

PURE WATER QUALITY STANDARDS

Purified water is commonly used in many industries and science organisations, for analysis use or in productive processes. Therefore, in order to promote a more suitable utilisation, several international organisations have set specific quality standards for each type of application:

ISO (International Standards Organisation)

ASTM (American Society for Testing and Materials)

NCCLS (National Committee for Clinical Laboratory Standards)

Pharmacopoeia

These quality standards have prompted the definition of three purity-grade standards:

grade 1

Water utilised basically for dissolving ionic colloids and organic polluting substances. It is furthermore employed in high precision analyses and, in particular, in HPLC chromatography. This type of water can be obtained starting from grade 2 water, by means of a further treatment with ionic-exchange resins, as well as the filtering process through a 0.2 micron porous septum for the elimination of organic residue which might still be present, or by a re-distillation.

grade 2

Water characterised by an extremely low concentration of contaminating substances, of ionic, organic or colloidal base. It is normally used for high-precision analyses, including the spectrometry under atomic absorption and in the determination of elements in traces. This type of water can be obtained through multiple distillations or by the reverse osmosis treatment followed by ionic-exchange resins.

grade 3

Water suitable for general purpose laboratory preparations and chemical reagents in solution. This type of water can be obtained by distillation, ion exchange or reverse osmosis.

Specifications according to the International Standardisation Organisation For laboratory-use, reference is ISO 3696: 1987

Parameter	Grade 1	Grade 2	Grade 3
pH - value at 25°C	N/A	N/A	5-7.5
Specific electrical conductivity (µS/cm)	0,1	1	5
Total oxidable carbon from O ₂ (mg/l)	N/A	0,08	0,4
Max. Unit absorbance at 250 nm	0,001	0,01	NON SPEC.
Fixed residue 110°C (mg/l)	N/A	1	2
Silica max (mg/l)	0,01	0,02	NON SPEC.

Specifications according to the American Society for Testing and Materials Reference Standard for REAGENT GRADE WATER

Parameter	type I*	type II**	type III***	type IV
Specific electrical conductivity (µS/cm)	0,056	0,1	0,25	5
Specific electrical resistivity (MOHM.cm)	18	10	4	0,2
pH - value at 25°C	-	-	-	5-8
TOC (mg/l)	50	100	200	no limit
Sodium max (mg/l)	1	5	10	50
Silica max (mg/l)	3	3	500	no limit
Chloride max (mg/l)	1	5	10	50

* Filtering through 0.2 µm membrane is required ** Prepared for distillation *** Filtering through 0.45 µm membrane is required

Should microbiological checks have to be carried out, the following further classification will apply

Parameter	Type A	Type B	Type C
Max total bacteria count (UFC/100ml)	1	10	1000
Max endotoxins (IU/ml)	0,03	0,25	-

Specifications according to the National Committee for Clinical Laboratory Standards (1988)

Parameter	Type I	Type II	Type III
Bacteria (UFC/ml)	<10	<1000	N/A
pH - value at 25°C	N/A	N/A	5-8
Specific electrical resistivity (MOhm/cm)	>10	>1	>0,1
Silica max (mg/l)	<0,05	<0,1	<1
Total Solids (mg/l)	0,1	1	5
Total carbon oxidable from O ₂ (mg/l)	<0,05	<0,2	<1

Specifications from European Pharmacopoeia and USP Requisites for purified waters for body injecting

PARAMETER	EP	USP
NITRATE	< 0,2 ppm	-
HEAVY METALS	< 0,1 ppm	-
TOC	< 500 mg/l C	< 500 mg/l C
Specific electrical conductivity at 25°C	< 4,3 µS/cm	< 1,3 µS/cm
BACTERIA	< 100 UFC/ml	< 100 UFC/ml