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1 Scope of application

In order to assess the welding execution, reference can be made to the tensile test in conjunction with other tests.

The short-time welding factor and the fracture pattern give an indication of the ductility of the joint and thus of the quality of the execution. The results are not transferable to the creep behaviour of the welded structure subjected to tensile stresses.

2 Removal and number of the test specimens, type and structure

The tensile test is performed with reference to DIN EN ISO 527. Welded joints are tested according to the actual execution, i.e. with or without a welding bead.

The test specimens may only be removed eight hours after the welding. Each test specimen must be marked in such a way that its original position in the test piece is comprehensible.

The specimens must be neither heat-treated nor subjected to mechanical stresses.

The test is carried out on at least six welded test specimens and six unwelded reference test specimens which were removed as uniformly distributed as possible around the circumference or over the length. In the case of pipes with a diameter ≤ 63 mm, the number of the test specimens can be reduced to four.

If the test specimens according to Fig. 1 crack or stretch within the clamping region, it is necessary to use test specimens with Shape 2 according to Fig. 2 or with Shape 3 according to Fig. 3. The dimensions for the test specimens are included in Table 1 or Table 2 respectively.

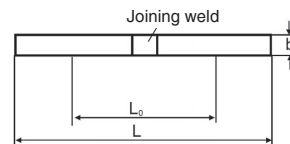
3 Shape and manufacture of the test specimens

Figure 1. Test specimen, Shape 1.

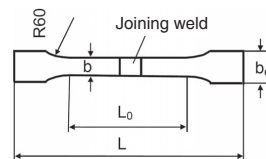


Figure 2. Test specimen, Shape 2.

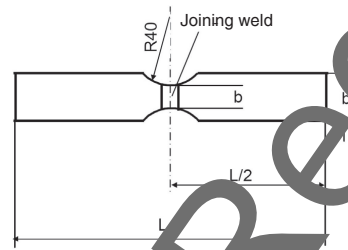


Figure 3. Test specimen, Shape 3.

Table 1. Dimensions of the test specimens with Shape 1 and Shape 2 from panels.

Thickness (nominal dimension) mm	Test specimens with shapes 1 and 2			Test specimens with Shape 2
	b mm	L ₀ mm	L mm	
≤ 10	5	120	≥ 170	20
10 < s ≤ 20	10	120	≥ 300	40
≥ 20	1,5 · s	200	≥ 400	80

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DVS, Technical Committee, Working Group "Joining of Plastics"

Table 2. Dimensions of the test specimens with Shape 1 and Shape 2 from pipes.

Diameter d (nominal dimension) mm	Thickness s (nominal dimension) mm	Test specimens with Shapes 1 and 2			Test specimens with Shape 2
		b mm	L ₀ mm	L mm	b _e mm
20 ≤ d < 50		s + d/10	80	≥ 120	b + 10 (but min. b + 5)
50 ≤ d < 100			120	≥ 170	
≥ 100	≤ 10	15	120	≥ 170	20
	10 < s ≤ 20	30	120	≥ 300	40
	> 20	1.5 · s	200	≥ 400	80

Table 3. Dimensions of the test specimens with Shape 3 from panels.

Thickness s (nominal dimension) mm	L mm	b _e mm	b = b _e /2 mm
≤ 10	160	14	7
10 < s ≤ 20	180	18	9
> 20	180	28	14

Table 4. Dimensions of the test specimens with Shape 3 from pipes.

Diameter d (nominal dimension) mm	L mm	b _e mm	b = b _e /2 mm
20	160	10	5
25–63	160	12	6
75–110	160	14	7
125–160	180	16	8
200	180	18	9
225–250	180	20	10
280–315	180	22	11
355	180	24	12
400	180	26	13
450	180	28	14

All the surfaces of the test specimens must be free from visible imperfections, scratches or other defects. Any heating caused by the machining must be kept at a low level. Before the test, it is necessary to visually detect and to document the appearance of the test specimens and, in particular, the welding execution.

Note: In order to obtain a fracture failure in the weld and thus better differentiation for assessing the weld quality, the joining weld in the specimen can be weakened by a central hole notch with a diameter of (for example) 3 mm but max. 1/3 of the specimen width. This special test is recommendable particularly whenever no fracture in the region of the joining weld is obtained during the normal test. For assessment purposes, the tests with a hole notch must also be conducted with corresponding reference specimens.

4 Execution

Unless anything else has been agreed upon or specified in the technical terms of delivery for the product to be tested, the test is carried out in a standard atmosphere according to ISO 5543:2000 (normal tolerances).

The testing speeds are listed in Table 5 for selected materials. For other materials, the speed is established, if necessary in preliminary test, in such a way that the yield strength of the unwelded specimen is reached in about one minute at the next standard speed according to DIN EN ISO 527-1, when selected.

Table 5. Testing speeds for a few plastics.

Material	Testing speed mm/min
PE	50 ± 10 %
PP-R	
PA 12	
PP-H	20 ± 10 %
PP-B	
PVDF	
PE, electrically conductive	
E-CTFE	10 ± 20 %
PVC-U	
PVC-C	

The force at the moment of the cracking must be recorded. If the specimen is stretched, the force at the yield stress must be recorded.

5 Evaluation

The short-time tensile welding factor $\sigma_{\text{w}}/\sigma_{\text{S}}$ is determined from the arithmetic mean values of the fracture stress of the welded test specimens (σ_{w}) and of the reference test specimens (σ_{S}). If the test specimens are stretched before the cracking, the yield stress may be utilized as the reference variable. The values required for the short-time tensile welding factors are included in DVS 2203-1, Supplement 1.

Clamping fractures are ignored in the test evaluation. Substitute test specimens must be tested instead.

The fracture type and the fracture pattern must be detected visually and documented.

6 Test report

The following items must be specified in the test report with an indication of this technical code:

- type, supply form and designation of the product
- manufacturing date and process of the test specimens
- appearance of the test specimens before the test
- visual assessment of the welding execution
- hole notch (if present)
- position of the test specimens in the product
- shape of the test specimens
- thickness of the test specimens in mm
- width of the test specimens in mm
- number of the test specimens
- testing atmosphere (in so far as it deviates from this technical code)