

Adhesives for Bonding Pipes
and Pipe System Elements of Rigid PVC
General Quality Requirements and Testings

DIN
16970

Klebstoffe zum Verbinden von Rohren und Rohrleitungsteilen aus PVC hart;
Allgemeine Güteanforderungen und Prüfungen

For connection with the Recommendations of the International Organization for Standardization (ISO), at present in course of preparation, see Explanations.

Dimensions in mm

1. Scope

This Standard applies to adhesives for bonding pipes of rigid PVC (rigid polyvinyl chloride) according to DIN 8061 and DIN 8062, pipe series 2 to 6¹⁾, up to a pipe outside diameter of 315 mm or with pipe system elements of rigid PVC according to DIN 8063.

Certain of these requirements can be omitted or supplemented in technical conditions of delivery or directions²⁾ for given fields of application.

2. Requirements

2.1. Composition

It is left to the manufacturer to decide on the constituents of an adhesive.

The adhesive used should, when it has set, have much the same resistance to chemicals as rigid PVC, in line with DIN 16929³⁾.

2.2. Condition of delivery

The condition of delivery of the adhesive must be adapted to the processing method and satisfy the appropriate regulations²⁾.

2.3. Strength properties in shear test

When subjected to the shear test according to Section 3.2 the bonded joints must display a shear strength of 50 kp/cm².

2.4. Tightness

When testing according to Section 3.3 the bonded joints must be tight.

2.5. Strength properties in internal pressure endurance test

When subjected to the internal pressure endurance test according to Section 3.4 the bonded joints must meet the strength requirements of Table 1. They must remain tight during the stipulated testing time.

Table 1. Strength requirements for bonded joints in the internal pressure endurance test

Test temperature °C	Testing time (minimum endurance time) Hours	Test pressure kp/cm ²
20	1	4,2 ND
20	1000	3,2 ND
60	1000	1 ND

ND = nominal pressure

3. Testings

3.1. Time of the testings

The testings must be undertaken within the adhesive's shelf life stated by the adhesive manufacturer. The minimum setting times according to Sections 3.2.3, 3.3.3 and 3.4.3 should be adhered to.

3.2. Shear test

3.2.1. 3 bonded joints should be tested.

3.2.2. Two pipe ends prepared for a bonded spigot and socket joint from pipe of 50 mm pipe outside diameter, series 5 according to DIN 8062 (pipe 50 x 3.7 DIN 8062) or 1 pipe end of 50 mm pipe outside diameter and a sleeve for 50 mm pipe outside diameter according to DIN 8063 Sheet 8, Preliminary Standard (sleeve M 50 DIN 8063) are bonded together in accordance with the adhesive manufacturer's specifications. The pipe end and inside diameter of the sleeve should be machined beforehand so that the following fits are obtained:

Clearance fit with maximum play 0.6 mm
Interference fit with maximum oversize 0.2 mm

If the adhesive is to be used only for bonding with an interference fit, only the joint with interference fit should be tested.

Bond length should be as follows:

for a pipe to pipe bond 50 mm
for a pipe to fitting bond 31 mm

3.2.3. The bond should set at a temperature of 20 °C ± 5 deg. From bonding to testing the setting time should be 20 days.

1) See Explanations

2) E.g. KRV Working Sheet A 1.1.7 (November 1967) "Heavily dissolving adhesive based on tetrahydrofurane (THF) for bonding pipes and fittings by the KRV system of fits. Requirements, testing" issued by the Kunststoffrohrverein (KRV) (Plastic Pipe Association), Bonn, Dyroffstrasse 2

3) Where very aggressive fluids are involved it is advisable to refer the matter to the adhesive manufacturer.

Continued on pages 2 and 3
Explanations on page 3

No guarantee can be given in respect
of this translation
In all cases the latest German-language version of this
standard shall be taken as authoritative

Nachdruck, auch auszugsweise, nur mit Genehmigung des Deutschen Normenausschusses, Berlin 30, gestattet.

Translation
Fachtechnisches Übersetzungsinstitut
Henry G. Freeman, Düsseldorf

3.2.4. A ring with a length of 10 mm should be cut from the bond made according to Section 3.2.2 for use as a test specimen

with a pipe to pipe bond it is taken from the middle of the bonded spigot and socket joint with a pipe to fitting bond from the middle of the sleeve element bonded to the pipe (see Fig. 1)

3.2.5. The test specimen is placed in a circular cut-out steel plate so that the outer pipe ring makes contact. The inner pipe ring of the test specimen is forced out by a suitable plunger on a press or tensile tester with appropriate equipment (see Fig. 1). The plunger should advance at the rate of 5 mm per minute, the test temperature should be $20^{\circ}\text{C} \pm 2$ deg.

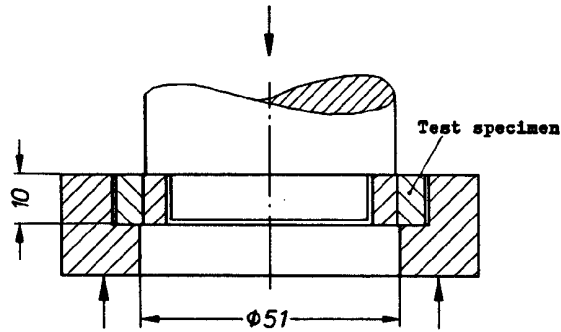


Figure 1. Shear test

3.2.6. The test specimen should be examined to determine whether it has reached the stipulated shear strength.

3.3. Testing for tightness

3.3.1. 3 bonded joints should be tested for tightness.

3.3.2. Two pipe ends prepared for a bonded spigot and socket joint from pipe pieces of 50 mm pipe outside diameter, series 5 according to DIN 8062, pipe type PVC 100 (pipe 50 x 3.7 DIN 8062 - PVC 100) or 2 pipe pieces of 50 mm pipe outside diameter and a length of 200 mm of PVC 100 and a sleeve for 50 mm pipe outside diameter according to DIN 8063 Sheet 8, Preliminary Standard (sleeve M 50 DIN 8063) are bonded together in accordance with the adhesive manufacturer's specifications.

The pipe ends and inside diameter of the sleeves should be machined beforehand so that the following fits are obtained:

Clearance fit with maximum play	0.6 mm
Interference fit with maximum oversize	0.2 mm

If the adhesive is to be used only for bonding with an interference fit, only the joint with interference fit should be tested.

Bond length should be as follows:

for a pipe to pipe bond	50 mm
for a pipe to fitting bond	31 mm

3.3.3. The bond should set at a temperature of $20^{\circ}\text{C} \pm 5$ deg. From bonding to testing the setting time should correspond to particulars supplied by the adhesive manufacturer but should not exceed 24 hours.

3.3.4. The free ends of the pipe pieces should be fitted with caps so that the axial forces originating from the internal pressure are applied to the bonded joint. Water at the test temperature (permissible variation ± 5 deg) is poured in through a closable opening in one of the caps.

3.3.5. Afterwards the test specimens are brought at a test temperature of $20^{\circ}\text{C} + 5$ deg to a pressure of 1.5 ND in 10 to 15 seconds. This pressure should be maintained for 5 minutes.

3.3.6. The joint is regarded as tight if no water emerges.

3.4. Internal pressure endurance test

3.4.1. 3 bonded joints should be tested for each test condition in Table 1 (see Section 2.5).

3.4.2. The bonded joints are produced from two pipe ends prepared as a bonded spigot and socket joint from pipe pieces or from two pipe pieces and a sleeve according to Section 3.3.2.

If the adhesive is to be used only for bonding with an interference fit, only the joint with interference fit should be tested.

Bond length should be as follows:

for a pipe to pipe bond	50 mm
for a pipe to fitting bond	31 mm

3.4.3. The bond should set at a temperature of $20^{\circ}\text{C} \pm 5$ deg. From bonding to testing the setting time should be 20 days.

3.4.4. The free ends of the pipe pieces should be fitted with caps so that the axial forces originating from the internal pressure are applied to the bonded joint. To prevent deformation of the fitting having any effect on the bonded joint when testing at 60°C suitable supporting elements are permissible, although they should not overlap the bond length (see Fig. 2).

Water at the test temperature (permissible variation ± 5 deg) is poured through a closable opening in one of the caps.

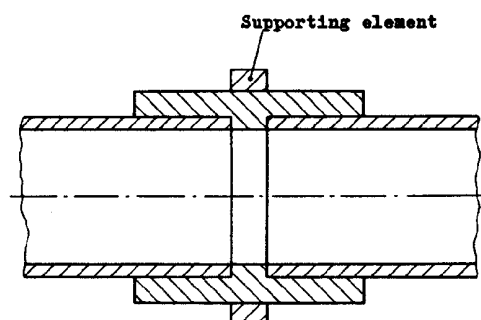


Figure 2. Internal pressure endurance test

3.4.5. The test assemblies are kept for one hour in a pressureless state in a room at the test temperature (permissible variation ± 1 deg) in order to adjust them to the proper temperature. Afterwards the test assemblies are brought in 10 to 15 seconds to the test pressure according to Table 1 which should then be maintained with a permissible variation of ± 2.5 % during the testing time stipulated in Table 1 (minimum endurance time).

3.4.6. The bond to be tested is then examined to determine whether it has become leaky during the stipulated testing time. Tests in which leakiness or ruptures of the pipes or sleeves occur should not be evaluated and should be repeated.

3.5. Evidence of test

If so agreed, a works report according to DIN 50049 is issued for the testings undertaken by the manufacturer.

Explanations

This Standard was dealt with the Subsidiary Committee 12.5 "Plastic Fittings for PVC and PE Pipes" appointed in the Committee for Plastics (FNK) by the Advisory Committee 12 "Plastic Pipe Systems". In this connection the general subject matter was adapted to DIN 8061 "Pipes of rigid PVC (rigid polyvinyl chloride), general quality requirements, testing" (December 1968 issue) which is only intended to represent a basic standard containing the general quality characteristics of a PVC pipe and its test methods. Provisions with regard to the scope of test, supervision and special requirements for certain fields of application, e.g. drinking water supplies, gas supplies etc. are left to the bodies responsible for these fields.

In the case of the internal pressure endurance test the testing at 60 °C was included in this Standard along the lines of the strength requirements for pipes according to DIN 8061 and pipe system elements according to DIN 8063 Sheet 5 "Pipe connections and pipe system elements for pressure pipe systems of rigid PVC (rigid polyvinyl chloride); general quality requirements and testings".

In this case, however, a straightforward testing of the adhesive is involved so that influencing factors such as deformation of fittings should be excluded by suitable reinforcement.

The general quality requirements and testings for adhesives in this Standard have for the time being been limited in their scope to pipe connections up to a pipe outside diameter of 315 mm because further testings have to be carried out and wider experience gained with pipes above this dimension.

The existing state of knowledge on behaviour over longer periods of time shows that bonded joints made from pipes of rigid PVC and from pipes and fittings of rigid PVC withstand the operating pressures listed in Table 2 if the bonded joint is resistant or of limited resistance to chemical attack. At higher temperatures the creep rupture strength drops so that suitability for use at higher temperatures must be carefully examined in each particular case.

In this Standard the strength properties for the shear test, internal pressure endurance test and tightness testing are largely in agreement with the provisions in the drafts for ISO Recommendation ISO/DR 795 (9.1964) "Adhesives for pipes and fittings of rigid PVC. Chapter I. General specifications and methods of test" - "Adhésifs pour tubes et raccords en PVC rigide. Chapitre I: Spécifications générales et méthodes d'essai", ISO/DR 797 (9.1964) "Adhesives for pipes and fittings of rigid PVC. Chapter II. Detailed specifications. Section I B. Adhesives for cold welding, based as a "strong solvent" - "Adhésifs pour tubes et raccords en PVC rigide. Chapitre II: Spécifications particulières. Section I B: Adhésifs par soudure à froid, a solvant fort" and the appropriate revised draft proposals ISO/TC 5/SC 6
N 366 - Adhesives for pipes and fittings of unplasticized polyvinyl chloride (PVC). Part 1: General specifications and methods of test
N 368 - Adhesives for pipes and fittings of unplasticized polyvinyl chloride (PVC). Part 2: Detailed specifications. Section 2: Adhesives for cold welding, based as a "strong solvent".
The "Power of Adhesion" testing specified in N 366 and 368, which is, e.g., suitable as a short laboratory testing for development series of new adhesives, was not included in this Standard as the tightness testing can be regarded as adequate as a short testing closely simulating practical conditions.

Table 2

Range of application No.	Fluid	Temperature up to °C	Series according to DIN 8062				
			2	3	4	5	6
1	Water and harmless ⁴⁾ fluids to which PVC is resistant ⁵⁾	20	4	6	10	16	6)
2		40	2,5	4	6	10	
3		60	—	—	1	2,5	
4	Dangerous ⁴⁾ fluids to which PVC is resistant ⁵⁾	20	2,5	4	6	10	6)
5		40	—	1	2,5	4	
6		60	—	—	—	1	
7	Fluids to which PVC has limited resistance ⁷⁾	20	1 ⁷⁾	2,5 ⁷⁾	4 ⁷⁾	10 ⁷⁾	6)
8		40	—	—	1 ⁷⁾	4 ⁷⁾	

4) "dangerous" and "harmless" within the meaning of DIN 2403, March 1965 issue, Section 7.2.

5) DIN 16929 serves as a reference. With strong acids it is advisable to enquire with the adhesive manufacturer.

6) Pipe series 6 has been stipulated as a special series for constructing pipelines and apparatus in the chemical industry. These pipes at least withstand the pressures of series 5; in view of their suitability for welding and plastic forming they have bigger wall thicknesses than the pipes of series 5.

7) When using these pipes the dangerous nature of the fluid should be considered in each case and the service life on the basis of operating experiences. Pipes with wall thicknesses < 2 mm should not be used.

8) For definition of operating pressure, see DIN 2401 Sheet 1.