SLOVENSKI STANDARD
SIST EN 16479:2023

01-junij-2023

Nadomešča:
SIST EN 16479:2014

Kakovost vode - Zahteve za zmogljivost in postopki preskušanja skladnosti opreme za monitoring vode - Avtomatski vzorčevalniki za vodo in odpadno vodo

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

Wasserbeschaffenheit - Leistungsanforderungen und Konformitätsprüfungen für Geräte zum Wassermonitoring - 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 - Dispositifs d'échantillonnage automatiques (échantillonneurs) pour l'eau et les eaux usées

Ta slovenski standard je istoveten z: **EN 16479:2023**

ICS:

13.060.45	Preiskava vode na splošno	Examination of water in general

SIST EN 16479:2023 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16479

April 2023

ICS 13.060.45

Supersedes EN 16479:2014

English Version

Water quality - Performance requirements and conformity test procedures for water monitoring equipment - Automatic 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

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

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European foreword

This document (EN 16479:2023) 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of an identical text or by endorsement, at the latest by October 2023, and conflicting national standards shall be withdrawn at the latest by October 2023.

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

This document supersedes EN 16479:2014.

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Introduction

This document is a product standard for automatic sampling devices (samplers) for water and waste water. It specifies general requirements, performance requirements, and procedures for the conformity testing of samplers.

The general requirements include functional facilities that samplers need to meet users' applications and information that needs to be included in associated documents. Conformity with these requirements is verified by inspection. The performance requirements define the capability of a sampler to collect samples of water reliably. Conformity with these requirements is determined by testing carried out in a laboratory under controlled conditions. Statistical procedures are defined for evaluation of the conformity test data and some example calculations are provided.

The sample volume over which the test procedures will be applied, the "set sample volume", is not specified. It is for the sampler manufacturer and/or the user to decide on the required set sample volume taking into account varying national commercial markets and regulatory requirements.

These requirements and statistical procedures take into account those specified in ISO 5667-10:2020 [1] for automatic samplers. Samplers that are shown, by means of the tests, to conform to the requirements specified in this document are considered to be fit for purpose. However, this document does not cover the installation and on-going use of samplers.

This document is associated with EN 17075 [2] which covers measuring devices for water and waste water.

Automatic sampling devices are widely used for compliance monitoring purposes under national and European regulations.

The use of an automatic sampling device, for example in a hazardous environment, can also be subject to national, European and international rules and legislation governing the safety of products.

1 Scope

This document specifies general requirements, performance requirements and conformity test procedures for automatic 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.

It does not include sampling systems built into online and in-line analysers.

The general requirements include functional facilities that samplers need to meet users' applications and information that needs to be included in associated documents.

The test procedures specify uniform methods to be used when determining key performance characteristics of samplers at one or more set sample volume. It is for the sampler manufacturer and/or user to decide on the required set sample volume(s). All of the test procedures are to be carried out under laboratory conditions. It is recognized that for some samplers, certain test procedures are not applicable.

Statistical procedures are specified for evaluation of the test data. Some example calculations are provided.

Specific sample integrity requirements are specified for samplers to be used for the collection of samples of final effluent or influent for the purpose of monitoring the performance of urban waste water treatment works. Samplers to be used for other industrial applications do not need to be assessed against these specific sample integrity requirements.

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

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
automatic sampling device for water and waste water
automatic sampler
equipment for collecting and storing samples of water or waste water for subsequent laboratory 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.] [4]

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 value of a desired characteristic may be obtained

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

[SOURCE: ISO 6107:2021, 3.126] [5]

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] [6]

3.8
discrete sample
single sample taken from a body of water

[SOURCE: ISO 6107:2021, 3.183, modified — “process, whereby” deleted] [5]

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 to be confused with production error or mistake.

[SOURCE: ISO/IEC Guide 99:2007, 2.16] [4]

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 water 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
measurement repeatability
repeatability
measurement precision under a set of repeatability conditions of measurement

[SOURCE: ISO/IEC Guide 99:2007, 2.21] [4]

3.13
repeatability condition of measurement
repeatability condition
condition of measurement, out of a set of conditions that includes the same measurement procedure, same operators, same measuring system, same operating conditions and same location, and replicate measurements on the same or similar objects over a short period of time

Note 1 to entry: A condition of measurement is a repeatability condition only with respect to a specified set of repeatability conditions.

Note 2 to entry: In chemistry, the term "intra-serial precision condition of measurement" is sometimes used to designate this concept.

[SOURCE: ISO/IEC Guide 99:2007, 2.20] [4]

3.14
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 [4], 2.15] [4]

3.15
sampling interval
time between successive sampling events

3.16
sampling line
conduit from intake point to inlet of dosing system

[SOURCE: ISO 6107:2021, 3.494, modified — "sampling probe" was replaced by "intake point" and delivery point was replaced by "inlet of dosing system"] [5]

4 General requirements for samplers

See 6.3 for details on verification by inspection.

A sampler shall:

a) have a 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 document 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 set sample volumes of a discrete sample inscribed on the sampler or declared in the operating manual published by the manufacturer;

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 minimize the possibility of clogging of the sample line by suspended solids in 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 at all rated operating voltages.

The requirement on sample line diameter excludes 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 can need to be taken into account.

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

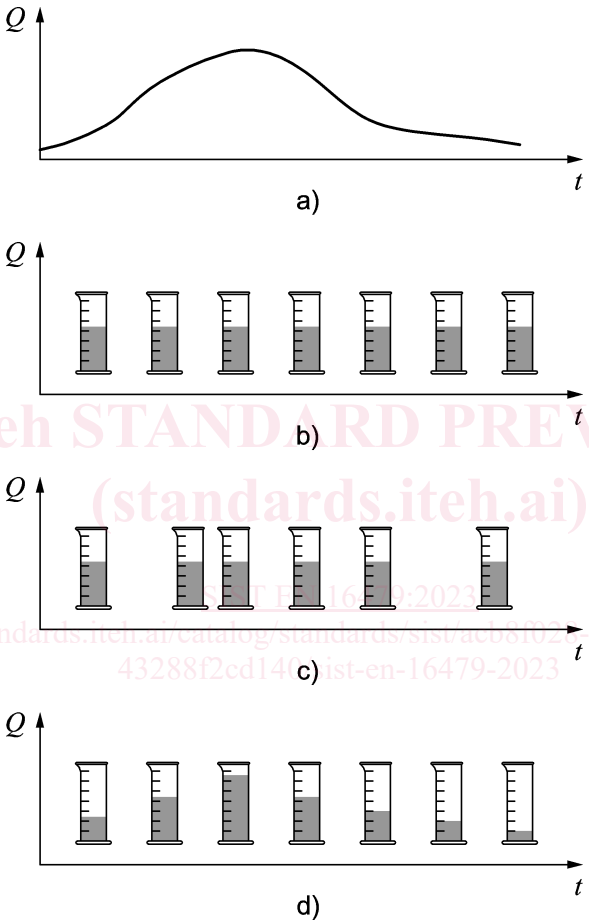
o) have stated ingress protection (IP) rating inscribed on the sampler or stated in the operating manual;

Requirements for ingress protection are detailed in EN 60529:1991 [7].

p) have a rated sample water and/or waste water temperature range of at least +1 °C to +25 °C at which all of the performance requirements of this document are met. The rated temperature range shall be inscribed on the sampler or declared in the operating manual published by the manufacturer;

q) have rated minimum and maximum voltages at which all of the performance requirements of this document that are relevant to the sampler are met. The rated minimum and maximum operating voltages shall be inscribed on the sampler or declared in the operating manual published by the manufacturer.

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

The bias of the collected sample volume shall not be greater than 5 % of the set volume over the tested range for lift height.

The repeatability of the collected sample volume for set volumes greater than 100 ml shall not be greater than 2,5 %, expressed as the repeatability variation coefficient, for the set volume over the tested range for lift height.

The repeatability of the collected sample volume for set volumes less than or equal to 100 ml shall not be greater than 4,0 %, expressed as the repeatability variation coefficient, for the set volume over the tested range for lift height.

NOTE 1 The repeatability variation coefficient is expressed as the relative standard deviation.

NOTE 2 Details of how to calculate bias and repeatability are given in Annex A. Example calculations are detailed in Annex B.

5.2 Sampling principles

See conformity tests 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 %.

Event triggered timing error

The sampler shall start sample extraction, unless it is already doing so, within 10 s of a trigger signal being received from an external input.

5.3 Sample line velocity

See conformity test 6.4.3.

The mean velocity of the sample water 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 An example calculation of sample line velocity is given in Annex B.

National legal requirements can specify different minimum values for internal sample line diameter and mean sample line velocity and these possibly need to be taken into account.

5.4 Power supply

See conformity test 6.4.4.

The mean velocity of the sample water 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 An example calculation of sample line velocity is given in Annex B.

5.5 Sample integrity

See conformity test 6.4.5 and the example procedure in Annex C.

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 water representative of a waste water from an urban waste water treatment plant in accordance with the