



Certification made simple™

# Certificate of Registration

Presented to

**AQUAGAS Plastic Industries L.L.C.**

**P.O. Box 56790, Dubai Investment Park – 2, Dubai, United Arab Emirates**

**(ISO Certified Company)**

*IMS Certification certify that the Environmental Management System of the above organisation has been audited and found in compliance with the requirements of the standard detailed below:*

### Management Standard Certifications:

ISO 14001:2015 Environmental Management System

<b>Legal Status:</b>	Limited Liability Company
<b>Certificate ID:</b>	AE-20-1003505
<b>Registration Term:</b>	10 years <i>(Subject to annual surveillance audit to confirm the continued satisfactory operation of the organisation's Management System)</i>
<b>Initial Registration:</b>	28 <sup>th</sup> June 2018
<b>This Certificate issued:</b>	4 <sup>th</sup> June 2020
<b>Certificate valid to:</b>	27 <sup>th</sup> June 2021
<b>Main SIC Code:</b>	423840
<b>Scope of Certification:</b>	Manufacturer of "AQUATERRA" PPR Pipes and Fittings and "PPTERRA" Pipes and Fittings

*This certificate remains the property of IMS and can be verified at: [www.isoregister.info](http://www.isoregister.info)  
Issuing Authority: IMS Certification Limited.  
P.O. Box 4142 Sheffield, S7 2QU, United Kingdom*



Signed for and on behalf of  
IMS Certification Body

Certifying companies worldwide™







Certification made simple™

# Certificate of Registration

Presented to

**AQUAGAS Plastic Industries L.L.C.**

**P.O. Box 56790, Dubai Investment Park – 2, Dubai, United Arab Emirates**

**(ISO Certified Company)**

*IMS Certification certify that the Quality Management System of the above organisation has been audited and found in compliance with the requirements of the standard detailed below:*

### Management Standard Certifications:

ISO 9001:2015 Quality Management System

<b>Legal Status:</b>	Limited Liability Company
<b>Certificate ID:</b>	AE-20-1003448
<b>Registration Term:</b>	3 years <i>(Subject to annual surveillance audit to confirm the continued satisfactory operation of the organisation's Management System)</i>
<b>Initial Registration:</b>	12 <sup>th</sup> February 2020
<b>This Certificate issued:</b>	12 <sup>th</sup> February 2020
<b>Certificate valid to:</b>	11 <sup>th</sup> February 2021
<b>Main SIC Code:</b>	20590
<b>Scope of Certification:</b>	Manufacturer of "AQUATERRA" PPR Pipes and Fittings and "PPTERRA" Pipes and Fittings

*This certificate remains the property of IMS and can be verified at: [www.isoregister.info](http://www.isoregister.info)  
Issuing Authority: IMS Certification Limited.  
P.O. Box 4142 Sheffield, S7 2QU, United Kingdom*



*[Signature]*  
Signed for and on behalf of  
IMS Certification Body

Certifying companies worldwide™



**Table of contents:****Page:**

<b>1</b>	<b>Order</b>	<b>3</b>
<b>2</b>	<b>Test material</b>	<b>3</b>
<b>3</b>	<b>Test procedure</b>	<b>4</b>
<b>4</b>	<b>Test results</b>	<b>5</b>
<b>4.1</b>	<b>Marking</b>	<b>5</b>
<b>4.2</b>	<b>Melt mass flow rate</b>	<b>5</b>
<b>4.3</b>	<b>Appearance</b>	<b>5</b>
<b>4.4</b>	<b>Colour</b>	<b>5</b>
<b>4.5</b>	<b>Dimensions</b>	<b>5</b>
<b>4.6</b>	<b>Impact resistance (round-the-clock method)</b>	<b>6</b>
<b>4.7</b>	<b>Longitudinal reversion</b>	<b>6</b>
<b>4.8</b>	<b>Thermal cycling test (sagging)</b>	<b>6</b>
<b>4.9</b>	<b>Fire behaviour</b>	<b>6</b>
<b>4.10</b>	<b>Resistance to internal pressure</b>	<b>7</b>
<b>4.11</b>	<b>Resistance to internal pressure</b>	<b>7</b>
<b>5</b>	<b>Assessment of test results</b>	<b>7</b>



## 1 Order

By its letter of 06 May 2015 company Aquagas Plastic Industries, Dubai Investment Park 2, DUBAI, UNITED ARAB EMIRATES, instructed SKZ - Testing GmbH to execute an initial type test on pipes made of PP, dimension groups 1 and 2, according to DIN EN 1451-1 and DIN CEN/TS 1451-2, application area code "B" and "BD".

## 2 Test material

On 03 June 2015 and 06 June 2016 SKZ - Testing GmbH received following samples for testing:

Sample no.	Quantity [piece]	Nominal size	Description
1	10 x 1 m	DN 50	PP-HT pipe without socket
2.1	10 x 1 m	DN 110	PP-HT pipe without socket
2.2	8 x 1 m	DN 110	PP-HT pipe without socket

Sample no.	Marking
1	PP TERRA EN 1451 DN 50X1.8 PP B S20 EXT:PPS-8 16/03/2015 16:35 Made in U.A.E B NO: BDB501103PP501502
2.1	PP TERRA EN 1451 DN 110X2.7 PP B S20 EXT:PPS-8 26/03/2015 18:14 Made in U.A.E B NO: H03
2.2	PP TERRA EN 1451 DN 110X3.4 PP BD S16 02/05/16 11:12 Made in U-A-E BNO: B518903PPBD1101605



### 3 Test procedure

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](http://www.skz.de).

This initial type test was carried out according to DIN EN 1451-1:1999-03 and DIN CEN/TS 1451-2:2012-05, application area code "B".

Unless otherwise noted all tests were carried out at standard atmosphere 23/50, class 2, according to DIN EN ISO 291:2008-08 "Plastics - Standard atmospheres for conditioning and testing (ISO 291:2008); German version EN ISO 291:2008" and after a storage of at least 88 hours in this climate.

Tests marked with \* have been performed within SKZ project no, 120554/16 as complementary tests.

Following tests were carried out:

No.	Tests	Requirements / tests according to DIN EN 1451-1:1999-03, par.
1	Marking	12
2	Melt mass-flow rate	4.3
3	Appearance	5.1
4	Colour	5.2
5	Dimensions	6.2
6	Impact resistance (round-the-clock-method)	7.1
7	Longitudinal reversion	8.1
8	Temperature cycling test (sagging)	9
9	Fire Behaviour	4.6
10	Resistance to internal pressure	10.2
11	Ring stiffness	10.3



## 4 Test results

### 4.1 Marking

The marking on samples no. 1 and 2 is conforming with requirements of DIN EN 1451-1 (see par. 2).

### 4.2 Melt mass flow rate

Sample no.	MFR 230/2.16 [g/10 min]	
	Mean value	Set value
1	0.67	≤ 3.0
2.1	0.66	≤ 3.0

### 4.3 Appearance

The internal and external surfaces of pipes and fittings had smooth surfaces. Cracks, bubbles and inhomogeneities were not ascertained. Pipe ends were properly cut and pipes and fittings were rectangular to their axis.

### 4.4 Colour

All samples were coloured continuously grey.

### 4.5 Dimensions

Sample no.	Feature		Actual value [mm]		Set value [mm]	
			minimum	maximum	minimum	maximum
1	Outside diameter	$d_{em}$	50.0	50.1	50.0	50.3
	Wall thickness	$e_{min}$	1.8	---	1.8	---
	Wall thickness	$e_{m,max}$	---	2.0	---	2,2

Sample no.	Feature		Actual value [mm]		Set value [mm]	
			minimum	maximum	minimum	maximum
2.1	Outside diameter	$d_{em}$	110.1	110.1	110.0	110.4
	Wall thickness	$e_{min}$	2.7	---	2.7	---
	Wall thickness	$e_{m,max}$	---	3.0	---	3.2

Sample no.	Feature		Actual value [mm]		Set value [mm]	
			minimum	maximum	minimum	maximum
2.2	Outside diameter	$d_{em}$	110.2	110.2	110.0	110.4
	Wall thickness	$e_{min}$	3.4	---	3.4	---
	Wall thickness	$e_{m,max}$	---	3.6	---	4.0





#### 4.6 Impact resistance (round-the-clock method)

Sample no.	Conditioning temperature [°C]	Type of striker	Mass of striker [kg]	Drop height [m]	Remark
1	0	d25	0.5	1.0	no failure
2.1	0	d90	1.0	1.6	no failure

#### 4.7 Longitudinal reversion

Sample no.	Change in dimensions after longitudinal revision [%]			
	Temperature [°C]	Immersion time [min]	Mean value	Set value
1	150	30	0.5	≤ 2
2.1	150	30	0.6	≤ 2

#### 4.8 Thermal cycling test (sagging)

Sample no.	Diameter	Cycles	Sagging [mm]		Evaluation
			Actual value	Set value	
1	Pipe DN 50	1500	1.3	≤ 3.0	without any complaint
2.1	Pipe DN 110	1500	0.4	≤ 5.5	

#### 4.9 Fire behaviour

SKZ - Testing GmbH received the following fire behaviour test reports, issued for pipes PP TERRA, DN110:

Test report	Test standard	Test result
AB-0001-T 270839, dated 16 October 2015, issued by TSE, Turkey	TS EN ISO 11925-2:2010-10	No signs of ignition or dripping during test.
AB-0001-T 270841, dated 16 October 2015, issued by TSE, Turkey	TS EN 13501-1 + A1:2013-04	Reaction to fire and flaming droplets behaviour Classification: E



#### 4.10 Resistance to internal pressure

Sample no.	Test temperature [°C]	Test stress [N/mm <sup>2</sup> ]	Time-to-failure [h]	
			Actual value	Set value
2.2	80	4.2	> 140	≥ 140
2.2	95	2.5	> 1000	≥ 1000

#### 4.11 Resistance to internal pressure

Sample no.	Ring stiffness S [ kN/m <sup>2</sup> ]				Set value
	Actual value				
	S <sub>a</sub>	S <sub>b</sub>	S <sub>c</sub>	S $\bar{x}$	
2.2	4.86	5.50	5.46	5.27	≥ 4.0

### 5 Assessment of test results

Pipes made of PP, dimension groups 1 and 2, have met the requirements according to DIN EN 1451-1:1999-03 and DIN CEN/TS 1451-2:2012-05, application area code "B" and "BD".







TÜRKAK - TÜRK AKREDİTASYON KURUMU tarafından akredite  
Accredited by TÜRKAK

**TSE DENEY ve KALİBRASYON MERKEZİ BAŞKANLIĞI**  
**Makina ve Yapı Malzemeleri Grup Başkanlığı**  
**Yapı Malzemeleri Yangın ve Akustik Laboratuvarı Müdürlüğü**

Adres: Aydınlı Mah. Gülenur Sok. No: 7/1 Tuzla/ İSTANBUL  
Tel: +90 (312) 560 05 00 Fax: +90 (312) 560 05 65 E-posta: yalitim@tse.org.tr Web: www.tse.org.tr

*HEADSHIP OF TSE TEST and CALIBRATION CENTER*  
*CONSTRUCTION MATERIALS FIRE AND ACOUSTICS LABORATORY DIRECTORATE*

Address: Aydınlı Mah. Gülenur Sok. No: 7/1 Tuzla/ İSTANBUL  
Tel: +90 (312) 560 05 00 Fax: +90 (312) 560 05 65 E-mail: yalitim@tse.org.tr Web: www.tse.org.tr

**MUAYENE VE DENEY RAPORU**  
**TEST REPORT**



Test  
TS EN ISO/IEC 17025  
AB-0001-T

AB-0001-T

270841

09-15

<b>Deneyi Talep Eden</b> (Adı, Adresi, Şehir vb.) <i>Customer (Name, Address, City etc.)</i>	: AQUAGAS PLASTIC INDUSTRIES L.L.C  (AQUAGAS PLASTIC INDUSTRIES L.L.C: P.O BOX:56790 DUBAI --Dubai)
<b>Deney Talep Tarihi/No</b> <i>Order Date / No</i>	: 08.09.2015 / 136434
<b>Numunenin Tanımı</b> (Cins, Marka, Tip, Tür, Model vb.) <i>Sample Description (Type, Mark, Model etc.)</i>	: POLİPROPİLEN ATIK SU BÖRUSU, PP TERRA, 110MM, -, -, 110.00 milimetre  <i>POLYPROPYLENE DRAINAGE PIPES, PP TERRA, 110MM, -, -, 110,00 millimeter</i>
<b>Numune Kabul Tarihi</b> <i>Test Item Receipt Date</i>	: 31.08.2015  <i>Samples were collected by the manufacturer</i>
<b>Deneylerin Yapıldığı Tarih</b> <i>Date of Test</i>	: 31.08.2015 - 18.09.2015
<b>Uygulanan Standard / Metod</b> <i>Applied Standard/Method</i>	: TS EN 13501-1 + A1:2013-04 Yapı mamulleri ve yapı elemanları - Yangın sınıflandırması- Bölüm I: Yangın karşısındaki davranış deneylerinden elde edilen veriler kullanılarak sınıflandırma  <i>TS EN 13501-1 + A1:2013-04 Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests</i>
<b>Raporun Sayfa Sayısı</b> <i>Number of pages of the report</i>	: 4
<b>Açıklamalar</b> <i>Remarks</i>	:

Türk Akreditasyon Kurumu (TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği (EA) ve Uluslararası Laboratuvar Akreditasyon Birliği (ILAC) ile karşılıklı tanıma antlaşmasını imzalamıştır.

*The Turkish Accreditation Agency (TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation (EA) and of the International Laboratory Accreditation (ILAC) for the Mutual recognition of test reports.*

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metodları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

*The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.*

Bu rapor özel deney talebine istinaden düzenlenmiş olup, Standartlara Uygunluk Belgesi niteliğinde değildir. Partiyi temsil etmez, ayrıca ilan, reklam ve ihalelerde uygunluk belgesi niteliğinde kullanılamaz.



**Deney Sorumlusu**  
*Person in charge of tests*  
  
Arda ATAKOL  
Uzman Yardımcısı

**Kontrol Eden**  
*Reviewer*  
  
Sencer GÜVEN  
Teknik Şef

**Onaylayan**  
*Approved by*  
  
Metehan ÇALIŞ  
Laboratuvar Müdürü

Bu rapor, hazırlayan laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürlü raporlar geçersizdir.

Bu rapor, sadece deneyi yapılan numune için geçerlidir ve "Ürün Belgesi" yerine geçmez.

*This test report shall not be reproduced other than in full except with the written permission of the laboratory. Test reports without signature and seal are not valid.*

*This test report represents only tested sample(s), and shall not be used as Product Certificate*



## Reaction to Fire Classification Report

### 1 Introduction

This classification report defines the classification assigned to the product “PP TERRA Polypropylene Drainage Pipe” in accordance with the procedures given in the standard EN 13501-1 + A1: 2009 Fire classification of construction products and building elements – Part 1: Classification using data from reaction to fire tests.



### REACTION TO FIRE CLASSIFICATION ACCORDING TO EN 13501-1: 2010

Sponsor	AQUAGAS PLASTIC INDUSTRIES L.L.C., DUBAI Investment Park 2 P.O.Box: 56790, DUBAI / U.A.E
Prepared by	TSE Construction Materials Fire and Acoustics Laboratory Aydınlı Mah. Gülenur Sok. No:7/1 Tuzla, İSTANBUL / TURKEY
Notified Body No.	1783
Product name	PP TERRA Polypropylene Drainage Pipe
Classification report No.	270841 / 09-15
Issue number	2/2
Date of issue	29.09.2015

This classification report consists of 4 pages and may only be used or reproduced in its entirety.

### 2 Details of Classified Product

#### 2.1 General

The product “PP TERRA Polypropylene Drainage Pipe” is defined as a polypropylene water pipe that is used for waste discharge within buildings.

#### 2.2 Product description

“PP TERRA Polypropylene Drainage Pipe” refers to the polypropylene waste water discharge pipes manufactured according to EN 1451. The fittings and connection parts that are manufactured with the same recipe, density and wall thickness are also included in this scope.

Property	Value/Definition
Outer diameter	110 mm
Wall thickness	2.9 mm (average of 10 measurements)
Weight per unit length	906 g/m
Surface	Gray, matte
Visible markings	PP TERRA EN 1451 DN 110X2.7PP B S20







## Reaction to Fire Classification Report

### 3 Test Reports and Results in Support of This Classification Report

#### 3.1 Reports

Following test reports were taken into account in the determination of this classification.

Laboratory	Sponsor	Test Report Ref. No	Test Method
TSE Construction Materials Fire and Acoustics Laboratory	AQUAGAS PLASTIC INDUSTRIES L.L.C.	270839 / 09-15	EN ISO 11925: 2010

#### 3.2 Results

Results of the above mentioned test reports and the classification criteria corresponding to class E as stated in EN 13501-1 + A1: 2009 were given in the following table.

Test Method	Parameter	Number of tests	Test Results	
			Mean of Continuous Parameters	Compliance
TS EN ISO 11925-2 (15 s exposure)	$F_s \leq (150 \text{ mm})$ in 20 s	6	(-)	Comply
	No ignition of filter paper		(-)	Comply

(-) Not applicable (based on observation)

### 4 Classification and Direct Field of Application

#### 4.1 Reference of classification

This classification has been carried out in accordance with clauses 11.3 and 11.10.2 of EN 13501-1 + A1: 2009.

#### 4.2 Classification

In relation to its reaction to fire and flaming droplets behaviour, the product "PP TERRA Polypropylene Drainage Pipe" has been classified as:

E

In relation to its smoke production behaviour, the product "PP TERRA Polypropylene Drainage Pipe" has not been classified.

Fire behaviour	Smoke production	Flaming droplets
E	Not applicable	No indication needed

Reaction to fire classification: E





## Reaction to Fire Classification Report

### 4.3 Field of application

This classification is valid for the products manufactured with the same recipe, having the same color and surface properties and complying the following parameters

Wall Thickness:	2.6 or larger
Pipe diameter:	Any
Weight per unit length:	906 g/m <sup>2</sup> or larger

This classification is valid for any end use condition that does not involve fixing with or getting in touch with materials having a reaction to fire class worse than the product.

### 5 Limitations

At the time of publishing of the standard TS EN 13501-1 + A1: 2010, there was not any decision concerning the duration of validity of a classification report.

The present document represents neither type approval nor certification of the product.

*End of classification report.*







TÜRKAK - TÜRK AKREDİTASYON KURUMU tarafından akredite  
Accredited by TÜRKAK

**TSE DENEY ve KALİBRASYON MERKEZİ BAŞKANLIĞI**  
**Makina ve Yapı Malzemeleri Grup Başkanlığı**  
**Yapı Malzemeleri Yangın ve Akustik Laboratuvarı Müdürlüğü**

Adres: Aydınlı Mah. Gülenur Sok. No: 7/1 Tuzla/ İSTANBUL  
Tel:+90 (312) 560 05 00 Fax: +90 (312) 560 05 65 E-posta:yalitim@tse.org.tr Web:www.tse.org.tr

*HEADSHIP OF TSE TEST and CALIBRATION CENTER*  
*CONSTRUCTION MATERIALS FIRE AND ACOUSTICS LABORATORY DIRECTORATE*

Address:Aydınlı Mah. Gülenur Sok. No: 7/1 Tuzla/ İSTANBUL  
Tel:+90 (312) 560 05 00 Fax: +90 (312) 560 05 65 E-mail:yalitim@tse.org.tr Web:www.tse.org.tr

**MUAYENE VE DENEY RAPORU**  
**TEST REPORT**



Test  
TS EN ISO IEC 17025  
AB-0001-T

AB-0001-T

270839

09-15

<b>Deneyi Talep Eden</b> (Adı,Adresi,Şehir vb.)	:	AQUAGAS PLASTIC INDUSTRIES L.L.C
<i>Customer (Name,Address,City etc.)</i>		(AQUAGAS PLASTIC INDUSTRIES L.L.C: P.O BOX:56790 DUBAI --Dubai)
<b>Deney Talep Tarihi/No</b> <i>Order Date / No</i>	:	08.09.2015 / 136434
<b>Numunenin Tanımı</b> (Cins, Marka, Tip, Tür, Model vb.)	:	POLİPROPİLEN ATIK SU BORUSU, PP TERRA , 110MM , - , - , 110.00 milimetre
<i>Sample Description (Type,Mark,Model etc.)</i>		<i>POLYPROPYLENE DRAINAGE PIPES,PP TERRA,110MM,-,-,110,00 millimeter</i>
<b>Numune Kabul Tarihi</b> <i>Test Item Receipt Date</i>	:	31.08.2015
		<i>Samples were collected by the manufacturer</i>
<b>Deneylerin Yapıldığı Tarih</b> <i>Date of Test</i>	:	31.08.2015 - 18.09.2015
<b>Uygulanan Standard / Metod</b> <i>Applied Standard/Method</i>	:	TS EN ISO 11925-2:2010-10 Yangın dayanımı deneyleri - Alev doğrudan maruz kaldığında tutuşabilirlik - Bölüm 2: Tek alev kaynağıyla deney (ISO 11925-2:2010) <i>TS EN ISO 11925-2:2010-10 Reaction to fire tests - Ignitability of products subjected to direct impingement of flame - Part 2: Single-flame source test (ISO 11925-2:2010)</i>
<b>Raporun Sayfa Sayısı</b> <i>Number of pages of the report</i>	:	3
<b>Açıklamalar</b> <i>Remarks</i>	:	

Türk Akreditasyon Kurumu(TÜRKAK) deney raporlarının tanınması konusunda Avrupa Akreditasyon Birliği(EA) ve Uluslararası Laboratuvar Akreditasyon Birliği(ILAC) ile karşılıklı tanınma antlaşmasını imzalamıştır.

*The Turkish Accreditation Agency(TURKAK) is signatory to the multilateral agreements of the European co-operation for the Accreditation(EA) and of the International Laboratory Accreditation(ILAC) for the Mutual recognition of test reports.*

Deney ve/veya ölçüm sonuçları, genişletilmiş ölçüm belirsizlikleri (olması halinde) ve deney metodları bu raporun tamamlayıcı kısmı olan takip eden sayfalarda verilmiştir.

*The test and/or measurement results, the uncertainties (if applicable) with confidence probability and test methods are given on the following pages which are part of this report.*

Bu rapor özel deney talebine istinaden düzenlenmiş olup, Standartlara Uygunluk Belgesi niteliğinde değildir. Partiyi temsil etmez, ayrıca ilan, reklam ve ihalelerde uygunluk belgesi niteliğinde kullanılamaz.



**Deney Sorumlusu**  
*Person in charge of tests*  
  
Arda ATAKOL  
Uzman Yardımcısı

**Kontrol Eden**  
*Reviewer*  
  
Sencer GÜVEN  
Teknik Şef

**Onaylayan**  
*Approved by*  
  
Metehan ÇALIŞ  
Laboratuvar Müdürü

Bu rapor, hazırlayan laboratuvarın yazılı izni olmadan kısmen kopyalanıp çoğaltılamaz. İmzasız ve mühürsüz raporlar geçersizdir.

Bu rapor, sadece deney yapılan numune için geçerlidir ve "Ürün Belgesi" yerine geçmez.

*This test report shall not be reproduced other than in full except with the written permission of the laboratory. Test reports without signature and seal are not valid.*

*This test report represents only tested sample(s), and shall not be used as Product Certificate*



## TEST RESULTS

### TS EN ISO 11925-2 Ignitability of building products subjected to direct impingement of flame – Part 2: Single-flame source test

<b>Sponsor</b> (Name&Address)	AQUAGAS PLASTIC INDUSTRIES L.L.C., DUBAI Investment Park 2 P.O.Box: 56790, DUBAI / U.A.E
<b>Manufacturer</b> (Name&Address)	AQUAGAS PLASTIC INDUSTRIES L.L.C., DUBAI Investment Park 2 P.O.Box: 56790, DUBAI / U.A.E
<b>Deney Tarihi</b>	18.09.2015

### Sample Details

<b>Arrival date</b>	31.08.2015
<b>Trade name</b>	PP TERRA
<b>Description</b>	Polypropylene Drainage Pipes manufactured in accordance with EN 1451
<b>Packaging</b>	Total number of packages: 1 Material: Cardboard Dimensions: 30 cm x 40 cm x 30 cm Total weight: 2.5 kg
<b>Outer diameter</b>	110 mm
<b>Wall thickness</b>	2.9 mm (average of 10 measurements, min: 2.6 mm, max: 3.4 mm)
<b>Weight per unit length</b>	906 g/m
<b>Surface</b>	Gray, matte
<b>Visible markings</b>	PP TERRA EN 1451 DN 110X2.7PP B S20 EXT :PPS-817/01/14 8:05 Made in U.A.E BNO:HO3

### Sample Collection and Preparation

Test samples were taken, cut into 25 cm pieces and delivered to the laboratory by the manufacturer.

### Şartlandırma

The samples were conditioned at 23 °C ± 2 °C temperature and under 50% ± 5% relative humidity for 18 days in accordance with the instructions given under clause 4.3 of EN 13238.







## TEST RESULTS

### Test Results

Flame impingement type and duration	Surface, 15 s					
Sample No	1	2	3	4	5	6
Occurance of ignition	No	No	No	No	No	No
Wheter flame reaches 150 mm mark	No	No	No	No	No	No
Ignition of the filter paper	No	No	No	No	No	No
Observations and additional notes	The samples showed no sign of ignition or dripping during the test.					

The test results relate to the behaviour of the test specimens of a product under the particular conditions of the test; they are not intended to be the sole criterion for assessing the potential fire hazard of the product in use.

*End of test report.*





Dear

2017.09.29

# Letter of Guarantee

► **Product Name(Grade) : Topilene® HB242P**

We wish your company much prosperity. We, HYOSUNG CORPORATION, hereby confirm that our polypropylene resin TOPILENE® HB242P does not emit any toxic gas when being bunt. Also, we confirm that TOPILENE® HB242P has properties as below.

1. Temperature range : 0~100 °C
2. Izod impact resistance : 80~90kgcm/cm

A handwritten signature in black ink that reads "Y. S. Lee".

**Yong Sung Lee**

**Chief of Market Development Team**

**PP/DH Performance Unit, HYOSUNG CORPORATION**



# CERTIFICATE OF PRODUCT ANALYSIS (TOPILENE)

\*PRODUCT TO :  
 \*RESIN : POLYPROPYLENE  
 \*GRADE : HB242P  
 \*LOT No. : 60914H  
 \*DATE : 2017/02/17

分析項目 ANALYSIS ITEMS	分析方法 METHOD	單位 UNIT	結果 RESULT	備考 REMARK
熔融指數(2.16kg) Melt Index(2.16kg)	ASTM D1238	g/10分	0.28	
密度 Density	HS Method	g/cm <sup>3</sup>	0.90	
屈曲彈性率 Flexural Modulus	ASTM D790	kg/cm <sup>2</sup>	18010	
屈曲強度 Flexural Strength	ASTM D790	kg/cm <sup>2</sup>	520	
衝擊強度(23℃) Izod impact(23℃)	ASTM D256	kg.cm/cm	73.6	
引張強度(降伏點) Tensile Strength at Yield	ASTM D638	kg/cm <sup>2</sup>	340	
引張強度(破斷點) Tensile Strength at Break	ASTM D638	kg/cm <sup>2</sup>	180	
伸率(破斷點) Elongation	ASTM D638	%	770	
硬度 Hardness(R-scale)	HS Method		93.6	

RESULT

O.K

I certify above statement of quality is to be true and correct

技術課長



Chief of Technical Team



Chemical Resistance  
according to  
ISO/TR 10358  
Issue 1993-06-01

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
acetaldehyde	technically pure	20	⊙	○	●
		40	○		⊙
		60			
		80			
		100			
acetaldehyde	40%, hydrous	20	●	⊙	●
		40	●	○	●
		60	●		⊙
		80	⊙		
		100	○		
acetone	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
	up to 10% hydrous	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
acetonitrile		20		○	
		40			
		60			
		80			
		100			
acetophenone		20		○	
		40			
		60			
		80			
		100			
acrylonitrile	technically pure	20	●	○	●
		40	⊙		●
		60			●
		80			
		100			
crylic acid ethyl ester	technically pure	20	○	○	
		40			
		60			
		80			
		100			
crylic acid methyl ester	technically pure	20		○	
		40			
		60			
		80			
		100			
adipic acid	saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	○	●
		80	●		
		100			
allyl alcohol	96%	20	●	⊙	●
		40	●	○	●
		60	●		●
		80			
		100			

  

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
aluminium chloride	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
	saturated	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	⊙		
aluminium sulphate	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
formic acid*	up to 50% hydrous	20	●	●	●
		40	●	●	●
		60	⊙	⊙	●
		80			
		100			
ammonia*	gaseous, technically pure	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
ammonium acetate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
ammonium carbonate	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
ammonium chloride	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
ammonium hydrogen fluoride	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			

  

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
ammonium hydroxide	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
ammonium nitrate	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	⊙
		80	⊙		
		100			
	saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	⊙
		80	⊙		
		100			
ammonium phosphate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
ammonium sulphate	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
	saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
ammonium sulphide	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
amyl acetate	technically pure	20	⊙	○	●
		40	⊙		●
		60	○		●
		80			
		100			
amyl alcohol*	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
aniline	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			
anile hydrochloride	saturated, hydrous	20	●	○	●
		40	●		●
		60	⊙		⊙
		80			
		100			

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
antimony-trichloride*	90%, hydrous	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			
arsenic acid	80%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
barium hydroxide	hydrous, saturated	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
barium salts	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100			
benzaldehyde	saturated, hydrous	20	●	○	●
		40			●
		60			●
		80			
		100			
gas*	free from lead and aromatic compounds	20	⊙	●	●
		40		●	●
		60	○	●	⊙
		80			
		100			
benzoic acid	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
benzol	technically pure	20	⊙	○	⊙
		40	○		⊙
		60			
		80			
		100			
benzyl alcohol*	technically pure	20	●	⊙	●
		40	●		●
		60	⊙		⊙
		80			
		100			
amber salt	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
beer	usual	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
lead acetate	hydrous, saturated	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
lead tetraethyl*	technically pure	20	●	●	●
		40			
		60			
		80			
		100			
borax	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
boric acid	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
wine spirits*	usual	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
bromine benzol	high	20	○	○	○
		40			
		60			
		80			
		100			
bromine	technically pure	20	○	○	○
		40			
		60			
		80			
		100			
bromine water	saturated, hydrous	20	○	●	○
		40			
		60			
		80			
		100			
bromhydric acid*	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
butadiene°	technically pure	20	●	●	●
		40	●		
		60	●		
		80			
		100			
butane	technically pure	20	●	●	●
		40			
		60			
		80			
		100			
butandiol*	10%, hydrous	20	●	●	●
		40	●	⊙	●
		60	●		●
		80			
		100			
butanol*	technically pure	20	●	●	●
		40	●	●	●
		60	⊙	⊙	●
		80	○		
		100			
butanoic acid*	technically pure	20	●	●	●
		40			●
		60			⊙
		80			
		100			
butyl acetate	technically pure	20	⊙	○	●
		40			
		60			
		80			
		100			
butylene (liquid)	technically pure	20	○	●	○
		40			
		60			
		80			
		100			
butylene glycole*	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
butylphenol, p-tertiary	technically pure	20	●	⊙	⊙
		40		○	
		60			
		80			
		100			
calcium toulfit	cold saturated, hydrous	20		●	
		40		●	
		60		⊙	
		80			
		100			
calcium chloride	saturated, hydrous (each)	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
calcium hydroxide	saturated, hydrous (suspension)	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100			
calcium hypochlorite*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			



Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
calcium nitrate	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			
chlorine	97%, gas, moist	20	○	○	○
		40			
		60			
		80			
		100			
	technically pure, dry	20	○	○	⊙
		40			⊙
		60			○
		80			
		100			
	technically pure, liquid	20	○	○	○
		40			
		60			
		80			
		100			
chloral hydrate	technically pure	20	⊙	○	●
		40			●
		60	○		●
		80			
		100			
chloroethanol	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
chlorobenzene	technically pure	20	●	○	⊙
		40			
		60			
		80			
		100			
chloroacetic acid, mono-*	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			
	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
chloroethanol	technically pure	20		○	
		40			
		60			
		80			
		100			
chloroform	technically pure	20	⊙	○	○
		40			
		60			
		80			
		100			

  

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
cloric acid*	10%, hydrous	20	○	●	●
		40		●	●
		60		⊙	
		80			
		100			
	20%, hydrous	20	○	●	⊙
		40		●	
		60		⊙	
		80			
		100			
cloric acid	< 20%	20	○	●	⊙
		40		●	
		60		⊙	
		80			
		100			
chlorosulphonic acid	technically pure	20	○	⊙	○
		40			
		60			
		80			
		100			
chlorine water*	saturated	20	⊙	●	⊙
		40		●	⊙
		60		⊙	
		80			
		100			
hydrochloric acid*	technically pure, gaseous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
chrom alum	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
chromate*	up to 50%, hydrous	20	⊙	⊙	⊙
		40	○	⊙	○
		60		○	
		80			
		100			
	each, hydrous	20	⊙	⊙	⊙
		40			
		60			
		80			
		100			
clophen	technically pure	20		○	
		40			
		60			
		80			
		100			
crotonaldehyde	technically pure	20	●	○	●
		40			
		60			
		80			
		100			

  

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
hydrocyanic acid	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
cyclohexane*	technically pure	20	●	○	●
		40			●
		60			●
		80			
		100			
cyclohexanone*	technically pure	20	●	●	●
		40	●	●	●
		60	⊙	●	●
		80			
		100			
cyclohexanone	technically pure	20	●	○	●
		40	⊙		⊙
		60	⊙		⊙
		80			
		100			
densodrin		20		●	
		40		●	
		60		●	
		80			
		100			
dextrin	usual	20	●	●	●
		40		●	●
		60		●	●
		80			
		100			
dibutyl ether	technically pure	20	⊙	○	⊙
		40	○		○
		60			
		80			
		100			
dibutyl phthalate	technically pure	20	●	○	●
		40	⊙		⊙
		60	⊙		⊙
		80			
		100			
dibutyl sebazate	technically pure	20	●	○	●
		40			
		60			
		80			
		100			
dichlorethylene	technically pure	20	⊙	○	○
		40			
		60			
		80			
		100			
dichlorbenzene	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			

Agressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
dichloroacetic* technically pure		20	●	●	●
		40	●	●	●
		60	⊙	⊙	⊙
		80			
		100			
50%, hydrous		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
dichloroacetic acid methyl esters technically pure		20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
diesel **		20	⊙	●	●
		40		●	
		60			⊙
		80			
		100			
diethylamine technically pure		20	●	⊙	
		40			
		60			
		80			
		100			
diethyl ether technically pure		20	●	○	⊙
		40			
		60			
		80			
		100			
diglycolic acid aqueous* 30%, hydrous		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
diisobutylketone technically pure		20	●	○	●
		40			
		60	○		○
		80			
		100			
N,N- dimethylaniline technically pure		20		○	
		40			
		60			
		80			
		100			
dimethylformamide technically pure		20	●	○	●
		40	●		●
		60	●		⊙
		80			
		100			
dimethylamine technically pure		20	●	⊙	●
		40			
		60			⊙
		80			
		100			
dinonylphthalate technically pure		20	●	○	⊙
		40			
		60			
		80			
		100			
dioctylphthalate* technically pure		20	●	○	⊙
		40			
		60	○		
		80			
		100			
dioxane technically pure		20	⊙	○	●
		40	⊙		●
		60	⊙		●
		80	○		
		100			
fertilizer salts hydrous		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
iron salts each, hydrous		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
acetic acid* technically pure, (glacial acetic acid)		20	●	⊙	●
		40	●	○	●
		60	⊙		⊙
		80	○		
		100			
50%, hydrous		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
10%, hydrous		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
acetic unhydride* technically pure		20	●	○	●
		40	⊙		⊙
		60			
		80			
		100			
ethyl acetate technically pure		20	●	○	●
		40	⊙		⊙
		60	⊙		⊙
		80			
		100			
ethyl alcohol* technically pure 96%		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
ethyl alcohol* technically pure		20	●	●	●
		40	●	●	●
		60	●	⊙	●

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
hydrofluoric acids*	50% hydrous	20	●	●	●
		40	●		●
		60	●		⊙
		80			
		100			
	70%, hydrous	20	●	●	●
		40			
		60			⊙
		80			
		100			
formaldehyde*	40%, hydrous	20	●	●	●
		40	●	●	●
		60			●
		80			
		100			
formamide	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
photo emulsion*	usual	20	●	●	●
		40	●	●	●
		60			
		80			
		100			
film developer*	usual	20	●	●	●
		40	●	●	●
		60		⊙	⊙
		80			
		100			
photo fixing baths*	usual	20	●	●	●
		40	●	●	●
		60		⊙	
		80			
		100			
frigen 12-	technically pure	20	○	●	○
		40			
		60			
		80			
		100			
fruit juices*	usual	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100			
furfuryl alcohol*	technically pure	20	●	○	●
		40			●
		60	⊙		●
		80			
		100			
gelatin	each, hydrous	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
tanner extracts* (vegetable)	usual	20	●	●	●
		40			
		60			
		80			
		100			
tannic acid (tannin)	each, hydrous	20	●	●	●
		40	●		●
		60	●		●
		80			
		100			
glucose (dextrose)	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
glycerin	technically pure	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
aminoacetic acid*	10%, hydrous	20	●	●	●
		40	●	●	●
		60			
		80			
		100			
glycolic acid	37% hydrous	20	●	●	●
		40			●
		60			●
		80			
		100			
urea*	up to 30% hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
yeast	each, hydrous, suspension	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			
fuil oil	usual	20	⊙	●	⊙
		40	○	⊙	○
		60			
		80			
		100			
n-heptane*	technically pure	20	●	●	●
		40			
		60	⊙		⊙
		80			
		100			
n-hexane*	technically pure	20	●	●	●
		40			
		60	⊙		⊙
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
hydracine hydrate*	hydrous	20	●	●	●
		40	●		●
		60	●		●
		80			
		100			
hydroquinone	GL	20		●	
		40		●	
		60			
		80			
		100			
hydroxylamine sulphate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●		●
		80			
		100			
iso butyl acetate	technically pure	20		○	
		40			
		60			
		80			
		100			
isooctane*	technically pure	20	●	●	●
		40			
		60	⊙		⊙
		80			
		100			
isopropanol*	technically pure	20	●	●	●
		40	●		●
		60	●		●
		80	●		
		100	●		
isopropyl-ether	technically pure	20	⊙	○	⊙
		40			
		60	○		○
		80			
		100			
tincture of iodine	6,5% iodine in ethanol	20	●	○	●
		40			
		60			○
		80			
		100			
potassium acetate*	GL	20		●	
		40		●	
		60		●	
		80			
		100			
potassium hydroxide	50% hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
potassium-aluminium sulphate (alum)	50% hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
potassium bichromate*	saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
potassium borat	10% hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
potassium bromate	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	⊙
		80	●		
		100	●		
potassium bromide	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
potassium chlorate*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
potassium chloride	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
potassium chromate*	cold saturated, hydrous	20	●	●	●
		40	●	●	
		60	●	●	
		80			
		100			
potassium cyanide	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
potassium iodide	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
potassium nitrate	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			

  

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
potassium perchlorate*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
potassium permanganate*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	⊙
		80			
		100			
potassium persulphate*	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
potassium phosphate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
potassium sulphate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
hexafluorosilic acid*	32% hydrous	20	●	●	●
		40		●	●
		60		●	●
		80			
		100			
carbon dioxide	technically pure, dry	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
carbonic acid	technically pure, moist	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
coconut oil alcohol*	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
coconut oil*	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	⊙
		80			
		100			
nitrohydrochloric acid*	concentration 1:3 up to 1:6	20	○	●	○
		40		⊙	
		60			
		80			
		100			

  

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
cresols	cold saturated, hydrous	20	●	⊙	●
		40	●		●
		60			
		80			
		100			
cuprous salts	each, hydrous	20	●	●	●
		40	⊙	●	●
		60	○	⊙	●
		80			
		100			
lanolin* (wool fat)	technically pure	20	●	●	●
		40	●	⊙	●
		60	●		●
		80			
		100			
linseed oil*	technically pure	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
illuminating gas, benzol free		20	●	●	●
		40			
		60			
		80			
		100			
liquers		20	●	●	●
		40		●	●
		60			
		80			
		100			
magnesium salts	each hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
corn oil*	technically pure	20	●	⊙	●
		40	●		●
		60	⊙		⊙
		80			
		100			
maleic acid*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
marmelade		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
molasses		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			



Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
molasses flavour		20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
methane (natural gas)	technically pure	20	●	●	●
		40			
		60			
		80			
		100			
methanol* (methyl alcohol)	each	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
methyl acetate	technically pure	20	●	○	●
		40	●		
		60	⊙		
		80			
		100			
methylamine	32%, hydrous	20	●	⊙	●
		40			
		60			
		80			
		100			
methyl bromide	technically pure	20	○	○	⊙
		40			
		60			
		80			
		100			
methyl chloride	technically pure	20	○	○	⊙
		40			
		60			
		80			
		100			
methylene chloride	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			
methyl ethyl ketone	technically pure	20	●	○	●
		40	⊙		⊙
		60	⊙		○
		80			
		100			
milk*		20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
lactic acid*	10%, hydrous	20	●	●	●
		40	●	⊙	●
		60	●	○	●
		80	●		
		100	●		

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
mineral oils, free from aromatic compounds		20	●	●	●
		40	●	●	●
		60	⊙	●	⊙
		80			
		100			
mineral water		20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
mixed acid		20	○	●	○
		40		⊙	
		60		○	
		80			
		100			
-acid sulphur	48%	20	○	⊙	○
		40		⊙	
		60		○	
		80			
		100			
-nitric acid	49%	20	○	⊙	○
		40		⊙	
		60		○	
		80			
		100			
-water	3%	20	○	⊙	○
		40		⊙	
		60		○	
		80			
		100			
	50%	20	○	⊙	○
		40		○	
		60			
		80			
		100			
	10%	20	○	⊙	○
		40			
		60			
		80			
		100			
	87%	20	○	⊙	○
		40			
		60			
		80			
		100			
	3%	20	○	⊙	○
		40			
		60			
		80			
		100			
	50%	20	○	●	○
		40			
		60			
		80			
		100			
	31%	20	○	⊙	○
		40			
		60			
		80			
		100			
	19%	20	○	⊙	○
		40			
		60			
		80			
		100			
	50%	20	○	●	○
		40			
		60			
		80			
		100			
	33%	20	○	●	○
		40		⊙	
		60			
		80			
		100			
	17%	20	○	⊙	○
		40			
		60			
		80			
		100			
	10%	20	○	●	⊙
		40		●	
		60			
		80			
		100			
	20%	20	○	●	⊙
		40		●	
		60			
		80			
		100			
	70%	20	○	⊙	○
		40			
		60			
		80			
		100			
mixed acid		20	○	⊙	⊙
		40			
		60			
		80			
		100			
-nitric acid	3 parts	20	○	⊙	○
		40			
		60			
		80			
		100			
-hydrofluoric acid	1 part	20	○	⊙	○
		40			
		60			
		80			
		100			
-acid sulphur	2 parts	20	○	⊙	○
		40			
		60			
		80			
		100			
mixed acid		20	●	●	●
		40	⊙	●	⊙
		60			
		80			
		100			
-acid sulphur	30%	20	○	⊙	○
		40			
		60			
		80			
		100			
-phosphoric acid	60%	20	○	⊙	○
		40			
		60			
		80			
		100			
-water	10%	20	○	⊙	○
		40			
		60			
		80			
		100			
mono chlorine acetic acid ethyl ester	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80	●		●
		100	●		●

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
mono chlorine acetic acid methyl ester	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
Morpholene	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
Mowilith D	usual	20	●	●	●
		40			
		60			
		80			
		100			
naphthalene	technically pure	20	●	○	●
		40			
		60			⊙
		80			
		100			
sodium acetate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
sodium benzoate	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
sodium bromate	each, hydrous	20	●	●	●
		40	⊙	⊙	⊙
		60			
		80			
		100			
sodium bromide	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
sodium carbonate (soda)	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
sodium chlorate*	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
sodium chloride (table salt)	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
sodium chlorite*	diluted, hydrous	20	●	●	●
		40	●		
		60	⊙		
		80			
sodium chromate*	diluted, hydrous	20	●	●	●
		40	●	●	
		60		⊙	
		80			
sodium disulphite	each, hydrous	20	●	●	●
		40		●	
		60		⊙	
		80			
sodium dithionite (-hydrosulfit)	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium fluoride	cold saturated, hydrous	20	●	●	●
		40		●	
		60			
		80			
sodium bicarbonate	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
sodium hydrogen sulphate (Natriumup toulfat)	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium hydrogen sulphite (Natriumup toulfit)	each, hydrous	20	●	●	●
		40	●	⊙	●
		60	●	○	●
		80			
sodium hypochloride* (bleaching liquor)	12,5% activ chlorine, hydrous	20	⊙	●	⊙
		40	○	●	○
		60		⊙	
		80			
sodium iodide	each, hydrous	20	●	●	●
		40		●	
		60		⊙	
		80			
sodium nitrate (salpeter)	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium nitrite	cold saturated, hydrous	20	●	●	●
		40			
		60			
		80			
sodium oxalate	cold saturated, hydrous	20	●	●	●
		40		●	
		60		⊙	
		80			
sodium perborate	GL	20	ng	ng	ng
		40			
		60			
		80			
sodium perchlorate	GL	20	ng	ng	ng
		40			
		60			
		80			
sodium persulphate*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium phosphate	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
sodium silicate	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium sulphate (Glauber's salt)	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
sodium sulphide	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium sulphite	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
sodium thiosulphate (fixing salt)	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
caustic soda	up to 10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
caustic soda	up to 40%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
caustic soda	up to 50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
surfactants*	up to 5%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
nickel salt	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
nitrobenzene	technically pure	20	●	○	●
		40	●		●
		60	●		⊙
		80			
nitrous fumes	diluted, moist, dry	20	●	●	●
		40	⊙		●
		60	○	⊙	●
		80			
nitrotoluene (o-,m-,p-)	technically pure	20	●	○	●
		40	●		●
		60	⊙		⊙
		80			
fruit pulp		20	●	●	●
		40	●	●	●
		60	●	●	●
		80			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
fruit wine		20	●	●	●
		40			
		60			
		80			
		100			
fats and oils*, vegetale		20	●	●	●
		40	●	⊙	⊙
		60	⊙		
		80			
		100			
oleum vapours*	low	20	○	●	○
		40			
		60			
		80			
		100			
olive oil*		20	●	●	●
		40	●	●	●
		60	●	●	⊙
		80	●		
		100			
oleic acid	technically pure	20	●	●	●
		40	●	●	●
		60	⊙	●	⊙
		80			
		100			
oxalic acid*	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
oxygen*	up to 2%, in air	20	⊙	●	⊙
		40	○		○
		60			
		80			
		100			
	cold saturated, hydrous	20	⊙	●	⊙
		40	○	●	○
		60			
		80			
		100			
palmitic acid*	technically pure	20	⊙	●	⊙
		40			
		60	○		
		80			
		100			
palm oil* (palm kernel oil)		20	●	●	●
		40	●	○	●
		60	⊙		⊙
		80			
		100			
paraffin emulsion	usual, hydrous	20	●	●	●
		40	●	●	●
		60	⊙		⊙
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
paraffin oil		20	●	●	●
		40	●	●	●
		60	⊙	⊙	●
		80			
		100			
perchloroethylene (tetrachloroethylene)	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			
perchloric acid*	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
petroleum ether*	technically pure	20	●	●	●
		40	●	●	⊙
		60	⊙	●	⊙
		80			
		100			
petroleum	technically pure	20	●	●	●
		40	⊙		●
		60	⊙		⊙
		80			
		100			
phenol*	up to 10%, hydrous	20	●	●	●
		40	●	⊙	●
		60	●		⊙
		80			
		100			
	up to 90%, hydrous	20	●	⊙	●
		40	●		●
		60	●		⊙
		80			
		100			
phenylhydrazine	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			
phenylhydrazine-hydrochloride	hydrous	20	●	⊙	
		40	⊙		
		60	⊙		
		80			
		100			
phosgene*	technically pure, liquid	20	⊙	○	
		40			
		60			
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
phosgene*	technically pure, gaseous	20	⊙	●	⊙
		40		⊙	
		60		⊙	
		80			
		100			
phosphor chloride:*	technically pure	20	●	○	●
		40			
		60			
		80			
		100			
-phosphor-tri-chloride	technically pure	20			
		40			
		60	⊙		⊙
		80			
		100			
-phosphor-penta-chloride		20			
		40			
		60	⊙		⊙
		80			
		100			
-phosphoryl chloride		20	ng	ng	ng
		40			
		60			
		80			
		100			
phosphoric acid	up to 30%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
	up to 50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
85%, hydrous		20	●	●	●
		40	●	●	●
		60	●	●	⊙
		80	●		
		100	●		
phthalic acid*	saturated, hydrous	20	●	●	●
		40	●	⊙	●
		60	●	○	●
		80			
		100			
picric acid*	1%, hydrous	20	●	●	●
		40			
		60			
		80			
		100			
potassium carbonate	cold saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●		
		80			
		100			
compressed air, oil emulsive		20	⊙	⊙	●
		40			●
		60			
		80			
		100			
propane	technically pure, liquid	20	●	●	●
		40			
		60			
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
propane	technically pure, gaseous	20	●	●	●
		40			
		60			
		80			
		100			
propanol,* n- and iso-	technically pure	20	●	●	●
		40	●	⊙	●
		60	●	⊙	●
		80			
		100			
propargyl alcohol*	7%, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
propanoic acid*	50%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
	technically pure	20	●	●	●
		40	⊙	⊙	⊙
		60	⊙		⊙
		80			
		100			
propylene glycol*	technically pure	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
pyridine	technically pure	20	⊙	○	●
		40	⊙		⊙
		60	⊙		⊙
		80			
		100			
quicksilver	rein	20	●	●	●
		40			
		60			
		80			
		100			
quicksilver salts	cold, saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
ramasit	usual	20		●	
		40		●	
		60		●	
		80			
		100			
suet-emulsion,* sulphurized	usual	20	●	●	●
		40			
		60			
		80			
		100			

  

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
nitric acid*	6,3%, hydrous	20	●	●	●
		40		●	●
		60	⊙	●	●
		80			
		100			
Attention: regarding PVC-U glued connections please see introduction 2.3.1					
	up to 40%, hydrous	20	⊙	●	⊙
		40		●	
		60	○	⊙	○
		80			
		100			
	65%, hydrous	20	○	⊙	⊙
		40		⊙	○
		60		○	
		80			
		100			
	85%	20		○	
		40			
		60			
		80			
		100			
	100%	20	○	○	○
		40			
		60			
		80			
		100			
salt acid °-	5%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	⊙		
		100			
Attention: regarding PVC-U glued connections please see introduction 2.3.1					
	10%, hydrous	20	●	●	●
		40	●	●	●
		60	⊙	⊙	●
		80	⊙		
		100			
	up to 30%, hydrous	20	●	●	●
		40	⊙	●	●
		60	⊙	⊙	●
		80	○		
		100			
	36%, hydrous	20	●	●	●
		40	⊙	●	●
		60	○	⊙	●
		80			
		100			
dioxigen	technically pure	20	●	●	●
		40		●	●
		60	⊙	●	⊙
		80			
		100			
lubricating grease*		20	⊙	●	●
		40		●	●
		60		●	⊙
		80			
		100			

  

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
sulphur	technically pure	20	●	⊙	●
		40	●	○	●
		60	●		●
		80	●		
		100			
sulphur dioxide	technically pure, dry	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
	each, moist	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
	technically pure liquid	20	○	○	○
		40			
		60			
		80			
		100			
carbon disulphide	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			
sodium sulphide		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
acid sulfur*	up to 40%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
Attention: regarding PVC-U glued connections please see introduction 2.3.1					
	up to 60%,* hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
	up to 80%, hydrous	20	●	●	●
		40	●	●	●
		60	⊙	●	⊙
		80			
		100			
	90%, hydrous*	20	⊙	●	⊙
		40		●	
		60			
		80			
		100			
	96%, hydrous*	20	○	●	○
		40		●	
		60		⊙	
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
hydrogen sulphide	technically pure	20	●	●	●
		40	●	●	●
		60	●	●	⊙
		80			
		100			
	saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
sulfurous acid	saturated, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
seawater		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
soap solution*	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
silver salt	cold, saturated, hydrous suspension	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
silicone oil		20	●	●	●
		40	●	⊙	●
		60	●	○	●
		80	●		
		100	●		
spindle oil		20	●	⊙	⊙
		40	⊙		
		60	○		⊙
		80			
		100			
spinning bath acids* containing CS <sub>2</sub>	100 mg CS <sub>2</sub> /l	20	●	●	●
		40		●	
		60			
		80			
		100			
	200 mg CS <sub>2</sub> /l	20	●	⊙	●
		40			
		60			
		80			
		100			
700 mg CS <sub>2</sub> /l	20	●	○	●	
	40				
	60				
	80				
	100				
120					

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
spirituous beverages	ca. 40% (ethyl alcohol)	20	●	●	●
		40			
		60			
		80			
		100			
starch solution	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
starch syrup	usual	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
stearic acid*	technically pure	20	●	●	●
		40		●	
		60	⊙	●	⊙
		80			
		100			
sebum*	technically pure	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
oil of turpentine*	technically pure	20	○	●	⊙
		40		⊙	⊙
		60			
		80			
		100			
tetrachloromethane	technically pure	20	○	○	○
		40			
		60			
		80			
		100			
tetrahydrofuran	technically pure	20	○	○	⊙
		40			
		60			
		80			
		100			
tetrahydronaphthalin	technically pure	20	○	○	⊙
		40			
		60			
		80			
		100			
toluol	technically pure	20	⊙	○	⊙
		40	○		
		60			○
		80			
		100			
triethanolamine*	technically pure	20	●	⊙	●
		40			●
		60			●
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
tributyl phosphate	technically pure	20	●	○	●
		40	●		●
		60	●		●
		80			
		100			
trichloroethane	technically pure	20	⊙	○	⊙
		40			
		60			
		80			
		100			
trichloroethylene	technically pure	20	⊙	○	○
		40			
		60			
		80			
		100			
trichloroacetic acid*	technically pure	20	●	⊙	●
		40	●		⊙
		60	●		○
		80			
		100			
	50%, hydrous	20	●	●	●
		40	●	⊙	●
		60	●		●
		80			
		100			
1, 1, 2-trichloro-1, 2, 2-trifluoroethane* (freon 113)	technically pure	20		●	
		40		●	
		60			
		80			
		100			
tri-kresyl phosphate*	technically pure	20	●	○	●
		40			●
		60	⊙		●
		80			
		100			
tri-octyl phosphate*	technically pure	20	●	○	⊙
		40			
		60			
		80			
		100			
urine		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
vaseline	technically pure	20	●	⊙	⊙
		40		○	
		60	⊙		○
		80			
		100			
vinyl acetate	technically pure	20	●	○	
		40			
		60	⊙		
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
vinyl chloride	technically pure	20		○	
		40			
		60			
		80			
		100			
viscose-spinning solution		20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100			
wax alcohol*	technically pure	20	⊙	●	⊙
		40	○	●	○
		60		●	
		80			
		100			
detergent*	for suds usual	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
water (distilled, deionized, completely desalinated)		20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
water, drinking water chlorinated		20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100	●		
water, sewage water without organic solvents		20	●	●	●
		40	●	●	●
		60	●		●
		80	●		
		100			
water, condensation		20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100			
hydrogen	technically pure	20	●	●	●
		40	●	●	●
		60	●	●	●
		80			
		100	○		
hydrogen peroxide*	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
	30%, hydrous	20	●	●	●
		40	●	●	●
		60	⊙		●
		80			
		100			

Aggressive Medium	Concentration	Temperature	Material		
			PP	PVC	PE
	50%, hydrous	20		●	●
		40			
		60			
		80			
		100			
	90%, hydrous	20	○	●	●
		40			
		60			○
		80			
		100			
wine, red and white	usual	20	●	●	●
		40	●		●
		60	●		●
		80			
		100			
wine vinegar* (vinegar)	usual	20	●	●	●
		40	●	●	●
		60	●	●	●
		80	●		
		100			
acidity of wine	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
xylol	technically pure	20	○	○	○
		40			
		60			
		80			
		100			
zinc salts	each, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80			
		100			
citric acid	10%, hydrous	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		
sugar syrup	usual	20	●	●	●
		40	●	●	●
		60	●	⊙	●
		80	●		
		100	●		

## Key

●	resistant
⊙	limited resistant
○	not resistant
ng	not tested
*	stress cracking
GL	saturated solution
°	moisture expansion/softening



TEST REPORT

Test Report No. AGPI/QC/OTR/084

Date 31/12/2013

**OBJECT**

Pipe	PP 110
Item code	PP TERRA 1011103000
Batch No.	H 03
Machine No.	L03
Date of Production	06.11.2013
Raw Material	HYOSUNG PP
Raw Material - Batch No.	10925H

**TEST RESULTS**

PARAMETER		ACTUAL	STANDARD
Appearance / color		Good	Visual
Marking		Good	Visual
Outside diameter PN-EN ISO 3126		110.1	110-110.4
Wall Thickness PN-EN ISO 3126		2.8	2.7-3.2
Melt flow rate (MFR) ISO 4440		Material M.F.R=0.3 Pipe M.F.R= 0.4	Max. Allowed Material M.F.R+ 0.2g
Impact Resistance/ EN 744		0%	TIR ≤10%
Longitudinal reversion/ EN 743		0.75%	≤2%
Resistance to internal pressure EN 921	140hour, T=80°C, σ= 4.2 Mpa	No Change	visual

**REMARKS**

---

*Accepted By*

*Tested By*



Testing. Advising. Assuring.

### Test witnessing report

Description	Witnessing of 110x2.7 PP-Copolymer Pipe – Impact Resistance		
Tested for	Aqua Gas LLC, P.O. Box: 56790, Dubai, United Arab Emirates		
Lab Report No.	WR14-00019 (Page 1 of 2)	Request No.	D14-00012
Date of Received	31.12.2013	Date Reported	02.01.2014

Client's reference : DQ9004, date: 30/12/2013  
AFE sample No. : D14-00012

#### 1.0 Introduction

Further to the test work instructions received from M/s. Aqua Gas LLC, Dubai, dated 31.12.2013, a representative from Al Futtaim Exova L.L.C visited their factory in Dubai Investment Park#2 on 31.12.2013. The purpose of the visit was to witness the following test on their PP-Copolymer pipe samples.

#### 2.0 Sampling, Testing and Witnessing

Sample selected, prepared and tested by Aqua Gas LLC and witnessed by a representative from Al Futtaim Exova LLC.

#### 3.0 Test Details – Impact Resistance

Test method: BS EN 744 / ISO 3127

Test Description	Observations / Results
Sample Description	110x2.7 PP-Copolymer Pipe
Printing	PP TERRA EN 1451 DN110x2.7PP BS20 EXT: PPS-8 06/11/2013/20:34 Made in U.A.E
Conditioning medium	Air
Manufacturer	Aqua Gas LLC, Dubai
Conditioning temperature	0°C
Conditioning period	60 minutes
Sampling procedure	EN 744
Type of striker	D90
Mass of striker	1.0 kg
Fall height of striker	1.6 meter
Number of strikes	25 strikes/Each points

**Procedure:** Each specimen marked in six points at equidistantly with a longitudinal zero line positioned at random and from this line and then the pipe shall be placed on the vee block so that one of the marked lines is uppermost. The striker shall be allowed to fall freely through a height of 1.6m on to the pipe specimen which is centrally mounted on the vee block support. If the specimen does not fail as a result of cracking or splitting, the specimen shall be rotated until the next marked line is uppermost in the vee block, and a second blow made by the striker. The process shall then be repeated until all the marked lines have been tested, or until a failure is recorded.

#### 4.0 Test Results

Results are given on attached sheet

This report shall only be reproduced in full. Approval of the testing laboratory is required for partial reproduction  
The test results relate only to the samples tested.



**Sample Reference: 110x2.7 PP-Copolymer Pipe**  
**AFE Sample No.D14-00012**

**Test Results & Observation**

**4.1 Impact Resistance**

Test	Test Reference	Number of Failure	Requirements	Results
Impact Resistance	EN 744	Zero	TIR ≤10% (1.0 kg weight at 1.6 meter height)	Passed
Observation	No sign of cracking or splitting was observed			



(15)

الفطيم إكسوفيا المحدودة  
 Al Futtaim Exova LLC  
 P.O. Box 34924, Dubai, United Arab Emirates  
 Tel:+971 (0)4 885 1001 Fax:+971 (0)4 885 4004

*Handwritten signature in Arabic script*

**For and on behalf of Al Futtaim Exova (L.L.C)**

Test witnessed by: A.V.Sasi, Witnessing date: 31.12.2013

Sampled by the client, certificate of sampling was not given.