

Prefabricated high density polyethylene (PE-HD)
manholes for use in sewerage systems
Dimensions and technical delivery conditions

DIN
19 537
Part 3

Röhre, Formstücke und Schächte aus Polyethylen hoher Dichte (PE-HD) für Abwasserkanäle und -leitungen;
Fertigschächte; Maße, technische Lieferbedingungen

In keeping with current practice in standards published by the International Organization for Standardization (ISO), a comma has been used throughout as the decimal marker.

Dimensions in mm

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1 Scope and field of application

This standard specifies requirements and methods of test for prefabricated circular manholes made from high density polyethylene (PE-HD) components as specified in subclause 2.2 of this standard and DIN 19 537 Part 2.

This standard shall apply by analogy for prefabricated manhole components of other cross-sectional shape.

2 Concepts

The general terminology used here has been taken from DIN 19 549, except for concepts and nomenclature characteristic of manholes made from PE-HD components.

2.1 Manhole

For the purposes of this standard, a manhole is a structure built on a buried drain or sewer, which is mainly intended for ventilation purposes and permits entry of a person for inspection, maintenance and cleaning. It may be designed to accommodate sewage lifting equipment and be provided at junctions of drains or sewers and at points where these change direction, gradient or cross section (quoted from DIN 19 549, February 1989 edition).

PE-HD manholes are assembled from prefabricated components, as illustrated in figure 1.

2.2 Manhole components

2.2.1 Bottom section

A bottom section is a manhole component that consists of:

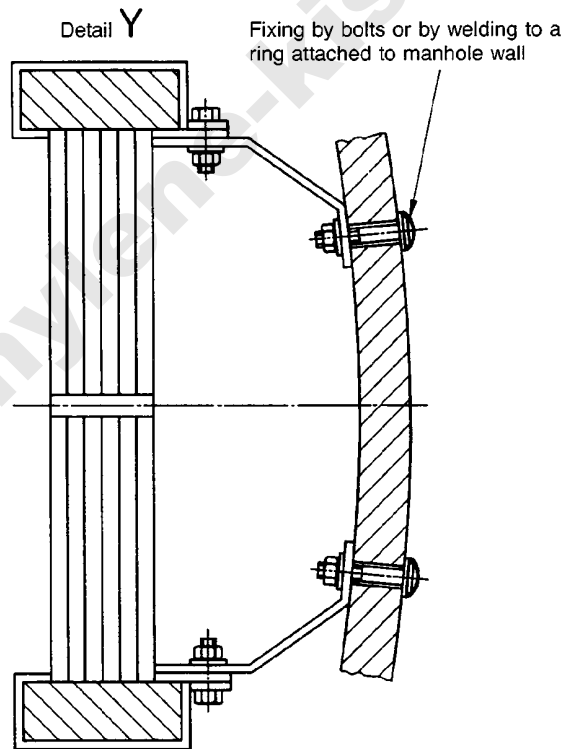
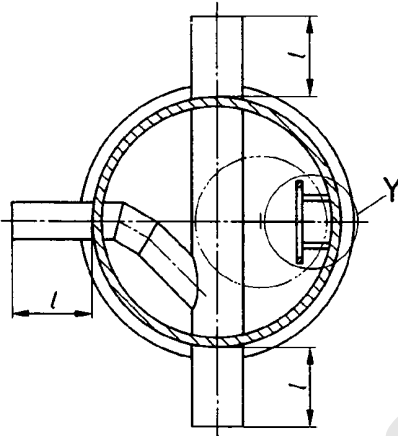
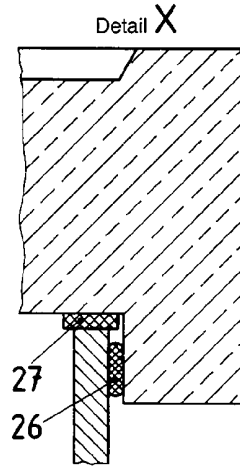
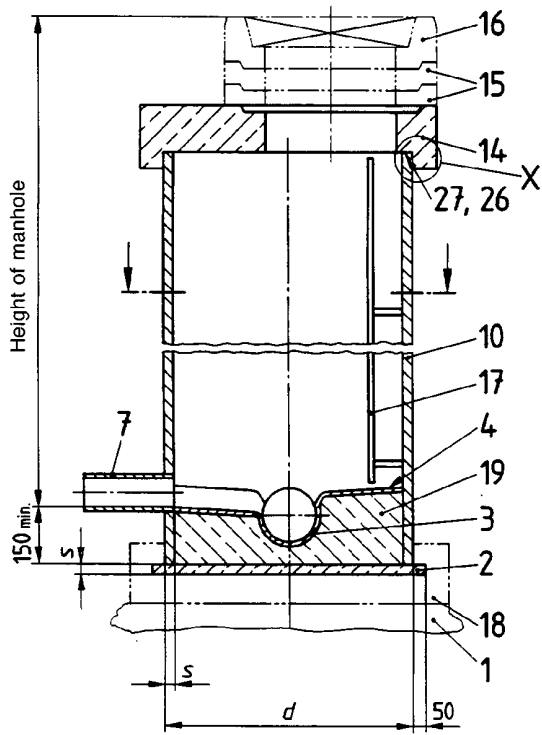
- a) base;
- b) channel;
- c) benching;
- d) connector;
- e) single-unit shaft.

Table 1. **Diameter and wall thickness of single-unit shaft**

Manhole size DN	External diameter, d	Minimum wall thickness, $s^1)$
1000	$1100 \begin{smallmatrix} + 5 \\ 0 \end{smallmatrix}$	34,2
1100	$1200 \begin{smallmatrix} + 6 \\ 0 \end{smallmatrix}$	37,3
1500	$1600 \begin{smallmatrix} + 6 \\ 0 \end{smallmatrix}$	49,7

¹⁾ s as determined by design analysis.

Continued on pages 2 to 6



- 1 Sub-base
 - 2 Base
 - 3 Channel
 - 4 Benching
 - 7 Connector
 - 10 Single-unit shaft
 - 14 Cover slab
 - 15 Seating ring
 - 16 Manhole top
 - 17 Access facility (ladder)
 - 18 Reinforced concrete foundation
 - 19 B 15 concrete bedding
 - 26 DIN 4062 sealant
 - 27 DIN 4060 sealant
- (item numbers 1 to 17 as in DIN 19 549)

Figure 1. Prefabricated PE-HD manhole (assembly)

Table 2. Effective connector length, *l*

Size of connector (cf. DIN 19 537 Part 1)	Effective connector length, <i>l</i> (± 50), for manhole of size (DN)		
	1000	1100	1500
150	300	300	300
200	300	300	300
250	300	300	300
300	300	300	300
400	500	500	500
500	500	500	500
600	500	500	500
700	-	-	500
800	-	-	500
900	-	-	500
1000	-	-	500
1100	-	-	500

2.2.2 Cover slab

A cover slab is a reinforced concrete slab with an eccentric entry hole as shown in figure 2 (cf. table 3) and with reinforcement as specified in DIN 4034 Part 1.

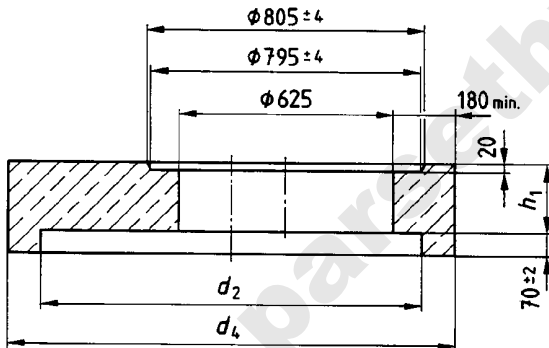


Figure 2. Cover slab

Designation of a DN 1000/DN 625 cover slab (AP) and an effective length, h_1 , of 200 mm:

Cover slab DIN 19 537 – AP 1000/625 × 200

2.2.3 Seating ring

Seating rings are manhole components placed between the uppermost manhole section and top. They shall be manufactured in effective lengths, h_s , of 60, 80 and 100 mm (cf. DIN 4034 Part 1).

Table 3. Cover slab dimensions

Manhole DN	h_1 ±3	d_2 ±1	d_4
1000	200	1113	1300
1100	200	1213	1400
1500	200	1613	1800

2.2.4 Manhole top

A manhole top is a component that consists of frame, dirt pan and cover (as specified in EN 124 and DIN 1229*), DIN 4271 Parts 2 and 3 or DIN 19 584 Part 2).

3 Requirements

3.1 Materials

PE-HD manhole components (e.g. single-unit shaft, connectors) shall comply with DIN 19 537 Part 2, plain and reinforced concrete components, with DIN 4034 Part 1, DIN 1045 and DIN 4281.

Elastomer seals shall comply with DIN 4060 and plastic sealants, with DIN 4062, use of other seals or sealants being permitted, provided they have been issued an *IBt*¹⁾ test certificate.

3.2 Dimensions

The dimensions of manhole components shall comply with those given in tables 1 to 3 and figures 1 and 2. For dimensions without tolerance indication, the general tolerances, accuracy grade sg, as specified in DIN 7168, shall apply.

Dimensions and tolerances for manhole components of a cross-sectional shape other than specified here are subject to agreement.

3.3 Interchangeability of components

Manhole components of the same type, size and material shall be interchangeable.

3.4 Stability

Manholes shall be adequately stable when analysed for resistance to forces resulting from earth pressure, uplift and imposed loads (see Explanatory notes).

The creep modulus of the PE-HD used shall comply with the specifications of DIN 19 537 Part 2 and *ATV-Arbeitsblatt* (ATV Code of practice) A 127, table 3.

The flexural stress shall comply with the specifications for the yield stress given in DIN 16 776 Part 2, taking into account a reduction factor as specified in *DVS-Richtlinie* (DVS Code of practice) 2205 Part 1, adding 15 % to allow for the stress/strain behaviour of PE-HD.

*) At present at the stage of draft.

1) *Institut für Bautechnik* (Institute of Building Technology), Reichpietschufer 74 – 76, D-1000 Berlin 30.

3.5 Watertightness

Given normal environmental influences, manhole components and their joints shall be watertight when subjected to an internal or external hydrostatic pressure of 0,5 bar. Where higher stresses are likely, more stringent requirements may be agreed on the basis of DIN 4033.

3.6 Hydraulic design

For outgoing drains up to DN 500, the benching shall be formed to the height of the soffit on both sides. For larger sizes, the benching shall reach a height 500 mm above the invert. For benching higher than 500 mm, step irons shall be provided. The benching shall slope at a gradient of 1:20.

Branch drains shall enter the main drain at an angle equal to or less than 90°, angles between 60° and 90° being permissible provided that there is a difference in invert level for branch and main sewer equal to at least 1/20th of the size of the main drain (in mm) and the flow at the junction is not obstructed.

Where the drain or sewer changes direction, the radius of the channel shall be equal to at least the diameter of the incoming drain, if the manhole design so permits.

3.7 Chemical resistance

Prefabricated PE-HD manholes shall be resistant to sewage as defined in DIN 1986 Part 3. Where such manholes are likely to come into contact with other types of waste water, their suitability shall be checked separately. For cover slabs, see DIN 4034 Part 1.

3.8 Connections

Connections made to manholes shall be watertight, jointing being normally effected by heated tool welding as specified in *DVS-Richtlinie* 2207 Part 2.

This requirement shall also apply for connections to existing pipes.

3.9 Jointing of components

Jointing of components shall be in accordance with *DVS-Richtlinien* 2207 Part 2 and 2209 Part 1.

For joints between manhole components of dissimilar materials, connectors as specified in DIN 19 537 Part 1 shall be used. The lubricants required for assembly are to be supplied by the manhole manufacturer.

3.10 Installation

Manholes shall be installed in accordance with DIN 4033 and *ATV-Arbeitsblatt* A 139. Supply of non-standardized ancillary parts to be fitted in the manhole shall be the manhole manufacturer's responsibility.

4 Testing

4.1 Material

PE-HD manhole components shall be tested as specified in clause 4 of DIN 19 537 Part 2 and those made from other materials, as specified in the relevant standards (e.g. DIN 4034 Part 1, DIN 1045 or DIN 4281).

4.2 Dimensions

The dimensions of manhole components shall be checked for compliance with the specifications of tables 1 to 3 and with figure 2, as specified in DIN 19 537 Part 2.

4.3 Interchangeability of components

Provided that components complying with this standard are used, verification of their being interchangeable is not required.

4.4 Stability

The stability of manholes, i.e. their resistance to earth pressure, uplift and imposed loads, shall be verified by a design analysis. Where there is the risk of uplift, the base shall be anchored to the ground over its full area.

4.5 Watertightness

For watertightness testing, in accordance with DIN 4033, a hydrostatic pressure of 0,5 bar shall be applied to a complete manhole (fitted with connectors and with at least one joint sealed), which is filled with water up to the upper edge of the cover slab.²⁾

4.6 Hydraulic design

The hydraulic design of manholes shall be checked by measuring the linear and angular dimensions.

4.7 Chemical resistance

Testing for the resistance of manholes to waste water as specified in DIN 1986 Part 3 is not required. The suitability of waste water with properties considerably deviating from the specifications of that standard shall be checked as specified in Supplement 1 to DIN 8075.

4.8 Connections

The performance of connections to the manhole shall be checked in conjunction with the test described in sub-clause 4.5.

4.9 Jointing of components

A dimensional check of the manhole joints shall be made in accordance with DIN 19 537 Part 2, in conjunction with *DVS-Richtlinien* 2203 Part 2 and 2206.

5 Access facilities

PE-HD single-unit shafts shall be provided with a ladder as specified in DIN 4568 Parts 1 and 2 and complying with *Unfallverhütungsvorschrift* (Accident Prevention Regulation) VBG 74. A hand grip shall be provided in the upper part of the manhole.

²⁾ See *ATV-Arbeitsblatt* A 139 for on-site testing.

6 Inspection

6.1 General

Compliance with the requirements specified in clause 3 shall be verified by inspection involving internal control and third-party inspection, in accordance with DIN 18 200.

Where manhole components are made of materials other than PE-HD, inspection shall be based on the specifications of the relevant standards.

6.2 Internal control

The quality of manhole components shall be checked as part of the inspection described in DIN 1230 Part 2. A dimensional check shall be made once a week on one manhole.

6.3 Third-party inspection

Third-party inspection shall be undertaken, on the basis of an inspection contract, either by a testing agency³⁾ accredited for this purpose or by a quality assurance association⁴⁾.

Third-party inspection shall be carried out at least twice a year and shall cover a check of the results of internal control and testing, as well as a dimensional check and watertightness testing.

7 Marking

Manholes shall be legibly and permanently marked with at least the following information:

- a) DIN number (DIN 19 537 Part 3);
- b) manufacturer's mark (or mark of manufacturer's works);
- c) mark of quality assurance association or inspection mark;
- d) date of manufacture (week and year).

The use of this marking indicates that the manufacturer assures compliance of the manhole or its components with this standard.

³⁾ Quality assurance associations and testing agencies accredited by the building inspectorate are registered in a list kept by the *Institut für Bautechnik*, in which the corresponding inspection/quality mark is also reproduced. This list is published and updated in the institute's *Mitteilungen*, obtainable from *Verlag Wilhelm Ernst & Sohn*, Hohenzollerndamm 170, D-1000 Berlin 31.

⁴⁾ Information to be obtained from *Gütegemeinschaft Kunststoffrohre e. V.*, D-5300 Bonn.

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Standards and other documents referred to

DIN 1045	Part 1	Structural use of concrete; design and construction
DIN 1229		(at present at the stage of draft) Gully tops and manhole tops for traffic areas; classification, design, testing, inspection and marking
DIN 1230	Part 2	Vitrified clayware for sewers; socket pipes and fittings; dimensions
DIN 1986	Part 3	Site drainage systems; operation and maintenance
DIN 4033		Drains and sewers; design and installation
DIN 4034	Part 1	Precast unreinforced and reinforced concrete components for manholes over buried drains and sewers; dimensions and technical delivery conditions
DIN 4060		Elastomer seals for pipe joints in drains and sewers; requirements and testing
DIN 4062		Cold-applied plastic jointing materials for use with precast concrete drains and sewers; requirements, testing and application
DIN 4271	Part 2	Class B 125 manhole tops; frames
DIN 4271	Part 3	Class B 125 manhole tops; covers
DIN 4281		Concrete for drainage units; manufacture, requirements and testing
DIN 4568	Part 1	Ladders; concepts, classification and functional dimensions
DIN 4568	Part 2	Ladders; requirements and testing
DIN 7168	Part 1	General tolerances for linear and angular dimensions and geometrical tolerances (not to be used for new designs)
Supplement 1 to DIN 8075		High density polyethylene (PE-HD) pipes; chemical resistance of pipes and fittings
DIN 16 776	Part 2	Polyethylene (PE) moulding materials; preparation of specimens and determination of their properties
DIN 18 200		Inspection of construction materials, structural members and types of construction; general principles
DIN 19 537	Part 1	High density polyethylene (PE-HD) pipes and fittings for drains and sewers; dimensions
DIN 19 537	Part 2	High density polyethylene (PE-HD) pipes and fittings for drains and sewers; technical delivery conditions
DIN 19 549		Manholes for buried drains and sewers; general requirements and testing
DIN 19 584	Part 2	Class D 400 manhole tops; components
EN 124		Gully tops and manhole tops for vehicular and pedestrian areas; design requirements, type testing, marking
DVS-Richtlinie 2203	Part 2	<i>Prüfen von Schweißverbindungen aus thermoplastischen Kunststoffen; Zugversuch</i> (Tensile testing of joints in welded thermoplastic components) ⁵⁾
DVS-Richtlinie 2205	Part 1	<i>Berechnung von Behältern und Apparaten aus Thermoplasten; Kennwerte</i> (Design of thermoplastic vessels and containers; characteristic values) ⁵⁾
DVS-Richtlinie 2206		<i>Prüfung von Bauteilen und Konstruktionen aus thermoplastischen Kunststoffen</i> (Testing of thermoplastic components and constructions) ⁵⁾
DVS-Richtlinie 2207	Part 2	<i>Schweißen von Polyethylen hoher Dichte (PE-HD); Heizelementstumpfschweißen; Rohre und Rohrleitungsteile für Abwasserkanäle und -leitungen</i> (Heated tool butt welding; PE-HD pipes and fittings for drains and sewers) ⁵⁾
DVS-Richtlinie 2209	Part 1	<i>Schweißen von thermoplastischen Kunststoffen, Extrusionsschweißen; Verfahren, Merkmale</i> (Extrusion welding of thermoplastics; welding procedure, characteristics) ⁵⁾
ATV-Arbeitsblatt A 127		<i>Richtlinie für die statische Berechnung von Entwässerungskanälen und -leitungen</i> (Guideline for the structural analysis of drains and sewers) ⁶⁾
ATV-Arbeitsblatt A 139		<i>Richtlinie für die Herstellung von Entwässerungskanälen und -leitungen</i> (Guideline for the manufacture of drains and sewers)
Unfallverhütungsvorschrift		<i>Leitern und Tritte</i> (Ladders and step irons) (VBG 74) ⁷⁾

Explanatory notes

It should be noted that, in exceptional cases, the maximum distance between the manhole top surface and the first step iron (dimension *a* in DIN 19 549) may exceed a value of 500 mm by 240 mm, subject to the necessary safety provisions being agreed with the responsible employers' liability insurance association.

International Patent Classification

E 03 F 1/00
G 01 B 21/00
G 01 M 3/00
G 01 N 3/00

⁵⁾ Obtainable from *DVS-Verlag GmbH*, Postfach 27 25, Aachener Straße 172, D-4000 Düsseldorf 1.

⁶⁾ Obtainable from *Gesellschaft zur Förderung der Abwassertechnik e.V.*, Markt 71, D-5205 St. Augustin 1.

⁷⁾ Obtainable from *Carl Heymanns Verlag KG*, Luxemburger Straße 449, D-5000 Köln 41.