SLOVENSKI STANDARD
SIST EN 16713-1:2016

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Plavalni bazeni za domačo uporabo - Vodni sistemi - 1. del: Filtrirni sistemi - Zahteve in preskusne metode

Domestic swimming pools - Water systems - Part 1: Filtration systems - Requirements and test methods

Schwimmbäder für private Nutzung - Wassersysteme - Teil 1: Filtrationssysteme - Anforderungen und Prüfverfahren

Piscines privées à usage familial - Systèmes de distribution d'eau - Partie 1: Systèmes de filtration - Exigences et méthodes d'essai

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Domestic swimming pools - Water systems - Part 1: Filtration systems - Requirements and test methods

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

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (EN 16713-1:2016) has been prepared by Technical Committee CEN/TC 402 “Domestic Pools and Spas”, the secretariat of which is held by AFNOR.

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of an identical text or by endorsement, at the latest by August 2016, and conflicting national standards shall be withdrawn at the latest by August 2016.

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EN 16713, *Domestic swimming pools — Water systems*, currently comprises:

— *Part 1: Filtration systems— Requirements and test methods*;

— *Part 2: Circulation systems— Requirements and test methods*;

— *Part 3: Water treatment— Requirements*.

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Introduction

The filtration system in any swimming pool is there to remove the suspended matter from the pool water. Filtration is achieved by passing the water through a suitable medium contained in a filter body.

It is generally accepted that there are four types of filters associated with swimming pools:

a) pre-coat filtration/diatomaceous earth (DE);

b) disposable cartridge or filter bag;

c) graded aggregate (single/multi-layer-filter);

d) other filters (e.g. membrane systems).

1 Scope

This European Standard specifies filtration requirements and test methods of filter elements or media, filtration units or systems designed to be used in domestic swimming pools.

This standard applies to swimming pools as defined in EN 16582-1 and will be read in conjunction with it.

This standard does not apply to:

— pools for public use covered by EN 15288-1;

— spas for domestic or public use;

— paddling pools according to EN 71-8;

— pre filtration;

— natural and nature like pools.

NOTE For circulation systems see EN 16713–2 and for treatment systems EN 16713–3.

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 837-1, *Pressure gauges — Part 1: Bourdon tube pressure gauges — Dimensions, metrology, requirements and testing*

EN 872, *Water quality — Determination of suspended solids — Method by filtration through glass fibre filters*

EN 12902, *Products used for treatment of water intended for human consumption — Inorganic supporting and filtering materials — Methods of test*

EN ISO 7010:2012, *Graphical symbols — Safety colours and safety signs — Registered safety signs (ISO 7010:2011)*

HD 60364-7-702, *Low-voltage electrical installations — Part 7-702: Requirements for special installations or locations — Swimming pools and fountains (IEC 60364-7-702)*

ISO 3864-2, *Graphical symbols — Safety colours and safety signs — Part 2: Design principles for product safety labels*

ISO 12103-1, *Road vehicles — Test dust for filter evaluation — Part 1: Arizona test dust*

ISO 21501-3, *Determination of particle size distribution — Single particle light interaction methods — Part 3: Light extinction liquid-borne particle counter*

3 Terms and definitions

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

3.1
backwash
method of cleaning consisting of a flow of water through filter element(s) or media in a reverse direction to dislodge accumulated dirt and/or filter aid and remove them from the filter body

3.2
bulk density
ρ_B
mass of many particles of a material divided by the total volume they occupy; the total volume includes particle volume, inter-particle void volume and particle internal pore volume

Note 1 to entry: Bulk density in kg/m^3:

$$\rho_B = \frac{\text{mass}}{V_{solid} + V_{pores} + V_{void}} \quad (1)$$

3.3
cleaning
physical removal of soiling materials

3.4
cleaning differential pressure
maximum differential pressure allowed at the terminals of the filter element or the filter to guarantee its efficiency and from which the filter media should be cleaned or replaced

Note 1 to entry: It often corresponds to the differential pressure that defines the retention capacity of the filter element or filter.

3.5
filtrate
treated water after the filtration process

3.6
differential pressure
difference between the upstream and the downstream pressure of the filter

3.7
effective size d_x
size of the sieve in mm through which approximately x % of the total grains by weight are smaller

Note 1 to entry: d_{10} for the smaller size and d_{90} for the bigger size are generally used in the pool business.

Note 2 to entry: Effective size at x % (d_x).

3.8
filter
element made up of the filter body and the filter medium/media or filter element(s)

3.9
filter body
container enclosing the filter medium or filter element(s), and providing inlets and outlets for pool water to circulate through and connecting devices

3.10
filter element
interchangeable element comprising the filter medium and the end devices which force water to go through the filter medium by watertight contact with the filter body

EXAMPLE Filter cartridge, filter sock, filter pocket.

3.11
filter medium
natural or synthetic water-permeable material that retains the particles present in the water

EXAMPLE Sand, diatomaceous earth, zeolite, anthracite, folded nonwoven, agglomerated fibres.

Note 1 to entry: Some filter media can also have a chemical action.

3.12
filtration efficiency
ratio, multiplied by 100, of the number of particles with a dimension greater than or equal to a given dimension retained by the filter to the number of particles of the same dimension present at the same instant upstream of the filter:

$$Ed = \frac{Nd_e - Nd_s}{Nd_e} \cdot 100 \quad (2)$$

where

Ed is the filtration efficiency, expressed in percentage (%);

$Nd_e - Nd_s$ is the number of particles with a size greater than or equal to a given size (d in µm) retained by the filter at the instant t;

Nd_e is the number of particles with a size greater than or equal to a given size (d in µm) present at the instant t upstream of the filter;

Nd_s is the number of particles with a size greater than or equal to a given size (d in µm) present at the instant t downstream of the filter.

3.13
filtration rating
S
size of standardised grade A4 dust (ISO CTD) according to ISO 12103-1 for which the average filtration efficiency measured according to this standard is greater than 80 %

Note 1 to entry: Filtration rating in µm.

3.14
filtration system
all of the equipment suitable for the volume of water to be filtered, generally consisting of a filtration unit, a return/suction system, a skimmer and, if necessary, hydraulic connection

3.15
nominal flow rate
manufacturer's specified water flow rate with a clean filter for a given component or a combination of components (i.e. filter, filtration unit, filtration system)

Note 1 to entry: Nominal flow rate in m^3/h.

3.16
filtration unit
assembly made up of a pump, generally centrifugal, a filter body and one or more filter elements or a mass of granular filtering material which retains the suspended solids from the swimming pool water circulating through it

Note 1 to entry: The pump may be placed before or after the filter.

Note 2 to entry: The filter may be closed or open, out of the water or submerged.

3.17
granular media filter
filter whose media consists of separated solid material, forming a porous layer, used for the filtration of liquids

3.18
hydraulic connections

couplings, pipes and watertight equipment required for operating water circulation systems

EXAMPLE Hydraulic connection between the different component of the filtration unit or between the filtration unit and the basin.

3.19
limit cleaning value
minimum or maximum value of a specified operating parameter of the filter to ensure filtered water quality and impose the cleaning or replacement of the filter element or medium

Note 1 to entry: This limit cleaning value may be defined according to:

— the flow rate through the filter (minimum value), or

— the filter head loss (maximum value), or

— the increase of the pressure upstream the filter (maximum value);

— time (e.g. weekly).

3.20
maximum operating negative pressure
MONP
reduction of the nominal pressure by the clogging - induced additional pressure multiplied by a safety factor of 1,3

Note 1 to entry: The filter element cleaning and/or replacement criteria, and not the mechanical strength of the filter body, define the maximum operating negative pressure allowed.

Note 2 to entry: The additional pressure is generally measured downstream of the filter medium and can be caused by building up debris on the filter medium.

Note 3 to entry: MONP in kPa (bar).

3.21
maximum operating pressure
MOP
sum of the nominal pressure and the clogging - induced additional pressure multiplied by a safety factor of 1,3

Note 1 to entry: The filter element cleaning and/or replacement criteria, and not the mechanical strength of the filter body, define the maximum allowable pressure.

Note 2 to entry: The additional pressure is generally measured upstream of the filter medium and can be caused by building up debris on the filter medium.

Note 3 to entry: MOP in kPa (bar).

3.22
net differential pressure
difference between initial differential pressure at beginning of the test and the final differential pressure at the end of the test

[SOURCE: EN 13443-2:2005+A1:2007, 3.24, modified — the definition was altered and the symbol originally mentioned is not reproduced here.]

3.23
nominal pressure,
for closed systems only, manufacturer's specified upstream/downstream pressure of the clean filter at its nominal flow rate

Note 1 to entry: Nominal pressure in kPa (bar).

3.24
retained mass
mass of standardized grade A4 dust (ISO CTD) according to ISO 12103-1 retained by the filter upon completion of the retention capacity test

Note 1 to entry: Retained mass in g.

3.25
retention capacity
Cr
mass of standardized grade A4 dust (ISO CTD) according to ISO 12103-1 effectively retained by the filter at the limit cleaning value calculated by subtraction of the mass of contaminant in the filtrate from the injected mass

Note 1 to entry: Retention capacity is given in g.

3.26
return system
all of the equipment specifically designed to reinject the filtered water into the pool from the filtration unit

3.27
suction system
all of the equipment ensuring the water flow output from the pool into the filtration unit through one (or more) water recovery part(s)

3.28
system volume
total amount of water in the test circuit including the test filter unit

Note 1 to entry: Therefore the volume of the reservoir and the volume of the wet media and interstitial and wetting volume should be considered.

3.29
recirculation cycle
complete turnover of the system volume through the test circuit

3.30
turbidity reduction efficiency
TBR
ratio, multiplied by 100, between the decrease of the upstream turbidity after 20 cycles and the initial upstream turbidity (excluding the raw water turbidity)

$$TBR = \frac{(TB_{us,0} - TB_{rw}) - (TB_{us,20} - TB_{rw})}{(TB_{us,0} - TB_{rw})} \cdot 100 \quad (3)$$

where

TBR is the turbidity reduction efficiency, expressed in percentage in %;

$TB_{us,20}$ is the upstream turbidity measured after 20 recirculation cycles;

$TB_{us,0}$ is the upstream initial turbidity measured at the start of the test procedure;

TB_{rw} is the raw water turbidity before addition of the standard contaminant (ISO CTD).

3.31
uniformity coefficient
C_u
ratio of the sieve size at which 60 % of the grains by weight pass through (D_{60}) over the sieve size at which 10 % of the grains by weight pass through (D_{10})

$$C_u = D_{60} / D_{10} \quad (4)$$

where

D_{60} is sieve size at 60 % passing;

D_{10} is sieve size at 10 % passing.

Note 1 to entry: See EN 12901.

4 Requirements

4.1 General

All of the tests carried out and claimed performances are for new products.

If air is trapped in the filter body, then it needs to be evacuated.

Assembled in accordance with the assembly and commissioning manual, the electrical installation of any material related to the pool and its surrounding shall comply with the requirements of HD 60364-7-702 or valid national/regional requirements.

4.2 Maximum filter flow rate

The filtration flow rate shall be adapted to the nature and surface area of the filter medium used in the filter.

The velocity at which the water to be filtered passes through the new filter medium shall be adapted to the type of medium used.

The following list of common, but not exhaustive maximum permissible velocities is given as the flow rate per unit surface area of the filter medium:

a) granular media filter: low rate ≤ 10 $(m^3/h)/m^2$;

b) granular media filter: medium rate > 10 $(m^3/h)/m^2$ to ≤ 30 $(m^3/h)/m^2$;

c) granular media filter: high rate > 30 $(m^3/h)/m^2$ to ≤ 50 $(m^3/h)/m^2$;

d) diatomaceous earth filter ≤ 5 $(m^3/h)/m^2$;

e) synthetic cartridge filter ≤ 3 $(m^3/h)/m^2$;

f) paper cartridge filter ≤ 2 $(m^3/h)/m^2$.

Regardless of any adopted flow rates, all filters shall demonstrate their efficiency according to Clause 7.

NOTE For the granular media filter, the filtration surface area to be taken into account is that of the inside horizontal cross section of the filter vessel, generally taken at 2/3rd of its height. For the other types of filter, the total functional developed surface area of the support (unfolded) is taken into account.

4.3 Filter media

4.3.1 General

If the filter medium being used is covered by an existing European standard this standard shall be applied.

NOTE See Bibliography.

4.3.2 Granular media

In general, dealing with granular filter media, the type of filter media and height of filter media within the filter are some of the main aspects, which are expected to be supplied by the manufacturer.

The specification of the media shall include:

— chemical composition;

— density of a material (in kg/m^3) (also called specific gravity);

— bulk density (uncompacted and/or packed) (in kg/m^3);

— effective size (in mm);

— uniformity coefficient C_u, which represents the degree of uniformity in a granular material;

— height of filter media and/or its mass to be used because it is directly related to the performance of the unit.

In case of multilayer filter, the specification of the media for each layer as well as the height or mass of each one shall be specified.

4.3.3 Sand filter media

Sand filter media shall be silica and free from carbonates, clay and other foreign materials, which may have negative effects on the pool water quality.

The filter installed with a specified sand media and bed height shall be in accordance with Clause 4.

4.3.4 Alternatives to sand media

In case of replacing sand by an alternative granular media, the manufacturer of the same shall provide the specification parameter indicated before.

Moreover, the filter installed with the specified alternative media and bed height, shall also be in accordance with Clause 4.

4.4 Maximum operating pressure (MOP)

The filter's MOP shall be greater than or equal to the maximum manometric head of the pump of the filtration unit.

4.5 Turbidity reduction efficiency

The turbidity reduction efficiency shall be 50 % or greater

The testing procedure for measuring the turbidity reduction efficiency shall be carried out according to Clause 7.

4.6 Retention capacity

The retention capacity shall be greater than or equal to the value specified by the manufacturer.

The testing procedure for measuring the retention capacity shall be carried out according to Clause 7.

4.7 Backwashing/Replacement/Cleaning Criteria

4.7.1 General

For different types of filtration, different backwash conditions shall be applied to ensure the removal of debris and other accumulated matter out of the filter.