



A guide to handling and transport conditions (Drinking water)

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Scope

This document describes handling and transport of water samples from the territory of Portugal to ALS Laboratory to comply with international standards to ensure high quality of provided analytical data.

Terms

Matrix spike

refers to an intralaboratory split sample spiked with a representative set of target analytes. This QC parameter monitors potential matrix effects on analyte recoveries

Method blank

refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. This QC parameter monitors potential laboratory contamination

Laboratory control sample

refers to a known interference free matrix spiked with target analytes or to a certified reference material. This QC parameter monitors the method accuracy

Laboratory duplicates

Refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample homogeneity

Material and consumables

- Glass bottles, plastic containers, glass vials
- Shipping material (ALS transport paper box, ALS transport insulation bag, ice packs)
- Preservatives
- Documentation (chain of custody, labels)
- Freezer to reach at least – 18°C
- Refrigerator to maintain 3±2°C

an ice pack



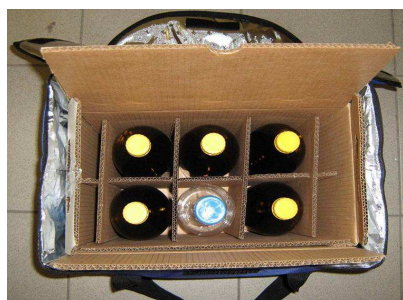
one-liter ice bottle



ALS transport insulation bag



ALS transport paper box already placed in the ALS transport insulation bag and filled with five 1-liter amber glass bottles and one ice bottle



Measured analytes

List of analytes routinely monitored in drinking water (Portugal) and recommended handling and transport conditions. The analytical procedures used by ALS have been developed from established internationally recognized procedures such as those published by the USEPA, ISO or APHA. In house developed procedures are employed in the absence of documented standards or by a client request.

Parameter	Handling	Holding time	Container	Reference
aluminum (Al)	add HNO ₃ to pH < 2	6 months	plastic	USEPA 200.7
ammonia (NH ₃)	add H ₂ SO ₄ to pH <2, cool to 5±3°C	28 days	plastic	APHA 21 st ed.
conductivity	cool to 5±3°C	24 hours	plastic	EN 27888
color	cool to 5±3°C	2 days	plastic	APHA 21 st ed.
pH	cool to 5±3°C, air tight container	24 hours	plastic	CSN ISO 10523
iron (Fe)	add HNO ₃ to pH < 2	6 months	plastic	APHA 21 st ed.
manganese (Mn)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
nitrate (NO ₃) ⁻	cool to 5±3°C	2 days	plastic	APHA 21 st ed.
nitrite (NO ₂) ⁻	cool to 5±3°C	2 days	plastic	APHA 21 st ed.
chemical oxygen demand (COD)	add H ₂ SO ₄ to pH <2, cool to 5±3°C	28 days	plastic or glass	APHA 21 st ed.
odor	cool to 5±3°C, if residual chlorine is present, add sodium thiosulfate, store in dark, container must be filled to zero headspace	3 days	glass	CSN EN 1622
taste	cool to 5±3°C, if residual chlorine is present, add sodium thiosulfate, store in dark, container must be filled to zero headspace	3 days	glass	CSN EN 1622
turbidity	store in dark, cool to 5±3°C	24 hours	plastic / glass	CSN EN ISO 7027
antimony (Sb)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
arsenic (As)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
benzene	cool to 5±3°C, store in dark, vials must be filled to zero headspace	5 days	glass vial with Teflon lined septum	USEPA 8260B
benzo(a)pyrene	cool to 5±3°C, if residual chlorine is present, add 100 mg/l of sodium thiosulfate	extract within 7 days, analyse within 40 days	amber glass bottle with Teflon lined septum	USEPA 8270
boron (B)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
bromates (BrO ₃) ⁻	cool to 5±3°C	1 month	plastic	CSN EN ISO 5667-3
cadmium (Cd)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
calcium (Ca)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
lead (Pb)	add HNO ₃ to pH < 2	6 months	plastic	USEPA

Parameter	Handling	Holding time	Container	Reference
cyanides (CN) ⁻	add NaOH to pH > 12, store in dark, cool to 5±3°C	14 days	plastic	APHA 21 st ed.
copper (Cu)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
chromium (Cr)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
1,2-dichloroethane	cool to 5±3°C, store in dark, vials must be filled to zero headspace	5 days	glass vial with Teflon lined septum	USEPA 8260B
total hardness	add HNO ₃ to pH < 2	6 months	plastic	USEPA
fluoride (F ⁻)	cool to 5±3°C	28 days	plastic	APHA 21 st ed.
magnesium (Mg)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
mercury (Hg)	add HNO ₃ to pH < 2	28 days	glass	USEPA
nickel (Ni)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
PAH	cool to 5±3°C	extract within 7 days, analyse within 40 days	amber glass bottle with Teflon lined septum	USEPA 8270
Pesticides individual	cool to 5±3°C, if residual chlorine is present, add 100 mg/l of sodium thiosulfate, store in dark	7 days of collection and analyzed within 40 days of extraction	glass vial with Teflon lined septum	CSN EN ISO 5667-3 Application note Applied Biosystems 114AP59-01 114AP43-01
Pesticides total	cool to 5±3°C, if residual chlorine is present, add 100 mg/l of sodium thiosulfate, store in dark	7 days of collection and analyzed within 40 days of extraction	glass vial with Teflon lined septum	CSN EN ISO 5667-3 Application note Applied Biosystems 114AP59-01 114AP43-01
selenium (Se)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
chloride (Cl ⁻)	none required	28 days	plastic	APHA 21 st ed.
trichloroethylene tetrachloroethylene	cool to 5±3°C, store in dark, vials must be filled to zero headspace	5 days	glass vial with Teflon lined	USEPA 8260B
trihalomethanes	cool to 5±3°C, store in dark, vials must be filled to zero headspace	5 days	glass vial with Teflon lined septum	USEPA 8260B
sodium (Na)	add HNO ₃ to pH < 2	6 months	plastic	USEPA
Total organic carbon (TOC)	add HCl pH < 2, cool to 5±3°C	7 days	glass / plastic	EN 1484
sulphate (SO ₄ ²⁻)	cool to 5±3°C	28 days	plastic	APHA 21 st ed.
vinylchloride	cool to 5±3°C, store in dark, vials must be filled to zero headspace	5 days	glass vial with Teflon lined septum	USEPA 8260B
Epichlorohydrine				
Acrylamide				

* ALS recommends in the field measurement

Internal quality control

ALS Czech Republic has a comprehensive QA/QC program. Our QA/QC procedures are designed to provide reliable and defensible analytical results. All ALS analytical procedures are fully validated and accredited according to the international norm ISO EN 17025. Quality control is a systematic process and encompasses, among others:

- regular calibration of instruments
- regular verification of calibration by independent standards
- regular measurement of blank samples (minimum frequency 5% of all measured samples)
- regular measurement of laboratory control samples (minimum frequency 5% of all measured samples)
- regular measurement of duplicate samples (minimum frequency 5% of all measured samples)



- regular measurement of spiked matrix samples and matrix certified reference materials
- surrogate spikes (for target organics)

The above mentioned procedure ensures that the method accuracy (both precision and trueness) meets the requirements. The measurement of quality control samples is described in ALS internal documents. The evaluation of quality control samples is based on statistical procedures, including the quality control charts.

A proposal of external quality control

Besides the internal data quality, ALS suggests also an external quality control procedure which monitors quality during sampling and sample transport. This includes, but is not limited to:

- client duplicate
- field (trip) sample blank

These QC samples are fully client's responsibility and, also, are evaluated by client as these samples are processed as regular samples by the laboratory. Client duplicate samples ensure that the sampling was performed correctly and also, monitors the sample homogeneity. Client duplicate is sampled into another but identical type of container as the regular sample. Field sample blank monitors potential contamination on the sampling site or during the transport and cleanness of used containers. An analyte free matrix is used as a blank.

Logistics requirements

- All samples should be cooled to $3\pm 2^{\circ}\text{C}$ for before shipment
- All ice packs and ice bottles should be cooled to -18°C or lower temperature before shipment
- ALS recommends to place during summer period (i.e. elevated temperature) within each box approximately 3 kg of ice before shipment. This measure assumes the worst case scenario. Under "normal" conditions 1,5 kg of ice per transport box is recommended.
- Use the DHL overnight service to ensure 16 hours transport time to ALS Laboratory

The transport conditions from Portugal to ALS laboratory in the Czech Republic have been reviewed using a continual temperature logging (logging frequency 1 minute). Furthermore, the transport procedure has been optimized to avoid a change of the sample properties which might affect the analytical results.

Figure 1: Simulation of transport condition and temperature of transported samples for a period of 24 hours if packed according to the proposed procedure.

