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Separator systems for light liquids (e.g. oil and petrol) - Part 1: Principles of product design, performance and testing, marking and quality control

Abscheideranlagen für Leichtflüssigkeiten (z.B. Öl und Benzin) - Teil 1: Bau-, Funktions- und Prüfgrundsätze, Kennzeichnung und Güteüberwachung

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Installations de séparation de liquides légers (par exemple hydrocarbures) - Partie 1: Principes pour la conception, les performances et les essais, le marquage et la maîtrise de la qualité

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**Ta slovenski standard je istoveten z: EN 858-1:2002**

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English version

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This European Standard was approved by CEN on 8 March 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

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 Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.



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

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## Foreword

This European Standard has been prepared by Technical Committee CEN /TC 165, "Wastewater 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of an identical text or by endorsement, at the latest by July 2002, and conflicting national standards shall be withdrawn at the latest by December 2002.

This is the first part of the two part standard for separator systems for light liquids. Part 2 of this standard contains the necessary statements on selection of nominal size, installation, operation and maintenance of separator systems for light liquids.

Annexes A and B are normative. The annexes C, D and E are informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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## 1 Scope

This standard specifies definitions, nominal sizes, principles of design, performance requirements, marking, testing and quality control for separator systems for light liquids.

This standard applies to separator systems for light liquids, where light liquids are separated from waste water by means of gravity and/or coalescence.

This standard does not apply to the treatment of stable emulsions, solutions of light liquids and water, grease and oils of vegetable and animal origin.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

ISO 48, *Rubber, vulcanized or thermoplastic – Determination of hardness (hardness between 10 IRHD and 100 IRHD)*.

ISO 178, *Plastics – Determination of flexural properties*.

ISO 180, *Plastics – Determination of Izod impact strength*.

ISO 185, *Grey cast iron – Classification*.

ISO 527-2, *Plastics – Determination of tensile properties – Part 2: Test conditions for moulding and extrusion plastics*.

- ISO 630, *Structural steels – Plates, wide flats, bars, sections and profiles.*
- ISO 877:1994, *Plastics – Methods of exposure to direct weathering, to weathering using glass-filtered daylight, and to intensified weathering by daylight using Fresnel mirrors.*
- ISO 1083, *Spheroidal graphite cast iron – Classification.*
- ISO 1133, *Plastics – Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics.*
- ISO 1183, *Plastics – Methods for determining the density and relative density of non-cellular plastics.*
- ISO 1518, *Paints and varnishes – Scratch test.*
- ISO 1817, *Rubber, vulcanized – Determination of the effect of liquids.*
- ISO 1920, *Concrete tests – Dimensions, tolerances and applicability of test specimens.*
- ISO 2409, *Paints and varnishes – Cross-cut test.*
- ISO 2736-1, *Concrete tests – Test specimens – Part 1: Sampling of fresh concrete.*
- ISO 2736-2, *Concrete tests – Test specimens – Part 2: Making and curing of test specimens for strength tests.*
- ISO 2808, *Paints and varnishes – Determination of film thickness.*
- ISO 2812-1, *Paints and varnishes – Determination of resistance to liquids – Part 1: General methods.*
- ISO 2812-2, *Paints and varnishes, determination of resistance to liquids, Part 2 : water immersion method.*
- ISO 2815, *Paints and varnishes – Buchholz indentation test.*
- ISO 3755, *Cast carbon steels for general engineering purposes.*
- ISO 4012, *Concrete – Determination of compressive strength of test specimens.*
- ISO 4624, *Paints and varnishes – Pull-off test for adhesion.*
- ISO 4628-2, *Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defects – Part 2: Designation of degree of blistering.*
- ISO 4628-3, *Paints and varnishes – Evaluation of degradation of paint coatings – Designation of intensity, quantity and size of common types of defects – Part 3: Designation of degree of rusting.*
- ISO 6272, *Paints and varnishes – Falling-weight test.*
- ISO 7253, *Paints and varnishes – Determination of resistance to neutral salt spray (fog).*
- ISO 8217, *Petroleum products – Fuels (class F) – Specifications of marine fuels.*
- ISO 8501-1, *Preparation of steel substrates before application of paints and related products – Visual assessment of surface cleanliness – Part 1: Rust grade and preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.*
- EN 60, *Glass reinforced plastics – Determination of the loss of ignition.*
- EN 61, *Glass reinforced plastics – Determination of tensile properties.*
- EN 62, *Glass reinforced plastics – Standard atmospheres for conditioning and testing.*
- EN 63, *Glass reinforced plastics – Determination of flexural properties – Three point method.*

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EN 124:1994, *Gully tops and manhole tops for vehicular and pedestrian areas – Design requirements, type testing, marking, quality control.*

EN 228, *Automotive fuels – Unleaded petrol – Requirements and test methods.*

EN 288-1, *Specification and approval of welding procedures for metallic materials – Part 1: General rules for fusion welding.*

EN 288-2, *Specification and approval of welding procedures for metallic materials – Part 2: Welding procedure specification for arc welding.*

EN 288-3, *Specification and approval of welding procedures for metallic materials – Part 3: Welding procedure tests for the arc welding of steels.*

EN 476, *General requirements for components used in discharge pipes, drains and sewers for gravity systems.*

EN 681-1, *Elastomeric seals – Materials requirements for pipe joint seals used in water and drainage applications – Part 1: Vulcanized rubber.*

EN 976-1:1997, *Underground tanks of glass-reinforced plastics (GRP) – Horizontal cylindrical tanks for the non-pressure storage of liquid petroleum based fuels – Part 1: Requirements and test methods for single wall tanks.*

EN 978, *Underground tanks of glass-reinforced plastics (GRP) – Determination of factor  $\alpha$  and factor  $\beta$ .*

ENV 10080, *Steel for the reinforcement of concrete – Weldable ribbed reinforcing steel B 500 – Technical delivery conditions for bars, coils and welded fabric.*

EN 10088-1, *Stainless steels – Part 1: List of stainless steels.*

EN 10088-2, *Stainless steels – Part 2: Technical delivery conditions for sheet/plate and strip for general purposes.*

EN 10088-3, *Stainless steels – Part 3: Technical delivery conditions for semi-finished products, bars, rods and sections for general purposes.*

EN ISO 1514, *Paints and varnishes – Standard panels for testing (ISO 1514:1993).*

### 3 Terms and definitions

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

**3.1 light liquid**  
liquid with a density no greater than  $0,95 \text{ g/cm}^3$ , which is actually or practically insoluble and unsaponifiable

**3.2 separator system**  
arrangement comprising a separator (class I, class II), a sludge trap and a sampling point

**3.3 sludge trap**  
part of the separator system where material settles, i. e. sludge, silt and grit, and which can be a separate unit or constructed with the separator as a combined unit

**3.4 separator (class I, class II)**  
part of the separator system, which separates light liquid from waste water and retains the light liquid

**3.5 sampling point**  
part of the separator system situated downstream of the separation process where samples can be taken of the waste water discharged from the separator



**3.6****extension shaft**

component used to extend an opening in the separator system to finished level for inspection and maintenance purposes

**3.7****nominal size (NS)**

number, without units, approximately equivalent to the maximum effluent flow in litres per second from the separator when tested in accordance with 8.3.3

**3.8****separating zone**

zone, in which light liquid is separated from waste water in the separator

**3.9****storage capacity for light liquids**

volume of separated light liquid, which can be held in the separator without the stored light liquid entering the inlet or outlet of the separator

**3.10****automatic closure device**

mechanism, operated by the accumulated light liquid, which prevents discharge of the light liquid from the separator

**3.11****maximum operational liquid level**

highest level of liquid at the flow, corresponding to the nominal size and after reaching the storage capacity for light liquids

**3.12****automatic warning device**

device to warn of excessive depth of light liquid or waste water or low level condition

**3.13****bypass separator**

separator with a device, which allows a flow in excess of the maximum permissible effluent flow to bypass the separator

**3.14****coating/lining**

a protective layer on a separator component

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## 4 Classes of separators

There are two classes of separators as shown in table 1.

**Table 1 — Classes of separators**

Class	Maximum permissible content of residual oil <sup>a</sup> mg/l	Typical separating technique (for example)
I	5,0	Coalescing separators
II	100	Gravity separators

<sup>a</sup> When tested in accordance with 8.3.3.1 and samples being analysed for their hydrocarbon content using infrared spectroscopy in accordance with A.2 and A.3.

## 5 Nominal sizes

The preferred nominal sizes of separator systems for light liquids are: 1,5, 3, 6, 10, 15, 20, 30, 40, 50, 65, 80, 100, 125, 150, 200, 300, 400 and 500.

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## 6 Requirements

### 6.1 General

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Separator systems for light liquids and their separate components shall be in accordance with the material requirements specified in 6.2. Where required, regulations with regard to environment and "safety in case of fire" shall be considered.

### 6.2 Materials

#### 6.2.1 General

Separator systems may be constructed from:

- unreinforced concrete, fibre-reinforced concrete, reinforced concrete;
- metallic materials: cast iron, stainless steel, steel;
- plastics materials: glass fibre reinforced plastics, polyethylene.

Any other materials used in the construction of a separator system shall meet all the requirements of this standard and may need additional requirements.

#### 6.2.2 Concrete

The minimum compressive strength of concrete at 28 days shall be 45 N/mm<sup>2</sup> when tested on a cube of 150 mm, or 35 N/mm<sup>2</sup> when tested on a cylinder 150 mm diameter x 300 mm high.

#### 6.2.3 Metallic materials

- a) The production, quality and testing of the metallic materials listed below shall be in accordance with the following standards:

Flake graphite cast iron	ISO 185	Reinforcing steel	ENV 10080
Spheroidal graphite cast iron	ISO 1083		
Cast steel	ISO 3755		
Rolled steel	ISO 630	Stainless steel	EN 10088-1 EN 10088-2 EN 10088-3

b) Additional requirements for metallic materials

**Stainless steel**

For good general corrosion resistance and stability against intercrystalline corrosion effects of the various steels listed in the EN 10088-1, EN 10088-2 and EN 10088-3, only austenitic steels minimum quality X6 CrNi 1810 shall be used.

**Welding of steel**

The requirements given in EN 288-1, EN 288-2 and EN 288-3 shall apply

**6.2.4 Plastic materials**

a) Glass fibre reinforced plastics

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The laminate shall be constructed using resins, reinforcement materials, processing agents and other materials in accordance with EN 976-1:1997, clause 3.

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b) Polyethylene

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1) The requirements for moulding and fabricating polyethylene are as follows:

Polyethylene for rotational moulding:

- Density shall not be less than 935 kg/m<sup>3</sup> when measured in accordance with ISO 1183.
- Melt mass-flow rate, under a nominal load of 21,6 N and at a temperature of 190 °C, shall be between 1,0 g/10 min and 5,0 g/10 min, measured in accordance with ISO 1133.

Polyethylene for blow moulding:

- Density shall not be less than 945 kg/m<sup>3</sup> when measured in accordance with ISO 1183.
- Melt mass-flow rate, under a nominal load of 50 N and at a temperature of 190 °C, shall be between 0,3 g/10 min and 1,0 g/10 min, measured in accordance with ISO 1133.

Polyethylene for injection moulding:

- Density shall not be less than 945 kg/m<sup>3</sup> when measured in accordance with ISO 1183.
- Melt mass-flow rate, under a nominal load of 50 N and at a temperature of 190 °C, shall be between 0,3 g/10 min and 1,0 g/10 min, measured in accordance with ISO 1133.

Polyethylene for butt-weld-sheet assembly:

- Density shall not be less than 950 kg/m<sup>3</sup> when measured in accordance with ISO 1183.

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- Melt mass-flow rate, under a nominal load of 50 N and at a temperature of 190 °C, shall be between 0,3 g/10 min and 1,0 g/10 min, measured in accordance with ISO 1133.

### 2) Additional requirements

Tensile strength:

- The tensile properties, when determined in accordance with ISO 527-2 (using a testing speed of 100 mm/min) shall be as follows:

Polyethylene for rotational moulding:

- Tensile stress at yield shall be greater than 15 MPa.
- Tensile strain at yield shall be less than 25 %.
- Tensile strain at break shall be greater than 200 %.

Polyethylene for blow moulding, injection moulding and butt-weld-sheet assembly:

- Tensile stress at yield shall be greater than 21 MPa.
- Tensile strain at yield shall be less than 25 %.
- Tensile strain at break shall be greater than 200 %.

U.V. stability:

- When exposed to U. V. radiation of 3,5 GJ/ (m<sup>2</sup> . a) in accordance with ISO 877:1994, annex C, the mechanical properties shall not decrease more than 50 %.

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### 6.2.5 Sealing materials

For separator systems, only elastomers (rubber) or permanent elastic sealing materials shall be used. Cement mortar and similar sealing cements or compounds shall not be used.

Rubber seals shall comply with the requirements of EN 681-1, type WC, and their hardness for joints shall not be less than 40 IRHD in accordance with ISO 48.

### 6.2.6 Coatings/linings

#### 6.2.6.1 General

If there are coating/lining applied to the surfaces of the separator system for protection against the effects of the influent (for internal surfaces), and ground conditions (for external surfaces), they shall be in accordance with the following requirements.

#### 6.2.6.2 Technical documentation

The supplier of the coating materials shall provide full technical documentation to ensure that:

- a) the complete and correct identification and application of the material supplied, and
- b) the possibility and limitations of a repair to the coating

are determined.

### 6.2.6.3 Preparation, application and curing

#### 6.2.6.3.1 Surface preparation

Rolled steel surfaces shall be grit blasted to achieve a degree of cleanliness of at least Sa 2,5 and the roughness profile,  $R_a$ , shall be between 10  $\mu\text{m}$  and 20  $\mu\text{m}$  in accordance with ISO 8501-1.

Concrete surfaces shall be rough, clean and free from cement skin prior to coating. This can be achieved by grit blasting with non-metallic abrasives, flame blasting or by using pressurized water devices.

#### 6.2.6.3.2 Application and curing

The application and curing shall be carried out in accordance with the supplier's written instructions.

#### 6.2.6.4 Properties

- a) Dry film thickness – to be stated by the manufacturer of the separator system.
- b) Adhesion – at least 6  $\text{N}/\text{mm}^2$  on steel and at least 2  $\text{N}/\text{mm}^2$  on concrete in accordance with ISO 4624.
- c) Impact resistance – at least 4  $\text{Nm}$  in accordance with ISO 6272.
- d) Scratch resistance – at least 50  $\text{N}$  in accordance with ISO 1518.
- e) Porosity – the coating shall have no pores when tested in accordance with 8.1.3.2.5.

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### 6.2.7 Chemical resistance

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#### 6.2.7.1.1 General

All materials referred to in 6.2 in contact with the influent shall be resistant to mineral oils, fuels (i. e. diesel oil), petrol, gasoline, detergents and their decomposing products or protected accordingly. When tested in accordance with 8.1.4 the following requirements shall be met.

#### 6.2.7.1.2 Concrete

When uncoated concrete is tested in accordance with 8.1.4.1, it shall comply with the requirements given in 6.2.2.

#### 6.2.7.1.3 Plastics materials

The test specimens from the test in 8.1.4.2 shall retain the following tensile strength, flexural strength, modulus and Izod impact resistance when compared with the control specimen:

- at least 80 % for glass reinforced plastics;
- at least 70 % for polyethylene

#### 6.2.7.1.4 Sealing materials

When tested in accordance with 8.1.4.3 the test pieces shall not show any signs which may affect their fitness for use.

#### 6.2.7.1.5 Coatings

When tested in accordance with 8.1.4.4 the following requirements shall be met:

- Degree of blistering : not worse than degree 2, class 2 gradation in accordance with ISO 4628-2.
- Degree of rusting : Re 0 in accordance with ISO 4628-3.
- Width of coating detachment : not greater than 1 mm along the surface scratch in accordance with ISO 1518.
- Degree of Buchholz : not more than 25 % indentation in accordance with ISO 2815.

### **6.2.7.2 External surfaces for underground conditions**

When external coatings are required to steel or concrete and tested in accordance with 8.1.5 the following requirements shall be met:

- Degree of blistering : not worse than degree 2, class 2 gradation in accordance with ISO 4628-2.
- Degree of rusting : Re 0 in accordance with ISO 4628-3
- Width of coating detachment : not greater than 1 mm along the surface scratch in accordance with ISO 1518.

## **6.3 Design requirements**

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### **6.3.1 Area of the separator or sludge trap**

The area up to 40 mm above the maximum operational liquid level shall be considered as part of the separator or sludge trap.

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### **6.3.2 Watertightness of components**

All components of a separator system (including joints, seals, connections and partitions) shall be watertight and the separator system including extension shafts shall be tested in accordance with 8.2.

### **6.3.3 Accessibility**

The separator system including the inlet and outlet areas of the sludge trap and separator shall be accessible for maintenance and inspection. Extension shafts and access openings shall be provided to allow the removal of light liquids and any settled material. Their dimensions shall comply with the requirements for manholes and inspection chambers as given in EN 476.

On separator equal to or greater than NS 10 there shall be at least one access point in compliance with clause 7.3 of EN 124:1994.

### **6.3.4 Water seals**

Water seals shall be provided at the inlet and outlet of the separator. The depth of the water seal shall be a minimum of 100 mm.

Where the separator and sludge trap are combined, the inlet seal may be provided either at the sludge trap or at the separator.

### **6.3.5 Pipes and pipe joints**

The minimum nominal diameters  $DN_{min}$  of the inlet(s) and outlet(s) for the separator system shall be selected from table 2 and compatible with standardized pipe systems.

Table 2 — Pipe minimum nominal diameters  $DN_{min}$ 

Nominal size	$DN_{min}^a$
up to and including NS 3	100
Over NS 3 up to and including NS 6	125
Over NS 6 up to and including NS 10	150
Over NS 10 up to and including NS 20	200
Over NS 20 up to and including NS 30	250
Over NS 30 up to and including NS 100	300
Over NS 100	400
<sup>a</sup> The nominal diameter can apply to either the internal or external pipe diameter.	

Provision shall be made for possible ground movement and settlement when joining inlet, outlet and connection pipes.

### 6.3.6 Internal components

Provision shall be made for cleaning the internal components using pressurized air or water. Parts which need to be removed for maintenance shall be accessible and easily removed. Any oil retained in the separator system shall be prevented from entering the outlet pipe.

### 6.3.7 Sludge traps

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Sludge traps shall be constructed with a flow-control device at the inlet to reduce the inflow velocity and provide a uniform flow pattern. This device shall be designed to avoid short circuits and allow sediments to settle.

### 6.3.8 Access covers

Access covers shall be in accordance with EN 124. Access covers with ventilation openings or those which can be bolted down, are not permitted.

## 6.4 Structural stability

### 6.4.1 General

The separator system shall be designed to withstand the various loadings to which they are expected to be subjected (dead loads, live loads, soil pressure, water pressure) without detriment to their function and to the environment and be protected against possible floating when empty.

The structural stability shall be based on national standards, transposing European Standards as available, or in the absence of those is based on established national procedures and/or regulations for calculation or testing valid in the place of use of separator.

NOTE Annex C lists documents which can be used in the framework of this clause and which will remain valid until replaced by European Standards.

### 6.4.2 Separator systems made of unreinforced concrete, fibre-reinforced concrete, reinforced concrete

The crack width under design load shall not be greater than 0,20 mm for reinforced concrete.

When steel reinforcement is used, the concrete cover to the steel shall not be less than 20 mm on all sides for prefabricated units, and not less than 30 mm on all sides for units built in-situ.