

Thermoplastics pressure pipelines

Metal compression fittings for polyethylene (PE) pipes

General quality requirements Testing

DIN
8076
Part 1

Druckrohrleitungen aus thermoplastischen Kunststoffen;
Klemmverbinder aus Metall für Rohre aus Polyethylen (PE);
allgemeine Güteanforderungen, Prüfung

Supersedes DIN 8076,
July 1969 edition

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

1 Field of application

This standard applies to metal compression fittings (in the following briefly referred to as fittings) for jointing low density polyethylene (LDPE) pipes as specified in DIN 8072 and types 1 and 2 high density polyethylene (HDPE) pipes as specified in DIN 8074 Part 1 and Part 2 to one another and to pipes and fittings made of other materials.

Note. It is necessary to check in each individual case whether fittings in accordance with this standard can be used for jointing pipes made of materials other than PE.

In the technical delivery conditions for specific applications, particular requirements may be dropped or added.

2 Materials

The materials of fittings and the components of the joint assemblies shall be suitable for the intended application. It is recommended that the materials listed in table 1 be used for joint assemblies.

Table 1.

Material	As specified in
CuZn39Pb3	DIN 17 660
CuZn40Pb2	DIN 17 660
GK-CuZn37Pb	DIN 1709
GD-CuZn37Pb	DIN 1709
G-CuSn5ZnPb	DIN 1705
Cast iron, minimum quality GG 25	DIN 1691
GGG, ductile cast iron, GTW 40-05 and GTS 35-10 are also suitable	DIN 1692
G-ALSi7Mg wa	DIN 1725 Part 2
USt 37-2, RSt 37-2	DIN 17 100

The components (items No. 2, 4 and 6) of joint assemblies may also be manufactured from other suitable materials.

The materials used shall not contain constituents such as plasticizers, anti-ageing agents, stabilizers, impurities, etc. that can damage the PE pipes.

The seals shall comply with the requirements of ISO/DIS 4633.2 or DIN 3535 Part 3, depending on the field of application of the fittings.

3 Nomenclature and designation

3.1 Nomenclature

The nomenclature given in table 2 shall apply to the components shown in the schematic diagrams of examples of fittings.

Table 2.

Item No.	Term
1	Fitting body
2	Clamping ring
3	Coupling nut/screwed body/supported flange
4	Support sleeve
5	Joint ring
6	Gasket
7	Bolt
8	Nut

Note. The drawings of fittings are intended solely to show the nomenclature of the components and not to indicate those types of fittings that conform to this standard.

Continued on pages 2 to 5

Type K1 fitting
(without support sleeve)

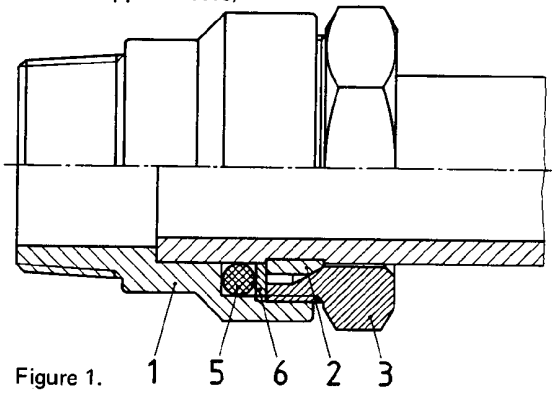


Figure 1.

Type K2 fitting
(with support sleeve, without drift expanding of the pipe)

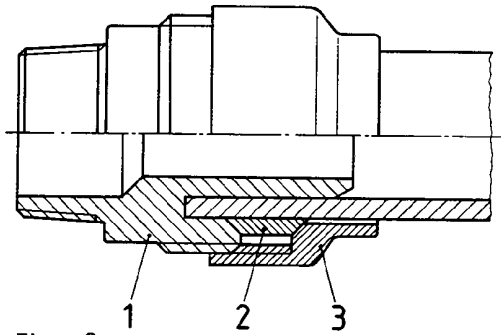


Figure 2.

Type K3 fitting
(with support sleeve and with drift expanding of pipe)

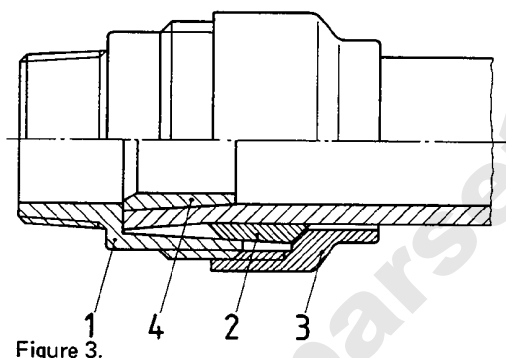


Figure 3.

Type K4 fitting
(assembly in the form of a push-fit joint)

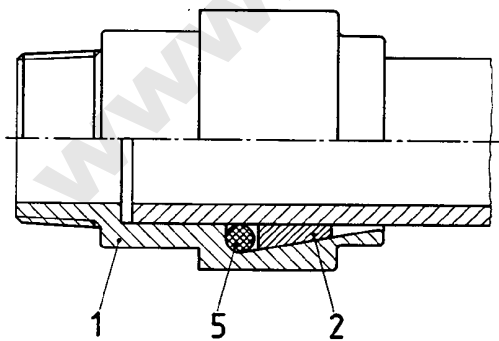


Figure 4.

Type K5 fitting
(assembly in the form of a flanged joint)

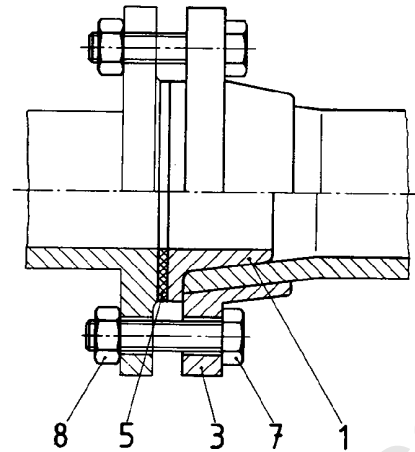


Figure 5.

3.2 Designation

A type K3 fitting (with support sleeve and with drift expanding of pipe) for a pipe of outside diameter 50 mm and wall thickness 2,9 mm shall be designated as follows:

Fitting DIN 8076 – K3 – 50 × 2,9

4 Requirements

4.1 Design, dimensions

4.1.1 Fittings shall be suitable for all pipe series as specified in DIN 8072 and DIN 8074 Parts 1 and 2 and shall at least meet the requirements of rated pressure PN 10. It shall be possible to assemble the fitting with the tools normally used in pipework construction (the manufacturer's instructions on assembly of fittings shall be observed, particularly with regard to torques to be applied).

4.1.2 The drift expanding of the pipe caused by the support sleeves shall not exceed 6% of the pipe outside diameter. The taper of the support sleeves shall not exceed 5° (see figure 6).

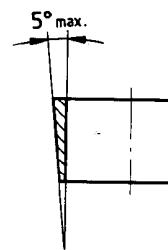


Figure 6.

4.1.3 The connecting threads shall comply with DIN 2999 Part 1 and the flange mating dimensions with DIN 2501 Part 1.

Weld-on ends as specified in DIN 3239 Part 1 or welded sleeves as specified in DIN 3239 Part 2 can be used instead of threaded connections.

4.1.4 Fittings and the components of joint assemblies shall be such that no notch or torsional effects occur that could impair the serviceability of the PE pipe.

4.2 Behaviour in internal pressure test

The fitting shall remain leakproof in the test described in subclause 5.1.1. No cracks or breaks shall occur in the PE pipe inside the fitting or within a distance d from the fitting.

4.3 Tightness under vacuum

The test piece consisting of PE pipe and fitting shall remain leakproof in the test described in subclause 5.1.2.

4.4 Effectiveness of axial force

The pipe shall not be pulled out of the fitting in the test described in subclause 5.1.3. No cracks or breaks shall occur in the pipe within the fitting.

4.5 Behaviour in bending test

The test piece consisting of a straight PE pipe and the fitting shall remain leakproof in the test described in subclause 5.1.4. No cracks or breaks shall occur in the pipe within the fitting.

4.6 Surface condition

Fittings shall exhibit a smooth surface on the inside and the outside, i. e. they shall be free from residues of the mould and free from burrs. This requirement does not exclude the possibility of profiling the compression surfaces as part of the design.

5 Testing

5.1 Type testing

Fittings shall be submitted for type testing by a recognized test house. For each pipe material, three different diameters (at the discretion of the test house) shall be tested for compliance with the requirements given in subclauses 4.2 to 4.5. The tests shall be carried out on test pieces made by using the proposed PE pipe and the fitting. The manufacturer's instructions regarding torques to be used when assembling shall be observed. The dimensions shall be checked, taking into account the requirements specified in subclause 4.1.2. Fittings shall be submitted to repeated type testing after any design modification.

5.1.1 Internal pressure test

The test shall be carried out on three different diameters in each case with three fittings to check compliance with the mechanical strength requirements A and B specified in DIN 8073 and DIN 8075 Parts 1 and 2. The test consists of checking whether the fitting remains leakproof throughout the test and whether cracks or other damage occur in the PE pipe inside the fitting or within a distance d (being the pipe outside diameter) from the fitting. Tests in which breaks occur in the PE pipe outside the fitting and at a distance of more than d from the fitting during the test period specified shall not be included in the evaluation and shall be repeated.

5.1.2 Tightness under vacuum

The test shall be carried out on the three different diameters in each case with three fittings. The test pieces shall be connected via a suction tube with a shut-off valve to a source of vacuum (vacuum pump, suction chamber, etc.). The pressure gauge shall be arranged between the shut-off valve and the test piece. The test system shall be stored for one hour at $(20 \pm 5)^\circ\text{C}$ to achieve temperature equilibrium and the test then carried out at this temperature. Temperature variations during the test shall not exceed $\pm 2^\circ\text{C}$. An atmospheric pressure difference of $(-0,8 \pm 0,05)$ bar shall be set up in the test piece, from the vacuum source, and the shut-off valve then closed. The test begins at this moment. If the established atmospheric pressure difference changes by no more than 0,05 bar during the test period of one hour, the test piece may be regarded as leakproof. If the pressure variation is greater than 0,05 bar and if the leak is in the fitting, this fitting shall be regarded as not leak-proof under vacuum.

5.1.3 Effectiveness of axial force

This test shall be carried out on three different diameters in each case with three fittings. The PE pipes used shall be straight.

The test pieces shall be clamped in a loading device such as to permit application of an axial stress, without bending component, of $1,5 \cdot \sigma$ for the pipe (for example by means of weights, if necessary via a lever arm).

The test force to be applied shall be calculated from the equation

$$F = 1,5 \cdot \sigma \cdot (d - s) \cdot \pi \cdot s$$

where

F is the test force, in N;

σ is the permissible stress

for LDPE pipes as specified in DIN 8072:

$$\sigma = 2,5 \text{ N/mm}^2,$$

for type 1 HDPE pipes as specified in

DIN 8074 Part 1 and type 2 HDPE pipes as specified in DIN 8074 Part 2: $\sigma = 5 \text{ N/mm}^2$;

d is the pipe outside diameter (nominal size), in mm;

s is the wall thickness (nominal thickness), in mm.

The test force F shall be applied within 10 to 15 seconds and then maintained for one hour, with a permissible deviation of $\pm 2,5\%$. The test shall be carried out at $(23 \pm 2)^\circ\text{C}$. It shall be observed whether the pipe is pulled out of the fitting and whether cracks or breaks occur in the pipe within the fitting.

If there is a relative movement between the pipe and the fitting resulting from the design of the fitting immediately after the test force has been reached (settling) the pipe shall not be deemed to have been pulled if such movement ceases during the one hour test period. If a relative motion is still taking place between the pipe and the fitting at the end of the test period the test shall be continued until no such movement is taking place or until the pipe is pulled out of the fitting.

5.1.4 Bending test

The test shall be carried out on three different diameters in each case with three fittings.

Pipe sections with a free length l_1 between the fitting being tested and an end fitting shall be mounted in a

bending apparatus as shown in figure 7. The PE pipe shall be bent over a bending gauge with a bearing length l_2 and a bending radius r until the pipe lies flush against the former and so that equal lengths of pipe project beyond the former at the fitting to be tested and the end fitting.

After bending, the test pieces shall be subjected to an internal pressure $p_{e,p}$ for one hour at a test temperature of $(20 \pm 2)^\circ\text{C}$. This internal pressure $p_{e,p}$ is to be calculated from the equation

$$p_{e,p} = \frac{2 \cdot s \cdot \sigma_0}{\bar{d} - s_{\min}}$$

where

\bar{d} is the mean outside diameter over the bearing length l_2 ;

s_{\min} is the minimum wall thickness over the bearing length l_2 ;

σ_0 is the test stress
for low density PE pipes as specified in DIN 8072:
7 N/mm²,

for high density type 1 PE pipes, as specified in
DIN 8074 Part 1: 15 N/mm²,

for type 2 HDPE pipes, as specified in
DIN 8074 Part 2: 12 N/mm².

Table 3.

Pipe outside diameter d	Free length l_1	Bearing length l_2	Bending radius r	
			for PN 6 pipes	for PN 10 pipes
25 to 63	10 d	7,5 d	15 d	20 d

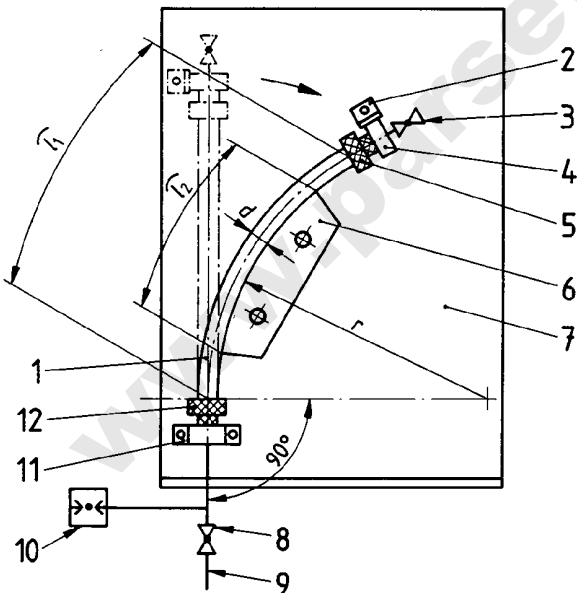


Figure 7. Bending apparatus

Table 4.

Item No.	Term
1	PE pipe
2	Stop block
3	Air release valve
4	Stop nipple
5	End fitting
6	Bending gauge
7	Test panel
8	Shut-off valve
9	Connecting pipe to pump
10	Pressure gauge
11	Connection nipple
12	Fitting to be tested

The test shall be carried out by observing whether the fitting remains leakproof during the test and whether any cracks or breaks occur in the PE pipe inside the fitting or within a distance d from the fitting.

5.2 Repeat tests

If one or more fittings fail to meet the requirements specified in subclauses 4.2 to 4.5, a repeat test shall be carried out on three fittings of the same lot supplied. If only one of these fittings does not meet the requirements specified, the whole supply shall be regarded as not in accordance with this standard.

5.3 Verification

Compliance with the requirements given in subclauses 4.1.2 and 4.2 to 4.5 shall be certified by the manufacturer by means of a test certificate of a recognized test house (see subclause 5.1).

6 Marking

Fittings in accordance with this standard may be marked with the following information:

- DIN number;
- pipe outside diameter X wall thickness ¹⁾;
if necessary the individual parts shall also be marked with this information;
- trademark.

By applying this marking the manufacturer certifies that the fittings meet the requirements of this standard.

Additional markings for the various fields of application shall be specified in the technical delivery conditions.

¹⁾ Marking of the wall thickness is not necessary in the case of fittings without a support sleeve.

Standards referred to

DIN 1691	Cast iron with lamellar graphite (grey cast iron)
DIN 1692	Malleable cast iron; concept, properties
DIN 1705	Copper-tin and copper-tin-zinc casting alloys (cast tin bronze and gunmetal); castings
DIN 1709	Copper-tin casting alloys (cast brass and special cast brass); castings
DIN 1725 Part 2	Aluminium alloys; casting alloys; sand castings, gravity die castings, pressure die castings
DIN 2501 Part 1	Flanges; connecting dimensions
DIN 2999 Part 1	Pipe threads for tubes and fittings; cylindrical internal thread and conical external thread; thread dimensions
DIN 3239 Part 1	Weld-on ends of valves; weld-on ends
DIN 3239 Part 2	Weld-on ends of valves for socket welding
DIN 3535 Part 3	Sealants for gas supplies; elastomeric sealants for gas supply mains and pipelines; safety requirements and testing of materials
DIN 8072	Low density PE (polyethylene) pipes; dimensions
DIN 8073	Low density PE (polyethylene) pipes; general quality requirements, testing
DIN 8074 Part 1	High density type 1 polyethylene (HDPE) pipes; dimensions
DIN 8074 Part 2	High density type 2 polyethylene (HDPE) pipes; dimensions
DIN 8075 Part 1	High density type 1 polyethylene (HDPE) pipes; general quality requirements, testing
DIN 8075 Part 2	High density type 2 polyethylene (HDPE) pipes; general quality requirements, testing
DIN 17 100	Steels for general structural purposes; quality standard
DIN 17 660	Wrought copper alloys; copper-zinc alloys (brass, special brass), composition
ISO 4633	Rubber seals; joint rings for water supply, drainage and pipelines; specification for materials

Other relevant standards and documents

DIN 1988	Drinking water pipe installations on premises; technical specifications for installation and operation
DIN 16 928	Pipes of thermoplastic materials; pipe joint assemblies, fittings, laying; general rules
DIN 19 533	HDPE (high density polyethylene) and LDPE (low density polyethylene) pipework for drinking water supply; pipes, pipe joint assemblies, fittings
DVGW-W 320 ²⁾	Manufacture, quality control and testing of uPVC (unplasticized polyvinyl chloride), HDPE (high density polyethylene) and LDPE (low density polyethylene) pipes for water supply and requirements for pipe joint assemblies and fittings
DVGW-W 323/1 ²⁾	Requirements regarding pipe joint assemblies for unplasticized PVC, low density PE and high density PE pipes in drinking water supply systems
DVGW-G 477 ²⁾	Manufacture, quality control and testing of uPVC (unplasticized polyvinyl chloride) and HDPE (high density polyethylene) pipes for gas pipelines and requirements regarding pipe joint assemblies and fittings

Previous editions

DIN 8076: 12.66, 07.69

Amendments

The following amendments have been made in comparison with the July 1969 edition of DIN 8076:

- The content has been completely revised.
- DIN 8076 has been changed to DIN 8076 Part 1.
- The "Tightness under vacuum", "Effectiveness of axial force" and "Bending test" clauses in accordance with International Standard ISO 3503 – 1976 and the relevant tests have been adopted as additional requirements.

Explanatory notes

This standard has been prepared by *FNK* Subcommittee 504.3 *Metall-Fittings für PVC- und PE-Rohre*.

It is proposed to delete the information on marking of fittings from this standard as soon as the technical delivery conditions have been prepared for the main fields of application for the fittings or as soon as the existing technical rules have been appropriately revised.

Technical delivery conditions with additional requirements or limitations on use, governing the use of fittings in public gas supply systems are in preparation at the present time.

International Patent Classification

B 29 D 23-00

E 02 B 9-06

²⁾ Obtainable from *ZfGW-Verlag*, Zeppelinallee 38, D-6000 Frankfurt am Main.

