SLOVENSKI STANDARD
SIST EN 16932-2:2018

01-junij-2018

Nadomešča:
SIST EN 1091:2000
SIST EN 1671:1998

Sistemi za odvod odpadne vode in kanalizacijo zunaj stavb - Črpalni sistemi - 2. del: Tlačni sistemi

Drain and sewer systems outside buildings - Pumping systems - Part 2: Positive pressure systems

Entwässerungssysteme außerhalb von Gebäuden - Pumpsysteme - Teil 2: Druckentwässerungssysteme

Réseaux d'évacuation et d'assainissement à l'extérieur des bâtiments - Systèmes de pompage - Partie 2 : Systèmes sous pression

Ta slovenski standard je istoveten z: **EN 16932-2:2018**

ICS:

93.030	Zunanji sistemi za odpadno vodo	External sewage systems

SIST EN 16932-2:2018 **en,fr,de**

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 16932-2

April 2018

ICS 93.030

Supersedes EN 1091:1996, EN 1671:1997

English Version

Drain and sewer systems outside buildings - Pumping systems - Part 2: Positive pressure systems

Réseaux d'évacuation et d'assainissement à l'extérieur des bâtiments - Systèmes de pompage - Partie 2: Systèmes sous pression

Entwässerungssysteme außerhalb von Gebäuden - Pumpsysteme - Teil 2: Druckentwässerungssysteme

This European Standard was approved by CEN on 22 January 2018.

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This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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 16932-2:2018) has been prepared by Technical Committee CEN/TC 165 “Waste water engineering”, 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of an identical text or by endorsement, at the latest by October 2018, and conflicting national standards shall be withdrawn at the latest by October 2018.

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

Together with EN 16932-1:2018 and EN 16932-3:2018, this document supersedes EN 1091:1996 and EN 1671:1997.

EN 16932, *Drain and sewer systems outside buildings — Pumping systems*, contains the following parts:

— *Part 1: General requirements*;

— *Part 2: Positive pressure systems*;

— *Part 3: Vacuum systems*.

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, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

1 Scope

This European Standard specifies requirements for design, construction and acceptance testing of wastewater pumping systems in drain and sewer systems outside the buildings they are intended to serve. It includes pumping systems in drain and sewer systems that operate essentially under gravity as well as systems using either positive pressure or partial vacuum.

This document is applicable to positive pressure systems.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1610:2015, *Construction and testing of drains and sewers*

EN 12050-1:2015, *Wastewater lifting plants for buildings and sites — Part 1: Lifting plants for wastewater containing faecal matter*

EN 12050-2, *Wastewater lifting plants for buildings and sites — Part 2: Lifting plants for faecal-free wastewater*

EN 12050-3, *Wastewater lifting plants for buildings and sites — Part 3: Lifting plants for limited applications*

EN 12050-4, *Wastewater lifting plants for buildings and sites — Part 4: Non-return valves for faecal-free wastewater and wastewater containing faecal matter*

EN 16323:2014, *Glossary of wastewater engineering terms*

EN 16932-1:2018, *Drain and sewer systems outside buildings — Pumping systems — Part 1: General requirements*

EN 16933-2:2017, *Drain and sewer systems outside buildings — Design — Part 2: Hydraulic design*

EN ISO 9906:2012, *Rotodynamic pumps — Hydraulic performance acceptance tests — Grades 1, 2 and 3 (ISO 9906:2012)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16323, in EN 16932-1 and the following apply.

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

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

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

Note 1 to entry: Certain key definitions from EN 16323:2014 have been repeated below for clarity. The following additional terms used in this document are defined in EN 16323:

aerobic;

anaerobic;

maintenance;

pumping station;

collection tank;
combined system;
confined space;
drain;
dry weather flow;
extraneous flow;
gradient;
infiltration;
relevant authority;
retention period;
rising main;
septic wastewater;
sewer;
sewer system;
wastewater treatment plant.

Note 2 to entry: The following terms used in this part of this standard are defined in EN 16932-1:2018:

collection chamber;
duty point;
forwarding pump;
level sensor;
lift station;
profile;
pump;
pump unit
pumping system;
vacuum station.

3.1
ball passage
passage where a ball with a defined diameter can pass through without deformation

[SOURCE: EN 12050-1:2015, 3.1.9]

3.2
foul wastewater
wastewater comprising domestic wastewater and/or industrial wastewater

[SOURCE: EN 16323:2014, 2.1.2.6]

3.3
net positive suction head
NPSH
amount of the absolute value of the total head above the head equivalent to the vapour pressure of the liquid at the particular temperature, with reference to the NPSH-datum plane

[SOURCE: EN ISO 17769-1:2012, 2.2.2.1]

3.4
NPSH datum plane
horizontal plane through the centre of the circle described by the external points of the entrance edges of the impeller blades, in the first stage in the case of multi-stage pumps

[SOURCE: EN ISO 17769-1:2012, 2.2.2.1]

3.5
surface water
water from precipitation, which has not seeped into the ground and is discharged to the drain or sewer system directly from the ground or from exterior building surfaces

[SOURCE: EN 16323:2014, 2.1.1.3]

3.6
wastewater
water composed of any combination of water discharged from domestic, industrial or commercial premises, surface run-off and accidentally any sewer infiltration water

[SOURCE: EN 16323:2014, 2.3.10.65]

4 Symbols and units

a	wave speed of pressure transients, in metres per second [m/s]
D	internal diameter of the pipe (bore), in metres [m]
D_i	internal diameter of the pipe (bore) in section i, in metres [m]
E_P	elastic modulus of the pipe material, in Newtons per square metre [N/m^2]
E_W	elastic modulus of wastewater, in Newtons per square metre [N/m^2]
f	maximum permitted frequency of pump starts per hour [1/h]
g	acceleration due to gravity, in metres per second squared [m/s^2]
H_s	total head of the system, in metres [m]
H_p	total head at the pump unit, in metres [m]
H_A	required pump head in an air flushed rising main, or a rising main where air or gas accumulation can occur, in metres [m]
h_f	local head loss in the bends, valves and other fittings, in metres [m]
h_l	head loss, in metres [m]
h_p	head loss due to friction in the pipe, in metres [m]
$h_{z,rm}$	level difference between the end of the rising main and pump unit(s), in metres [m]
$\Sigma h_{A,i}$	sum of the level differences of all downsloping sections in the rising main which can be filled with air or gas, (i.e. the level differences between all their high and subsequent low points), in metres [m]
h_z	hydrostatic head, in metres [m]
Σk_p	sum of the local head loss coefficients in bends, valves and other fittings in the pipeline (dimensionless) [-]
$\Sigma k_{p,i}$	sum of the local head loss coefficients in bends, valves and other fittings in section i, dimensionless [-]
L	length of the pipeline, in metres [m]
L_i	length of section i of the rising main, in metres [m]
L_t	length of the pipeline before or after a closing device, in metres [m]
$\Sigma L_{A,i}$	sum of the lengths of the downsloping sections in section i, which can be filled with air, in metres [m]

P_P power consumption of the pump unit, in Watts [W]

Δp_{max} Joukowski surge pressure, in Pascals [Pa]

Q_p pump flow rate, in cubic metres per second [m^3/s]

Q_{pm} mean capacity of the active pump between switch on and switch off levels for the pump, in cubic metres per hour [m^3/h]

s wall thickness of the pipe, in metres [m]

t_R reflection period of the pressure wave, in seconds [s]

V_c working volume of the collection tank, which is the volume between the lowest pump switch on level and the lowest switch off level, in cubic metres [m^3]

v velocity in the direction of flow averaged across the flow cross-section, in metres per second [m/s]

v_{AR} velocity needed for air removal, in metres per second [m/s]

v_i velocity of the design wastewater flow in section i, in metres per second [m/s]

Δv change in flow velocity, in metres per second [m/s]

α angle of the downsloping section downstream of a high point, in degrees

η_P efficiency of the pump unit, dimensionless [-]

λ friction coefficient, which is the pipeline headloss per unit length, dimensionless [-]

λ_i friction coefficient in section i, dimensionless [-]

μ lateral contraction coefficient of the pipe material, dimensionless [-]

ρ density of wastewater, in kilogrammes per cubic metre [kg/m^3]

5 General

This European Standard shall be read in conjunction with EN 16932-1. Positive pressure systems shall comply with the requirements of EN 16932-1 as well as the requirements of this European Standard.

6 Planning of positive pressure systems

6.1 Type of pumping station

6.1.1 Introduction

Typical pumping station types include the following:

— pumping stations with submersible pumps;

— pumping stations with dry installed pumps;

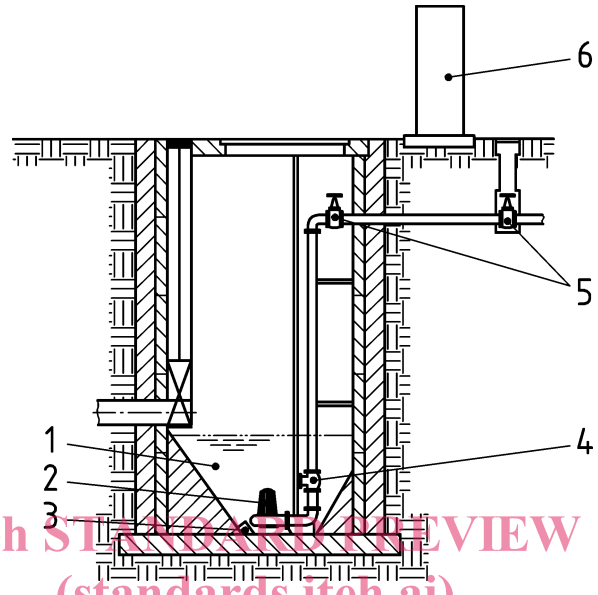
— pumping stations with screw pumps;

— pumping assemblies;

— ejector tank stations.

6.1.2 Pumping stations with submersible pumps

Pumping stations with submersible pumps are the most common type of pumping stations in drain and sewer systems. They comprise one or more submersible rotodynamic pump units in a collection tank. The pump units are connected to the rising main using fittings that allow the pump units to be removed from, and replaced in the collection tank from the surface without the need for personnel to enter the collection tank.



Key

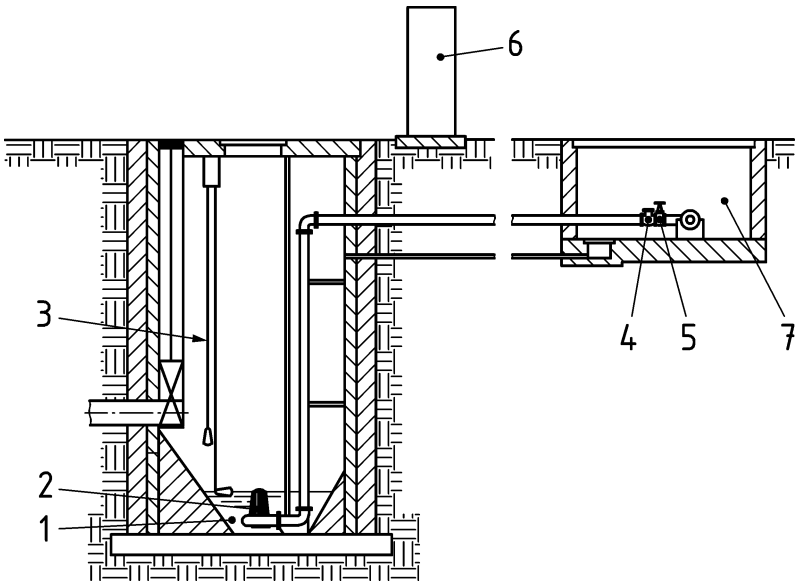
1 collection tank
2 pump unit
3 level sensor (pressure sensor shown, other methods are possible)
4 non-return valve
5 isolating valve (alternative positions shown)
6 controls and electrical equipment and instrumentation cabinet

Figure 1 — Example of pumping station with submersible pumps and no external valve chamber

The non-return valves can be installed either in the collection tank (see Figure 1) or in an adjacent valve chamber (see Figure 2), allowing easier access for maintenance. Isolating valves can be buried directly in the ground or installed in the collection tank (see Figure 1), or installed in a separate valve chamber (see Figure 2). The choice depends on the anticipated frequency of maintenance and the availability of access. The position of non-return valves should be sufficiently low to ensure tight closure.

An isolating valve can also be fitted on the incoming gravity drain or sewer.

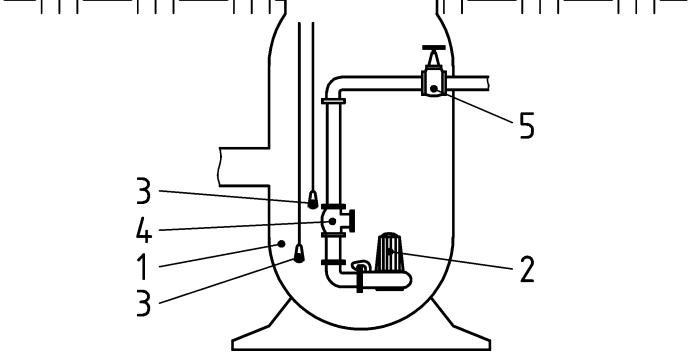
Such pumping stations are suitable for a wide range of applications within the sewer network.



Key

1 collection tank
2 pump unit
3 level sensor (float switch shown, other methods are possible)
4 non-return valve
5 isolating valve
6 controls and electrical equipment and instrumentation cabinet
7 valve chamber

Figure 2 — Example of pumping station with submersible pumps and external valve chamber



Key

1 collection tank
2 pump unit
3 level sensor (float switch shown, other methods are possible)
4 non-return valve
5 isolating valve

Figure 3 — Example of a pumping station for use in pressure sewer systems

Figure 3 shows an example of a pumping station with submersible pumps for use in pressure sewer systems.