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Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specifications —

Part 1:
Fittings for socket fusion using heated tools

Raccords en polyéthylène pour utilisation avec des tubes en polyéthylène pour la distribution de combustibles gazeux — Série métrique — Spécifications —

Partie 1: Raccords à emboîture à souder au moyen d'outils chauffés

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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 part of ISO 8085 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 8085-1 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*.

ISO 8085 consists of the following parts, under the general title *Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specifications*:

— *Part 1: Fittings for socket fusion using heated tools*

— *Part 2: Spigot fittings for butt fusion, for socket fusion using heated tools and for use with electrofusion fittings*

— *Part 3: Electrofusion fittings*

Annexes A, B and C form a normative part of this part of ISO 8085.

Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specifications —

Part 1:
Fittings for socket fusion using heated tools

1   Scope

This part of ISO 8085 specifies the requirements for polyethylene (PE) socket fusion fittings intended to be used with PE pipes and fittings for the supply of gaseous fuels.

In addition, it specifies some general properties of the material from which these fittings are made.

This part of ISO 8085 also lays down requirements for dimensions and performance of such fittings.

It is applicable to socket fusion fittings designed to be fusion-jointed to PE pipes conforming to ISO 4437, and to spigot fittings conforming to ISO 8085-2.

2   Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 8085. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 8085 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 3:1973, *Preferred numbers — Series of preferred numbers*

ISO 497:1973, *Guide to the choice of series of preferred numbers and of series containing more rounded values of preferred numbers*

ISO 1133:1997, *Plastics ⎯ Determination of the melt mass-flow rate (MFR) and the melt volume-flow rate (MVR) of thermoplastics*

ISO 1167:1996, *Thermoplastics pipes for the conveyance of fluids ⎯ Resistance to internal pressure ⎯ Test method*

ISO 1183 (all parts), *Plastics — Methods for determining the density of non-cellular plastics*

ISO 1872-1:1993, *Plastics ⎯ Polyethylene (PE) moulding and extrusion materials ⎯ Part 1: Designation system and basis for specifications*

ISO 3126:—[1], *Plastics piping systems — Plastics piping components — Measurement and determination of dimensions*

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1)   To be published. (Revision of ISO 3126:1974)

ISO 4437:1997, *Buried polyethylene (PE) pipes for the supply of gaseous fuels ⎯ Metric series ⎯ Specifications*

ISO 6964:1986, *Polyolefin pipes and fittings ⎯ Determination of carbon black content by calcination and pyrolysis — Test method and basic specification*

ISO 8085-2:2001, *Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels — Metric series — Specifications — Part 2: Spigot fittings for butt fusion, for socket fusion using heated tools and for use with electrofusion fittings*

ISO 8085-3:2001, *Polyethylene fittings for use with polyethylene pipes for the supply of gaseous fuels ⎯ Metric series ⎯ Specifications — Part 3: Electrofusion fittings*

ISO 9356:1989, *Polyolefin pipe assemblies with or without jointed fittings — Resistance to internal pressure — Test method*

ISO 9080:—[2], *Plastics piping and ducting systems — Determination of the long-term hydrostatic strength of thermoplastics materials in pipe form by extrapolation*

ISO/TR 10837:1991, *Determination of the thermal stability of polyethylene (PE) for use in gas pipes and fittings*

ISO/TS 10839:2000, *Polyethylene pipes and fittings for the supply of gaseous fuels ⎯ Code of practice for design, handling and installation*

ISO 12162:1995, *Thermoplastics materials for pipes and fittings for pressure applications ⎯ Classification and designation ⎯ Overall service (design) coefficient*

ISO 13477:1997, *Thermoplastics pipes for the conveyance of fluids ⎯ Determination of resistance to rapid crack propagation (RCP) ⎯ Small-scale steady-state test (S4 test)*

ISO 13478:1997, *Thermoplastics pipes for the conveyance of fluids ⎯ Determination of resistance to rapid crack propagation (RCP) ⎯ Full-scale test (FST)*

ISO 13479:1997, *Polyolefin pipes for the conveyance of fluids ⎯ Determination of resistance to crack propagation ⎯ Test method for slow crack growth on notched pipes (notch test)*

ISO 13951:2001, *Plastics piping systems — Test method for the resistance of polyolefin pipe/pipe or pipe/fitting assemblies to tensile loading*

ISO 18553:—[3], *Method for the assessment of pigment or carbon black dispersion in polyolefin pipes, fittings and compounds*

ASTM D 4019-94, *Standard Test Method for Moisture in Plastics by Coulometric Regeneration of Phosphorus Pentoxide*

3   Terms and definitions

For the purposes of this part of ISO 8085, the following terms and definitions apply.

3.1   Geometrical definitions

3.1.1
nominal diameter of a fitting
d_n
the nominal diameter of a fitting is taken as the nominal diameter of the corresponding pipe series

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2)   To be published. (Revision of ISO/TR 9080:1992)

3)   To be published. (Revision of ISO 11420:1996 and ISO 13949:1997)

3.1.2
nominal wall thickness of a fitting
e_n
the nominal wall thickness of a fitting is taken as the nominal wall thickness of the corresponding pipe series

3.1.3
mean inside diameter
arithmetic mean of at least two inside diameters measured at right angles to each other in transverse planes

3.1.4
out-of-roundness of a socket
maximum inside diameter minus the minimum inside diameter of the socket, measured in the same plane, parallel to the plane of the mouth

3.1.5
maximum out-of-roundness of a socket
greatest value of the out-of-roundness between the plane of the mouth and a plane separated from it by a distance L (the socket reference length)

3.1.6
socket taper
included angle at the vertex of the triangle corresponding to the longitudinal cross-section of a cone based on the mean socket-mouth diameter, the mean socket-root diameter and the reference length of the socket

3.1.7
standard dimension ratio of a fitting
SDR
the SDR value of a fitting is taken as being the same as that of the corresponding pipe series

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

3.1.8
wall thickness of a fitting
E
wall thickness at any point of the body of the fitting which could be subjected to the full stress induced by the pressure of the gas in the piping system

3.2   Material definitions

3.2.1
virgin material
thermoplastics material in a form such as granules or powder which has not been previously processed other than for compounding and to which no reprocessable or recyclable materials have been added

3.2.2
reprocessable material
thermoplastics material prepared from clean unused rejected pipes, fittings or valves, produced in a manufacturer's plant by a process such as injection-moulding or extrusion, which will be reprocessed in the same plant

NOTE   Such material may include trimmings from the production of such pipes, fittings and valves.

3.2.3
compound
homogenous mixture of base polymer (PE) and additives, e.g. anti-oxidants, pigments and UV-stabilizers, at concentrations necessary for the particular application

3

3.3 Definitions related to material characteristics

3.3.1
lower confidence limit
σ_{lcl}
quantity with the dimensions of stress, in megapascals, which can be considered as a property of the material and represents the 97,5 % lower confidence limit of the mean long-term hydrostatic strength at 20 °C for 50 years determined by pressurizing internally with water

3.3.2
overall service (design) coefficient
C
overall coefficient, with a value larger than 1,0, which takes into consideration service conditions as well as properties of the components of a piping system other than those represented in the lower confidence limit

NOTE   For gas applications, C can have any value equal to or greater than 2,0.

3.3.3
minimum required strength
MRS
the value of σ_{lcl} rounded down to the next lower value in the R 10 series when σ_{lcl} is less than 10 MPa, or to the next lower value in the R 20 series when σ_{lcl} is greater than or equal to 10 MPa

NOTE   The R 10 and R 20 series are the Renard number series as defined in ISO 3 and ISO 497.

3.3.4
melt mass-flow rate
MFR
value relating to the viscosity of molten thermoplastic material at a specified temperature and rate of shear

3.4 Definitions related to service conditions

3.4.1
gaseous fuel
any fuel which is in the gaseous state at a temperature of + 15 °C and a pressure of 1 bar[4)]

3.4.2
maximum operating pressure
MOP
maximum effective pressure of the gas in a piping system, expressed in bars, which is allowed in continuous use

NOTE   It takes into account the physical and the mechanical characteristics of the components of a piping system and is given by the equation:

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

4 Symbols

The dimensions and symbols used in this part of ISO 8085 are shown in Figure 1, where

D_1 is the mean inside diameter of the socket mouth, i.e. the mean diameter of the circle at the intersection of the extension of the socket with the plane of the socket mouth.

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4)   1 bar = 10^5 N/m^2 = 0,1 MPa

D_2 is the mean inside diameter of the socket root, i.e. the mean diameter of the circle in a plane parallel to the plane of the mouth and separated from it by a distance L which is the reference length of the socket.

D_3 is the minimum bore, i.e. the minimum diameter of the flow channel through the body of the fitting.

L is the reference socket length, i.e. the theoretical minimum socket length used for calculation purposes.

L_1 is the actual length of the socket from mouth to shoulder (if any).

L_2 is the heated length of the fitting, i.e. the length of penetration of the heated tool into the socket.

L_3 is the insertion depth, i.e. the depth of penetration of the heated pipe end into the socket.

NOTE L_3 is also the depth of the "depth gauge" tool used in normal socket fusion jointing practice.
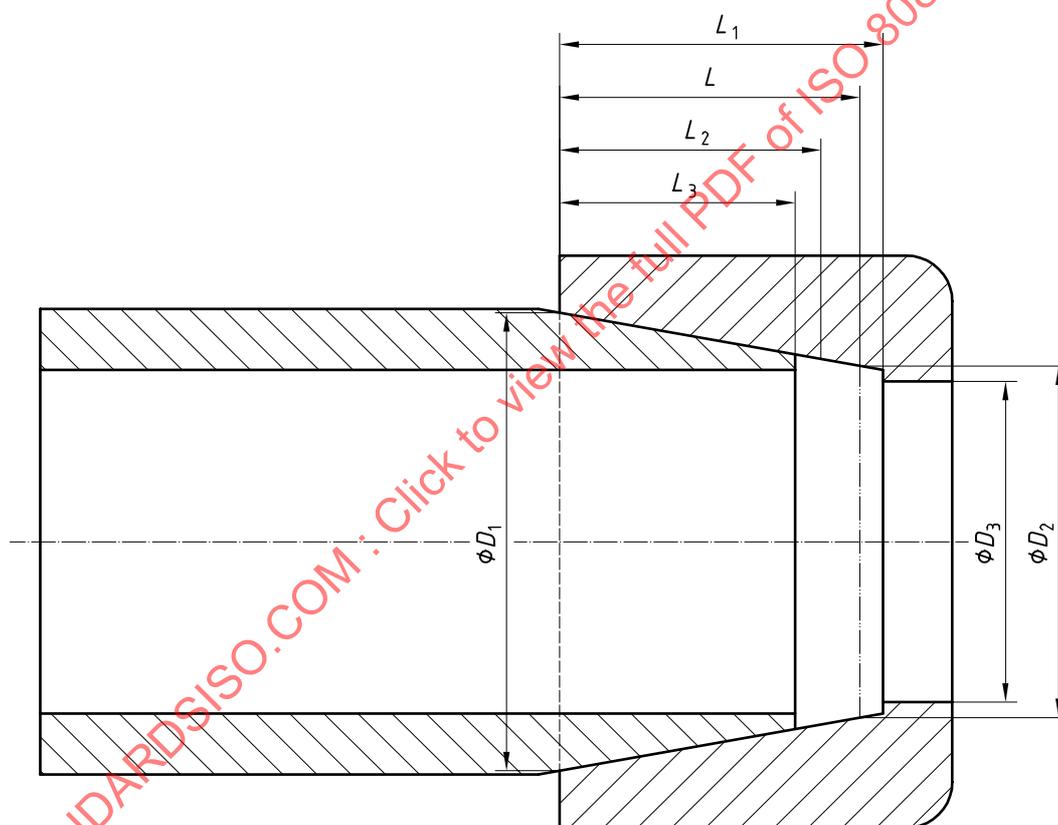

Figure 1 — Socket dimensions

5 Material

5.1 Technical data

The technical data referred to in Table 1 concerning the materials used shall be made available by the fitting manufacturer.

Any change in the choice of materials affecting the quality shall require fresh type-testing of the fitting in accordance with clause 8.

Table 1 — Characteristics of the PE compound [a]

Property	Units	Requirement	Test parameters	Test method
Density	kg/m^3	$\geqslant 930$ (base polymer)	23 °C	ISO 1183, ISO 1872-1
Melt mass-flow rate	g/10 min	$\pm$ 20 % of value declared by compound producer	190 °C/5 kg (set of conditions T)	ISO 1133:1997
Thermal stability	minutes	> 20	200 °C [b]	ISO/TR 10837
Volatile-matter content	mg/kg	$\leqslant 350$		ISO 4437:1997, annex A
Water content [c]	mg/kg	$\leqslant 300$		ASTM D 4019
Carbon black content [d]	% (m/m)	2,0 % to 2,5 %		ISO 6964
Carbon black dispersion [d]	grade	$\leqslant 3$		ISO 18553
Pigment dispersion [e]	grade	$\leqslant 3$		ISO 18553
Resistance to gas constituents	h	$\geqslant 20$	80 °C, 2 MPa	ISO 4437:1997, annex B
Resistance to rapid crack propagation (RCP): [f] Full-scale (FS) test: d_n > 250 mm or	MPa	The critical pressure in the FS test shall be greater than or equal to the value of the MOP of the system multiplied by 1,5	0 °C	ISO 13478
S4 test [g]	MPa	The critical pressure in the S4 test shall be greater than or equal to the value of the MOP of the system divided by 2,4, minus 0,72 (expressed in bars) [h]	0 °C	ISO 13477
Resistance to slow crack growth, e_n > 5 mm [f]	h	165	80 °C, 8,0 bar [i] 80 °C, 9,2 bar [j]	ISO 13479

[a] Non-black compounds shall conform to the weathering requirements of ISO 4437.

[b] Test may be carried out at 210 °C provided that there is a clear correlation with the results at 200 °C. In cases of dispute, the reference temperature shall be 200 °C.

[c] Only applicable if the compound does not conform to the requirement for volatile-matter content. In cases of dispute, the requirement for water content shall apply.

[d] For black compounds only.

[e] Pigment dispersion method for non-black compounds only.

[f] Only applicable to material in pipe form.

[g] Shall be performed on pipe with a wall thickness $\geqslant$ 15 mm.

[h] If this requirement is not met, then retesting using the full-scale (FS) test shall be performed (the calculation formula is still under study).

[i] Test parameters for PE 80, SDR 11.

[j] Test parameters for PE 100, SDR 11.

5.2   Compound

The compound from which the fitting is produced shall be polyethylene which shall be made by adding only those additives necessary for the manufacture and end use of fittings conforming to this specification and for their fusion jointing.

All additives shall be uniformly dispersed. The additives shall not have a negative influence on the performance with respect to fusability.

5.3 Reprocessable material

Only clean reprocessable material generated from a manufacturer's own production of fittings to this specification may be used, and it shall be derived from the same resin as used for the relevant production.

5.4 Characteristics of the compound

The fittings shall be made of

a) virgin material,

b) reprocessable material or

c) a combination of virgin and reprocessable material.

The PE compound from which the fitting is manufactured shall conform to the requirements given in Table 1.

5.5 Classification

PE compounds shall be classified by MRS as specified in Table 2.

Table 2 — Classification of PE compounds

Designation	σ_{lcl} (20 °C, 50 years, 97,5 %) MPa	**MRS** MPa
PE 80	$8,00 \leqslant \sigma_{lcl} \leqslant 9,99$	8,0
PE 100	$10,00 \leqslant \sigma_{lcl} \leqslant 11,19$	10,0

The classification shall be established by the producer of the compound using the ISO 9080 extrapolation method and stated in accordance with ISO 12162.

5.6 Compatibility

Conformity to clause 8 shall be established by the fitting manufacturer to ensure compatibility of the fittings with PE pipes conforming to ISO 4437. The PE pipe compound(s) used for this demonstration, the fusion condition(s) and the tooling shall be as detailed in the fitting manufacturer's technical file (see clause 10).

6 General requirements

6.1 Multiple connections

If a fitting includes one or more spigot ends, these shall conform to the relevant product standard.

6.2 Appearance of the fitting

When viewed without magnification, the internal and external surfaces shall be smooth, clean and free from scoring, cavities and other surface defects which might prevent conformity to this part of ISO 8085.

6.3 Appearance of the joint (factory-made)

When viewed without magnification, the internal and external surfaces of the pipe and fitting after fusion-jointing shall be free from melt exudation outside the confines of the fitting, apart from that which may be declared acceptable by the fitting manufacturer.

7 Geometrical characteristics

7.1 General

The dimensions of the fittings shall be measured, not less than 24 h after manufacture, in accordance with ISO 3126, after being conditioned for at least 4 h without any support for re-rounding of the fusion ends.

This part of ISO 8085 concerns only fittings and assemblies and is not concerned with heating-tool dimensions.

The fittings are designated by the nominal diameter of the socket, which corresponds to the nominal outside diameter d_n of the pipe with which they are to be used.

7.2 Socket dimensions

Fittings shall be classified by fusion type as follows:

Type A: Fittings intended for use with pipes having dimensions and tolerances as given in ISO 4437. No external peeling of the pipe shall be carried out. The measured value of D_1 shall be greater than or equal to that of D_2.

Type B: Fittings intended for use with pipes having dimensions and tolerances in accordance with ISO 4437, but with the outside surface of the pipe peeled in accordance with the manufacturer's instructions. The measured value of D_1 shall be greater than or equal to that of D_2.

Table 3 — Dimensions and tolerances for type A sockets

Dimensions in millimetres

Nominal inside diameter of socket d_n	Mean inside diameter				Ovality (for D_1 and D_2)	Reference length of socket L	Minimum bore D_3
	at socket mouth D_1		at distance L D_2				
	min.	max.	min.	max.	max.		
16	15,20	15,50	15,10	15,40	0,40	13,30	9,00
20	19,20	19,50	19,00	19,30	0,40	14,50	13,00
25	24,10	24,50	23,90	24,30	0,40	16,00	18,00
32	31,10	31,50	30,90	31,30	0,50	18,10	25,00
40	39,10	39,50	38,80	39,20	0,50	20,50	31,00
50	49,00	49,50	48,70	49,20	0,60	23,50	39,00
63	62,00	62,50	61,60	62,10	0,60	27,40	49,00
75	74,30	74,80	73,00	73,50	1,00	30,00	59,00
90	89,30	89,90	87,90	88,50	1,00	33,00	71,00
110	109,40	110,00	107,70	108,30	1,00	37,00	87,00
125	124,40	125,00	122,60	123,20	1,00	40,00	99,00

Table 4 — Dimensions and tolerances for type B sockets

Dimensions in millimetres

Nominal inside diameter of socket d_n	Mean inside diameter				Ovality (for D_1 and D_2) max.	Reference length of socket L	Minimum bore D_3
	at socket mouth D_1		at distance L D_2				
	min.	max.	min.	max.			
16	15,00	15,30	14,95	15,25	0,40	13,30	9,00
20	19,20	19,50	19,00	19,30	0,40	14,50	13,00
25	24,10	24,50	23,90	24,30	0,40	16,00	18,00
32	31,10	31,50	30,90	31,30	0,50	18,10	25,00
40	39,05	39,45	38,80	39,20	0,50	20,50	31,00
50	48,95	49,45	48,70	49,20	0,60	23,50	39,00
63	61,90	62,40	61,60	62,10	0,60	27,40	49,00
75	73,50	74,20	73,45	73,95	1,00	31,00	59,00
90	88,60	89,20	88,25	88,85	1,00	35,50	71,00
110	108,45	109,05	108,05	108,65	1,00	41,50	87,00
125	123,35	123,95	122,90	123,50	1,00	46,00	99,00

Formulae for calculating the equivalent dimensions of non-metric fitting series are given in annex A.

7.3 Wall thickness E of the fitting

7.3.1 General

Appropriate combinations of the wall thickness E of the fitting and of the minimum required strength MRS selected in accordance with 5.5 shall be used in the production of fittings conforming to this part of ISO 8085.

Fittings and associated fusion joints shall meet the requirements for mechanical characteristics given in 8.1 (Table 6).

Any changes in wall thickness inside the body of the fitting shall be gradual in order to prevent stress concentrations.

7.3.2 Relationship between fitting and pipe wall thickness

Fittings and associated fusion joints shall meet the performance requirements given in 8.2 (Table 8) or, alternatively, the wall thickness of the fitting E shall

a) be greater than or equal to the minimum wall thickness of the corresponding pipe e_{min} at every part of the fitting located at a distance beyond $2L_1/3$ from any entrance face of the fitting, when the fitting and the corresponding pipe are made from polyethylene with the same MRS classification;

b) conform to Table 5 when the fitting and the corresponding pipe are not made from polyethylene with the same MRS classification.

Table 5 — Relationship between fitting and pipe wall thickness

Pipe and fitting material		Relationship between fitting (E) and pipe (e_n) wall thickness
Pipe	**Fitting**	
PE 80	PE 100	$E \geqslant 0{,}8e_n$
PE 100	PE 80	$E \geqslant e_n/0{,}8$

7.4 Other dimensions

Other dimensions and dimensional characteristics appropriate to each manufacturer, such as the overall dimensions or mounting dimensions, shall be as specified in the manufacturer's technical file.

8 Mechanical characteristics

8.1 General

Fittings shall be tested using pipes which conform to ISO 4437. Test assemblies shall be assembled in accordance with the manufacturer's instructions.

When tested in accordance with the methods specified in Table 6, using the test parameters indicated, the fitting/pipe assemblies shall have mechanical characteristics conforming to the requirements given in Table 6.

Fusion-joint integrity shall be demonstrated by destructive testing.

NOTE   The test procedures described in ISO 8085-2 and ISO 8085-3 may be used as guidelines.

Table 6 — Mechanical properties

Property	Units	Requirement [a]	Test parameters		Test method
Hydrostatic strength at 20 °C	h	Failure time $\geqslant$ 100	End caps	Type a)	ISO 9356
			Orientation	Unimportant	
			Conditioning time	1 h	
			Type of test	Water-in-water	
			Pressure calculated to produce the following circumferential (hoop) stress:		
			PE 80 pipe	10 MPa	
			PE 100 pipe	12,4 MPa	
			Test temperature	20 °C	
Hydrostatic strength at 80 °C	h	Failure time $\geqslant$ 165	End caps	Type a)	ISO 9356
			Orientation	Unimportant	
			Conditioning time	12 h	
			Type of test	Water-in-water	
			Pressure calculated to produce the following circumferential (hoop) stress:		
			PE 80 pipe	4,6 MPa	
			PE 100 pipe	5,5 MPa	
			Test temperature	80 °C	
Hydrostatic strength at 80 °C	h	Failure time $\geqslant$ 1 000	End caps	Type a)	ISO 9356
			Orientation	Unimportant	
			Conditioning time	12 h	
			Type of test	Water-in-water	
			Pressure calculated to produce the following circumferential (hoop) stress:		
			PE 80 pipe	4 MPa	
			PE 100 pipe	5 MPa	
			Test temperature	80 °C	

[a] For the hydrostatic strength test at 80 °C, only brittle failures shall be taken into account. If ductile failure occurs before the required time, a lower stress shall be selected and the minimum test time shall be obtained from the line through the stress/time points given in Table 7.

Table 7 — Hydrostatic strength (80 °C) — Stress/minimum failure time correlation

PE 80		PE 100	
Stress	Minimum failure time	Stress	Minimum failure time
MPa	h	MPa	h
4,6	165	5,5	165
4,5	219	5,4	233
4,4	293	5,3	332
4,3	394	5,2	476
4,2	533	5,1	688
4,1	727	5,0	1 000
4,0	1 000	—	—

In the event of modification of the fusion-jointing parameters, the manufacturer shall ensure that the joint conforms to clause 8.

8.2 Relationship between fitting and pipe wall thickness

The performance requirements specified in 7.3.2 shall be verified by the tests given in Table 8.

Table 8 — Performance requirements

Property	Units	Requirement	Test parameters		Test method

Short-term internal-pressure resistance	bar	Failure pressure shall be greater than pressure equivalent of 2,00 × MRS calculated for thickest-walled pipe for which fitting has been designed	End caps
			Orientation
			Conditioning time
			Type of test
			Minimum pressure:
			  PE 80 pipe, SDR 11
			  PE 100 pipe, SDR 11
			Pressure increase rate
			Test temperature
				Type a)
				Unimportant
				12 h
				Water-in-water
				
				32 bar
				40 bar
				5 bar/min
				20 °C
					Annex B

Resistance to tensile load	—	Minimum elongation shall be 25 % before pipe yields	Test temperature	23 °C	Annex C

9 Physical characteristics

When determined in accordance with the methods specified in Table 9, using the test parameters indicated, the physical characteristics of the fittings shall conform to the requirements given in Table 9.

Table 9 — Physical characteristics of fittings

Characteristic	Units	Requirement	Test parameters	Test method
Thermal stability	minutes	> 20	200 °C [a]	ISO/TR 10837
Melt mass-flow rate (MFR)	g/10 min	The MFR of the material of the manufactured fitting shall not differ by more than ± 20 % from the MFR of the batch compound from which the fitting was manufactured	190 °C/5 kg (set of conditions T)	ISO 1133
[a] The test may be carried out at 210 °C provided that there is a clear correlation with the results at 200 °C. In cases of dispute, the reference temperature shall be 200 °C.				

10 Technical file

The manufacturer of the fittings shall ensure the availability of a technical file (generally confidential) containing all relevant data necessary to prove the conformity of the fittings to this part of ISO 8085. The file shall include all results of type-testing and shall conform to the relevant publicly available technical brochure. It shall also include all data necessary to implement a traceability system where required.

The manufacturer's technical file shall include at least the following information:

a) conditions of use (pipe and fitting temperature limits, SDRs and out-of-roundness);

b) dimensions;

c) assembly instructions;

d) required fusion-jointing equipment;

e) fusion-jointing instructions (fusion-jointing parameters with limits).

If applicable, the fact that the production site is certified to e.g. ISO 9001 or ISO 9002 shall also be stated in the technical file.

11 Marking

11.1 General

Unless otherwise specified in Table 10, the marking elements shall be printed or formed directly on the fitting in such a way that, after storage, handling and installation in accordance with ISO/TS 10839, legibility is maintained.

NOTE   The manufacturer is not responsible for marking being illegible due to actions caused during installation and use such as painting, scratching, covering of the components or using detergents on the components unless agreed to or specified by the manufacturer.

Marking shall not initiate cracks or other types of defect which adversely influence the performance of the fitting.

If printing is used, the colour of the printed information shall differ from the basic colour of the fitting.

The size of the markings shall be such that they are legible without magnification.

11.2 Minimum required markings

The minimum required markings are specified in Table 10.

Table 10 — Minimum required markings

Item	Marking
Reference to this part of ISO 8085 [a]	ISO 8085-1
Manufacturer's name and/or trademark [b]	Name or symbol
Nominal diameter(s) d_n of pipe(s) to which fitting is intended to be jointed	e.g. 110
Material and designation	e.g. PE 80
Applicable pipe series	SDR (e.g. SDR 11 and/or SDR 17,6) or SDR range
Manufacturing information [b]	— the production period (year and month in figures or in code); — name or code for production site if manufacturer produces at different sites, nationally and/or internationally.
Fluid to be conveyed [a]	Gas

[a]	This information may be printed on a label associated with the fitting or on the bag containing an individual fitting.
[b]	To provide traceability.

11.3 Additional marking

Additional information relative to the fusion-jointing conditions, e.g. fusion and cooling time, may be given on a label which may be attached to a fitting or may be separate from the fitting.

12 Packaging

The fittings shall be packaged in bulk or individually protected where necessary in order to prevent deterioration. Whenever possible, they shall be placed in individual bags in cardboard boxes or cartons.

The boxes or cartons and/or the individual bags shall bear at least one label with the manufacturer's name, the type of part, the dimensions of the part, the number of units in the box or carton, and any special storage conditions and storage time limits.

Annex A
(normative)

Formulae for calculating the equivalent dimensions of non-metric fitting series

A.1 Mean inside diameter D_1 of type A fittings

The minimum value of the mean inside diameter at the socket mouth, D_1, is given by

$D_1 = 0,996 \times d_n - 0,76$ mm   for 16 mm $\leqslant d_n <$ 75 mm;

$D_1 = 1,002 \times d_n - 0,85$ mm   for 75 mm $\leqslant d_n \leqslant$ 125 mm.

The maximum value of the mean inside diameter at the socket mouth, D_1, is given by

$D_1 = 1,000 \times d_n - 0,50$ mm   for 16 mm $\leqslant d_n <$ 75 mm;

$D_1 = 1,004 \times d_n - 0,49$ mm   for 75 mm $\leqslant d_n \leqslant$ 125 mm.

The minimum value of the mean inside diameter at distance L, D_2, is given by

$D_2 = 0,980 \times d_n - 0,60$ mm   for 16 mm $\leqslant d_n <$ 32 mm;

$D_2 = 0,990 \times d_n - 0,80$ mm   for 32 mm $\leqslant d_n <$ 75 mm;

$D_2 = 0,992 \times d_n - 1,40$ mm   for 75 mm $\leqslant d_n \leqslant$ 125 mm.

The maximum value of the mean inside diameter at distance L, D_2, is given by

$D_2 = 0,995 \times d_n - 0,56$ mm   for 16 mm $\leqslant d_n <$ 75 mm;

$D_2 = 0,994 \times d_n - 1,01$ mm   for 75 mm $\leqslant d_n \leqslant$ 125 mm.

All results shall be rounded to the nearest tenth of a millimetre.

A.2 Mean inside diameter D_1 of type B fittings

The minimum value of the mean inside diameter at the socket mouth, D_1, is given by

$D_1 = 15,000$ mm   for $d_n <$ 20 mm;

$D_1 = 0,980 \times d_n - 0,40$ mm   for 20 mm $\leqslant d_n <$ 32 mm;

$D_1 = 0,990 \times d_n - 0,57$ mm   for 32 mm $\leqslant d_n <$ 63 mm;

$D_1 = 0,970 \times d_n + 0,77$ mm   for 63 mm $\leqslant d_n <$ 90 mm;

$D_1 = 0,993 \times d_n - 0,77$ mm   for 90 mm $\leqslant d_n \leqslant$ 125 mm.

The maximum value of the mean inside diameter at the socket mouth, D_1, is given by

D_1 = 15,300 mm   for $d_n < 20$ mm;

$D_1 = 0,998 \times d_n - 0,45$ mm   for 20 mm $\leqslant d_n < 63$ mm;

$D_1 = 0,983 \times d_n + 0,45$ mm   for 63 mm $\leqslant d_n < 90$ mm;

$D_1 = 0,993 \times d_n - 0,16$ mm   for 90 mm $\leqslant d_n \leqslant 125$ mm.

The minimum value of the mean inside diameter at distance L, D_2, is given by

D_2 = 14,950 mm   for $d_n < 20$ mm;

$D_2 = 0,980 \times d_n - 0,60$ mm   for 20 mm $\leqslant d_n < 32$ mm;

$D_2 = 0,990 \times d_n - 0,79$ mm   for 32 mm $\leqslant d_n < 75$ mm;

$D_2 = 0,989 \times d_n - 0,75$ mm   for 75 mm $\leqslant d_n \leqslant 125$ mm.

The maximum value of the mean inside diameter at distance L, D_2, is given by

D_2 = 15,250 mm   for $d_n < 20$ mm;

$D_2 = 1,000 \times d_n - 0,70$ mm   for 20 mm $\leqslant d_n < 40$ mm;

$D_2 = 1,000 \times d_n - 0,80$ mm   for 40 mm $\leqslant d_n < 63$ mm;

$D_2 = 0,991 \times d_n - 0,355$ mm   for 63 mm $\leqslant d_n \leqslant 125$ mm.

All results shall be rounded to the nearest twentieth of a millimetre.

A.3 Out-of-roundness

The maximum value of the out-of-roundness at the socket mouth and of the out-of-roundness of the socket at distance L, Δd_e, is given by

$\Delta d_e = 0,4$ mm   for 16 mm $\leqslant d_n < 32$ mm;

$\Delta d_e = 0,5$ mm   for 32 mm $\leqslant d_n < 50$ mm;

$\Delta d_e = 0,6$ mm   for 50 mm $\leqslant d_n < 75$ mm;

$\Delta d_e = 1,0$ mm   for 75 mm $\leqslant d_n \leqslant 125$ mm.

All results shall be rounded up to the nearest tenth of a millimetre.

A.4 Reference length L of socket

The reference length L of the socket of type A fittings is given by

$L = 0,3 \times d_n + 8,5$ mm   for 16 mm $\leqslant d_n < 75$ mm;