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HG/T 3691-2012
In lieu of HG/T 3691-2001

Steel Mesh Reinforced Polyethylene (PE) Pipe Fittings for Industry

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Contents

Foreword

This standard is prepared in accordance with GB/T 1.1-2009.

This standard is in lieu of *Steel Mesh Reinforced Polyethylene (PE) Pipe Fittings for Industry* (HG/T 3691-2001) and has the following technical changes:

- The fitting of the specification of DN600 is added (refer to Annex A, Annex B, Annex C, Annex D and Annex E);
- The fitting types of flange fitting, elbow and reducing fitting are added (refer to Annex B, Annex C, Annex D and Annex E);
- "Sealing performance test" is deleted as it is repetitive to "short-term hydrostatic strength" (refer to Article 6.5);
- The structure of the tables in the Annexes are simplified and improved as per the fitting specifications, types and nominal pressure levels, etc. (refer to Annex A, Annex B, Annex C, Annex D and Annex E).

Annex A, Annex B, Annex C, Annex D and Annex E of this standard are all normative annexes.

This standard is proposed by China Petroleum and Chemical Industry Federation.

This standard is under centralized management of Technical Committee on Non-metal Chemical Equipment of Standardization Administration of the People's Republic of China (SAC/TC162).

This standard is prepared by China Chemical Standardization Institute, Huachuang Tianyuan Industrial Developing Co., Ltd., and Harbin Starway Machinery Manufacturing Co., Ltd.

This standard is mainly drafted by Li Peng, Liu Jishui, Tao Huafeng, Niu Mingchang, Mei Jian, Wang Xiaobing, and Zhou Wei.

This standard is initially published in January, 2002, and this is the first revision.

Steel Mesh Reinforced Polyethylene (PE) Pipe Fittings for Industry

1 Scope

This standard specifies the raw materials, basic performance, requirements, test procedures, inspection regulations, marking, packing, transportation and storage for steel mesh reinforced polyethylene (PE) pipe fittings for industry (hereinafter referred to as "fittings" or "fitting").

This standard applies to fittings that are injection molded with polyethylene and prefabricated reinforcing mesh of punched steel plate, and can be used in petroleum, chemical, pharmacy, metallurgical, mining, ship building, municipal construction and food industries, etc. The temperature range of the media conveyed by the fittings is from 0□ to 70□.

2 Normative References

The following documents are essential for the application of this document. For the references with specified dates, only the editions of the specified dates are applicable to this document; for the references without specified dates, the latest editions (including all the lists of revisions) are applicable to this document.

GB/T 709-2006 *Dimension, Shape, Weight and Tolerances for Hot-rolled Steel Plates and Sheets*

GB/T 1033.1-2008 *Plastics—Methods for Determining the Density of Non-cellular Plastics—Part 1: Immersion Method, Liquid Pyknometer Method and Titration Method*

GB/T 2828.1-2003 *Sampling Procedures for Inspection by Attributes—Part1: Sampling Schemes Indexed by Acceptance Quality Limit (AQL) for Lot-by-lot Inspection*

GB/T 2918-1998 *Plastics—Standard Atmospheres for Conditioning and Testing*

GB/T 6111-2003 *Thermoplastics Pipes for the Conveyance of Fluids—Resistance to Internal Pressure—Test Method*

GB/T 6283-2008 *Chemical Products—Determination of Water—Karlf Ischer Method (General Method)*

GB/T 8806-2008 *Plastics Piping Systems - Plastics Components - Determination of Dimensions*

GB/T 13021-1991 *Determination for the Carbon Black Content of Polyethylene Pipes and Fittings by Calcination and Pyrolysis*

GB 15558.1-2003 *Buried Polyethylene (PE) Piping Systems for the Supply of Gaseous Fuels—Part 1: Pipes*

GB/T 17391-1998 *Test method for Thermal Stability of Polyethylene Pipes and Fittings*

HG-T 3690-2012 *Steel Mesh Reinforced Polyethylene (PE) Pipe Fittings for Industry*

3 Terms and Definitions

For purposes of this standard, the following terms and definitions apply:

Nominal pressure

PN

The maximum allowable operating pressure of the fitting at 20□ for the conveyance of water, in MPa

4 Raw Materials

4.1 Polyethylene

4.1.1 Special Polyethylene Material

Polyethylene for making fittings must be the same as the raw material specified in HG/T 3690-2012, the basic performance of which shall meet the regulations in Table 1.

Table 1: Basic Performance of Special Polyethylene Material

Item	Performance requirement
Density/ (kg/m^3)	≥930
Moisture content/ (mg/kg)	<300
Volatile content/ (mg/kg)	<350
Carbon black content/ %	2.0~2.5
Thermal stability (200□)/ min	>20
ESCR (environmental stress cracking resistance) (100℃, 100%, F_0)/ h	≥1 000
Resistance to gas composition (80□, 2 MPa)/ h	≥30
Long term hydrostatic strength (20□, 50 years, 95%)/ MPa	≥8.0
Note: the carbon black content is only applicable to black pipes, and the resistance to gas composition is only applicable to fuel gas pipes.	

4.1.2 Recyclable Polyethylene Material

The clean excess material generated during production of pipes according to this standard and the scraps of commissioning and cutting processes can be recycled into fresh materials as per a proportion of not more than 5% after being crushed and re-prilled to produce fittings meeting the requirements of this standard.

4.2 Steel Mesh

4.2.1 Low Carbon Steel Plate

The low carbon steel plate for making the steel mesh shall be in accordance with the requirements for common low carbon thin steel plates in GB/T 709-2006.

4.2.2 Surface Coating

The surface of the steel mesh shall be smooth without dirt like oil stain and dust accumulation. Suitable surface treatment measures shall be taken to prevent rust.

5 Basic Performance

5.1 Fitting Series

5.1.1 The fittings are classified into different series as per the structure types, i.e. elbow, tee, reducing fitting, flange fitting and electro fusion coupler series, etc.

5.1.2 Based on the requirement of connection, the end structure can be flange joint type (code F), electro fusion socket type (code C) and spigot type (plain end or coned end type, code D), etc.

5.1.3 Change of the nominal pressure of the fitting is realized by changing the design of the embedded steel mesh instead of changing the uniform installation dimensions of the fitting.

5.1.4 When flange connection is used, the flange connection dimensions shall be in accordance with the corresponding flange standards.

5.2 Electro Fusion Couplers

5.2.1 The electro fusion couplers are coupler type connection fittings with two sockets on the same axis and resistance wire embedded on the inner wall of the sockets. According to the structural differences of the sockets at the two ends, the sockets are classified into plain electro fusion couplers and transition electro fusion couplers.

5.2.2 The plain electro fusion couplers have uniform socket structure at the two ends, while the transition electro fusion couplers have different socket structure or dimensions at the two ends. There are plain end and coned end transition electro fusion and reducer transition electro fusion.

5.2.3 The structure and dimensions of the sockets of the electro fusion couplers shall match with the plugging ends of the corresponding pipes. The wall thickness and mesh strength shall not be less than those of the corresponding pipes.

5.2.4 If the conveyed media have low temperature and pressure, purely plastic electro fusion couplers can be used on the premise of meeting requirements of corresponding design codes.

5.2.5 Refer to Annex A for the structure and basic parameters of the electro fusion couplers.

5.3 Elbows

5.3.1 There are four standard elbow angles, 11.25°, 22.5°, 45°and 90°. Based on the requirement of connection, the two ends of the elbow fittings can be of flange joint structure, plain end structure or coned end structure.

5.3.2 The processing type of the ends of the elbows is shown by the combination of the two letters reflecting the types of structure of the two ends, e.g. “DF”.

5.3.3 Refer to Annex B for the structure and basic parameters of 45°and 90°elbow fittings. 11.25°and 22.5°elbows have similar structure with 45°elbow.

5.4 Tees

5.4.1 There are two types of tee fittings, equal tee and reducing tee fittings. Based on the requirement of connection, the three ends can be of flange joint structure, plain end structure or coned end structure.

5.4.2 The processing type of the tees is shown by the codes of structure of the three ends in sequence, e.g. “DFD”. The code in the middle refers to the structure type of the branch end.

5.4.3 Refer to Annex C for the structure and basic parameters of the tee fittings.

5.5 Flange Fittings

5.5.1 There are two types of flange fittings, electro fusion socket flange fittings with embedded resistance wire and plain spigot flange fittings without resistance wire.

5.5.2 The flange fittings are used along with backpressure type flange plates. The flange connection dimensions shall be in accordance with the corresponding standards.

5.5.3 Refer to Annex D for the structure and basic parameters of the flange fittings.

5.6 Reducers

5.6.1 According to the fabrication process, the reducers can be classified into two types, one-time molded type and secondarily processed and molded type after being wound with blanks.

5.6.2 Based on the requirement of connection, the two ends of the reducers can be processed to electro fusion connection or flange connection types. The connection dimensions are the same as those of the ends of the corresponding pipes.

5.6.3 The processing type of the ends of the reducers is shown by the combination of the two letters reflecting the types of structure of the two ends, e.g. “DF”, in which the letter for the big end comes first.

5.6.4 Refer to Annex E for the specifications of common reducers.

5.7 Temperature Correction to Nominal Pressure

5.7.1 Temperature Correction Coefficient

The nominal pressure shall be corrected for the fitting conveying media above 20□. The correction method is to multiple the nominal pressure at 20□ by the corresponding temperature correction coefficient specified in Table 2.

Table 2: Temperature Correction Coefficient for Nominal Pressure

Temperature t/□	0＜t≤20	20＜t≤30	30＜t≤40	40＜t≤50	50＜t≤60	60＜t≤70
Correction coefficient	1.00	0.95	0.90	0.86	0.81	0.76

5.7.2 Nominal Pressure Correction Method for the Conveyance of Special Media

5.7.2.1 In case the media conveyed by the pipe have chemical actions to the polyethylene material, such as corrosion and oxidization, refer to the chemical corrosive properties of the media and determine the reduction coefficient accordingly.

5.7.2.2 The conveyance of special hazardous media must be in accordance with relevant laws and regulations.

6 Requirements

6.1 Color

The color of the fitting is usually black, but it can also be determined by the Supplier and the Client through discussion based on the uses of the fitting.

6.2 Appearance

6.2.1 The inner surface of the fitting shall be smooth, and the outer surface shall be in the state of natural contraction. The inner and outer surfaces shall be free from air bubbles, cracks, obvious scratches or decomposition decoloration lines. The end of the fitting shall be smooth, the seal grooves shall be smooth inside without burr, and the edges shall be in good shape.

6.2.2 The resistance wire in the electro fusion coupler shall be evenly distributed and firmly fixed, and the wiring terminals shall be firm and secure.

6.3 Specifications, Dimensions and Dimensional Deviations

Refer to Annex A, Annex B, Annex C, Annex D and Annex E respectively for the specifications, dimensions and dimensional tolerances of the electro fusion coupler, elbow, tee, flange fitting and reducing fitting.

6.4 Roundness

The roundness deviation of the fitting shall not exceed 0.05DN.

6.5 Physical and Mechanical Performance

The physical and mechanical performance of the fitting shall be in accordance with Table 3.

Table 3: Physical and Mechanical Performance

Sn.	Item		Performance requirement	Test method
1	Short-term hydrostatic strength test	Temperature: 20℃; test duration: 1h; test pressure: 1.5 times the nominal pressure	Without cracking or leakage	Refer to 7.11
		Temperature: 70℃; test duration: 165h; test pressure: 1.5×0.76 times the nominal pressure		
2	Burst strength test	Temperature: 20℃; pressure rise till the fitting bursts within 60s-70s	The burst pressure is not lower than 3 times the nominal pressure	Refer to 7.11

6.6 Resistance of Electro Fusion Fitting

The resistance of the electro fusion fitting shall not exceed ±10% of the design value.

7 Test Procedures

7.1 Standard Atmospheres for Conditioning and Testing

The standard atmospheres for conditioning and testing shall be in accordance with GB/T 2918-1998. The temperature is (23±2)□, and the conditioning duration is not less than 24h.

7.2 Appearance Inspection

The appearance can be visually inspected, and the inner wall can be observed with the help of a light source.

7.3 Determination of Geometric Dimensions

7.3.1 Fitting Length

Measure the length of the fitting using the measuring tool with a precision within 1mm.

7.3.2 Inner and Outer Diameters

Measure the inner and outer diameters of the fitting in accordance with GB/T 8806-2008.

7.3.3 Other Dimensions

Measure the other dimensions using the measuring tool with a precision within 0.02mm.

7.4 Determination of Roundness

Measure the maximum and minimum inner diameters on the same section using the measuring tool with a precision within 1mm. The difference between the two diameters is the roundness deviation of the fitting.

7.5 Determination of Density

The density shall be in accordance with GB/T 1033.1-2008.

7.6 Determination of Moisture Content

Determine the moisture content in accordance with GB/T 6283-2008. The samples are not subject to conditioning.

7.7 Determination of Volatile Content

Determine the volatile content in accordance with Annex C in GB 15558.1-2003.

7.8 Determination of Carbon Black Content

Determine the carbon black content in accordance with GB/T 13021-1991.

7.9 Thermal Stability Test

Determine the thermal stability in accordance with GB/T 17391-1998.

7.10 Test of Resistance to Gas Composition

Determine the resistance to gas composition in accordance with Annex D in GB 15558.1-2003.

7.11 Determination of Physical and Mechanical Performance

7.11.1 Conduct short-term hydrostatic strength test and burst strength test in accordance with GB/T 6111-2003.

7.11.2 Indicate the performance of the fitting by means of the performance of the assembly. For example, the connection method of the assembly of 45°elbow is as shown in Figure 1.

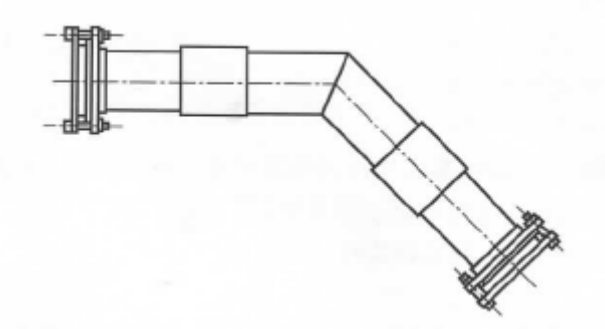


Figure 1

7.12 Measurement of Resistance

Measure the resistance using double bridge or small current resistance tester, and correct it to the standard design temperature by means of resistance wire temperature– resistivity coefficient.

8 Inspection Regulations

8.1 General

The fittings can be delivered only after passing inspection by the quality inspection department of the manufacturer and shall be provided with Quality Certificate.

8.2 Types of Inspection

There are delivery inspection and type inspection.

8.3 Delivery Inspection

8.3.1 Items of Delivery Inspection

The items of delivery inspection include what is specified in Articles 6.1, 6.2, 6.3, 6.4, 6.6 and short-term hydrostatic strength test at 20□specified in Article 6.5.

8.3.2 Batch Sampling

The fittings with the same specifications produced with the same raw materials, formula and process are considered as the same batch. Each batch has a quantity of not more than 1200 pieces, and if it does not reach 1200 pieces within the production period of 30d, the yield within these 30d is taken as one batch. Conduct sampling in accordance with GB/T 2828.1-2003. The normal inspection primary sampling scheme is employed with the general inspection level 1L=I and acceptance quality limit AQL=6.5. Refer to Table 4 for the sampling scheme.

Table 4: Sampling Scheme

Unit: piece

Range of batch *N*	Sample size *n*	Acceptance number A_C	Rejection number R_e
≤150	8	1	2
151~280	13	2	3
281~500	20	3	4
501~1200	32	5	6
1201~3200	50	7	8
3201~10000	80	10	11

8.3.3 Determination Criteria

Take sufficient samples randomly from the qualified products of sampling inspection by attributes, and conduct short-term hydrostatic strength test at 20□ as specified in Article 6.5. If disqualified products are found, take samples again of twice the number and conduct the tests again. If there are still disqualified ones, the batch is determined as disqualified.

8.4 Type Inspection

8.4.1 Items of Type Inspection

The items of type inspection include all the items specified in this standard.

8.4.2 Preconditions for Type Inspection

Type inspection shall be conducted in case of any of the following:

a) Major changes in raw materials and process, which may affect the performance of the products;

b) At least once in a year during normal production;

c) Resumption of production after more than six months' suspension;

d) Big differences between the results of delivery inspection and the last type inspection;

e) Request for type inspection by the national quality supervision authorities.

8.4.3 Sampling and Determination

Determine the items in Articles 6.2, 6.3, 6.4 and 6.5 in accordance with Table 4. If one item in Article 6.5 fails to reach the requirement, take samples randomly of twice the number to test again. If there is still any disqualified item, the batch is determined as disqualified.

9 Marking, Packing, Transportation and Storage

9.1 Marking

The fittings shall be marked with the following information either on the fittings or on the tags. Marks on the products shall not weaken the performance of the fittings.

a) Name of manufacturer or trademark;

b) Number of the standard employed;

c) Type, specifications and nominal pressure;

d) Date of production or batch number;

e) Quality Certificate;

f) Other requirements of the User.

9.2 Packing

The fittings shall be provided with suitable protective packing to prevent damages and shall be provided with Quality Certificate from the quality inspection department.

9.3 Transportation

During transportation, the fittings shall not be subject to severe impact and shall not be scratched, thrown, or exposed to sunshine, rain or pollution.

9.4 Storage

9.4.1 The fittings shall be stored in storages with a temperature of generally not more than 40□, away from heat sources with leveled ground and good ventilation.

9.4.2 The storage period of the electro fusion fittings is preferred to be not longer than 2 years. If the storage period is too long, the resistance shall be checked again before delivery to see whether it meets the technical requirement.

Annex A

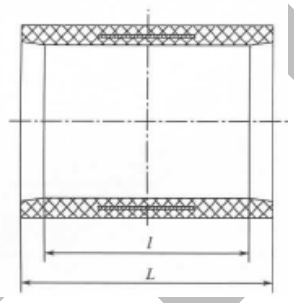
(Normative Annex)

Electro Fusion Coupler Structure and Basic Parameters

A.1 Electro Fusion Couplers with Two Ends Matching with Plain End Pipes

Refer to Table A.1 for the structure and basic parameters of the electro fusion couplers with the two ends matching with the plain end pipes.

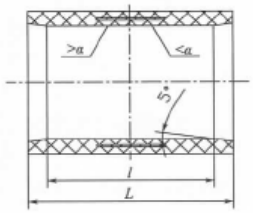
Table A.1: Structure and Basic Parameters of Electro Fusion Couplers with Two Ends Matching with Plain End Pipes

Name	Schematic	Nominal inner diameter of matching pipe *DN* / mm	Inner diameter and deviation of fusion area / mm	Minimum length of fusion area l / mm	Minimum length of coupler L / mm	Nominal pressure *PN* / MPa
Common plain end electro fusion coupler		50	$71_{0}^{+0.50}$	110	140	2.5
						4.0
		65	$86_{0}^{+0.50}$	110	140	2.5
						4.0
		80	$103_{0}^{+0.50}$	110	160	2.5
						4.0
		100	$123_{0}^{+0.50}$	140	170	1.6
						2.5
						4.0
		125	$148_{0}^{+0.60}$	160	190	1.6
						2.5
						4.0
		150	$173_{0}^{+0.70}$	180	210	1.6
						2.5
						4.0
		200	$224_{0}^{+0.80}$	200	230	1.0
						1.6
						2.0
		250	$274_{0}^{+0.80}$	220	250	1.0
						1.6
						2.0
		300	$324_{0}^{+0.80}$	260	290	1.0
						1.6
						2.0
		600	$641_{0}^{+1.0}$	470	500	1.0
						1.6
Note: the embedded meshes of the electro fusion couplers with the same specifications but different pressure levels have different thicknesses, materials or structures, but have the same basic connection dimensions.						

A.2 Electro Fusion Couplers with Two Ends Matching with Coned End Pipes

Refer to Table A.2 for the structure and basic parameters of the electro fusion couplers with the two ends matching with the coned end pipes.

Table A.2: Structure and Basic Parameters of Electro Fusion Couplers with Two Ends Matching with Coned End Pipes

Name	Schematic	Nominal inner diameter of matching pipe *DN* / mm	Inner diameter and deviation of fusion area / mm	L / mm	Nominal pressure *PN* / MPa	α
Common coned end electro fusion coupler		50	$75^{-0.3}_{-1.3}$	200	2.5	30’
					4.0	
		65	$89^{-0.3}_{-1.3}$	200	2.5	30’
					4.0	
		80	$104^{-0.3}_{-1.3}$	200	2.5	30’
					4.0	
		100	$125^{-0.3}_{-1.3}$	200	2.5	30’
					4.0	
		125	$152^{-0.3}_{-1.3}$	200	2.5	30’
					4.0	
		150	182±0.5	220	1.6	30’
					2.5	
					4.0	
		200	234±0.5	240	1.0	30’
					1.6	
					2.0	
		250	284±0.5	260	1.0	30’
					1.6	
					2.0	
		300	334±0.5	300	1.0	1°
					1.6	
					2.0	
		350	390±0.5	320	1.0	1°
					1.6	
					2.0	
		400	440±0.5	340	1.0	1°
					1.6	
					2.0	
		450	492±0.5	360	1.0	1°
					1.6	
					2.0	
		550	542±0.5	380	1.0	1°
					1.6	
					2.0	
Note: the embedded meshes of the electro fusion couplers with the same specifications but different pressure levels have different thicknesses, materials or structures, but have the same basic connection dimensions.						

A.3 Transition Electro Fusion Couplers

A.3.1 The transition electro fusion couplers have different socket structures or dimensions at the two ends. The type with one plain end and one coned end is called plain end and coned end transition electro fusion, plain-coned transition electro fusion, or emergency electro fusion; the type with the sockets at the two ends matching with the pipes with different nominal inner diameters is called reducing transition electro fusion, or reducing electro fusion.

A.3.2 The sockets of the transition electro fusion shall match with the structures of the ends of the corresponding pipes, and the basic parameters shall be uniform with the corresponding specifications in Table A.1 and Table A.2.

Annex B

(Normative Annex)

Elbow Fitting Structure and Basic Parameters

B.1 90° Elbow Fitting Structure and Basic Parameters

Refer to Figure B.1 and Table B.1 for the structure and basic parameters of 90° elbow fittings.

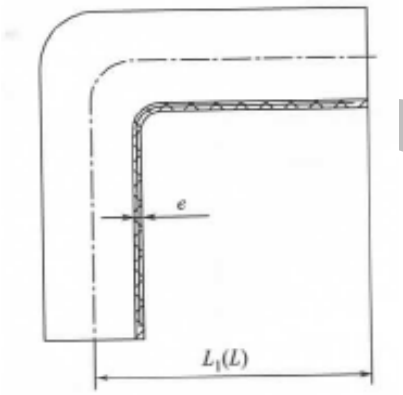


Figure B.1: 90° Elbow Fitting Structure

Table B.1: 90° Elbow Fitting Basic Parameters

Nominal inner diameter *DN* /mm	Nominal presssure *PN*/ MPa					L_1 / mm	
	1.0	1.6	2.0	2.5	4.0		
	Nominal wall thickness *e* and limit deviation / mm					I	II
50	—	—	—	9.5±0.5	11.0±0.5	150	185
65	—	—	—	9.5±0.5	11.0±0.5	160	195
80	—	—	—	9.5±0.5	11.5±0.6	180	205
100	—	9.5±0.5	9.5±0.6	11.5±0.6	12.0±1.0	190	220
125	—	11.0±0.7	11.0±0.7	12.0±0.7	12.5±1.2	200	235
150	—	12.0±0.8	12.0±0.8	12.5±0.8	16.0±1.2	225	255
200	—	12.5±0.8	13.0±0.8	13.0±1.0	—	280	295
250	13.5±0.9	13.5±0.9	13.5±0.9	13.5±1.2	—	335	
300	14.0±1.0	14.0±1.0	14.0±1.1	—	—	380	

Note 1: Based on different requirements of connection, the ends of the fittings can be processed to be flange joint type (F), plain end or coned end type (D). The structural dimensions shall be uniform with the corresponding end structure of the pipes with the same specifications. Refer to Table 5, Table 6 and Table 7 in HG/T 3690-2012.

Note 2: The dimensions of L1 in the Table correspond to the fittings with plain ends in Figure B.1. The fittings of DN200 and below are divided into shorter I series and longer II series.

Note 3: When the ends are flange joint type or coned end type, the fitting length L= L1+10mm.

B.2 45° Elbow Fitting Structure and Basic Parameters

Refer to Figure B.2 and Table B.2 for the structure and basic parameters of 45°elbow fittings.

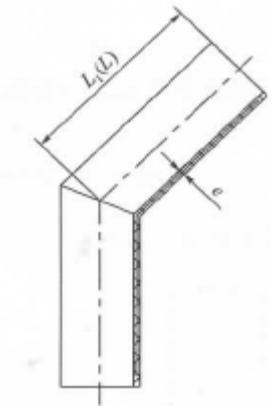


Figure B.2: 45° Elbow Fitting Structure

Table B.2: 45° Elbow Fitting Basic Parameters

Nominal inner diameter *DN* /mm	Nominal presssure *PN*/ MPa					L_1 / mm	
	1.0	1.6	2.0	2.5	4.0		
	Nominal wall thickness *e* and limit deviation / mm					I	II
50	—	—	—	9.5±0.5	11.0±0.5	110	150
65	—	—	—	9.5±0.5	11.0±0.5	125	155
80	—	—	—	9.5±0.5	11.5±0.6	145	160
100	—	9.5±0.5	9.5±0.6	11.5±0.6	12.0±1.0	140	165
125	—	11.0±0.7	11.0±0.7	12.0±0.7	12.5±1.2	160	170
150	—	12.0±0.8	12.0±0.8	12.5±0.8	16.0±1.2	170	185
200	—	13.0±0.8	13.0±0.8	13.0±1.0	—	185	210
250	13.5±0.9	13.5±0.9	13.5±0.9	13.5±1.2	—	215	230
300	14.0±1.2	14.0±1.2	14.0±1.1	—	—	240	260
350	15.0±1.4	16.0±1.4	17.0±1.5	—	—	320	
400	15.0±1.4	16.0±1.4	17.0±1.5	—	—	340	
450	16.0±1.4	17.0±1.5	18.0±1.6	—	—	360	
500	16.0±1.4	17.0±1.5	18.0±1.6	—	—	380	
600	22.0±2.0	24.0±2.0	—	—	—	460	

Note 1: Based on different requirements of connection, the ends of the fittings can be processed to be flange joint type (F), plain end or coned end type (D). The structural dimensions shall be uniform with the corresponding end structure of the pipes with the same specifications. Refer to Table 5, Table 6 and Table 7 in HG/T 3690-2012.

Note 2: The dimensions of L_1 in the Table correspond to the fittings with plain ends in Figure B.2. The fittings of DN300 and below are divided into shorter I series and longer II series.

Note 3: When the ends are flange joint type or coned end type, the fitting length $L= L_1+10$mm.

Note 4: The elbow of DN600 has socket end (C) at one side and plain end (D) at the other. The dimensions of the electro fusion socket shall be in accordance with Table A.1.

Annex C

(Normative Annex)

Tee Fitting Structure and Basic Parameters

C.1 Equal Tee Fitting Structure and Basic Parameters

Refer to Figure C.1 and Table C.1 for the structure and basic parameters of equal tee fittings.

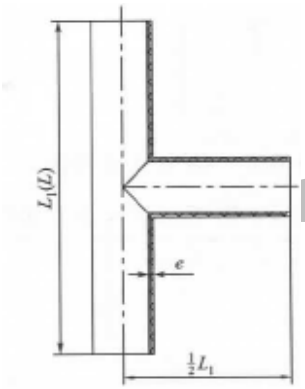


Figure C.1: Equal Tee Fitting Structure

Table C.1: Equal Tee Fitting Basic Parameters

Nominal inner diameter DN /mm	Nominal presssure PN/ MPa					L1 / mm	
	1.0	1.6	2.0	2.5	4.0		
	Nominal wall thickness *e* and limit deviation / mm					I	II
50	—	—	—	9.5±0.5	11.0±0.5	300	370
65	—	—	—	9.5±0.5	11.0±0.5	320	390
80	—	—	—	9.5±0.5	11.5±0.6	360	410
100	—	9.5±0.5	9.5±0.6	11.5±0.6	12.0±1.0	380	440
125	—	11.0±0.7	11.0±0.7	12.0±0.7	12.5±1.2	400	470
150	—	12.0±0.8	12.0±0.8	12.5±0.8	16.0±1.2	450	510
200	—	13.0±0.8	13.0±0.8	13.0±1.0	—	510	590
250	13.5±0.9	13.5±0.9	13.5±0.9	13.5±1.2	—	600	670
300	14.0±1.2	14.0±1.2	14.0±1.1	—	—	670	760
350	15.0±1.4	16.0±1.4	17.0±1.5	—	—	860	
400	15.0±1.4	16.0±1.4	17.0±1.5	—	—	930	
450	16.0±1.4	17.0±1.5	18.0±1.6	—	—	1000	
500	16.0±1.4	17.0±1.5	18.0±1.6	—	—	1070	
600	22.0±2.0	24.0±2.0	—	—	—	1300	

Note 1: Based on different requirements of connection, the ends of the fittings can be processed to be flange joint type (F), plain end or coned end type (D). The structural dimensions shall be uniform with the corresponding end structure of the pipes with the same specifications. Refer to Table 5, Table 6 and Table 7 in HG/T 3690-2012.
Note 2: The dimensions of L1 in the Table correspond to the fittings with plain ends in Figure C.1. The fittings of DN300 and below are divided into shorter I series and longer II series.
Note 3: When the ends are flange joint type or coned end type, the end length is increased by 10mm, and the total length of tees is thus increased by 10mm or 20mm.
Note 4: The tee of DN600 is of CDC structure, i.e. electro fusion sockets at two ends and electro fusion plug in the middle.

C.2 Reducing Tee Fitting Structure and Basic Parameters

C.2.1 The reducing tee fittings refer to the tee fittings with the same specifications at the two main ends while smaller specifications at the branch (vertical side).

C.2.2 The reducing tees can be molded by one-time injection or be connected with reducing fittings and transition electro fusion to realize combination of various diameters.

C.2.3 The structural dimensions of different ends of the reducing tees shall be the same as those of the ends of the pipes with the same specifications.

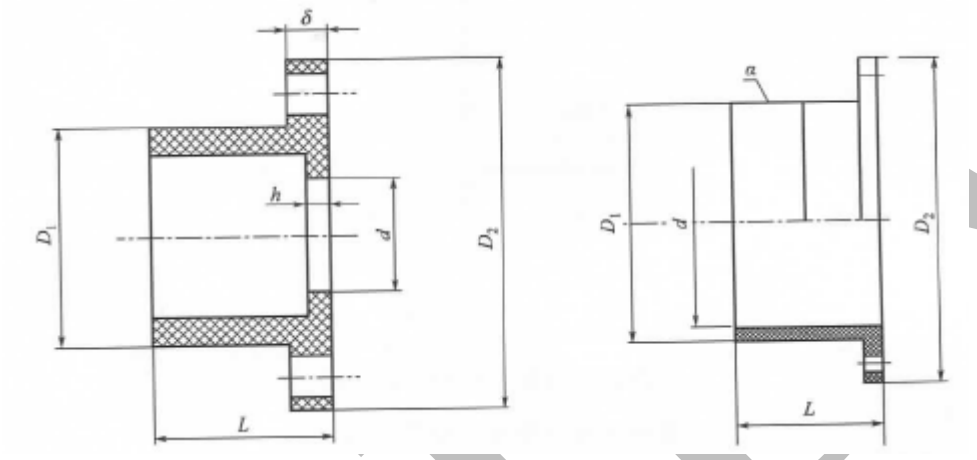
Annex D

(Normative Annex)

Flange Fitting Structure and Basic Parameters

D.1 Flange Fitting Structure and Basic Parameters

Refer to Figure D.1 and Table D.1 for the structure and basic parameters of flange fittings.



(a) Electro Fusion Type Flange Fitting (b) Common Flange Fitting

Figure D.1: Flange Fitting Structure Schematic

Table D.1: Flange Fitting Basic Parameters

Nominal inner diameter *DN* /mm	L / mm	D_1 / mm	D_2 / mm	δ / mm	h / mm	Nominal pressure *PN* / MPa	α
50	78±2.0	96±2.0	154	18±2.0	10±2.0	2.5	—
						4.0	
65	83±2.0	112±2.0	180	20±2.0		2.5	—
						4.0	
80	96±2.0	128±2.0	187	22±2.0		2.5	—
						4.0	
100	118±2.0	152±2.0	208	28±2.0	14±2.0	1.6	—
						2.5	
						4.0	
125	109±2.0	175±2.0	281	28±2.0		1.6	—
						2.5	
						4.0	
150	134±2.0	204±2.0	283	30±2.0		1.6	—
						2.5	
						4.0	
200	130±2.0	253±2.0	356	22±2.0		1.0	—
						1.6	
						2.0	

Table D.1 (Continued): Flange Fitting Basic Parameters

Nominal inner diameter DN /mm	L / mm	D1 / mm	D2 / mm	δ / mm	h / mm	Nominal pressure PN / MPa	α
250	270±3.0	284±2.0	425	28±2.0	—	1.0	30’
						1.6	
						2.0	
300	300±3.0	334±2.0	485	30±2.0	—	1.0	30’
						1.6	
						2.0	
350	310±3.0	390±2.0	520	32±3.0	—	1.0	1°
						1.6	
						2.0	
400	320±3.0	440±2.0	580	35±3.0	—	1.0	1°
						1.6	
						2.0	
450	330±3.0	492±2.0	640	38±3.0	—	1.0	1°
						1.6	
						2.0	
500	350±3.0	54±2.0	715	40±3.0	—	1.0	1°
						1.6	
						2.0	
600	275±3.0	678±2.0	780	40±3.0	22±3.0	1.0	—
	275±3.0	698±2.0	835			1.6	

Note 1: The flange fittings specified with the socket step dimension h are electro fusion type flange fittings; others are common flange fittings.
Note 2: The nominal inner diameter of the flange fittings refers to that of the pipes connected with the fittings.

Annex E

(Normative Annex)

Common Reducing Fitting Structure and Basic Parameters

E.1 Common Reducing Fitting Structure and Basic Parameters

Refer to Figure E.1 and Table E.1 for the structure and basic parameters of common reducers.

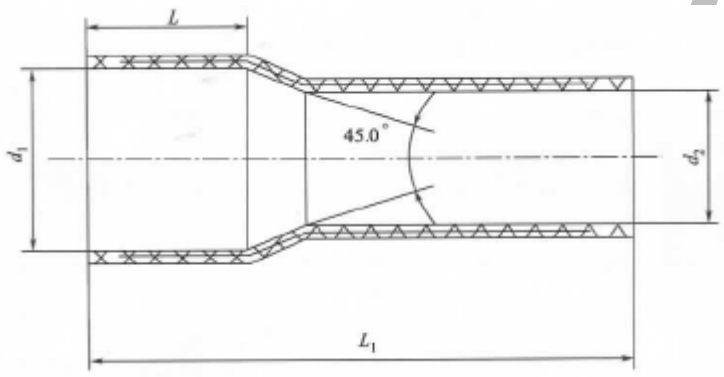


Figure E.1: Common Reducing Fitting Structure Schematic

Table E.1: Common Reducing Fitting Basic Parameters

Specification	d_1 /mm	d_2 /mm	Minimum length L_1/ mm		Specification	d_1 /mm	d_2 /mm	Minimum length L_1/ mm	
			Molding method	Winding method				Molding method	Winding method
600/500	600	500	—	700	250/200	250	200	500	400
500/450	500	450	800	665	250/150	250	150	500	395
500/400	500	400	800	620	200/150	200	150	450	325
450/400	450	400	760	610	200/125	200	125	450	325
450/350	45	350	760	570	150/125	150	125	380	—
400/350	400	350	720	560	150/100	150	100	380	—
400/300	400	300	720	470	125/100	125	100	360	—
350/300	350	300	640	460	125/80	125	80	360	—
350/250	350	250	640	400	100/80	100	80	340	—
300/250	300	250	500	400	100/65	100	65	340	—
300/200	300	200	500	410	100/50	100	50	340	—

Note 1: The products made by the winding method have different structure and appearance from those made by the molding method, but the connection dimensions at the two ends are the same, and the length L is uniform with the dimension L in Table 6 and Table 7 in HG/T 3690-2012.

Note 2: Other uncommon reducers can be made by secondary processing after winding.

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