	Number of Carbons	Number of Bench Studies	Number of Pilot Studies	Number of Full-scale Studies	Maximum NF Removal Efficiency	Maximum RO Removal Efficiency	Source(s) for Maximum Removal Efficiency
PFBA	4	2	1	2	99	99.9	Lipp et al. 2010
PFPeA	5	2	3	2	>99	>99	Horst et al. 2018; Liu et al. 2021; Dickenson and Higgins 2016
PFHxA	6	3	4	4	>98	99.2	Liu et al. 2021
PFHpA	7	1	2	3	99	>99	Steinle-Darling et al. 2008; Liu et al. 2021
PFOA	8	4	4	5	99.9	99.9	Boonya-Atichart et al. 2016; Lipp et al. 2010
PFNA	9	2	1	4	99	>98	Steinle-Darling et al. 2008; Dickenson and Higgins 2016; Appleman et al. 2014
PFDA	10	2	0	4	99	>99	Steinle-Darling et al. 2008; Dickenson and Higgins 2016; Appleman et al. 2014
PFUnA	11	1	0	2	99	>77	Steinle-Darling et al. 2008; Dickenson and Higgins 2016; Appleman et al. 2014
PFDoA	12	0	0	2	-	>87	Dickenson and Higgins 2016; Appleman et al. 2014

- = no data; NF = nanofiltration; RO = reverse osmosis
Sources: USEPA, 2021a; 2021c

Table 4-3. Studies of RO/NF Treatment for Sulfonate PFAS

PFAS Compound	Number of Carbons	Number of Bench Studies	Number of Pilot Studies	Number of Full-scale Studies	Maximum NF Removal Efficiency	Maximum RO Removal Efficiency	Source(s) for Maximum Removal Efficiency
PFPrS	3	0	1	0	>98	>99	Liu et al. 2021
PFBS	4	3	4	3	99.8	99.8	Lipp et al. 2010
PFPeS	5	0	1	0	>98	>99	Liu et al. 2021
PFHxS	6	2	4	4	>99	>99	Appleman et al. 2013; Thompson et al. 2011; Liu et al. 2021
PFHpS	7	0	1	0	>98	>99	Liu et al. 2021
PFOS	8	6	4	5	>99.9	99.9	Lipp et al. 2010; 2163
PFDS	10	1	0	0	99	-	Steinle-Darling et al. 2008

- = no data; NF = nanofiltration; RO = reverse osmosis
Sources: USEPA, 2021b; 2021c

Source: Technologies and Cost for Removing PFAS from Drinking Water March 2024, EPA Document No. EPA-815R24012