EAD **180026-00-0704**

www.eota.eu

April 2021

European Assessment Document for

Vacuum valves for the use in sewerage systems

Translation of the EAD title in the official languages of the European Union:

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

The vacuum valves for the use in sewerage systems (in the following referred to as interface valves) is made up of five parts which are assembled in the factory:

- the valve body and the upper parts (consisting of polypropylene),
- a pneumatically operated controller and stub pipes (made of polypropylene) to connect pulse tubes,
- a non-return valve (made of stainless steel),
- a sealing plunger (made of stainless steel),
- sealings.

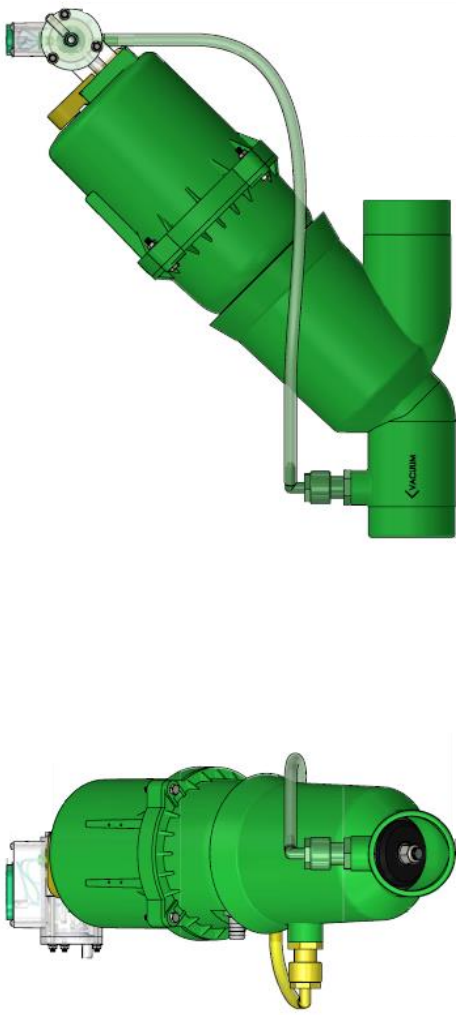
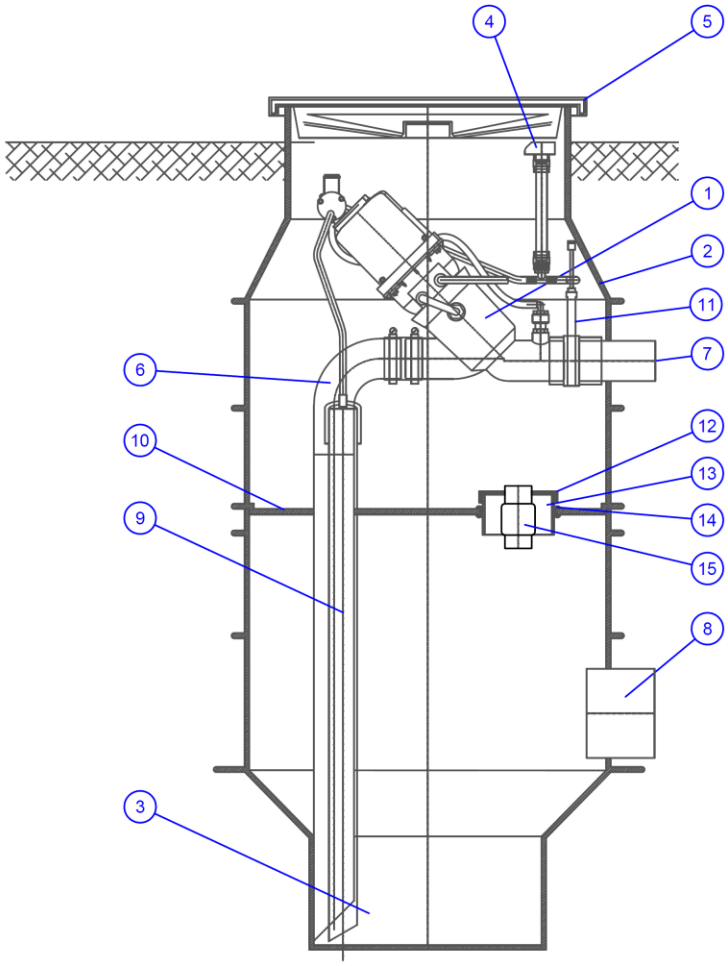


Figure 1.1.1: Vacuum valve



1 – Vacuum valve; 2 – Valve pit; 3 – Sewer collecting chamber; 4 – Atmospheric ventilation (internal); 5 – Valve pit cover; 6 – Suction pipe (d90); 7 – Vacuum line (d90); 8 – Gravitation sewer inlet; 9 – Level sensor pipe DN63; 10 – Partition wall; 11 – Isolation gate valve; 12 – Inspection cover; 13 – Inspection pipe; 14 – Grommet; 15 – Water drain

Figure 1.1.2: Installation of the vacuum valve in a sewer collecting chamber

The product is not covered by a harmonised technical specification.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use

The interface valve is designed for installation in outside vacuum sewerage systems meeting the requirements of EN 16932-3[1].

The product is intended to be used in the top, clean and dry space of vacuum collection chambers to which domestic wastewater flows by gravitation from the sewerage system within a building, and whose lower part constitutes a collecting tank in accordance with the schematic diagram in EN 16932-3, Figures 5 or 6.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the interface valve for the intended use of 25 years when installed in the works (provided that the interface valve is subject to appropriate installation). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product, the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works[2].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1 All undated references to standards or to EADs in this EAD are to be understood as references to the dated versions listed in chapter 4.

2 The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 2.1.1 shows how the performance of interface valve is assessed in relation to the essential characteristics.

Table 2.1.1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.2	Class
Basic Works Requirement 4: Safety and accessibility in use			
2	Changes as a result of heating	2.2.3	Level [°C]
Interface operation			
3	Minimum vacuum level	2.2.4	Level [kPa]
4	Operation after immersion	2.2.5	Level [-]
5	Free internal ball passage	2.2.6	Level [mm]
6	Resistance to external blows	2.2.1	Description
Aspects of durability			
7	Durability	2.2.7	Level [cycles]

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

2.2.1 Resistance to external blows

The resistance to external blows (Impact resistance) shall be determined according to EN 1451-1, Table 14.

The result of the assessment is to be given in the ETA according to EN ISO 13263, clause 7.

2.2.2 Reaction to fire

The following options shall be used for the assessment of the reaction to fire performance of the components of the interface valve and their description in the ETA:

1. The valve sealing plunger and the non-return valve made of stainless steel are considered to satisfy the requirements for performance class A1 in accordance with Commission Decision 96/603/EC, as amended by Commission Decisions 2000/605/EC and 2003/424/EC, without the need for testing on the basis of the fulfilling the conditions set out in that Decision and their intended uses being covered by that Decision.

   Therefore, the performance of the valve sealing plunger and the non-return valve is class A1.

2. The material of the valve body and the upper parts, the stub pipes and the sealing of the interface valve shall be tested, using the test methods relevant for the corresponding reaction to fire classes according to EN 13501-1. The product shall be classified according to Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

   The following conditions and parameters shall be taken into account when preparing test specimens and conducting the tests:

   a) The necessary tests according to EN ISO 11925-2 shall be performed with edge exposure as well as with surface exposure on specimens as follows:
      - flat boards made from the material of the valve body and stub pipes or cut sections of the valve body and stub pipes, mounted in a free-hanging test position without any substrate behind,
      - stripes of the sealing, mounted in a joint between steel angles and a steel sheet according to EN 13238 behind.
   b) The necessary tests according to EN 13823 (SBI) shall be performed on specimens as follows:
      - flat boards made from the material of the valve body and stub pipes, which are placed side by side with closed butt joints on a sub-construction made of vertically positioned linear metal profiles (Z- or I-profiles are recommended) and are mounted in a free-standing test position (80 mm distance to the backing board of the SBI test rig), Each of the flat boards shall be mechanically fixed to the profiles of the sub-construction with four small metal nails or screws (one fixing mean in each corner of the boards);
      - stripes of the sealing, mounted (as shown in Annex A.1 of EAD 350141-00-1106) side by side with closed but joints on a standard steel sheet according to EN 13238 behind.

   Relevant product parameters to be considered in the tests are:

   - Variations of a product family (as defined by a combination of certain raw materials and certain type of production process),[3]
   - highest and lowest thickness, if relevant,
   - highest and lowest density, if relevant, the greatest width of the sealings in tests according to EN ISO 11925-2.

   The results of tests considering the aforementioned parameters in fully are valid for:

   - all variations of the defined product family,
   - the tested thickness or the whole range between those thickness values tested,
   - the tested density or the whole range between those density values tested,
   - the same or any lower width of the sealing.

3 If the manufacturer provides sufficient information (e.g., on the basis of the composition of the products in question) this can allow the TAB to determine which material or material variants should be submitted to testing in order to reduce the number of tests.

The pneumatically operated controller is considered to be a small component due to its small dimensions. Its contribution to fire can be seen as negligible without the need for testing. This shall also be stated in the ETA.

2.2.3 Changes as a result of heating

The assessment of changes as a result of heating shall be done according to EN ISO 580 according to table 1**,** Method A.

The PP (polypropylene) housing of the interface valve is to be tested.

The maximum level of the temperature shall be given in the ETA.

2.2.4 Minimum vacuum level

The test shall be performed according to EN 16932-3, Annex B.1.2, on the test rig as described in Annex A. The details are:

1. Fill the collection tank of a vacuum collection chamber with water. Note: The opening of the suction pipe inlet shall be covered with water.
2. Set the system vacuum level to -10 kPa or to the minimum vacuum level as requested by the manufacturer.
3. Activate the controller manually for 10 seconds.
4. If the interface valve does not cycle (no water extracted from the collection tank), increase the vacuum level in steps of -1kPa and repeat the test until the interface valve cycles and extracts water from the collection tank.
5. Record the lowest vacuum level in kPa, where the interface valve has not cycled yet. This level shall be given in the ETA.

2.2.5 Operation after immersion

The assessment for operation after immersion shall be done on the test rig as described in Annex A and according to EN 16932-3, Annex B.1.5. The test conditions shall be done on a standard configuration. One product shall be tested.

The number of successful completed cycles and the number of successful repetitions of the test is stated in the ETA[4].

2.2.6 Free internal ball passage

One interface valve is to be tested. The free ball passage shall be determined by determining the biggest test-ball, that passes through the fully opened valve body (see Figure 2.2.6.1). The diameter of the test-balls should vary in steps of 1 mm beginning with a diameter of 40 mm or a size requested by the manufacturer.
The material of the ball shall not be deformable.
The ball shall be manually pushed through the interface valve, to determine the free ball passage of the interface valve when it is in the open position.

4 This information may be assessed in conjunction with EN 16932-3, Annex B.1.5.

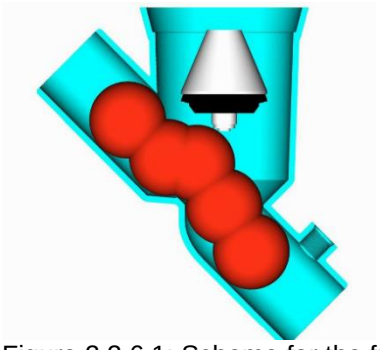


Figure 2.2.6.1: Scheme for the free ball passage test

The largest ball diameter which still fits through the interface valve shall be given in the ETA.

2.2.7 Durability

The test shall prove the ability to undertake a number of cycles of the interface valve without the attention of maintenance while the function of the interface valve is still effective. The interface valve shall be tested on a test rig according to Annex A. The durability test can be stopped at any time, or it automatically stops at the end of life of the interface valve due to failure. It shall be recorded as failure when the interface valve stays open/close or refuses to empty the collection chamber sump. Malfunctioning of the vacuum vessel (see schematic drawing Annex A) does not count as a failure and can be repaired if a breakdown occurs so that the test can be resumed afterwards.

The interface valve shall be connected to a vacuum source (see Annex A) and tested to determine that the valve will not operate unless the partial vacuum exceeds 15 kPa below atmosphere by reducing the vacuum to that level and determining that the valve does not then cycle. Checks shall also be undertaken to establish that the valve closes when the vacuum is released.

When the test is stopped or due to failure of the interface valve, the number of operation cycles of the interface valve shall be stated in the ETA.

One product shall be tested according to the type test criteria.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is Commission Decision 1999/472/EC, as amended by 2001/596/EC.

The system is 4 for any use except for uses subject to regulations on reaction to fire performance.

For uses subject to regulations on reaction to fire the applicable AVCP systems are 1, 3 or 4 depending on the conditions defined in the said Decision.

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.2.1.

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory in accordance with a prescribed test plan]					
1	Incoming materials Documentation of incoming materials	Sampling method[1]	According to control plan	According to control plan	Each delivery
2	Production Description of the production, including calibration of production means. Assembling	Internal process instruction	According to control plan	-	Continuously
3	Documentation of FPC Documentation (descripting, working/testing instructions) Calibration of measuring instruments	Internal process instruction	According to control plan	-	Continuously
4	Finished products	Suitable measurement	According to control plan	According to control plan	Each batch
	a) Wall thickness of the body				
	b) Inner diameter (nominal width) of the connecting pieces				
	c) Inner and outer diameter of the body				
	d) Maintenance of closed position	Annex A			
5	Function test - Minimum vacuum level - Operation after immersion - Durability	Clause 2.2.4 2.2.5 2.2.7	According to control plan	According to control plan	Each valve
6	Reaction to fire	Clause 2.2.2, option 2	According to control plan	According to control plan	Once per two years for tests according to EN ISO 11925-2, Once per 5 years for test according to EN 13823

1 Not more than 2,5 % of the incoming goods shall deviate from the documentation. After reaching the limit value the whole batch needs to be inspected.

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body of the product in the procedure of assessment and verification of constancy of performance are laid down in Table 3.3.1.

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)[5].

Table 3.3.1 Control plan for the notified body; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	The notified body shall verify the ability of the manufacturer for a continuous and orderly manufacturing of the product, taking especially into account a limiting of organic material, the addition of fire retardants and/or another clearly identifiable stage in the production process which results in the improvement of the reaction to fire classification. In particular the following items shall be appropriately considered – presence of suitable test equipment – presence of trained personnel – the suitability of the factory production control established by the manufacturer – full implementation of the prescribed test plan	Verification of the complete FPC, to be implemented by the manufacturer	See control plan	-	Before certification and starting the production process, after its modification and when starting a new production line
Continuous surveillance, assessment and evaluation of factory production control					
2	It shall be verified that the system of factory production control and the specified manufacturing process are maintained, taking into account a limiting of organic material, the addition of fire retardants and/or another clearly identifiable stage in the production process which results in the improvement of the reaction to fire classification. In particular the following items shall be appropriately considered: – Inspection of factory, of the production of the product and of the facilities for factory production control – Evaluation of the documents concerning factory production control – Issuing a report of surveillance	Verification of the controls carried out by the manufacturer on the raw materials, on the process and on the product as indicated in Table 3.2.1	See control plan	-	Annually

5 Only relevant for products of class C and higher (cf. Commission Decision mentioned in clause 3.1)

4 REFERENCE DOCUMENTS

EN 16932-3:2018	Drain and sewer systems outside buildings - Pumping systems - Part 3: Vacuum systems
EN 1451-1: 2017+AC:2018	Plastics piping systems for soil and waste discharge (low and high temperature) within the building structure – Polypropylene (PP) – Part 1: Specifications for pipes, fittings and the system
EN ISO 13263:2017	Thermoplastic piping systems for non-pressure underground drainage and sewerage - Thermoplastic fittings Test method for impact strength (ISO 13263:2010)
EN ISO 580:2005	Plastic piping and ducting systems – Injection moulded thermoplastics fittings- Methods for visually assessing the effects of heating (ISO 580:2005)
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using data from reaction to fire tests
EN ISO 11925-2:2020	Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2020)
EN 13238:2010	Reaction to fire tests for building products - Conditioning procedures and general rules for selection of substrates
EN 13823:2020+A1:2023	Reaction to fire tests for building products – Building products excluding floorings exposed to the thermal attack by a single burning item

ANNEX A: DESCRIPTION OF THE LABORATORY TEST RIG

Tests according to this Annex A shall be performed on a laboratory test rig. The vacuum station with equipment shall simulate a real situation according to EN 16932-3, Figure 11. The vacuum station shall be connected to a collection chamber with (transparent) piping. The system vacuum source shall be capable of maintaining the vacuum within the normal operating range and means of recirculating the water without interrupting the operation of the test rig shall be provided according to EN 16932-3, Annex B.1.3.1.

To ensure the stability of the test results, in addition the following equipment shall be installed as follows:

- The interface valve shall be fitted in the collection chamber and all hoses shall be connected as in a real situation.
- A digital vacuum sensor shall be fitted to the vacuum vessel with an accuracy of at least -1kPa.
- The vacuum vessel shall have a volume of ≥500l.
- The vacuum pump(s) shall have a capacity of ≥40 m3/h per pump.
- Waterflow into collection tank shall be capable of ≥0,3 l/s.

Long lasting tests (such as durability tests) shall be security sealed against tampering.

Figure A.1: Schematic test setup