INTERNATIONAL STANDARD

ISO 6993-1

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Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels —

Part 1:
Pipes for a maximum operating pressure of 1 bar (100 kPa)

Systèmes de canalisations enterrées en poly(chlorure de vinyle) à résistance au choc améliorée (PVC-HI) pour réseaux de combustibles gazeux —

Partie 1: Tubes pour une pression maximale de service de 1 bar (100 kPa)

Reference number
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

ISO 6993-1 was prepared by Technical Committee ISO/TC 138, *Plastics pipes, fittings and valves for the transport of fluids*, Subcommittee SC 4, *Plastics pipes and fittings for the supply of gaseous fuels*.

This first edition of ISO 6993-1, together with ISO 6993-2, ISO 6993-3 and ISO 6993-4, cancels and replaces ISO 6993:2001, of which it constitutes a technical revision.

ISO 6993 consists of the following parts, under the general title *Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels*:

— *Part 1: Pipes for a maximum operating pressure of 1 bar (100 kPa)*

— *Part 2: Fittings for a maximum operating pressure of 200 mbar (20 kPa)*

— *Part 3: Fittings and saddles for a maximum operating pressure of 1 bar (100 kPa)*

— *Part 4: Code of practice for design, handling and installation*

Buried, high-impact poly(vinyl chloride) (PVC-HI) piping systems for the supply of gaseous fuels —

Part 1:
Pipes for a maximum operating pressure of 1 bar (100 kPa)

1 Scope

This part of ISO 6993 specifies the requirements for pipes made of high-impact poly(vinyl chloride) (PVC-HI) intended to be used for the supply of gaseous fuels through buried pipelines having an operating temperature range of 0 °C up to and including +30 °C and a maximum operating pressure of 1 bar (100 kPa) [1)].

It is applicable only to pipes manufactured from the high-impact PVC materials PVC-A, PVC-CPE and PVC-EPR. The pipes are suitable for those gases not containing potentially damaging components in such concentrations as to impair the properties of the pipe material.

2 Normative references

The following referenced documents are indispensable for the application 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.

ISO 1167-1:2006, *Thermoplastics pipes, fittings and assemblies for the conveyance of fluids — Determination of the resistance to internal pressure — Part 1: General method*

ISO 2505:2005, *Thermoplastics pipes — Longitudinal reversion — Test method and parameters*

ISO 2507-1, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 1: General test method*

ISO 2507-2, *Thermoplastics pipes and fittings — Vicat softening temperature — Part 2: Test conditions for unplasticized poly(vinyl chloride) (PVC-U) or chlorinated poly(vinyl chloride) (PVC-C) pipes and fittings and for high impact resistance poly(vinyl chloride) (PVC-HI) pipes*

ISO 3126, *Plastics piping systems — Plastics components — Determination of dimensions*

ISO 3127, *Thermoplastics pipes — Determination of resistance to external blows — Round-the-clock method*

ISO 9080, *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO 9852, *Unplasticized poly(vinyl chloride) (PVC-U) pipes — Dichloromethane resistance at specified temperature (DCMT) — Test method*

ISO 9969, *Thermoplastics pipes — Determination of ring stiffness*

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1) 1 bar = 0,1 MPa = 10^5 Pa; 1 MPa = 1 N/mm^2

ISO 16871, *Plastics piping and ducting systems — Plastics pipes and fittings — Method for exposure to direct (natural) weathering*

EN 922:1994, *Plastics piping and ducting systems — Pipes and fittings of unplasticized poly(vinyl chloride) (PVC-U) — Specimen preparation for determination of the viscosity number and calculation of the K-value*

3 Terms and definitions

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

3.1 Geometrical definitions

3.1.1
nominal outside diameter
d_n
numerical designation of size which is common to all components in a thermoplastics piping system other than flanges and components designated by thread size

NOTE 1 It is a convenient round number for reference purposes.

NOTE 2 For metric pipes conforming to ISO 161-1, the nominal outside diameter, expressed in millimetres, is the minimum mean outside diameter $d_{em, min}$.

3.1.2
mean outside diameter
d_{em}
measured length of the outer circumference of the pipe divided by π, rounded up to the nearest 0,1 mm

NOTE The value for π is taken to be 3,142.

3.1.3
minimum outside diameter
$d_{e,min}$
minimum value of the mean outside diameter

NOTE It is equal to the nominal outside diameter d_n, expressed in millimetres.

3.1.4
maximum outside diameter
$d_{e,max}$
maximum value of the mean outside diameter

3.1.5
outside diameter at any point
d_e
measured outside diameter through the cross-section at any point of the pipe, rounded up to the nearest 0,1 mm

3.1.6
out-of-roundness
difference between the measured maximum outside diameter and the measured minimum outside diameter in the same cross-sectional plane of the pipe

3.1.7
nominal wall thickness
e_n
wall thickness, in millimetres, tabulated in ISO 4065, corresponding to the minimum wall thickness, e_{min}, at any point

3.1.8
mean wall thickness
e_m
arithmetic mean of at least four measurements regularly spaced around the same cross-sectional plane of the pipe, including the measured minimum and maximum values obtained, rounded up to the nearest 0,1 mm

3.1.9
wall thickness at any point
e
measured wall thickness at any point around the circumference of the pipe, rounded up to the nearest 0,1 mm.

3.1.10
standard dimension ratio
SDR
numerical designation of a pipe series, which is approximately equal to the ratio of the nominal outside diameter d_n to the nominal wall thickness e_n:

$$\mathrm{SDR} = \frac{d_n}{e_n}$$

NOTE It is a convenient round number for reference purposes.

3.2 Material definitions

3.2.1
high-impact poly(vinyl chloride)
PVC-HI
mixture of unplasticized PVC and an impact-resistance modifier

3.2.2
lower confidence limit of the predicted hydrostatic strength
σ_{LPL}
quantity with the dimensions of stress, which represents the 97,5 % lower confidence limit of the predicted hydrostatic strength for a single value at a temperature T and a time t

NOTE It is denoted as $\sigma_{LPL} = \sigma_{(T,\ t,\ 0,975)}$.

3.2.3
minimum required strength
MRS
value of σ_{LPL}, at a temperature of 20 °C and a time 50 years, $\sigma_{(20,\ 50\ \text{years},\ 0,975)}$, rounded down to the next smaller value of the R 10 series or of the R 20 series conforming to ISO 3 and ISO 497, depending on the value of σ_{LPL}

3.2.4
overall service [design] coefficient
C
overall coefficient with a value greater than 1, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the σ_{LPL}

3.3 Definitions related to service conditions

3.3.1
natural gas
gaseous fuel containing a mixture of hydrocarbons, primarily methane, but generally also including ethane, propane and higher hydrocarbons in much smaller amounts, as well as some inert gases such as nitrogen and carbon dioxide, plus minor amounts of trace constituents

NOTE Natural gas remains in the gaseous state under the temperature and pressure conditions normally found in service.

3.3.2
pressure
overpressure relative to atmospheric pressure

3.3.3
maximum operating pressure
MOP
maximum effective pressure of the gas in a piping system, expressed in bars, which is allowed in continuous use

NOTE 1 It takes into account the physical and the mechanical characteristics of the components of the piping system.

NOTE 2 MOP is given by the equation:

$$\mathrm{MOP} = \frac{20 \times \mathrm{MRS}}{C \times (\mathrm{SDR} - 1)}$$

4 Symbols and abbreviated terms

4.1 Symbols

C overall service (design) coefficient

d_{e} outside diameter at any point

$d_{\mathrm{e,max}}$ maximum outside diameter

d_{em} mean outside diameter

$d_{\mathrm{e,min}}$ minimum outside diameter

d_{n} nominal outside diameter

e_{n} nominal wall thickness

e wall thickness at any point

e_{max} maximum wall thickness

e_{m} mean wall thickness

e_{min} minimum wall thickness

σ hoop stress

σ_{LPL} lower confidence limit

4.2 Abbreviated terms

PVC-A acrylate modified PVC

PVC-CPE chlorinated polyethylene modified PVC

PVC-EPR ethylene propylene rubber modified PVC

MOP maximum operating pressure

MRS minimum required strength

PVC-HI high-impact PVC

PVC-U unplasticized PVC

SDR standard dimension ratio

STIS specific tangential initial stiffness

THT tetrahydrothiophene

5 Material

5.1 Composition

The pipes shall be made of high-impact PVC, to which only such additives are added that are necessary to facilitate conformity of the components to this part of ISO 6993.

The impact-resistant modified PVC shall be one of the following compositions:

a) a mixture based on PVC;

b) a blend based on PVC;

c) a copolymer based on PVC;

d) a combination of these types.

The proportion of the impact modifier in the composition shall be at least 7 % by mass.

5.2 Long-term strength

The MRS value of the extrusion material shall be at least 18 MPa. Conformity to this requirement shall be proven using a long-term evaluation in accordance with ISO 9080. Testing shall be carried out at 20 °C, 40 °C and 60 °C, for periods up to 9 000 h. At 60 °C no knee shall occur before 5 000 h.

This test shall be carried out on test pieces in the form of a solid wall extruded pipe made from the relevant extrusion material.

NOTE The MRS evaluation is used for a material qualification and is not intended to be used for a pressure rating.

5.3 Vicat softening temperature

The Vicat softening temperature of the extrusion material shall be not less than 76 °C when determined in accordance with ISO 2507-1 and ISO 2507-2.

5.4 K-value

The K-value of the unplasticized polyvinyl chloride (PVC-U) resin in the extrusion material shall exceed 65, when measured in accordance with EN 922.

5.5 UV stability

Test samples of the extrusion material in the form of a pipe of d_n 63 shall be exposed to weathering in accordance with 11.1 and 11.3. After exposure, the impact resistance of the weathered side shall be determined in accordance with Annex B, using a falling weight of ($750\,^{+5}_{-0}$) g and a drop height of ($2\,000\,^{+10}_{-0}$) mm at 0 °C.

5.6 Resistance to gas constituents

The resistance to gas constituents shall be determined in accordance with 11.1 and Annex A.

6 General characteristics

6.1 Contaminants

The material of the pipe shall not be shown to contain any contaminants, such as inorganic particles or agglomerations thereof, exceeding 50 µm in size, when measured in accordance with 11.1 and 11.2.

6.2 Appearance and finish

The appearance and finish of the pipes shall be examined visually without magnification.

Internal and external pipe surfaces shall be free from grooves, pits, blisters, indications of burning and other irregularities.

The pipe ends shall be cut cleanly and square to the axis of the pipe. The cut end shall not show any voids.

7 Geometrical characteristics

7.1 Measurements

All dimensions shall be measured in accordance with ISO 3126.

7.2 Nominal outside diameter

The nominal outside diameter, d_n, shall be selected from those given in Table 1.

7.3 Mean outside diameter

The mean outside diameter at any point, d_{em}, shall be in accordance with Table 1.

7.4 Out-of-roundness

The out-of-roundness at any cross-section, ($d_{e,max} - d_{e,min}$), shall be in accordance with Table 1.

7.5 Wall thickness

The wall thickness at any point, e, shall be in accordance with Table 1.

The measured e_m shall not be less than e_n.

NOTE In order to meet the requirements for handling and resistance to soil loads, a minimum wall thickness of 2,0 mm is specified for all SDR series.

Table 1 — Pipe dimensions and tolerances

Dimensions in millimetres

d_n	Mean outside diameter d_{em}		Out-of-roundness $d_{e,\,max} - d_{e,\,min}$	Wall thickness e			
				SDR 41 [c]		SDR 33 [c]	
	min.	max. [a]	max. [b]	min. [d]	max. [e]	min. [d]	max. [e]
50	50	50,2	1,2			2,0	2,4
63	63	63,2	1,6			2,0	2,4
75	75	75,3	1,8	2,0	2,4	2,3	2,8
90	90	90,3	2,2	2,2	2,7	2,8	3,3
110	110	110,4	2,7	2,7	3,2	3,4	3,9
125	125	125,4	3,0	3,1	3,6	3,8	4,4
140	140	140,5	3,4	3,5	4,0	4,3	4,9
160	160	160,5	3,9	3,9	4,6	4,9	5,6
180	180	180,6	4,4	4,4	5,1	5,5	6,3
200	200	200,6	4,8	4,9	5,6	6,1	6,9
225	225	225,7	5,4	5,5	6,3	6,9	7,8
250	250	250,8	6,0	6,1	7,0	7,6	8,6
280	280	280,9	6,8	6,9	7,6	8,6	9,6
315	315	316,0	7,6	7,7	8,7	9,6	10,8
355	355	356,0	8,6	8,7	9,6	10,8	12,1
400	400	401,0	9,6	9,8	11,0	12,2	13,6

[a] 0,003 d_{em} rounded up to the next 0,1 mm with a minimum of 0,2 mm and a maximum of 1 mm.

[b] 0,024 d_{em} rounded up to the next 0,1 mm.

[c] The SDR designation applies starting from the nominal diameter of 63 mm.

[d] $e_{min} = e_n$.

[e] 1,1 e_n + 0,2 mm, rounded up to the nearest 0,1 mm.

8 Physical characteristics

8.1 Degree of gelation

When tested in accordance with ISO 9852 at 15 °C, the material shall not show any visual deterioration.

8.2 Longitudinal reversion

The longitudinal reversion shall be determined in accordance with 11.1 and ISO 2505.

Using the test parameters according to ISO 2505:2005, Table 2, for PVC-U material, the calculated longitudinal reversion shall not be more than 5 %. In addition after exposure, there shall be no visible cracks, voids or blisters.

9 Mechanical characteristics

9.1 Resistance to internal hydrostatic pressure

When tested in accordance with 11.1 and 11.4, using the combinations of test temperatures and induced stresses given in Table 2, the time to failure of the pipes shall not be less than that according to Table 2.

Table 2 — Resistance of pipes to internal hydrostatic pressure — Test conditions

Test temperature °C	**Induced stress** MPa	**Minimum test time** h
20	30	1
	25	100
60	9	1 000

9.2 Resistance to external blows at 0 °C

Pipes shall be tested at 0 °C in accordance with 11.1 and Annex B and shall have a true impact rate (TIR) of not more than 5 % under the conditions in accordance wit Table 3.

Table 3 — Resistance to external blows of pipes — Test conditions

Nominal outside diameter d_n mm	**Striker mass** g	**Drop height** mm
50	$1\,250^{+10}_{-0}$	$2\,000^{+10}_{-0}$
63	$1\,750^{+15}_{-0}$	
75	$2\,250^{+15}_{-0}$	
90	$3\,000^{+15}_{-0}$	
⩾ 110	$4\,000^{+15}_{-0}$	

9.3 Ring stiffness for pipes $d_n \geqslant 63$

For pipes $d_n \geqslant 63$ the ring stiffness at 3 % deflection shall not be less than 2,75 kN/m^2 for SDR 41 pipes and 5,50 kN/m^2 for SDR 33 pipes.

The ring stiffness shall be determined in accordance with 11.1 and ISO 9969 at 23 °C at 3 % deflection.

10 General requirements for pipes

Pipe ends of pipes $d_n \geqslant 110$ shall have a chamfer.

For the design of the chamfer the following requirements apply:

a) the angle of the chamfer shall be between 5° and 15°.

b) the minimum length, l, of the chamfer (see Figure 1) shall be in accordance with Table 4.

c) the wall thickness, e_1, at the front of the chamfer (see Figure 1) shall not be less than 50 % of the minimum wall thickness e of the corresponding pipe (see Table 1).

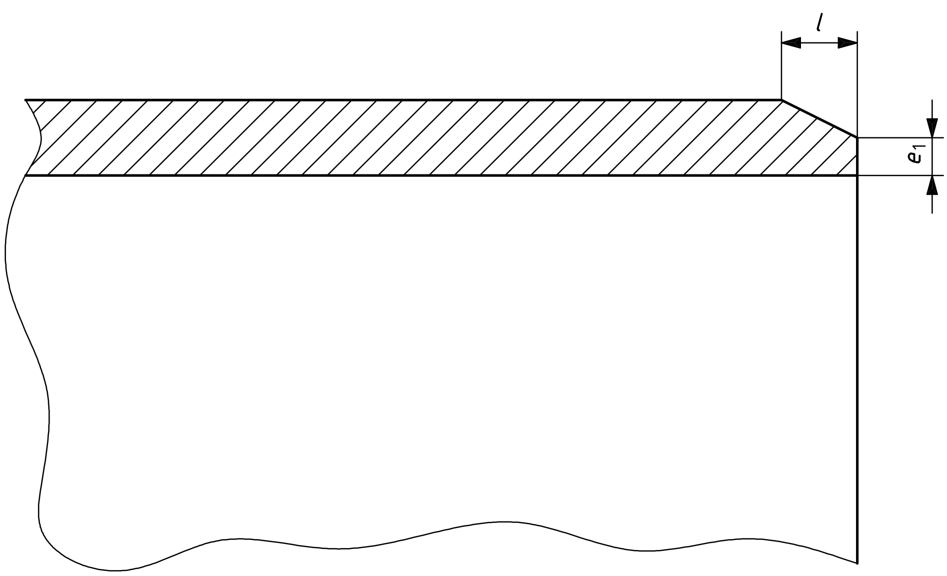


Figure 1 — Chamfer of pipe-end

Table 4 — Length of chamfer

Nominal outside diameter d_n	**Minimum length of chamfer** l_{min}
mm	
$110 \leqslant d_n \leqslant 140$	6
$160 \leqslant d_n \leqslant 400$	8

11 Test methods

11.1 General

Test samples shall be at least 15 h old.

Unless otherwise specified, the tests shall be carried out in triplicate.

Unless otherwise specified, a representative selection of diameters and types shall be made for testing the entire programme.

11.2 Determination of the particle size of contaminants

Five segments for testing are taken at random from the pipe.

These segments shall be cooled during 20 min in liquid nitrogen in order to prevent deformation while making microtome slices from the segments.

Microtome slices shall be made using a diamond knife.

The microtome slices shall be assessed with a light transmittance microscope with a measuring ocular (0,01 mm division).

The particle size of contaminants in the microtome slices shall not be greater than 50 µm.

11.3 Determination of resistance to weathering

The weathering exposure shall be in accordance with ISO 16871, using 24 lengths of 1 m of pipe of d_n 63 mm.

The exposure shall be to direct sunlight at the selected site, at 45° facing south for countries in the northern hemisphere, and at 45° facing north for countries in the southern hemisphere.

The solar irradiance shall be measured continuously during exposure.

The exposure shall be terminated after a total solar radiance of 3,5 GJ/m^2 has been received.

Each exposed pipe sample shall be cut in test pieces of about 200 mm length and the exposed side shall be impact tested in accordance with Annex B and using the test conditions according to 5.5.

11.4 Determination of the resistance to internal hydrostatic pressure of pipes

The resistance to the internal hydrostatic pressure of pipes shall be carried out in accordance with ISO 1167-1 with the following required temperature tolerances on the test water:

a) when testing the material in accordance with 5.2, the maximum temperature tolerance on the test water shall be ± 1 °C;

b) when testing the manufactured pipe in accordance with 9.1, the maximum temperature tolerance shall be between −1 °C and +3 °C.

12 Marking

Pipes shall be marked clearly and durably, in accordance with national regulations, with the word “Gas” and the following information:

a) manufacturer’s name or trademark;

b) material designation “PVC-HI”;

c) manufacturing information in clear figures or in a code providing traceability to the

— production period,

— extruder number for pipes and cavity number for injection moulded fittings (if relevant), and

— production site, if the manufacturer is producing in different sites, nationally and/or internationally;

d) nominal outside diameter;

e) for pipes $d_n \leqslant 63$, $d_n \times e_n$;

f) for pipes $d_n > 63$, SDR designation.

The marking shall be applied such that the properties of the pipes are not adversely affected.

Annex A
(normative)

Determination of resistance to gas constituents

A.1 Principle

A test piece in the form of a pipe ring is placed in an adjustable channel beam such that at the location of the highest wall thickness of the pipe a set strain can be adjusted.

This test piece is then subjected to a defined gas composition for a defined period of time.

After this defined period of time, microtome slices of the test piece are prepared from those places with the highest strain.

These slices are then observed for the presence of crazes, if any, by microscope.

A.2 Apparatus

A.2.1 Channel beam able to hold five rings of d_n 63, each 10 mm in length, and equipped with adjustable sidewalls to 0,1 mm.

A.2.2 Desiccators of sufficient size to contain the required channel beam(s) and equipped with fittings to a gas cylinder which allows a continuous gas flow at such a rate that the gas content of the flask will be renewed at least once a day.

A.2.3 Oven for keeping the test pieces at a temperature of (60 ± 4) °C.

A.2.4 Gas chromatograph for determining the concentration of THT in the gas medium.

A.2.5 Microtome apparatus equipped with a holder and with a knife in accordance with Figure A.1 sufficiently supported to avoid bending at cutting.

A.2.6 Segment holder with two jaws corresponding to the inside and the outside diameter of the segment.

A.2.7 Light transmittance microscope with a magnification of 100 and equipped with a measuring ocular (0,01 mm division).

A.2.8 Glass holder slide for holding the microtome slices.

All elements of the apparatus that come in contact with the gas medium shall be such that they will not absorb THT.

A.3 Gas medium

A mixture of (75 ± 5) mg tetrahydrothiophene (THT) per m^3 of nitrogen gas (N_2).

A.4 Contact liquid

The contact liquid to be used in the glass slide shall be n-hexadecane p.a.

A.5 Test pieces

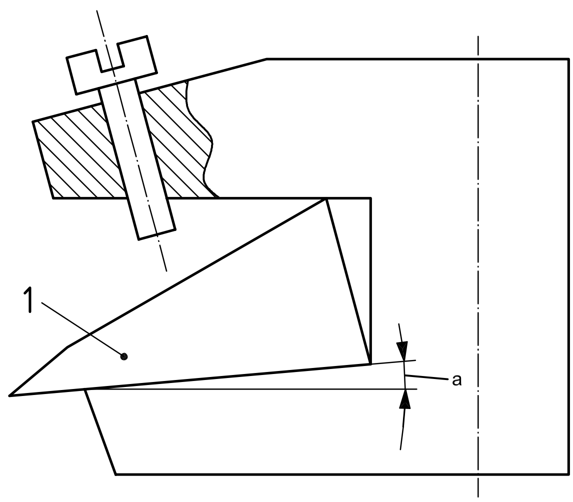
Cut from a pipe of d_n 63 five rings each with a width of (10 ± 1) mm.

Age the rings in an oven at 60 °C for (24 ± 1) h.

Cool the rings to a temperature of (23 ± 2) °C.

Determine, per ring, the location of the maximum wall thickness, and measure at the point (Y) of maximum wall thickness (e_{max}) and outside diameter (d_e) in millimetres.

The difference of the maximum wall thickness (e_{max}) of each ring shall not be greater than 0,05 mm. The mean value is then used in the procedure according to A.6.



Key

1 knife

a 10° to 15°.

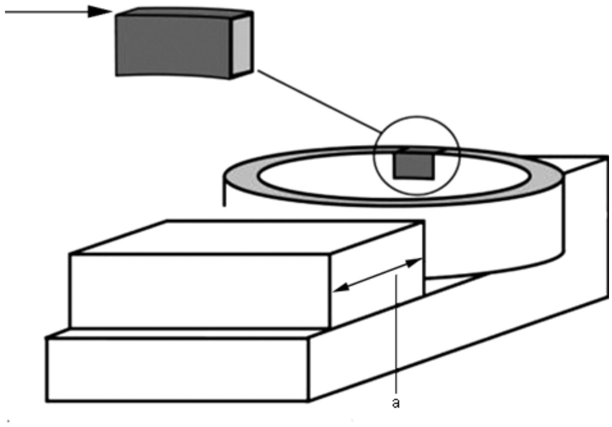
Figure A.1 — Clamping of knife in microtome apparatus

A.6 Test procedure

The test shall be performed in accordance with Table A.1.

Table A.1 — Procedure for determining resistance to gas constituents

Step	Procedure
1	Calculate, for the five rings, the distance between the side walls of the channel with a deflection based on a strain of 1 % on the inside of the ring, using the following formula: $$\Delta D = \frac{\varepsilon}{100\ \%} \times \frac{\left(d_{em} - e_{max}\right)^2}{4{,}27 \times e_{max}}$$ where ΔD is the calculated diametric deflection, in millimetres (mm); e_{max} is the mean value of the measured maximum wall thickness at point Y (mm); d_{em} is the mean value of the outside diameter of the ring at point Y (mm); ε is the strain of 1 % on the inside of the ring.
2	Place the five rings in the channel beam such that the point (Y) of maximum wall thickness is in contact with one of the side walls. Adjust the distance of the side walls, in accordance with the calculated deflection(s) of the respective rings, with a tolerance of 0,1 mm.
3	Leave the rings in the channel beam(s) for 5 h.
4	Place the channel beam(s), including the deflected rings, in the desiccators.
5	Connect the gas cylinder filled by the gas medium with a pressure-reducing valve to the glass flask.
6	Measure, before starting the exposure, the concentration of THT by gas chromatographic analysis.
7	Adjust, with the pressure-reducing valve, the gas stream such that a gentle flow of the gas medium passes through the glass flask. The rate of gas flow shall be such that the gas content of the flask will be renewed at least once a day.
8	Expose the test pieces at a temperature of (23 ± 2) °C to the gas medium for $(1\ 300\ ^{+72}_{-0})$ h.
9	Check, after the exposure time, the concentrations of THT by gas chromatographic analysis.
10	Disconnect the glass flask from the gas chamber and take the rings out of the beam channel(s).
11	Condition the rings for at least 1 h in ambient air.
12	Cut from each ring a segment from those locations with the maximum wall thickness (ε is 1 %), see Figure A.2. The length of the segments shall be approximately 20 mm.
13	Clamp the segments in the segment holder such that, when placed in the microtome apparatus, the longitudinal axis of the segment is parallel to the cutting direction.
14	Smooth and square the upper surface of the segment by cutting a couple of slices.
15	After this, cut slices with a thickness of $(7\ ^{+3}_{-1})$ µm, cutting a minimum of ten slices per segment, evenly divided over the total width of the segment. Re-sharpen the knife using leather after 20 slices have been cut.
16	From the slices, prepare microscope slides using the glass holder(s) and the contact liquid.
17	Examine the slides under the microscope and measure the depth of the crazes, when present.



a Movable.

Figure A.2 — Detail of segment

A.7 Requirement

In order for to be classified as resistant to gas constituents, no crazes of a depth greater than 30 μm shall be present.

NOTE Crazes of less than 30 μm are not regarded as stress corrosion initiation. It has been found that those crazes do not affect the impact resistance of the material.

Annex B
(normative)

Determination of resistance of pipes to external blows

B.1 Principle

A striker of a defined mass is launched from a defined height to determine the impact resistance of the pipe.

B.2 Testing and conditioning

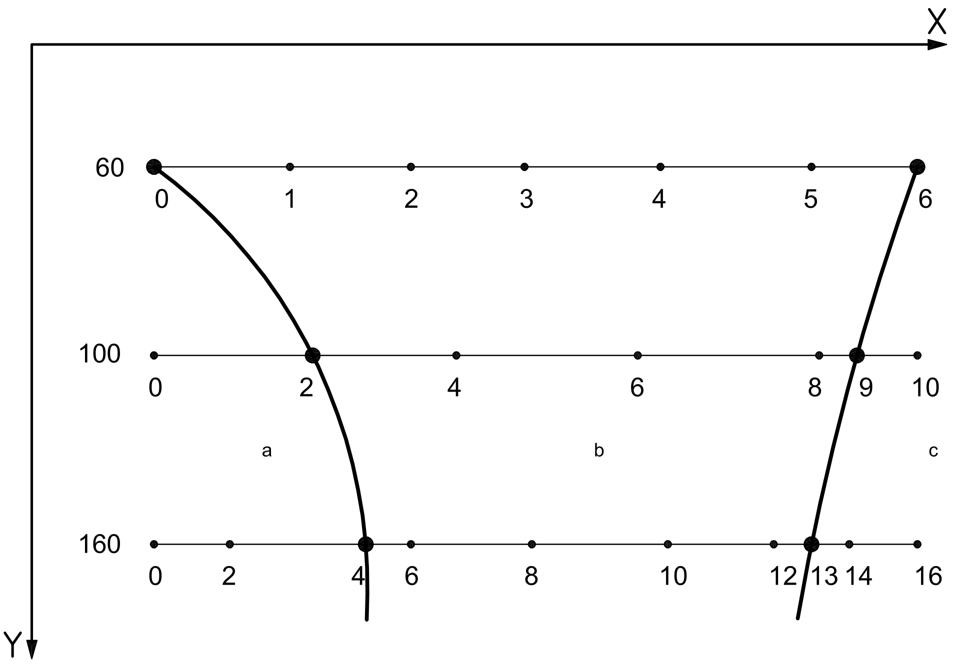
The test shall be carried out using apparatus and procedures in accordance with ISO 3127, with the exception of the striker nose. The nose of the striker shall be in the form of a hemisphere having a diameter of (25 ± 0,5) mm.

The test shall be carried out using test and conditioning temperatures according to 5.5 and 9.2, respectively.

A minimum of 60 blows shall be struck.

B.3 Interpretation of results

Figure B.1 gives the different areas for the number of failures in relation to the number of blows for which the tested lot with a confidence limit of 90 % has a true impact rate (TIR) smaller than 5 % or greater than 5 %, and the area in which no decision can be taken.



Key

X no. of fractured samples

Y total no. of blows

[a] Lot has TIR < 5 %.

[b] No decision can be taken in this area.

[c] Lot has TIR > 5 %.

Figure B.1 — Number of samples for determination of TIR of less than 5 % with 90 % confidence limit

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ICS 75.200; 83.140.30

Price based on 17 pages