

**Suyun sesini kestik. Türkiye'nin en sessizini ürettik.**



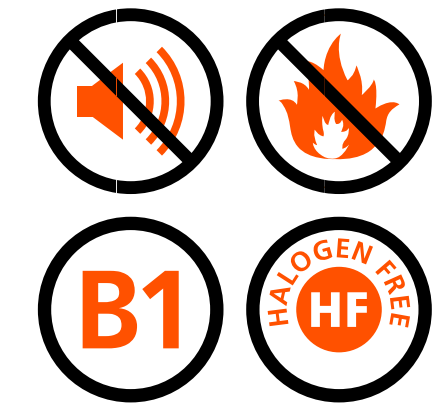
MİNERAL TAKVIYE İLE GÜÇLENDİRİLMİŞ U-PVC

U-PVC

**11 dB**

3.5 MM & 4,2 MM ET KALINLIĞI

DARBE DİRENCİNİ ARTTIRAN FEDERLİ YAPI



**RESIDENCE SESSİZ BORU & EK PARÇALARI**

**FIRATBORU**

**Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory according to DIN EN 14366**

**Fraunhofer IBP**

Test Report P-BA 137/2022e

**Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory according to DIN EN 14366**

**Client:** Firat Plastik Kaçukç. San. ve Tic. A.Ş. Address: Türkoba Mah.Firat Plastik Cad. No:23 Başyapırcımeşe İstanbul, TÜRKİYE

**Test object:** Wastewater system made of plastic "FRAT RESIDENCE PIPE, 110x4,2 PVC-U, ØB=ØD22" with fittings "FRAT DN 110, PVC-U" (manufacturer: Firat Plastik) and with acoustic pipe clamps with elastic ring (double clamp) "FRAT 4" - 110-115 with spaces 42 mm" (manufacturer: Firat Plastik). Test object no.: 110-115 with spaces 42 mm.

**Test setup:** The pipe system was mounted according to Figure 4 and 5 (see also Annex A). The system consisted of wastewater pipes (nominal size OD 110, 30 mm inlet tee (4-47), two 45°-elbow bends and a horizontal drain section. The view lies in the basement and in the ground floor were closed by ribs supplied by the manufacturer. Pipe sockets: "FRAT RESIDENCE PIPE, 110x4,2 PVC-U, ØB=ØD22", three layer pipes Material PVC-U, wall thickness 4,2 mm, weight 2,68 kg/m, density 2,12 g/cm³, values measured by BP. One-layer fittings: Maximum PVC-U wall thickness 3,6 mm, density 1,85 g/cm³, values measured by BP. Plug connection of the pipes and fittings (shaped pipe sockets). Pipe clamps: Acoustic pipe clamp (double clamp) "FRAT 4" - 110-115 with spaces 42 mm" (manufacturer: Firat Plastik) with elastomer ring (Øinner=4,00). In every story (UG and UG1) respectively two clamps were installed. At the lower wall area one double clamp consisting of supporting clamp with two elastomer spacer 2 x 21 mm on both sides and fixing clamp was installed. At the upper wall area one loose clamp with two elastomer spacer 2 x 21 mm on both sides was installed. To reduce contact to the pipe, the loose clamps and the supporting clamps were mounted with spaces 12 x 21 mm between the backing ribs of both sides of the clamp. The clamps were fixed with a tightening torque of 1 Nm for the supporting and loose clamps and with 3 Nm for the fixing clamps. The clamps were fixed to the installation wall with dowels and threaded ribs (Figure 5).

**Test facility:** Insulation test facility P12, mass per unit area of the insulation wall: 230 kg/m², mass per unit area of the ceiling: 460 kg/m², insulation room: sub-basement UG1, basement UG2, ground floor (GF) and top floor UG3, measuring room: UG front, UG rear, UG rear in Annex F and UG EN 14366, 2020-02

**Test method:** The measurements were performed according to DIN EN 14366:2020-02: noise isolation by steady water flow with 0,3 l/s, 1,0 l/s, 2,0 l/s and 4,0 l/s. Additional evaluation for comparison with requirements following German standards DIN 1956:2018-01 and DIN 4762:2011-10 (Annex A, 3 and 10).

Test result	Requirements
Sound pressure level L <sub>W</sub> (dB(A)) according to DIN EN 14366 for the basement test room	UG front: 40 47 49 52
Structure-borne sound characteristic level L <sub>W</sub> (dB(A)) according to DIN EN 14366 for the basement test room	UG rear: <10 <10 <10 <11
Insulation sound level L <sub>W</sub> (dB(A)) following DIN 4762 in the basement test room	UG front: 40 47 49 50
Insulation sound level L <sub>W</sub> (dB(A)) following VDI 4762 in the basement test room	UG front: 40 44 47 50
	UG rear: <10 <10 <10 <11

**Test date:** August 3, 2022

The mentioned measuring results exclusively refer to the investigated test object. The test was carried out in a laboratory, accredited according to DIN EN ISO/IEC 17025:2018 by DAkkS. The accreditation certificate is D-RI-11140-11-01.

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**Fraunhofer IBP**

Test Report P-BA 137/2022e

**Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory according to DIN EN 14366**

**Client:** Firat Plastik Kaçukç. San. ve Tic. A.Ş. Address: Türkoba Mah.Firat Plastik Cad. No:23 Başyapırcımeşe İstanbul, TÜRKİYE

**Test object:** Wastewater system made of plastic "FRAT RESIDENCE PIPE, 110x4,2 PVC-U, ØB=ØD22" with fittings "FRAT DN 110, PVC-U" (manufacturer: Firat Plastik) and with acoustic pipe clamps with elastic ring (double clamp) "FRAT 4" - 110-115 with spaces 42 mm" (manufacturer: Firat Plastik). Test object no.: 110-115 with spaces 42 mm.

**Test setup:** The pipe system was mounted according to Figure 4 and 5 (see also Annex A). The system consisted of wastewater pipes (nominal size OD 110, 30 mm inlet tee (4-47), two 45°-elbow bends and a horizontal drain section. The view lies in the basement and in the ground floor were closed by ribs supplied by the manufacturer. Pipe sockets: "FRAT RESIDENCE PIPE, 110x4,2 PVC-U, ØB=ØD22", three layer pipes Material PVC-U, wall thickness 4,2 mm, weight 2,68 kg/m, density 2,12 g/cm³, values measured by BP. One-layer fittings: Maximum PVC-U wall thickness 3,6 mm, density 1,85 g/cm³, values measured by BP. Plug connection of the pipes and fittings (shaped pipe sockets). Pipe clamps: Acoustic pipe clamp (double clamp) "FRAT 4" - 110-115 with spaces 42 mm" (manufacturer: Firat Plastik) with elastomer ring (Øinner=4,00). In every story (UG and UG1) respectively two clamps were installed. At the lower wall area one double clamp consisting of supporting clamp with two elastomer spacer 2 x 21 mm on both sides and fixing clamp was installed. At the upper wall area one loose clamp with two elastomer spacer 2 x 21 mm on both sides was installed. To reduce contact to the pipe, the loose clamps and the supporting clamps were mounted with spaces 12 x 21 mm between the backing ribs of both sides of the clamp. The clamps were fixed with a tightening torque of 1 Nm for the supporting and loose clamps and with 3 Nm for the fixing clamps. The clamps were fixed to the installation wall with dowels and threaded ribs (Figure 5).

**Test facility:** Insulation test facility P12, mass per unit area of the insulation wall: 230 kg/m², mass per unit area of the ceiling: 460 kg/m², insulation room: sub-basement UG1, basement UG2, ground floor (GF) and top floor UG3, measuring room: UG front, UG rear, UG rear in Annex F and UG EN 14366, 2020-02

**Test method:** The measurements were performed according to DIN EN 14366:2020-02: noise isolation by steady water flow with 0,3 l/s, 1,0 l/s, 2,0 l/s and 4,0 l/s. Additional evaluation for comparison with requirements following German standards DIN 1956:2018-01 and DIN 4762:2011-10 (Annex A, 3 and 10).

Test result	Requirements
Sound pressure level L <sub>W</sub> (dB(A)) according to DIN EN 14366 for the basement test room	UG front: 40 47 49 52
Structure-borne sound characteristic level L <sub>W</sub> (dB(A)) according to DIN EN 14366 for the basement test room	UG rear: <10 <10 <10 <11
Insulation sound level L <sub>W</sub> (dB(A)) following DIN 4762 in the basement test room	UG front: 40 47 49 50
Insulation sound level L <sub>W</sub> (dB(A)) following VDI 4762 in the basement test room	UG front: 40 44 47 50
	UG rear: <10 <10 <10 <11

**Test date:** August 3, 2022

The mentioned measuring results exclusively refer to the investigated test object. The test was carried out in a laboratory, accredited according to DIN EN ISO/IEC 17025:2018 by DAkkS. The accreditation certificate is D-RI-11140-11-01.

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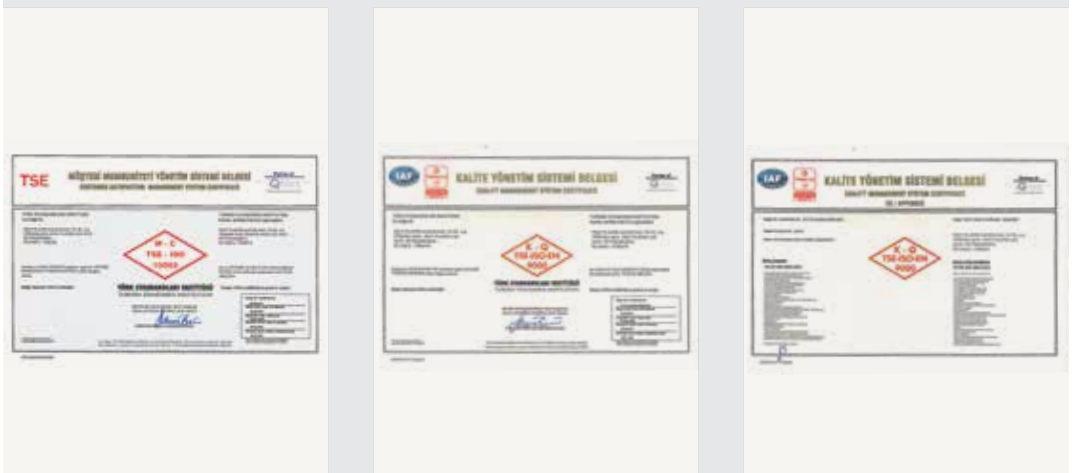
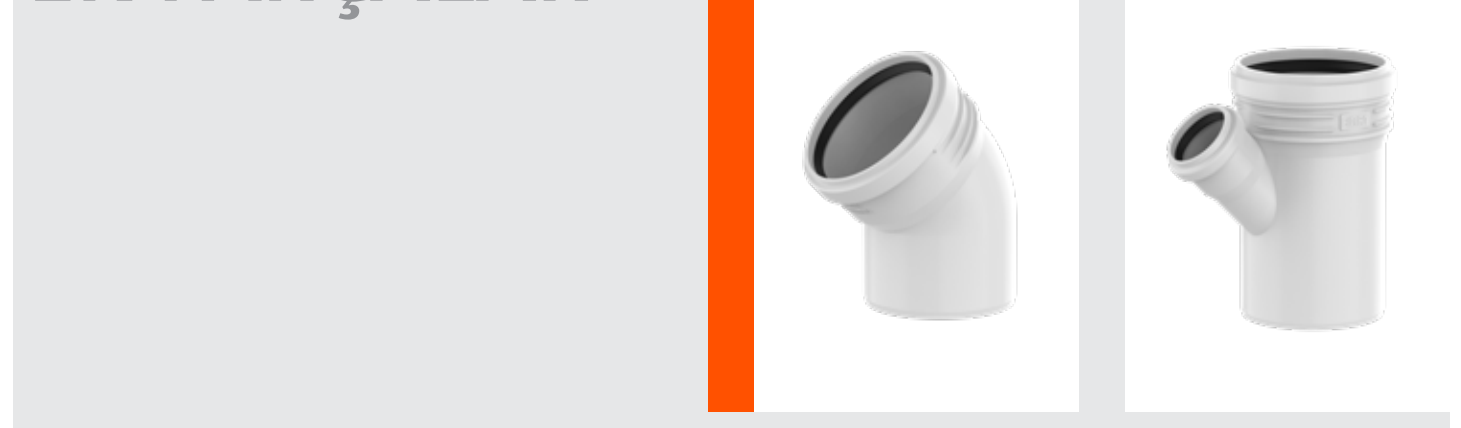
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**FUDEL AKREDİTE LABORATUAR**

Altyapı ve üst yapı yatırımlarında kullanılan plastik boru sistemlerinin kalitesi, uluslararası standartlara bağlıdır ve bu standartlara uygunluk Türk sanayinin ihrac yeteneği açısından önemli bir girdirdir. Gerekli testleri yapılmadan kalite onayı verilen sistemler çok daha yüksek maliyetlerle kaynaklarımızı israf etmektedir. Ülkemizde plastik boru testlerinin tarafsız ve bağımsız olarak yaptırılacağı yüksek test kapasitesine sahip akredite test laboratuvarları önemli bir eksikti. Artık bu eksikliği gidererek ülke kaynaklarımızın daha verimli kullanılmasını sağlayacak, uluslararası geçerliliği olan tek kamu kurumu TÜRKAK'tan akredite büyük bir laboratuvar var. Uzman ve yetkin kadrosuyla ülkemizin en geniş teknolojik altyapısına sahip ve sonuçları en hızlı şekilde müşterilerine teslim eden laboratuvarı FUDEL, 22 test kapsamı ile sektörünün öncüsüdür.



**EK PARÇALAR**



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**FIRAT**

TSE, TÜRKAK, ISO 9001, SGS, IONET, IBP

1120 - 4106001358 - A - 28.09.2022

# GENEL TANIM

Boru içerisinde farklı akış hızlarında geçen akışkanlar, boru çeperlerine ve boru içerisindeki engellere çarparak titreşimlere sebebiyet verirler ve yaşam alanlarında rahatsızlık veren sesler çıkarırlar. İnşaat sektöründe yaşanan modern gelişmeler, konut teslim sürelerini hızlandırmıştır. İnşaat firmaları, tesisat yatırımları için yaptıkları ek işçilik giderlerini ve zaman maliyetlerini düşürmek için daha sessiz borulara ihtiyaç duymuşlardır.



# SESSİZ BORU KULLANIM ALANLARI

Residence Boru ve Ek Parçaları; villa ve çok katlı konutlarda, hastanelerde, okullarda, otellerde, endüstriyel ve sportif vb. yapılarda sessizliği sağlaması, ekolojik ve ekonomik olması sebebiyle tercih edilir. Sessiz boru, yapı temelindeki ve yapı içindeki atık suların sızıntı yapmaksızın ideal ve güvenli bir şekilde tahliye edilmesini (50 yıl) sağlar.

# MALZEME ÖZELLİKLERİ

RESİDENCE BORU VE EK PARÇALARI U-PVC ve **vinyl-copolimer (FRvinylflex)** hammaddelerinin karışımıyla 3 katmanlı olarak üretilir.

**İç Katman:** Pürüzsüz iç yüzeye sahip U-PVC'den yapılmıştır.

**Orta Katman:** FRvinylflex, Fırat AR-GE laboratuvarları tarafından geliştirilen **mineral bezli bir katkı maddesidir** ve Residence II Borulara **sessizlik özelliği** kazandırmaktadır.

**Dış Katman:** Dışardan gelen darbelere karşı boruyu koruyan U-PVC'den üretilmiştir.



MİNERAL TAKVİYE İLE GÜÇLENDİRİLMİŞ U-PVC

# CONTA

Residence Boru ve Ek Parçalarında kullanılan contalar **EPDM** hamurdan üretilmekte, tek yönlü ve özel dış şekli ile %100 sızdırmazlık sağlamaktadır. TS EN 681-1 standartına uygun üretilmiştir



TEK YÖNLÜ EPDM CONTA VE ÖZEL DIŞ ŞEKLİ İLE %100 SIZDIRMAZLIK

# GÖRÜNÜM

→ Residence Boru ve Ek parçaları gri renkte üretilmektedir.

→ Muf kısımlarına darbe mukavemeti artırılmış **federli yapı** eklenmiştir.



DARBE DİRENCİNİ ARTTIRAN FEDERLİ YAPI

# FİZİKSEL VE KİMYASAL ÖZELLİKLER

Residence Boru ve Ek Parçaları, TS EN 1329-1 standardında belirtilen mekanik ve kimyasal özellikleri karşılamaktadır.

Sıra	Test	Deney Metodu	Test Süresi	Test Sıcaklığı	Göstermesi Gerek Performans
1	Darbe Dayanımı	ISO 3127	-	0°C	Max. %10
2	Vicat Yumuşama Sıcaklığı	ISO 2507-1	-	-	Min. 79°C
3	Uzunlamasına Boyut Değişikliği	EN ISO 2505	30 dk.	150°C	Max. %5
4	Diklorometana Dayanım	ISO 9852	30 dk.	15°C	Bozulma olmamalı
5	Sıcaklık Etkisi Testi (Ek parça)	EN ISO 580	30 dk.	150°C	Bozulma olmamalı
6	Sızdırmazlık Testi (0,5 bar) (Sistem)	TS EN ISO 13254	15 dk.	23°C	Sızdırma görülmemeli

## RESİDENCE BORU (3,5 & 4,2 MM) ÇAP VE ET KALINLIKLARI

Boru Dış Çapı (mm)	(3,5 mm için) Et Kalınlığı (mm)	(4,2 mm için) Et Kalınlığı (mm)
50	3,0	3,6
75	3,0	3,6
110	3,5	4,2
125	3,6	4,2
160	4,3	5,0



# RESİDENCE BORU VE EK PARÇALARI'NA AİT STANDARTLAR VE TEST RAPORLARI

→ **TS EN 1329-1** standardındaki BD sınıfının tüm mekanik ve fiziksel gerekliliklerini sağlamaktadır. BD Uygulama sınırı; bina içi ve siva üstü uygulama alanlarını, bina içi siva altı uygulama alanlarını ve binanın kanalizasyon bağlantısına kadar olan uygulama alanlarını kapsamaktadır.

→ Residence Boru ve Ek Parçaları Bayındırlık ve İskan Bakanlığının 2007/12937 karar sayısında belirtilen, "Binaların Yangından Korunması Hakkında Yönetmelik" kapsamında **zor alevlenici (alev almaz)** sınıfındadır.

→ Residence Boru ve Ek Parçaları, ABD merkezli bağımsız bir ürün güvenlik sertifikasyon kurumu olan **UL (Underwriters Laboratories)** tarafından yapılan yangın davranışı testinde **V-0 YANMAZLIK** sınıfında değerlendirilmiştir.

→ **TSE DENEY VE KALİBRASYON MERKEZ BAŞKANLIĞI MUAYENE VE DENEY RAPORU** Residence Boru ve Ek Parçalarının **TS EN 13501-1 +A1:2013-04 Yapı Mamülleri ve Yapı Elemanları-Yangına Tepki Sınıflandırması** deney sonuçlarına göre yangına tepki sınıflandırması **B S2 D0** olarak bulunmuştur. Yangın Sınıfı B, Duman Oluşumu S2, Alevli Damlacıklar D0'dır.

## RESİDENCE BORU VE EK PARÇALARI **SESSİZDİR.**

Residence Boru ve Ek Parçalarının, Fraunhofer Institut Bauphysik (Almanya) kurumunda yapılan ses seviyesi ölçüm test sonuçları, ulusal ve uluslararası tüm standart gerekliliklerini karşılamaktadır.

Akış Hızı (litre/saniye)	0,5	1,0	2,0	4,0
Karakteristik Ses Seviyesi Desibel (dBA)				
(Keleççeli Boru Sistemi)	<10	<10	<10	11



Client:	Fırat Plastik Kauçuk San. ve Tic. A.Ş. Address: Tsk.İskele Mah. Fırat Plastik Cad. No:23 Büyükdere İstanbul, TÜRKİYE
Test object:	Wastewater system made of plastic "FRAT RESIDENCE PIPE, 110x3,5, PVC-U, 0606022" with fittings "FRAT DN 110, PVC-U" (manufacturer: Fırat Plastik) and with acoustic pipe clamps with elastic inlay (double clamp) "FRAT 4", 110-115 with spacers 42 mm" (manufacturer: Fırat Plastik).
Content:	Results sheet 1: Summary of test results Figures 1 to 3: Detailed results Figures 4 and 5: Test set-up Annex A: Measurement set-up, noise excitation, acoustic parameters Annex E: Evaluation of measurements Annex F: Description of the test facility Annex V: Assessment according to VDI 4100
Test date:	The measurement was carried out on August 9, 2022 in the test facilities of the Fraunhofer Institute for Building Physics in Stuttgart.
Stuttgart, August 25, 2022	Responsible Test Engineer: Head of Laboratory:
Dipl.-Ing. Dr. J. Mohr	M.B.F. Dipl.-Ing. Dr. S. Orlitz

Test facility:	Installation room sub-basement (KG), basement (KG) front and top floor (KG), measuring room US floor, US rear (SBA) in Annex F and DIN EN 14396:2022-02)
Test method:	The measurements were performed according to DIN EN 14396:2022-02, noise excitation by steady water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s. Additional evaluation for comparison with requirements following German standards DIN 4109:2016-01 and VDI 4100:2012-10 (SBA) in Annexes A, F and V)
Result:	Table with noise level data (dB(A)) for different test rooms and frequencies.

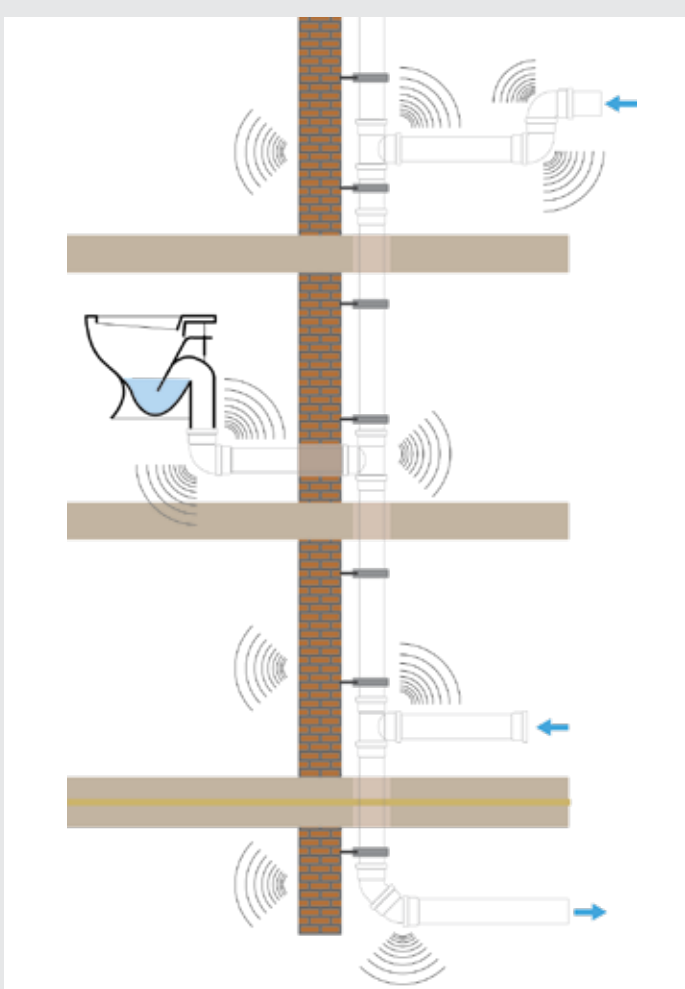
The mentioned measuring results exclusively refer to the investigated test object. The test was carried out in a laboratory, accredited according to DIN EN ISO/IEC 17025:2018 by DAkkS. The accreditation certificate is D-PL-11140-11-01.

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Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory according to DIN EN 14366	P-BA 138/2022e Results sheet 1
Client:	Fırat Plastik Kauçuk San. ve Tic. A.Ş. Address: Tsk.İskele Mah. Fırat Plastik Cad. No:23 Büyükdere İstanbul, TÜRKİYE
Test specimen:	Wastewater system made of plastic "FRAT RESIDENCE PIPE, 110x3,5, PVC-U, 0606022" with fittings "FRAT DN 110, PVC-U" (manufacturer: Fırat Plastik) and with acoustic pipe clamps with elastic inlay (double clamp) "FRAT 4", 110-115 with spacers 42 mm" (manufacturer: Fırat Plastik). Test object no.: S 11981-03; see figure 4 and 5.
Test set-up:	- The pipe system was installed according to figure 4 and 5 (see also Annex A). - The system consisted of wastewater pipes (nominal size DN 110), three inlet boxes (S17), two 45°-basement bends and a horizontal drain section. The inlet tests in the basement and in the ground floor were closed by IBS supplied by the manufacturer. - Pipe system: "FRAT RESIDENCE PIPE, 110x3,5, PVC-U, 0606022". Three layer pipe: Material PVC-U, wall thickness 3.7 mm, weight 2.42 kg/m, density 2.05 g/cm³, values measured by IFP. One-layer fittings: Material PVC-U, wall thickness 3.4 mm, density 1.85 g/cm³, values measured by IFP. Plug connection of the pipes and fittings (shaped pipe sockets). - Pipe clamps: Acoustic pipe clamps (double clamp) "FRAT 4", 110-115, with spacers 42 mm" (manufacturer: Fırat Plastik) with elastomer inlay (SBA-A 65). In every storey (BG and UG) respectively two clamps were installed. At the lower wall area one double clamp consisting of supporting clamp (with base elastomer spacer 2 x 2.1 mm on both sides) and fixing clamp was installed. At the upper wall area one loose clamp (with two elastomer spacer 2 x 2.1 mm on both sides) was mounted. To reduce contact to the SBA, the loose clamps and the supporting clamps were mounted with spacers (2 x 2.1 mm) between the locking tabs of both sides of the clamp. The clamps were closed with a tightening torque of 1 Nm for the supporting and loose clamps and with 2 Nm for the fixing clamps. The clamps were fixed by the installation wall with screws and threaded rods (figure 5).
Test facility:	The wastewater installation system was mounted by a technician under the authority of Fraunhofer IBP. Installation test facility P12, mass per unit area of the installation wall 230 kg/m², mass per unit area of the ceiling 440 kg/m². Installation room: sub-basement (KG), basement (KG) front, ground floor (BG) front and top floor (KG), measuring room: US floor, US rear (SBA) in Annex F and DIN EN 14396:2022-02)
Test method:	The measurements were performed according to DIN EN 14396:2022-02, noise excitation by steady water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s. Additional evaluation for comparison with requirements following German standards DIN 4109:2016-01 and VDI 4100:2012-10 (SBA) in Annexes A, F and V)
Result:	Table with noise level data (dB(A)) for different test rooms and frequencies.
Test date:	August 9, 2022
Notes:	- For comparing test results with requirements according to DIN 4109 and VDI 4100 note Annex A. - The above-mentioned measurement results require careful assembly of the pipe clamps (see test set-up). - Sound levels below 10 dB(A) are not mentioned in the official test report, since they are subject to an increased measurement uncertainty and moreover are not noticeable in a normal living environment.
	The test was carried out in a laboratory, accredited according to DIN EN ISO/IEC 17025:2018 by DAkkS. The accreditation certificate is D-PL-11140-11-01.
	Stuttgart, August 25, 2022 Head of Laboratory:



Residence Sessiz Boru atık su sistemlerinin özellikleri