SLOVENSKI STANDARD
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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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Foreword

This document (prEN 16479-1:2012) has been prepared by Technical Committee CEN/TC 230 "Water analysis", the secretariat of which is held by DIN.

This document is currently submitted to the CEN Enquiry.

Introduction

This part of prEN 16479-1 defines the general requirements, performance requirements, and procedures for the conformity testing of automated sampling devices (samplers) for water and waste water. Part 2 covers on-line analysers and Part 3 covers portable analysers.

The requirements of this part of prEN 16479-1 are intended to be technology transparent so that it can be applied to any type of sampler.

This part of prEN 16479-1 is applicable to any organization that wishes to demonstrate that a sampler conforms to the specified general requirements and performance requirements by means of the defined conformity testing. The conformity testing may be carried out by:

— a manufacturer or supplier – the first party, for the purposes of self-declaration of conformity;

— user or purchaser - the second party, generally for the purposes of commercial acceptance;

— an independent body – the third party, for the purpose of product certification.

Water monitoring equipment is widely used for compliance monitoring purposes under national and European regulations. This part of prEN 16479-1 supports the requirements of the following EU Directives:

— Industrial Emissions Directive (2010/75/EU) [1].

— Urban Waste Water Treatment Directive (UWWTD) (91/271/EEC and 98/15/EEC) [2].

— Water Framework Directive (2000/60/EC) [3].

— Marine Strategy Framework Directive (2008/56/EC) [4].

ISO/IEC Guide 67 [5] provides guidance on product certification. It defines product certification as "a means by which a third party provides assurance that a product complies with specified standards and other normative documents" and provides examples of product certification systems.

Competent authorities may require third party product certification of water monitoring equipment that is to be used for compliance monitoring. An example of a third party certification scheme is given in Annex A.

1 Scope

This part of prEN 16479-1 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 or flow proportional sampling;
- are intended to be permanently or temporarily sited.

Specific variations of the performance requirements are listed in Annex C 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 applications do not have to be assessed against the specific variations on the performance requirements listed in Annex C.

2 Terms and definitions

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

2.1
automated sampling devices (samplers) for water and waste water
equipment for collecting and storing samples of water or wastewater for subsequent analysis

2.2
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.]

2.3
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.

2.4
constant volume variable time sampling
C.V.V.T.
flow proportional sampling based on collecting equal increments of sample at equal increments of flow.

2.5
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.

2.6
determinand
property that is to be measured

2.7
error
difference between the value of the determinand obtained and the conventional quantity value or a reference quantity value, after compensating for any errors in the test equipment

2.8
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

2.9
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”.

2.10
precision
closeness of agreement between indications or measured quantity values obtained by replicate measurements on the same or similar objects under specified conditions.

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

2.11
sampling interval
time between successive sampling events

2.12
sampling line
conduit from intake point to sample delivery point into the collection vessel

2.13
time proportional sampling
equal volumes of sample or sub-sample collected at equal increments of time

3 General requirements

See 5.3 for details on verification by inspection.

The sampler shall have a unique designation that provides for its unambiguous identification.

The construction and operating methodology of the sampler shall be such as to ensure that the chemical composition of the sample is not altered by the sampling procedure.

The sampler shall have a rated maximum lift height at which all requirements of section 4 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.

NOTE 1 Conformity testing of the sampler will be based on a range of lift heights up to 7 m or the sampler’s rated maximum lift height.

The sampler shall have provision for the user to set the volume of a discrete sample.

The sampler shall have stated minimum and maximum sample volumes of a discrete sample. The stated minimum and maximum sample volumes shall be inscribed on the sampler or declared in the operating manual published by the manufacturer.

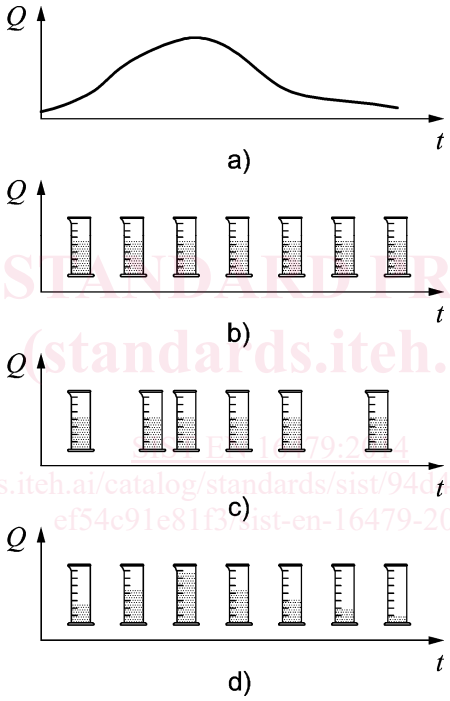
NOTE 2 Unless otherwise stated in section 5 of this standard conformity testing of the sampler will be based on a sample volume of 250 ml or the stated maximum sample volume if smaller.

For samplers that have integrated sample storage the storage capacities shall be stated. The stated capacities, both by number(s) and volume(s) of individual bottles and of a composite container, shall be inscribed on the sampler or declared in the operating manual published by the manufacturer.

NOTE 3 Annex C specifies a minimum total sample volume, collected either as a composite or in individual bottles, of not less than 2,5 l for UWWTD sampling.

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

The possible sampling options are illustrated in Figure 1.



Key

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

Figure 1 — Sampling options

The possible sampling intervals shall be inscribed on the sampler or declared in the operating manual published by the manufacturer.

NOTE 4 For time proportional sampling, provision should be made for the user to set the sample interval as a minimum in the range 5 min to 1 h with increments of 1 min.

NOTE 5 For flow proportional sampling, provision should be made 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

4 mA to 20 mA current loop) 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 1 999 pulses in increments of 1 pulse.

The sampler control unit shall be capable of recording sample collection failures.

The sampler control unit shall be capable of recording any low battery alarm during sample collection.

The nominal internal diameter of the sample line shall not be less than 9 mm to minimise clogging.

NOTE 6 This requirement excludes pipe restriction caused by the normal operation of pinch valves and peristaltic pumps.

The sampler shall be capable of purging the contents of the sampling line between each sampling event.

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

4 Performance requirements

Annex B defines in detail how performance requirements are determined.

4.1 Sample volume

See conformity test at 5.4.2.1, 5.4.2.2 and 5.4.2.3.

The bias of the sample volume and precision at the 95 % confidence limit, shall each not be greater than 5 % of the set volume at 20 °C, over the tested range for lift height.

NOTE 1 The bias is calculated as the mean volume minus the set volume divided by the mean volume.

NOTE 2 The precision is calculated as 2 times the sample standard deviation (*s*) of the measured volumes divided by the mean volume at the 95% confidence limit;

4.2 Sample line velocity

See conformity test at 5.4.3.

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 operating voltage for the power supply.

4.3 Power supply

See conformity test 5.4.4.

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 operating voltages for the power supply.

4.4 Sample integrity

See conformity test 5.4.5.

Samplers that are intended for use for sampling under the Urban Waste Water Treatment Directive (UWWTD) shall conform to the requirements specified in Annex C.

NOTE The design of a sample integrity test for other applications should be based on EN ISO 5667-3:1996 [8] which provides guidance on 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. Where an application can involve trace analysis additional demineralised water samples should be taken to act as blanks

4.5 Sample timing error

See conformity test 5.4.6.

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

4.6 Effect of ambient temperature

See conformity tests at 5.4.7.

4.6.1 Samplers NOT incorporating sample temperature control

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 4.1 when operated within one of the following sets of rated operating conditions with regards to ambient temperature:

a) from 0 °C to +40 °C; or

b) from -10 °C to +40 °C.

The rated operating conditions for the process fluid temperature shall be in the range from +1 °C to +30°C.

4.6.2 Samplers incorporating sample temperature control

Samplers which incorporate a means for maintaining the temperature of the sample within pre-set limits shall conform to the sample volume error requirements in 4.1 when operated within an ambient temperature range from -10 °C to +40 °C and a process fluid temperature range from +1 °C to +25 °C.

The mean temperature of the sample shall be maintained within the range from 0 °C to +5 °C during the sampling period, when the sampler is operated within the rated operating conditions for ambient temperature and process fluid temperature.

In the case of mains powered samplers, after completion of the sampling period, the sample temperature shall remain within the range from 0 °C to +5 °C for a minimum period of 24 h. The design of the sample temperature control shall ensure that ice does not form in the sample.

In the case of portable samplers which are not powered directly from a mains electricity supply, the minimum period of time, from the end of the sampling period, over which the temperature of the sample will remain within the range from 0 °C to +5 °C with no formation of ice shall be 12 h.

5 Conformity testing

5.1 General requirements

The sampler shall be installed in accordance with any instructions provided by the manufacturer.

Each performance requirement for the sampler shall be considered on its own when performing the conformity tests.

Sampler conformance shall be determined by processing the data from the tests in accordance with the calculation methods summarized in Annex B.

Results from the conformity testing should be reported using the example report form in Annex D.

5.2 Test conditions

The sample line shall be arranged so that no part of the sample is retained within the sample line.

During tests that require the sampler to collect a sample of fluid, the vessel containing the fluid to be sampled shall be open to the atmosphere.

In the case of a battery powered sampler, the battery shall be fully charged at the start of each conformity test unless stated otherwise in the test conditions.

Prior to carrying out any series of consecutive tests, the sampler shall be operated, for a total operating period of 2 000 sampling cycles, under the following conditions:

— lift height 7 m (or the rated maximum lift height);

— sampling interval 5 min;

— sample volume 250 ml, (or the stated maximum volume if less than 250 ml);

— samples shall be discarded or run to waste.

The sampler may be maintained, cleaned or recalibrated in accordance with the manufacturer's instructions prior to any test, but adjustments shall not be carried out during the course of the test.

Table 1 gives the reference conditions for possible influence quantities. The sampler shall be tested with all influence quantities at their reference values, including tolerances, unless where specifically varied in any one test.

Table 1 — Test reference conditions

Influence quantity	Reference value	Tolerance
Ambient temperature	20 °C	±2,5 °C
Ambient humidity at 20 °C	< 60 %	±15 %
Sample temperature	20 °C	±2,5 °C
Supply voltage (AC)	230 V [a] (or 110 V)	±6 % [a]
Supply voltage (DC)	Appropriate to sampler	Appropriate to sampler
[a] CENELEC Harmonisation Document HD 472 S1:1988 [7]		

5.3 Initial checks

Ensure that the sampler is set up, calibrated and adjusted in accordance with the manufacturer's instructions.

NOTE The manufacturer may set up and demonstrate the sampler before the testing begins.

The sampler (or statements in the manufacturer's operating manual) shall be inspected to verify conformance to the general requirements listed in Section 3, as appropriate to the sampler under test. The means by which each requirement is fulfilled shall be reported.

5.4 Performance tests

5.4.1 General

For samplers capable of operation under more than one principle (i.e. time proportional, C.V.V.T flow proportional and C.T.V.V. flow proportional) all available options shall be tested.

5.4.2 Sample volume

5.4.2.1 Time proportional sampling

The sample volume errors for samplers operating on the time proportional principle shall be determined in accordance with procedure below.

1) Set the sampler to operate on time proportional sampling.

2) Programme the sampler to collect 24 samples with a fixed sampling interval and a sample volume of 250 ml (or the maximum sample volume if less than 250 ml).

3) Operate the programme at a lift height of 1 m.

4) Measure and record the volume of each sample.

5) Repeat the sampling programme at 7 m (or the rated maximum lift height) and at half the maximum lift height. In each case, measure and record the volume of each sample.

6) Calculate and report in accordance with Annex B, section B.1

5.4.2.2 C.V.V.T. flow proportional sampling

The sample volume errors for samplers operating on the Constant Volume Variable Time (C.V.V.T.) flow proportional sampling principle shall be determined in accordance with the procedure below.

NOTE 1 For samplers capable of operating with different input signals (analogue, pulse, digital) each input should be tested separately.

1) Programme the sampler for the collection of C.V.V.T. flow proportional samples with a sample collected at 10 minute intervals when the maximum input signal is applied.

NOTE 2 For samplers using a pulse input programme the sampler for the collection of C.V.V.T. flow proportional samples with a sample collected at 10 min intervals when the maximum input signal is applied.

NOTE 3 If the maximum sample volume which can be set is less than 250 ml then select the maximum volume and adjust the sample collection rate accordingly, e.g. in the case of a sample volume of 125 ml, the sample collection rate would be one 125 ml sample per 2,5 m^3.

2) Operate the sampler at a lift height of 1 m.

3) Apply a simulated flow signal representing 25 % of the maximum input signal until 6 individual samples have been collected.

4) Determine the elapsed time from the instant that the sampler activates for the first sample to the instant that the sampler activates for the sixth sample.

5) Calculate the timing error between the first and last sampling action such that if the timing function overruns the error is reported as positive.

6) Normalise the reported error to seconds per 24 h.

7) Sequentially increase the flow signal to represent a flow rate of 50 %, 75 % and 100 % of the maximum input signal. In each case collect 6 individual samples and repeat steps 4 to 6.

8) Determine the volume of each sample and the simulated flow volume time increment between each sample event.