SLOVENSKI STANDARD

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Kakovost vode - Zahteve za zmogljivost in postopki skladnosti za opremo za monitoring vode - 1. del: Avtomatski vzorčevalniki za vodo in odpadno vodo

Water quality - Performance requirements and conformity test procedures for water monitoring equipment - Part 1: Automated sampling devices (samplers) for water and waste water

Wasserbeschaffenheit - Leistungsanforderungen und Konformitätsprüfungen für Geräte zum Wassermonitoring - Teil 1: Automatische Probenahmegeräte für Wasser und Abwasser

Qualité de l'eau - Exigences de performance et modes opératoires d'essai de conformité pour les équipements de surveillance de l'eau - Partie 1: Dispositifs d'échantillonnage automatiques (échantillonneurs) pour l'eau et les eaux usées

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Water quality - Performance requirements and conformity test procedures for water monitoring equipment - Automated sampling devices (samplers) for water and waste water

Qualité de l'eau - Exigences de performance et modes opératoires d'essai de conformité pour les équipements de surveillance de l'eau - Dispositifs d'échantillonnage automatiques (échantillonneurs) pour l'eau et les eaux usées

Wasserbeschaffenheit - Leistungsanforderungen und Konformitätsprüfungen für Geräte zum Wassermonitoring - Automatische Probenahmegeräte für Wasser und Abwasser

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Page

Foreword

This document (EN 16479:2014) has been prepared by Technical Committee CEN/TC 230 “Water analysis”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by January 2015, and conflicting national standards shall be withdrawn at the latest by January 2015.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document was submitted to the Formal Vote with the reference FprEN 16479-1.

According to the CEN-CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard is a product standard for automated sampling devices (samplers) for water and waste water. It defines general requirements, performance requirements, and procedures for the conformity testing of samplers. Samplers that are shown, by means of the tests, to conform with the specified requirements are considered to be fit for purpose. However, this European Standard does not cover the installation and on-going use of samplers.

The requirements of this European Standard are intended to be independent of measurement technology and applicable to all automated sampling devices.

Water monitoring equipment is widely used for compliance monitoring purposes under national and European regulations. This European standard supports the requirements of the following EU Directives:

— Industrial Emissions Directive (2010/75/EU) [6].

— Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC and 98/15/EEC) [7].

— Water Framework Directive (2000/60/EC) [8].

— Marine Strategy Framework Directive (2008/56/EC) [9].

1 Scope

This European Standard defines general requirements, performance requirements and conformity test procedures for automated sampling devices (samplers) for water and waste water that:

— sample water and waste water from non-pressurized (i. e. open to atmosphere) channels or vessels;

— sample over extended periods to collect discrete or composite samples based on time, event or flow proportional sampling.

Specific sample integrity requirements are defined for samplers to be used for the collection of samples of final effluent or influent for the purpose of monitoring the performance of waste water treatment works, as required under the Urban Waste Water Treatment Directive (UWWTD). Samplers to be used for other industrial applications do not have to be assessed against these specific sample integrity requirements.

This European Standard does not cover the installation and on-going use of samplers.

2 Normative References

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 5667-3:2012, *Water quality - Sampling - Part 3: Preservation and handling of water samples (ISO 5667-3:2012)*

EN ISO/IEC 17025, *General requirements for the competence of testing and calibration laboratories (ISO/IEC 17025)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
automated sampling device for water and waste water
automated sampler
equipment for collecting and storing samples of water or waste water for subsequent analysis

3.2
bias
estimate of a systematic measurement error

Note 1 to entry: The systematic measurement error is a component of measurement error that in replicate measurements remains constant or varies in a predictable manner.

[SOURCE: ISO/IEC Guide 99:2007, 2.18, modified — Note 1 to entry has been added.]

3.3
composite sample
two or more samples or sub-samples, mixed together in appropriate known proportions (either discretely or continuously), from which the average result of a desired requirement may be obtained

Note 1 to entry: The proportions are usually based on time or flow measurements.

[SOURCE: ISO 6107-2:2006/AMD, 1:2012, 29]

3.4
constant volume variable time sampling
C.V.V.T
flow proportional sampling based on collecting equal volumes of sample at frequencies proportional to flow

3.5
constant time variable volume sampling
C.T.V.V
flow proportional sampling based on collecting samples at fixed time intervals but where the volume of sample is varied in proportion to the flow

3.6
constant time constant volume sampling
C.T.C.V
equal volumes of sample or sub-sample collected at equal increments of time

3.7
determinand
property/substance that is required to be measured and to be reflected by/present in a calibration solution

[SOURCE: EN ISO 15839:2006, 3.13]

3.8
discrete sample
single sample taken from a body of water

[SOURCE: ISO 6107-2:2006, 40, modified – "process, whereby" deleted]

3.9
measurement error
error of measurement
error

measured quantity value minus a reference quantity value

Note 1 to entry: The concept of "measurement error" can be used both:

a) when there is a single reference quantity value to refer to, which occurs if a calibration is made by means of a measurement standard with a measured quantity value having a negligible measurement uncertainty or if a conventional quantity value is given, in which case the measurement error is known, and

b) if a measurand is supposed to be represented by a unique true quantity value or a set of true quantity values of negligible range, in which case the measurement error is not known.

Note 2 to entry: Measurement error is not be confused with production error or mistake.

[SOURCE: ISO/IEC Guide 99:2007, 2.16]

3.10
rated operating conditions
minimum to maximum values of any environmental, fluid or electrical parameter within which the sampler is designed to operate without adjustment and with errors within performance limits

3.11
lift height
vertical distance between the surface of the fluid being sampled and the highest point to which the sample is lifted

Note 1 to entry: Sometimes called "sampling head" or "suction height".

Note 2 to entry: The maximum lift height for samplers using vacuum pumps (e.g. pneumatic samplers and peristaltic samplers) is set to an atmospheric pressure of 1 000 mbar. At low atmospheric pressure the maximum lift height will be consequentially lower.

3.12
precision
closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions

Note 1 to entry: Measurement precision is usually expressed numerically by measures of imprecision, such as standard deviation, variance, or coefficient of variation under specified conditions of measurement.

Note 2 to entry: The "specified conditions" can be, for example, repeatability conditions of measurement, intermediate precision conditions of measurement, or reproducibility conditions of measurement (see ISO 5725-3:1994).

Note 3 to entry: Measurement precision is used to define measurement repeatability, intermediate measurement precision, and measurement reproducibility.

Note 4 to entry: Sometimes "measurement precision" is erroneously used to mean measurement accuracy.

[SOURCE: ISO/IEC Guide 99:2007, 2.15]

3.13
sampling interval
time between successive sampling events

3.14
sampling line
conduit from intake point to inlet of dosing system

[SOURCE: ISO 6107-2:2006/AMD, 1:2012, 115, modified – "sampling probe" was replaced by "intake point" and delivery point was replaced by "inlet of dosing system"]

4 General requirements for samplers

See 6.3 for details on verification by inspection.

A sampler shall:

a) have an unique designation that unambiguously identifies it (e.g. model, serial number);

b) be designed (including its operating methodology) and constructed to ensure that the composition of the sample is, as far as is practicable, not altered by the sampling procedure;

It can be impracticable to prevent the loss of volatile substances during sampling with vacuum and peristaltic samplers.

c) have a rated maximum lift height at which all of the performance requirements of this standard are fulfilled. The rated maximum lift height shall be inscribed on the sampler or declared in the operating manual published by the manufacturer;

Conformity testing of the sampler shall be based on a range of lift heights up to and including the sampler's rated maximum lift height.

d) have provision for the user to set the volume of a discrete sample;

e) have rated minimum and maximum sample volumes of a discrete sample inscribed on the sampler or declared in the operating manual published by the manufacturer;

Unless otherwise stated conformity testing of the sampler shall be based on a sample volume of 250 ml or the rated maximum sample volume, if smaller.

f) have the stated capacities, for any integrated sample storage, both by number(s) and volume(s) of individual bottles and of a composite container, inscribed on the sampler or declared in the operating manual published by the manufacturer;

g) be capable of collecting a series of samples, on a timed, event and/or a flow proportional basis. Samples can be collected and stored in individual bottles or a single composite sample bottle;

h) have its possible sampling intervals inscribed on the sampler or declared in the operating manual published by the manufacturer;

i) have provision for the user to set the sample interval as a minimum in the range 5 min to 1 h with increments of 1 min, for time proportional samplers;

j) have provision for the sample interval (in the case of C.V.V.T. sampling) or the sample volume (in the case of C.T.V.V. sampling) to be set on the basis of a flow signal (e.g. pulse or analogue) from a flow meter. For pulse inputs, the relationship between pulse input and sample interval or volume should be adjustable as a minimum over the range 1 pulse to 999 pulses in increments of 1 pulse;

k) have a control unit capable of recording sample collection failures;

l) have a control unit capable of recording any low battery alarm during sample collection;

m) be designed to minimise the possibility of clogging of the sample line by suspended solids in the waste water. The nominal internal diameter of the sample line shall be not less than 9 mm and the average sample line velocity shall not be less than 0,5 m/s. The sampler shall be capable of achieving this average sample line velocity at all lift heights up to and including its maximum rated lift height.

These requirements on sample line diameter exclude pipe restriction caused by the normal operation of pinch valves and peristaltic pumps.

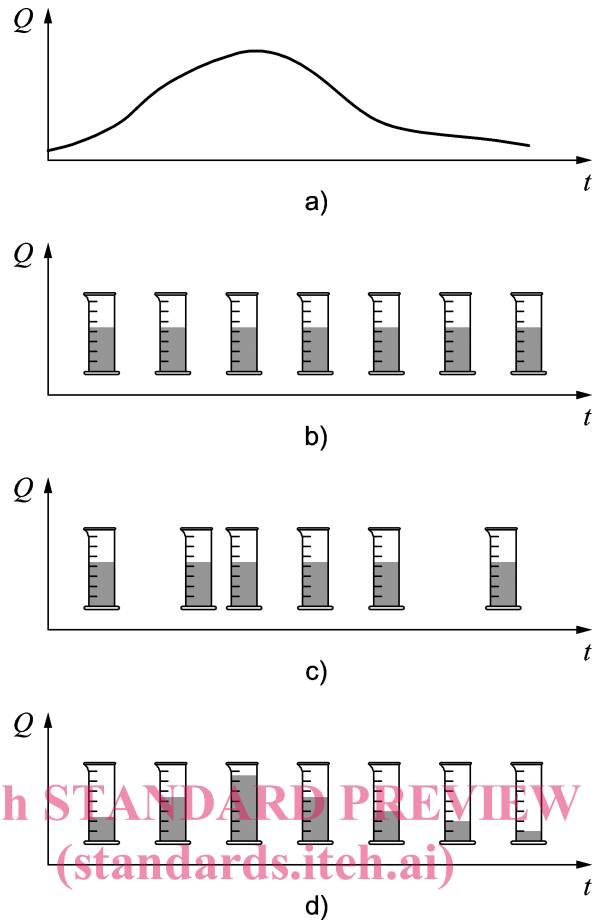
National legal requirements can specify different minimum values for internal sample line diameter and average sample line velocity. These may need to be taken into account.

n) be capable of purging the contents of the sampling line between each sampling event;

o) have stated ingress protection (IP) rating inscribed on the sampler or stated in the operating manual.

Requirements for ingress protection are detailed in EN 60529:1991 [1]

The possible sampling options are illustrated in Figure 1.



Key

Q	discharge
t	time
a)	Flow rate curve
b)	C.T.C.V. Time proportional sampling
c)	C.V.V.T. Flow proportional sampling
d)	C.T.V.V. Flow proportional sampling

Figure 1 — Sampling options

5 Performance requirements

5.1 Sample volume

See conformity test in 6.4.1.1 and 6.4.1.2.

The bias of the sample volume and precision at the 95 % confidence limit shall each not be greater than 5 % of the set volume over the tested range for lift height.

NOTE Details of how to calculate bias and precision and worked example calculations are given in A.1.

5.2 Sampling principles

See conformity tests in 6.4.2.2, 6.4.2.3, 6.4.2.4 and 6.4.2.5.

The performance of the sampling principle shall be tested and the results reported. The timing error for each operating principle shall not be greater than 1 %.

5.3 Sample line velocity

See conformity test in 6.4.3.

The average velocity of the sample as it passes through the sample line during the sampling event shall not be less than 0,5 m/s at each tested lift height and at the rated voltage for the power supply.

NOTE 1 A worked example calculation of sample line velocity is given in A.2.

NOTE 2 National legal requirements can specify different minimum values for internal sample line diameter and average sample line velocity and these may need to be taken into account.

5.4 Power supply

See conformity test in 6.4.4.

The average velocity of the sample as it passes through the sample line during the sampling event shall not be less than 0,5 m/s between the minimum and maximum rated voltages for the power supply.

NOTE A worked example calculation of sample line velocity is given in A.2.

5.5 Sample integrity

See conformity test in 6.4.5 and the example procedure at Annex B.

Analyses for BOD (biochemical oxygen demand), COD (chemical oxygen demand), total nitrogen, and total phosphorus in samples taken by the sampler and in samples taken manually from a test fluid in accordance with the conformity test detailed in 6.4.5 shall show no significant statistical difference based on an analysis of variance.

NOTE Details of how to calculate sample integrity using analysis of variance and a worked example calculation are given in A.3.

The design of a sample integrity test for other applications shall be based on EN ISO 5667-3 which describes the precautions to be taken to preserve and transport water samples. The same pass criteria should be applied when using a test fluid for an application other than the UWWTD and for which relevant determinands have been identified.

5.6 Sample timing error

See conformity test in 6.4.6.

The error of the sampler interval timing mechanism shall be no greater than ± 10 s per 24 h.

NOTE A worked example calculation of sample timing error is given in A.4.

5.7 Effect of ambient air temperature

5.7.1 Samplers not incorporating sample temperature control

See conformity tests in 6.4.7.

Samplers which do not incorporate a means for maintaining the temperature of the sample within pre-set limits shall conform to the sample volume error requirements in 5.1 when operated within one of the following sets of rated operating conditions with regards to ambient temperature:

a) from +5 °C to +40 °C; or