

Test report no.: 95819/11

Customer: FIRAT Plastik Kaucuk
San. ve Tic. A. S.
Türkoba Köyü P. K.: 12
34907 Büyükçekmece Istanbul
TURKEY

Production site: 34907 Büyükçekmece Istanbul
TURKEY

Order: Testing of the material properties of an extruded thermoplastic flat sealing tape in accordance with RAL-GZ 716/1, Quality and Test Specifications for Plastic Windows, Section II - Extruded Seals, Table 2, Product Class IV, Edition August 2000.

Letter dated: 2011-03-01

Ref.: Mr Mutlu Suner

Test samples received: 2011-03-17

Test period: 2011-03-18 to 2011-09-29

The test report comprises 8 pages.

Würzburg, 2011-11-02
Sc/ste

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Dr. Anton Zahn

International akkreditiert

SKZ-TeConA GmbH

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The original language of the report is German. In case of doubt, the German version is obligatory.

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1. Order

By its letter dated March 1, 2011 FIRAT Plastik Kaucuk; San. ve Tic. A. S., Türkoba Köyü P. K.: 12, 34907 Büyükçekmece Istanbul, TURKEY, placed an order with the SKZ - TeConA GmbH for testing the material properties of an extruded thermoplastic flat profile in accordance with RAL-GZ 716/1, Quality and Test Specifications for Plastic Windows, Section II - Extruded Seals, Table 2, Product Class IV, Edition August 2000.

2. Test Material

On March, 17, 2011 the SKZ - TeConA GmbH received the following samples for testing:

3.50 m extruded flat profile (20 x 2.0) mm

Material designation:	FIRAT TPE
Basic formulation:	TPE
Manufacturer of mix:	Firat
Production site:	34907 Büyükçekmece Istanbul, TURKEY
Product class:	IV (interior and exterior)
Tested colour:	grey
Nominal value of density:	0.91 g/cm ³

3. Test procedure

The tests listed below were carried out according to the Quality and Test Specifications for Extruded Sealing Profiles for Plastic Windows, RAL-GZ 716/1, Section II, Table 2, Product Class IV (for all applications, interior and exterior), Quality Requirements for **Thermoplastic** Materials, Edition August 2000.

If not indicated otherwise, preconditioning and testing was carried out at a standard atmosphere of 23/50, class 1 in accordance with DIN EN ISO 291.

Usually we carry out tests according to standards for which we have an accreditation. The list of all standards for which we are accredited is shown on the homepage at www.skz.de.

Material properties were tested on specimen taken out of an extruded flat profile. For testing Compression set and change in Shore hardness A on temperature variation specimen have been arranged in a pile.



3.1 Density deviation (Test Specification 3.1.1)

The density was determined on three test specimens in accordance with ISO 1183-1, procedure A.

3.2 Nominal hardness deviation (Test Specification 3.1.2)

The test was carried out in accordance with DIN ISO 48 using a ball diameter of 0.4 mm.

3.3 Tensile strength and elongation at break (Test Specification 3.1.3)

The test was carried out in accordance with DIN 53504 on five S2 test specimens. The specimens were taken from the extruded flat profile in extrusion direction. The testing speed was 200 mm/min.

3.4 Compression set (Test Specification 3.1.4)

The test was carried out in accordance with DIN ISO 815, using the sample shape B. Sandwiched between two talc-dusted steel plates these samples were compressed by 25 % of the original height and aged for 22 hours at a temperature of -25 °C, 23 °C and 70 °C.

At the end of the ageing period the samples were released and allowed to recover on a wooden plate (30 ± 3 min) at a standard atmosphere 23/50, class 1 according to DIN EN ISO 291. Afterwards the thickness of the samples was measured once more. Regarding the test at -25 °C, however, recovery and measurement took place at test temperature.

3.5 Behaviour after thermal ageing (Test Specification 3.1.5)

Artificial thermal ageing was carried out in accordance with DIN 53508 in a laboratory oven with forced ventilation at 100 °C for a period of 7 days. Subjected to this test were test specimens used for determining the IRHD hardness and S2 tensile test pieces used for determining the elongation at break and tensile strength.

After thermal ageing the test specimens were visually checked for changes (e.g. cracks or sticky surfaces).



3.6 Determination of change in Shore hardness when exposed to temperature change (Test Specification 3.1.6)

The test was carried out in accordance with DIN 53505 on the pressed plaque. Shore-A hardness was measured at a standard atmosphere of 23/50, class 1 as well as after ageing the test specimens for 22 h at a temperature of -10 °C.

3.7 Behaviour after exposure to ozone (Test Specification 3.1.7)

The test was carried out in accordance with DIN 53509, Part 1. Three test pieces with the dimensions 150 x 20 x 2 mm were subjected to the following test conditions:

Temperature 40 °C, ozone concentration: 50 pphm, time of exposure: 96 h, elongation: 20 %. (This test was not carried out at the SKZ.)

3.8 Behaviour after artificial weathering (Test Specification 3.1.8)

The test for the determination of weathering fastness and resistance was carried out in accordance with RAL-GZ 716/1, Section I, Test Method.

The procedure of the artificial weathering was carried out according to DIN EN 513, procedure 1, simulation of a moderate climate zone (M)

Artificial weathering device parameter:

Test apparatus:	XENOTEST® BETA LM
Light source:	Xenon-arc source (according to DIN EN ISO 4892-2)
Filter:	terrestrial daylight simulation
Operation:	non-alternating mode
Black standard temperature:	60 ± 3 °C
White standard temperature:	40 - 45 °C
Relative humidity:	65 ± 5 %
Spray cycle:	18 min water spray, 102 min dry cycle
Irradiance E _{UV} (300 - 400) nm:	60 ± 2 W/m ²
Irradiation dose (300 - 800) nm:	8 GJ/m ²
Exposure period:	4129 h
Start:	2011-03-18
End:	2011-09-12

3.8.1 Weathering fastness

Subsequent to artificial weathering the change in colour was determined visually by comparing the weathered with the non-weathered specimens, using the grey scale according to ISO 105-A02.



In addition, the weathered specimen surfaces were checked for changes (e.g. blistering or crack formation). The samples were evaluated by putting them under a microscope (laying flat) and by means of a tenfold magnification.

Requirement:

After artificial weathering the colour amendment must not be larger than level 3 corresponding to the grey scale according to ISO 105-A02.

There must not be any bubbles or cracks on the surface weathered.

3.8.2 Weathering resistance

After artificial weathering S2 test specimens were punched out of the weathered and non-weathered flat profiles and subjected to a tensile test according to DIN 53504 with a take-off speed of 200 mm/min in order to determine the elongation at break.

Requirement:

After artificial weathering the elongation at break must not be lower than the value of 200 %.

3.9 Contact discolouration (Test Specification 3.1.9)

The test was carried out in accordance with ISO 3865, Method A, using three test pieces with the dimensions 25 x 12 mm. A contact surface pressure of 0.7 N/cm² was exerted on each of the flat profile sections sandwiched between the visible surfaces of two white PVC-U frame profile sections with a 10 mm distance from the edge. This test set-up was aged in a laboratory oven with air circulation at 70 °C for a period of 24 h.

The visual assessment was made by comparing the frame profile surfaces after contact ageing with a reference section not previously aged, using the grey scale according to ISO 105-A03 (for white profiles).

3.10 Loss of weight (Test Specification 3.1.10)

The test was carried out in accordance with DIN EN ISO 176, Method A, on three test specimens, 75 x 20 x 2 mm in size, in direct contact with activated charcoal (with a granular size of 2 to 4 mm). Prior to and after ageing the test specimens in activated charcoal (28 days at 70 °C), the weight was determined accurate to 0.001 g and the loss of weight ascertained.



3.11 Compatibility (Test Specification 3.1.11)

The compatibility was determined on five test specimens made from frame profile material (PVC-U, colour white) with an E-modulus of 2887 N/mm². With the aid of steel radii (r = 300 mm) the test specimens, 100 x 20 x 3 mm, were clamped in such a way that the outer visible surface was subjected to a tensile stress in bending of 14.4 N/mm².

Flat profile sections of the sealing material, 100 x 20 x 2 mm in size, were pressed against the surfaces exposed to tensile stress in bending. One test specimen was aged which was not subjected to tensile stress in bending but against which also a sealing test specimen was pressed.

The test specimens were aged at 23 °C for period of 28 days. With a magnifying glass (tenfold magnification) the contact surfaces of the window profiles were visually examined for crack formation after 2, 4, 8, 14 and 28 days.



4. Test results FIRAT TPE; Colour: grey

Test	Unit	Requirement Product class IV	Result				Change	
			Individual values			Median		
4.1	Density	0.91 ± 0.03	0.91	0.91	0.91	-	0	
4.2	Nominal hardness	Nominal value 62 ± 5	61	62	63	62	63	
4.3 Tensile test								
4.3.1	Tensile strength	≥ 5.0	14.7	18.1	17.6	15.7	15.6	
4.3.2	Elongation at break	≥ 250	853	883	913	870	873	
4.4 Compression set								
4.4.1	-25 °C	≤ 90	77.3	78.9	78.6	-	78.6	
4.4.2	23 °C	≤ 35	18.3	19.1	18.3	-	18.3	
4.4.3	70 °C	≤ 50	47.4	47.7	47.4	-	47.4	
4.5 Behaviour after thermal ageing (7d, 100 °C)								
4.5.1	Change in hardness	≤ 5 d. Anfangswerts	60	61	61	61	62	
4.5.2	Change in tensile strength	≤ 25 v. Anfangswert	15.6 N/mm ²	13.1 N/mm ²	16.4 N/mm ²	-	- ²	
4.5.3	Elongation at break	≥ 200	873	816	878	-	-	
4.5.4	Visual assessment	no cracks, not sticky	without any objection					873
4.6 Change in Shore hardness when exposed to temperature change								
4.6.1	23 °C	---	55	55	55	-	55	
4.6.2	-10 °C	Change ≤ 25	63	63	63	-	63	
4.7	Behaviour after exposure to ozone ²	Crack level	The samples achieved the crack level 0.					8
4.8 Artificial weathering								
4.8.1	Weathering fastness visual assessment	GM A02 ³	The sample reaches the fastness grade 4 to 5 of the grey scale. Bubbles or cracks were not found (visual aid used: microscope, 10 x magnification)					---
4.8.2	Weathering resistance; elongation at break	%	875	855	860	855	868	
4.9	Contact discolouration	GM A03 ³	The samples reached the grade 5.					---
4.10	Loss of weight	%	2.8	2.9	2.8	-	2.8	
4.11	Compatibility	---	no cracks					---

¹ Arithmetic mean ² This test was not carried out at the SKZ ³ Fastness grade of the grey scale according to ISO 105-A02 or ISO 105-A03 (for white profiles)



5. Assessment of test results

The quality requirements of RAL-GZ 716/1, Section II - Extruded Seals, Table 2, Product Class IV, edition August 2000, are met.

