

REDUCTION OF ENERGY LOSS  
UP TO  
**-70%**



PP-R & PP-RCT  
Preinsulated System

## Upgrade the constructions

### ADVANTAGES:

- ◆ Linear thermal expansion less than copper
- ◆ Increased mechanical strength
- ◆ Saving up to 70% of energy compared to conventional insulation systems
- ◆ Zero condensations – Zero maintenance
- ◆ UV protected
- ◆ Oxygen Tight
- ◆ Fire Resistant

### APPLICATION AREA:

- ◆ Visible–non visible district heating and cooling networks
- ◆ Visible–non visible heating networks
- ◆ Underground networks for distribution of hot and cold water
- ◆ Industrial cooling networks



[interplast.gr/en](http://interplast.gr/en)

HOUSE OF INNOVATION





**Aquaplus Prins**



CERTIFIED SYSTEM  
BY ICC U.S.A.

Atlantica Aegean Blue 5', Rhodes

## HOUSE OF INNOVATION

Interplay with a passion for innovation, produces a complete and certified system of pre-insulated polypropylene pipes and fittings. Aqua-Plus Prins system constitutes a high-end technology insulation for industrial hydraulic applications. Aqua-Plus Prins ensures a certified and uninterrupted energy savings, elimination of linear expansions marking the beginning of the end to costly insulation maintenance and energy-intensive network operations, while the system resists on the extreme weather conditions, corrosive chemicals, oxidation and fire.

### PRODUCT DESCRIPTION

The system consists of service pipe which is produced from polypropylene, PPR 125 or PPR-CT. This is followed by a uniform layer of closed cell polyurethane insulation. The polyurethane foam exceeds the quality characteristics defined by the standard EN 253. Finally follows the outer casing (pipe) of modified polyvinyl chloride (M-PVC) or high density polyethylene (HDPE).

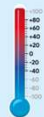
The casing M-PVC pipe meets the quality characteristics of EN 1329 with additional UV protection for sunlight.

### PRODUCTION AND DELIVERY INFORMATION

The length of the pre-insulated pipes is 4m, available in diameters from Ø20mm to Ø125mm and in 5.8m, with range from Ø160mm to Ø450mm. It is possible to be produced in SDR 7.4 - 9 - 11 and 17, with or without fiberglass. Upon request, our company has the ability to produce pipes and fittings with casing pipe made by polyethylene HDPE in straight lengths of 4m, 5.8m and 11.6m.

### SYSTEM OPERATION LIMITS

- Ambient temperature: -40°C to +80°C
- Inner fluid temperature for PPR-R or PPR-CT pipes: -10°C to +100°C
- Thermal linear expansion coefficient for the PPR / PUR / M-PVC system: 0.016mm/mK



The system has been awarded with the Gold Medal of Innovation and the Silver Medal of Industrial Excellence by the Hellenic Academy of Marketing. These distinctions are a justification of our company's efforts, which, since its establishment, constantly invests in scientists and state-of-the-art equipment which leads to innovation. This award does not belong only to us. It also belongs to all those who choose our products and support the efforts of our company throughout its years of operation, giving with us the stigma of innovation and high quality products with respect for the people and the environment.



### ADVANTAGES

- Reduction of energy loss up to 70% compared to classic types of pipe insulation
- Zero maintenance
- Long service life
- Constant thermal resistance of the insulation over the years
- Guaranteed insulation quality
- Full coverage of the inner surfaces so that no gaps are left, condensation and air entrapment phenomena are avoided
- Resistance to extreme weather conditions (rain, snow, frost, etc.)
- Sparse and simple support due to the minimal expansion and the small bending of the insulated pipes
- Thermal linear expansion smaller than copper
- Increased mechanical strength
- Zero condensation
- Quick installation compared to conventional insulation application
- High resistance to external stress
- Waterproof material
- UV protection
- Fire resistance (B-s2, d0)
- Oxygen tight
- Insulation wall thickness compliant with ASHRAE standards
- Extremely fast payback of the investment
- Low weight
- High resistance to corrosion



### APPLICATION AREA

The Aqua-Plus Prins insulated system is suitable for:

- Underground networks
- Outdoor networks
- Indoor networks
- New constructions
- Reconstructions



Below, some of system applications:

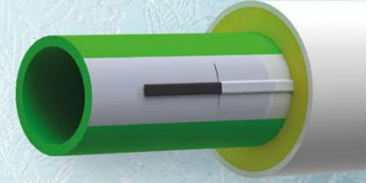
- Air conditioning networks and cooling towers
- Heating networks
- Transport of hot water & drinking water installations
- District heating and cooling
- Underground hot and cold water networks
- Industrial refrigeration networks
- Networks in food industries etc.
- Networks in the shipbuilding industry
- Geothermal systems
- Chemical liquid networks
- Spas and swimming pools

### ANTI-FROST PROTECTION SYSTEM

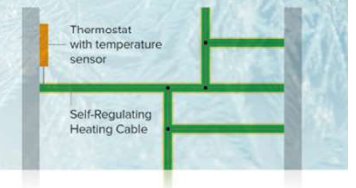
During the winter, extreme weather conditions may cause ice formation, even on pre-insulated pipes. Ice formation will result in the blockage of the pipe and in the worst scenario its failure, with the appearance of a leak. Repairing requires time and cost for the installer. The antifreeze protection system is an affordable and reliable solution which ensures both the integrity of the insulated pipes from low temperatures and the uninterrupted operation of the network of pipes and fittings for many years.

Antifreeze protection system offers:

- Elimination of the ice formation phenomenon
- Avoidance of Unpredictable repair costs
- Ensuring of continuous network flow even in extreme weather conditions



### ANTI-FROST PROTECTION SYSTEM



### LEAK DETECTION SYSTEM

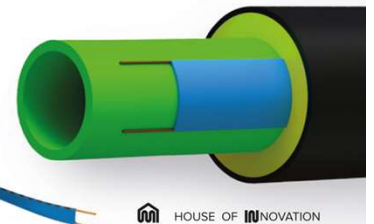
The pre-fabricated insulation of pipes offers multiple benefits to the hot and cold medium transportation networks. However, in insulated pipes, the occurrence of leakage in the main pipe is difficult to detect with emphasis on invisible underground networks. Even a small leak will cause deterioration of the insulating properties, high energy cost, damage and oxidation.

The solution to this problem is the installation of leak detection system to pipe network. The leak detection system is a complete and reliable system for monitoring and control of piping networks, which finds its optimal application in insulated pipes where there is no direct visual contact with the main pipe. This system detects the presence of a leak and its exact location, with high accuracy.



The leak detection system achieves:

- Safe and smooth operation of the network
- Leakage detection and determination of its extent
- Detection of the location of the leakage
- Monitoring and control of the network, at any time, for the whole year
- Reduction of repair costs
- Remote access with a simple internet connection
- Remote control of the detection system
- Creation of data history
- Creating reports and analyzing results



HOUSE OF INNOVATION



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**interplast** *Green line*

**Aqua-Plus Prins**

PP-R 125 and PP-RCT  
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**HOUSE OF INNOVATION**

## REFERENCE PROJECTS

The continuous improvement, innovation and high quality of Interplast products have ranked it in the first place in Greece in terms of plastic piping networks in plumbing, heating and air conditioning. At the same time, extroversion and export activity in 60 countries have resulted in the placement of the company's products at very important projects in Europe, America, Africa and the Middle East. A summary of some of the most important projects, in which the system of insulated pipes and fittings Aqua-Plus Prins of Interplast has been installed, is briefly presented.



Mayla Exclusive Resort & Spa 5\*, Rhodes



Hyatt Regency 5\*, Thessaloniki



Agia Napa Marina, Cyprus



Kuda Villingili Resort 5\*, Maldives



Pristina Mall, Pristina



European Interbalkan Medical Center, Thessaloniki



Cyprus Cancer Research Institute



Heli Energy Drinks Industry, Hungary



Mykonos Airport (JMK), Greece



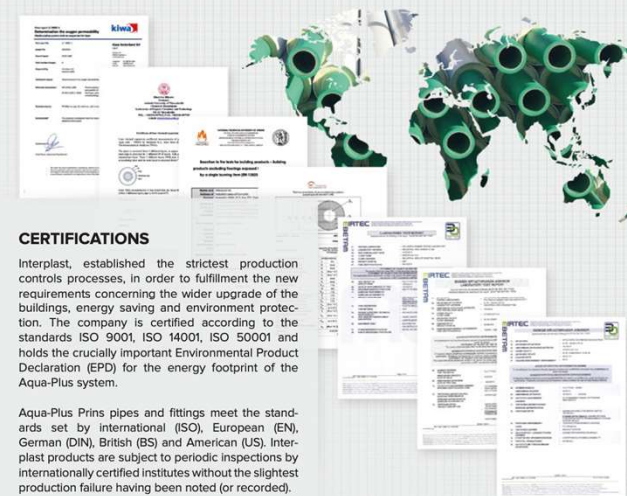
Deree College, Agia Paraskevi, Athens



Klima Alpha, Amyntaio



MarBella Elite 5\*, Karavostasi, Greece



## CERTIFICATIONS

Interplast, established the strictest production controls processes, in order to fulfillment the new requirements concerning the wider upgrade of the buildings, energy saving and environment protection. The company is certified according to the standards ISO 9001, ISO 14001, ISO 50001 and holds the crucially important Environmental Product Declaration (EPD) for the energy footprint of the Aqua-Plus system.

Aqua-Plus Prins pipes and fittings meet the standards set by international (ISO), European (EN), German (DIN), British (BS) and American (US). Interplast products are subject to periodic inspections by internationally certified institutes without the slightest production failure having been noted (or recorded).

The pre-insulated system Aqua-Plus Prins, along with service pipe certifications, has the following additional certifications and laboratory test reports:

- Hydraulic test at -10°C
- Thermal conductivity & energy losses
- Quality of polyurethane
- Linear expansion calculation
- Fire resistance
- Waterproofing of the joints process (jackets)
- Oxygen permeability

The wall thickness and insulation properties of the polyurethane meet the requirements of the American (ASHRAE), European (EN) and Greek (EERB) standards and regulations.



**Test / Certification Bodies - Audits:**  
EBETAM-MIRTEC Greece, ICC America, SKZ Germany, WRAS Great Britain, EMI Hungary, ISS Serbia, Aristotle University of Thessaloniki, National Technical University of Athens, KIWA Netherlands, FFI Germany.

**Certifications of Parts PN 30:**  
ICC America, SKZ Germany, EBETAM-MIRTEC Greece, WRAS Great Britain, EMI Hungary.

**Warranty: 10 years'** insurance coverage from Generali for a sum of up to € 3,000,000.



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# ISO



Sertifikacija za proces, razvijanje integrisanog sistema upravljanja zaštitom životne sredine u skladu sa EN ISO 14001: 2015



Sertifikacija za proces instaliranjem svih potrebnih „alata“ za uštedu energije u skladu sa EN ISO 50001: 2018



# NSF International

789 N. Dixboro Road, Ann Arbor, MI 48105 USA

RECOGNIZES

Interplast S.A.

Facility: Komotini, Greece

AS COMPLYING WITH NSF/ANSI 372 AND ALL APPLICABLE REQUIREMENTS.

PRODUCTS APPEARING IN THE NSF OFFICIAL LISTING ARE  
AUTHORIZED TO BEAR THE NSF MARK.

Aqua<sup>plus</sup>




This certificate is the property of NSF International and must be returned upon request. This certificate remains valid as long as this client has products in NSF's Official Listings for the referenced standards. For the most current and complete Listing information, please access NSF's website ([www.nsf.org](http://www.nsf.org)).

July 12, 2022  
Certificate# C0664594 - 01

David Purkiss  
Vice President, Global Water Division

## ENVIRONMENTAL PRODUCT DECLARATION DETAILS

Programme information	
Programme Operator:	The International EPD® System
Address:	EPD International AB Box 210 60 SE-100 31 Stockholm Sweden
Website:	<a href="http://www.environdec.com">www.environdec.com</a>
E-mail:	<a href="mailto:info@environdec.com">info@environdec.com</a>

PCR Information	
CEN standard EN 15804+A1:2013 serves as the Core Product Category Rules (PCR)	
Product category rules (PCR):	PCR 2012:01, Version 2.32 "Construction Products and Construction Services" UN CPC code 3632 "Tubes, pipes and hoses, and fittings therefore, of plastics"
PCR review was conducted by:	IVL Swedish Environmental Research Institute, Secretariat of the International EPD System Appointed PCR Moderator Martin Erlandsson IVL Swedish Environmental Research Institute (email: <a href="mailto:martin.erlandsson@ivl.se">martin.erlandsson@ivl.se</a> )
Independent third-party verification of the declaration and data, according to ISO 14025:2006:	
<input type="checkbox"/> EPD process certification <input checked="" type="checkbox"/> EPD verification	
Third party verifier:	 Dr. Nikolay Minkov <a href="https://www.greenzero.me">greenzero.me</a> GmbH ( <a href="https://www.greenzero.me">https://www.greenzero.me</a> ) Contact: <a href="mailto:nikolay.minkov@greenzero.me">nikolay.minkov@greenzero.me</a>
Approved by:	The International EPD® System

LCA information	
Background LCA Report prepared by:	 <b>Lycis.HMCS Group</b> Dr. Giannopoulos Dimitrios Dr. Stamatiaidou Marianna Dr. Bonou Alexandra
	 <b>Lycis.HMCS</b> is a research group of the Lab of Heterogeneous Mixtures & Combustion Systems School of Mechanical Engineering National Technical University of Athens (Greece)
Address:	Zografou Campus 9, Iroon Polytechniou str. 15780 Zografou Greece
Contact:	+30 210 772 1218
Website:	<a href="http://www.ntua.gr/hmcs">www.ntua.gr/hmcs</a>
E-mail:	<a href="mailto:diigiann@central.ntua.gr">diigiann@central.ntua.gr</a>

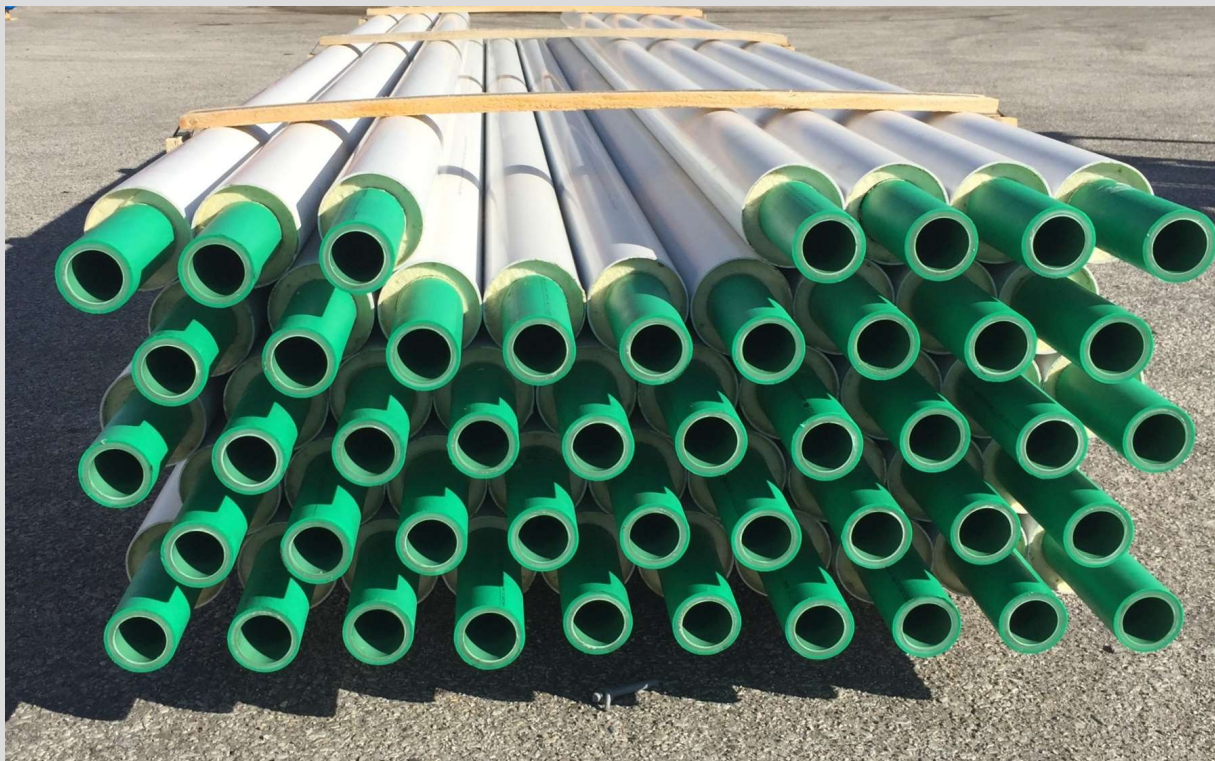
Završena razrada potrebnog LCA, što je dovelo do konačne redakcije neophodne EPD (Deklaracija o proizvodima za životnu sredinu) koja je uneta na njenu elektronsku platformu, sa šifrom SP-02120, kako je predviđeno ISO 14025 i EN 15804. EPD ili ekološki proizvod Deklaracija je sistem ekološkog obeležavanja koji na međunarodnim tržištima, posebno u Evropi i Sjedinjenim Državama, predstavlja „Međunarodni zlatni standard“ za beleženje ekoloških performansi proizvoda tokom njegovog životnog ciklusa.



TEHNIČKI PODACI	POLIURETAN
Ciklopentan	> 8%
Gustoća	> 60 Kgr/m <sup>3</sup>
Sadržaj zatvorenih ćelija	> 88%
Apsorpcija vode	< 10% (Vol)
čvrstina 10% deformacija	> 0,3 N/mm <sup>2</sup>
Otpornost na smicanje	> 0,12 N/mm <sup>2</sup>
Tangensna otpornost na smicanje	> 0,20 N/mm <sup>2</sup>
Koeficijent toplinske provodljivosti	0,021 W/mK

**Izolacijska pena izrađena je od kompaktne jednolične, zatvorene ćelije poliuretanske krute pene čija je gustoća veća od 60 kg / m<sup>3</sup> prema EN 253.**

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- Na osnovu naših iskustva proizveli smo novu liniju predhodno izolovanih cevi. Spoljni sloj se satoji od najkvalitetnijeg PVC materijala bele boje, bez olova, otporan na Sučeve zrake (UV zaštite), prigušivačem dima , kategorizovanim u B1 specifikacijama (ne širi vatru).
- Vreme izrade je 3-5 dana od potvrđene pismene porudžbenice.
- Dužina cevi su 4 metra što omogućava da se bolje kompresuje poliuretan, što ušteduje energiju.

**Patented**





- Odlična energetska efikasnost. Zbog poboljšanja poliuretanskih svojstva (koeficijent toplotne provodljivosti  $\lambda = 0,021 \text{ W/mK}$ ). **Gubici energije mogu se smanjiti za 58% u odnosu na konvencionalne izolacione sisteme.**
- **Materijal koji se sam gasi. Ne širi vatru.**
- Površine cevi su ispunjene izolacijom, da bi se izbegla kondenzacija vode i zarobljavanje vazduha.

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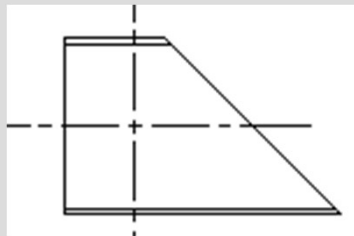


## Primena

- Unutrašnja i spoljašna instalacija.
- Centralno grejanje i hladjenja i DHW mreza.
- Pod zemljom i na zemlji, grejne, rashladne mreže i transport pitke vode.
- Tehnologija rashladne vode.
- Industrijske rashladne mreže.
- Transport hemisjkih fluida.

**Patented**



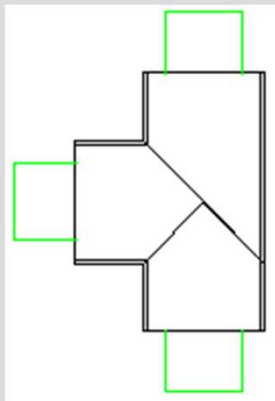
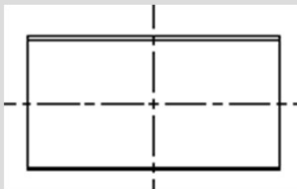
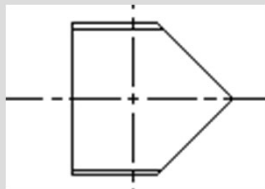
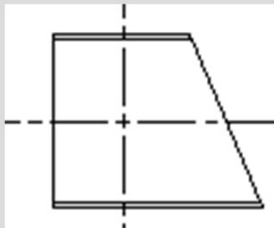
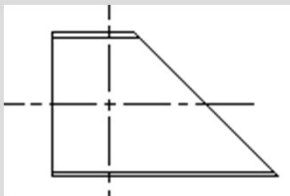


## **Dve opcije za instalaciju Aqua Plus Prins sistema:**

1) Korišćenje UPVC čaura zajedno sa PP-R fittingima. Instalater tokom instalacije lako može izolovati sistem. Prednosti ove opcije je visokokvalitetni izolovani sistem, lako rukovanje / ugradnja i jeftina ugradnja..

2) Upotreba montažnih predizolovanih fittinga. U ovom slučaju potrebna je samo UPVC rukavica za konekciju cevi sa fitinzima.

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## UPVC čaura / fittings

- UPVC koleno služi za spajanje dve cevi ili jedne cevi sa predhodno izoliranom cevi.
- Spajanjem dva priključka od 45° UPVC kreira se 90° Prins koleno.
- Spajanjem dva priključka po 22,5° UPVC kreira 45° Prins kolena.
- Spajanjem dva UPVC priključka jednog od 45° UPVC kreira se predhodno izolirani T spoj. Za sa redukcionim fittingom izmedju unutrašnjeg prečnika UPVC segmenta za T spoja javlja se zazor. Zazor će biti prekriven UPVC prstenom. UPVC prstenom će takodje biti izbegnuto širenje poliuretanske pene van prstena.
- Povezivanje UPVC priključka se vrši korišćenjem lepka ili UPVC trake.

**Patented**



SPOLJAŠNE DIMENZIJE (mm)	DEBLJINA ZIDA KONVERSIONALNE IZOLACIJE ( $\lambda=0,04$ )	DEBLJINA ZIDA POLIURETANSKE AQUA PLUS PRINS ( $\lambda=0,021$ )	ENERGETSKI GUBICI (W/m)	ERGETSKI GUBICI AQUA PLUS PRINS (W/m)	RAZLIKA
20	9 mm	20 mm	10	4,2	58%
25	9 mm	17,5 mm	11,2	5,1	54%
32	11 mm	14 mm	12	6,7	44%
40	11 mm	16 mm	13,6	7,2	47%
50	11 mm	18 mm	15,2	7,7	49%
63	13 mm	16,5 mm	16,4	9,7	41%
75	13 mm	23 mm	18,8	9	52%
90	13 mm	23 mm	21,2	10,3	51%
110	19 mm	23 mm	20,4	11,9	42%
125	19 mm	35,5 mm	23,2	9,9	57%
160	19 mm	30,5 mm	26,8	13,1	51%
200	19 mm	20 mm	31,2	20,7	34%
250	25 mm	27,5 mm	36,8	20,6	44%
315	25 mm	32,5 mm	44,2	22,1	50%

**Patented**

# Tehničke Informacije - Aqua Plus Prins



## Pre Insulated PP-R

### System analysis

#### Technical data of Aqua Plus Prins system

- Ambient temperature limits: - 40°C to + 80°C
- Fluid temperature limits: - 10°C to + 95°C
- Linear expansion coefficient of system PPR / PUR / M-PVC :  $\rightarrow = 0,016 \text{ mm/m} \cdot \text{K}$
- European classification of building products according EN13501-1 : B1 (Difficult to ignite)

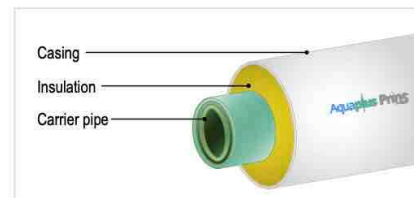


Fig.1 Aqua plus Prins® structure

#### Carrier pipe

Description	Value	Standard
PP-R Glass Fiber	PP-R112	DIN8077/78
Thermal conductivity $\lambda$ at 20°C	PP-RCT125	ISO 3146
Thermal conductivity $\lambda$ at 50°C	0,24 [W/m·K]	EN 8497
Dimensions :		
Ø20-125mm	4,0 [m]	-
Ø160-315mm	5,8 [m]	-
Modulus of elasticity 10°C_1min	1250 [N/mm²]	ISO 527
Tensile strength	38 [N/mm²]	ISO 527-2
Tensile stress at break	> 430 [%]	ISO 527-2
Coefficient of linear expansion	0,030 [mm/m·K]	DIN 53752

Tab.1 Technical data for 3-layer carrier pipe

#### Insulation

PUR Rigid Foam properties	Value	Standard
Thermal conductivity of insulation $\lambda_{50}$	0,028 [W/m·K]	EN 15632
Density	60 [Kg/m³]	EN 253
Closed cell	> 90 [%]	EN 8497
Water absorption	<10[%] Vol	EN 15632-1
Shearing resistance	> 0,12 [N/mm²]	-
Tangent shearing resistance	> 0,20 [N/mm²]	-
Compression strength 10% deformation	> 0,3 [N/mm²]	-

Tab.2 Technical data of PUR insulation acc. EN 253

#### Casing (jacket)

Description	Value	Standard
Modified Poly-vinyl Chloride	M-P.V.C	-
Thermal conductivity of casing pipe $\lambda_{50}$	0,23 [W/m·K]	EN 8497
Modulus of elasticity	3000 [N/mm²]	-
Density	1,43 [g/cm³]	ISO 527-2
Coefficient of linear expansion	0,06 [mm/m·K]	-

Tab.3 Technical data of casing pipe



Since 01/01/2015 the produced M-PVC pipes are free of lead (Pb-free).  
Lead stabilizers have been replaced with organic stabilizers (OBS) or calcium / zinc stabilizers (Ca / Zn) whose ingredients are labeled ecologically and are not included in the REACH list of materials to be removed.

## Pre Insulated PP-R



### Dimensions



Fig.2 Aqua Plus Prins section

#### Prins®

Size	Dimensions						Weights				Water content			
	d <sub>int</sub> [mm]	D <sub>PVC</sub> [mm]	S <sub>PVC</sub> [mm]	T <sub>insulation</sub> [mm]	X <sub>min</sub> [mm]	L <sub>system</sub> [m]	SDR 7,4 [Kg/m] <sub>A</sub>	SDR 9 [Kg/m] <sub>B</sub>	SDR 11 [Kg/m] <sub>F</sub>	SDR 17 [Kg/m] <sub>A</sub>	SDR 7,4 [lt/m] <sub>A</sub>	SDR 9 [lt/m] <sub>B</sub>	SDR 11 [lt/m] <sub>F</sub>	SDR 17 [lt/m] <sub>A</sub>
20/63	20	63	2,2	19,3	150	4,0	0,96 Kg/m	-	-	-	0,163 l/m	-	-	-
25/63	25	63	2,2	16,8			1,03 Kg/m	-	-	-	0,254 l/m	-	-	-
32/63	32	63	2,2	13,3			1,14 Kg/m	1,08 Kg/m	1,03 Kg/m	-	0,423 l/m	0,483 l/m	0,539 l/m	-
40/75	40	75	2,2	15,3			1,53 Kg/m	1,44 Kg/m	1,36 Kg/m	-	0,661 l/m	0,754 l/m	0,835 l/m	-
50/90	50	90	2,2	17,8			2,09 Kg/m	1,95 Kg/m	1,83 Kg/m	-	1,029 l/m	1,182 l/m	1,307 l/m	-
63/100	63	100	2,5	16,0	225	5,8	2,85 Kg/m	2,64 Kg/m	2,45 Kg/m	-	1,647 l/m	1,869 l/m	2,075 l/m	-
75/125	75	125	2,5	22,5			3,57 Kg/m	3,26 Kg/m	2,98 Kg/m	-	2,324 l/m	2,659 l/m	2,961 l/m	-
90/140	90	140	3,2	21,8			5,03 Kg/m	4,59 Kg/m	4,19 Kg/m	-	3,359 l/m	3,825 l/m	4,254 l/m	-
110/160	110	160	3,2	21,8			7,32 Kg/m	6,64 Kg/m	6,04 Kg/m	-	5,001 l/m	5,725 l/m	6,362 l/m	-
125/200	125	200	3,5	34,0			10,26 Kg/m	9,19 Kg/m	8,42 Kg/m	-	6,475 l/m	7,386 l/m	8,203 l/m	-
160/225	160	225	4,5	28,0	225	5,8	14,93 Kg/m	13,51 Kg/m	12,27 Kg/m	10,05 Kg/m	10,605 l/m	12,109 l/m	13,437 l/m	15,614 l/m
200/250	200	250	4,5	20,5			20,31 Kg/m	18,09 Kg/m	16,11 Kg/m	12,69 Kg/m	16,559 l/m	18,908 l/m	21,021 l/m	24,383 l/m
250/315	250	315	6,0	26,5			-	-	25,82 Kg/m	20,47 Kg/m	-	-	32,878 l/m	38,151 l/m
315/400	315	400	8,2	34,3			-	-	42,34 Kg/m	33,86 Kg/m	-	-	52,198 l/m	60,493 l/m

Tab.4 Table of preinsulated systems. The insulation properties are according to the requirements of EN 253.

- Not produced sizes or combinations.

The sum of the columns e.g.  $\boxed{A} + \boxed{A}$  or  $\boxed{B} + \boxed{B}$  in corresponding lines equals the total weight (Prins+water).

# Tehničke Informacije - Aqua Plus Prins

## Pre Insulated PP-R



### Loss of heat and cooling energy

#### Underground systems ■ Prins®

The following tables listed losses of heat and cooling energy in various temperatures. For different conditions (water temperature, air temperature and ground temperature) please use the relation (1) and heat transmission coefficient [U] as follow :

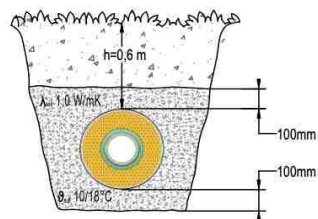
$$(1) \quad \phi = U \cdot (T_f - T_s) \quad [\text{W/m}]$$

Where:  $U$  [W/m·K] : Heat transmission coefficient  
 $T_f$  [°C] : Fluid temperature  
 $T_s$  [°C] : Soil temperature

Assumptions for calculating the U-Value :

Soil thermal conductivity  $\lambda_{\text{soil}}$  : 1,0 [W/m·K]

Laying depth  $h$  : 0,6 [m]



### Underground systems ■ Prins®

#### Loss of heat acc. EN ISO 8497:1996

Heating		Soil temperature $\theta_{\text{soil}}$ 10°C				
d <sub>PPR</sub> [mm]	D <sub>PVC</sub> [mm]	U-Value [W/m·K]	Heat loss $\phi$ [W/m]			
			$\theta_{\text{soil}} = 50^\circ\text{C}$ [W/m]	$\theta_{\text{soil}} = 60^\circ\text{C}$ [W/m]	$\theta_{\text{soil}} = 70^\circ\text{C}$ [W/m]	$\theta_{\text{soil}} = 80^\circ\text{C}$ [W/m]
AquaPlus Prins SDR 7,4 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
20	63	0,138	5,50	6,88	8,25	9,63
25	63	0,168	6,72	8,40	10,8	11,76
32	63	0,223	8,91	11,14	13,37	15,60
40	75	0,236	9,44	11,81	14,17	16,53
50	90	0,245	9,79	12,24	14,68	17,13
63	100	0,308	12,3	15,38	18,46	21,53
75	125	0,281	11,23	14,04	16,84	19,65
90	140	0,322	12,88	16,10	19,32	22,54
110	160	0,368	14,70	18,38	22,06	25,73
125	200	0,305	12,20	15,25	18,30	21,35
160	225	0,405	16,19	20,24	24,28	28,33
200	250	0,561	22,46	28,07	33,68	39,30
AquaPlus Prins SDR 9 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
32	63	0,225	9,00	11,25	13,50	15,75
40	75	0,239	9,56	11,95	14,34	16,73
50	90	0,252	10,08	12,60	15,12	17,64
63	100	0,312	12,48	15,60	18,72	21,84
75	125	0,284	11,36	14,20	17,04	19,88
90	140	0,327	13,08	16,35	19,62	22,89
110	160	0,374	14,96	18,70	22,44	26,18
125	200	0,309	12,36	15,45	18,54	21,63
160	225	0,428	17,12	21,40	25,68	29,96
200	250	0,567	22,68	28,35	34,02	39,69
AquaPlus Prins SDR 11 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
32	63	0,227	9,08	11,35	13,62	15,89
40	75	0,241	9,64	12,05	14,46	16,87
50	90	0,254	10,16	12,70	15,24	17,78
63	100	0,315	12,60	15,75	18,90	22,05
75	125	0,287	11,48	14,35	17,22	20,09
90	140	0,330	13,20	16,50	19,80	23,10
110	160	0,379	15,16	18,95	22,74	26,53
125	200	0,313	12,52	15,65	18,78	21,91
160	225	0,418	16,72	20,90	25,08	29,26
200	250	0,587	23,48	29,30	35,22	41,09
250	315	0,586	23,44	29,30	35,16	41,02
315	400	0,587	23,48	29,35	35,22	41,09
AquaPlus Prins SDR 17 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
160	200	0,427	17,08	21,35	25,62	29,89
200	250	0,605	24,20	30,25	36,60	42,35
250	315	0,604	24,16	30,20	36,24	42,28
315	400	0,604	24,16	30,20	36,24	42,28

Tab.5 Heat losses at soil temperature 10°C.  
<sup>(1)</sup>Basic production type of carrier pipe.  
<sup>(2)</sup>Optional carrier type upon request.

## Pre Insulated PP-R



### Underground systems ■ Prins®

#### Cooling energy loss acc. EN ISO 8497:1996

Cooling		Soil temperature $\theta_{\text{soil}}$ 18°C				
d <sub>PPR</sub> [mm]	D <sub>PVC</sub> [mm]	U-Value [W/m·K]	Cooling energy $\phi$ [W/m]			
			$\theta_{\text{soil}} = -6^\circ\text{C}$ [W/m]	$\theta_{\text{soil}} = 0^\circ\text{C}$ [W/m]	$\theta_{\text{soil}} = 7^\circ\text{C}$ [W/m]	$\theta_{\text{soil}} = 12^\circ\text{C}$ [W/m]
AquaPlus Prins SDR 7,4 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
20	63	0,138	3,30	2,48	1,51	0,83
25	63	0,168	4,03	3,02	1,85	1,01
32	63	0,223	5,35	4,01	2,45	1,34
40	75	0,236	5,67	4,25	2,60	1,42
50	90	0,245	5,87	4,40	2,69	1,47
63	100	0,308	7,37	5,54	3,38	1,85
75	125	0,281	6,74	5,05	3,09	1,68
90	140	0,322	7,73	5,80	3,54	1,93
110	160	0,368	8,82	6,62	4,04	2,21
125	200	0,305	7,32	5,49	3,36	1,83
160	225	0,405	9,71	7,28	4,45	2,43
200	250	0,561	13,47	10,11	6,18	3,37
AquaPlus Prins SDR 9 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
32	63	0,225	5,40	4,05	2,48	1,35
40	75	0,239	5,74	4,30	2,63	1,43
50	90	0,252	6,05	4,54	2,77	1,51
63	100	0,312	7,49	5,62	3,43	1,87
75	125	0,284	6,82	5,11	3,12	1,70
90	140	0,327	7,85	5,89	3,60	1,96
110	160	0,374	8,98	6,73	4,11	2,24
125	200	0,309	7,42	5,56	3,40	1,85
160	225	0,428	10,27	7,70	4,71	2,57
200	250	0,567	13,61	10,21	6,24	3,40
AquaPlus Prins SDR 11 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
32	63	0,227	5,45	4,09	2,50	1,36
40	75	0,241	5,78	4,34	2,65	1,45
50	90	0,254	6,10	4,57	2,79	1,52
63	100	0,315	7,56	5,67	3,47	1,89
75	125	0,287	6,89	5,17	3,16	1,72
90	140	0,330	7,92	5,94	3,63	1,98
110	160	0,379	9,10	6,82	4,17	2,27
125	200	0,313	7,51	5,63	3,44	1,88
160	225	0,418	10,03	7,52	4,60	2,51
200	250	0,587	14,09	10,57	6,46	3,52
250	315	0,586	14,06	10,55	6,45	3,52
315	400	0,587	14,09	10,57	6,46	3,52
AquaPlus Prins SDR 17 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
160	200	0,427	10,25	7,69	4,70	2,56
200	250	0,605	14,52	10,89	6,66	3,63
250	315	0,604	14,50	10,87	6,64	3,62
315	400	0,604	14,50	10,87	6,64	3,62

Tab.6 Heat losses at soil temperature 18°C.  
<sup>(1)</sup>Basic production type of carrier pipe.  
<sup>(2)</sup>Optional carrier type upon request.



# Tehničke Informacije - Aqua Plus Prins

## Pre Insulated PP-R



Above ground freely suspended pipes ■ Prins®

Loss of heat acc. EN ISO 8497:1996

Heating		Ambient temperature $\vartheta_{\text{a}} = -7^{\circ}\text{C}$				
d <sub>PPR</sub> [mm]	D <sub>PVC</sub> [mm]	Heat loss $\phi$ [W/m]				
		$\vartheta_{\text{med}} 50^{\circ}\text{C}$ [W/m]	$\vartheta_{\text{med}} 60^{\circ}\text{C}$ [W/m]	$\vartheta_{\text{med}} 70^{\circ}\text{C}$ [W/m]	$\vartheta_{\text{med}} 80^{\circ}\text{C}$ [W/m]	
AquaPlus Prins SDR 7,4 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
20	63	6,57	8,01	9,44	10,92	
25	63	7,82	9,51	11,19	12,93	
32	63	9,90	12,01	14,09	16,24	
40	75	10,87	13,20	15,50	17,88	
50	90	11,86	14,42	16,95	19,56	
63	100	14,64	17,76	20,85	24,04	
75	125	14,12	17,19	20,22	23,37	
90	140	16,37	19,92	23,42	27,05	
110	160	18,99	23,10	27,14	31,33	
125	200	16,36	19,98	23,54	27,25	
160	225	21,97	26,97	31,49	36,38	
200	250	30,98	37,66	44,17	50,89	
AquaPlus Prins SDR 9 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
32	63	9,98	12,10	14,21	16,38	
40	75	10,97	13,31	15,64	18,05	
50	90	11,98	14,56	17,12	19,77	
63	100	14,80	17,96	21,09	24,32	
75	125	14,29	17,93	20,46	23,65	
90	140	16,59	20,18	23,73	27,41	
110	160	19,29	23,46	27,58	31,85	
125	200	16,58	20,24	23,86	27,63	
160	225	22,37	27,25	32,07	37,07	
200	250	31,78	38,62	45,32	52,24	
AquaPlus Prins SDR 11 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
32	63	10,05	12,18	14,30	16,49	
40	75	11,04	13,40	15,75	18,17	
50	90	12,07	14,67	17,25	19,92	
63	100	14,94	18,13	21,29	24,56	
75	125	14,42	17,55	20,66	23,88	
90	140	16,77	20,40	23,99	27,72	
110	160	19,53	23,75	27,93	32,26	
125	200	16,76	20,45	24,12	27,94	
160	225	22,68	27,64	32,54	37,62	
200	250	32,44	39,42	46,27	53,36	
250	315	33,46	40,73	47,88	55,29	
315	400	35,41	43,17	50,79	58,69	
AquaPlus Prins SDR 17 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
160	225	23,16	28,22	33,24	38,45	
200	250	33,42	40,59	47,68	55,02	
250	315	34,50	41,99	49,40	57,08	
315	400	36,58	44,58	52,49	60,70	

Tab.7 Heat losses at ambient air temperature  $-7^{\circ}\text{C}$ .  
<sup>(1)</sup>Basic production type of carrier pipe.  
<sup>(2)</sup>Optional carrier type upon request.

Heating		Ambient temperature $\vartheta_{\text{a}} = 7^{\circ}\text{C}$			
d <sub>PPR</sub> [mm]	D <sub>PVC</sub> [mm]	Heat loss $\phi$ [W/m]			
		$\vartheta_{\text{med}} 50^{\circ}\text{C}$ [W/m]	$\vartheta_{\text{med}} 60^{\circ}\text{C}$ [W/m]	$\vartheta_{\text{med}} 70^{\circ}\text{C}$ [W/m]	$\vartheta_{\text{med}} 80^{\circ}\text{C}$ [W/m]
AquaPlus Prins SDR 7,4 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>					
20	63	5,10	6,53	7,96	9,46
25	63	6,11	7,80	9,50	11,26
32	63	7,81	9,94	12,08	14,29
40	75	8,54	10,89	13,24	15,67
50	90	9,29	11,85	14,42	17,08
63	100	11,50	14,66	17,81	21,08
75	125	10,99	14,05	17,11	20,29
90	140	12,76	16,30	19,84	23,51
110	160	14,80	18,91	23,00	27,25
125	200	12,63	16,18	19,73	23,44
160	225	17,03	21,78	26,52	31,44
200	250	24,19	30,88	37,48	44,32
AquaPlus Prins SDR 9 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>					
32	63	7,87	10,02	12,18	14,42
40	75	8,62	10,99	13,36	15,82
50	90	9,38	11,97	14,57	17,27
63	100	11,64	14,03	18,03	21,34
75	125	11,12	14,22	17,32	20,54
90	140	12,93	16,52	20,11	23,84
110	160	15,05	19,22	23,38	27,71
125	200	12,80	16,40	20,01	23,77
160	225	17,34	22,19	27,02	32,05
200	250	24,84	31,69	38,49	45,54
AquaPlus Prins SDR 11 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>					
32	63	7,93	10,09	12,27	14,52
40	75	8,68	11,06	13,46	15,94
50	90	9,45	12,06	14,68	17,41
63	100	11,75	14,97	18,21	21,55
75	125	11,23	14,35	17,49	20,75
90	140	13,08	16,70	20,34	24,12
110	160	15,24	19,46	23,69	28,08
125	200	12,94	16,58	20,23	24,04
160	225	17,60	22,51	27,43	32,54
200	250	25,37	32,37	39,33	46,55
250	315	25,99	33,22	40,42	47,90
315	400	27,38	35,03	42,65	50,58
AquaPlus Prins SDR 17 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>					
160	225	17,98	23,00	28,03	33,28
200	250	26,17	33,37	40,58	48,06
250	315	26,83	34,28	41,74	49,50
315	400	28,20	44,12	44,12	52,36

Tab.8 Heat losses at ambient air temperature  $7^{\circ}\text{C}$ .  
<sup>(1)</sup>Basic production type of carrier pipe.  
<sup>(2)</sup>Optional carrier type upon request.

## Pre Insulated PP-R



Above ground freely suspended pipes ■ Prins®

Cooling energy loss acc. EN ISO 8497:1996

Cooling		Ambient temperature $\vartheta_a$ 40°C				
d <sub>PPR</sub>	D <sub>PVC</sub>	U-Value	Cooling energy loss $\phi$ [W/m]			
[mm]	[mm]		$\vartheta_{med} 0^{\circ}\text{C}$	$\vartheta_{med} 7^{\circ}\text{C}$	$\vartheta_{med} 12^{\circ}\text{C}$	$\vartheta_{med} 18^{\circ}\text{C}$
Aqua Plus Prins SDR 7,4 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
20	63	0,105	4,22	3,48	2,95	2,32
25	63	0,127	5,08	4,19	3,55	2,79
32	63	0,167	6,66	5,49	4,66	3,66
40	75	0,180	7,21	5,95	5,05	3,97
50	90	0,194	7,75	6,40	5,43	4,26
63	100	0,243	9,71	8,01	6,80	5,34
75	125	0,226	9,03	7,45	6,32	4,97
90	140	0,263	10,51	8,67	7,36	5,78
110	160	0,305	12,20	10,06	8,45	6,71
125	200	0,253	10,12	8,35	7,08	5,57
160	225	0,345	13,79	11,38	9,65	7,58
200	250	0,271	10,84	8,95	7,59	5,96
Aqua Plus Prins SDR 9 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
32	63	0,168	6,73	5,55	4,71	3,70
40	75	0,182	7,30	6,02	5,11	4,01
50	90	0,196	7,85	6,48	5,50	4,32
63	100	0,246	9,85	8,13	6,90	5,42
75	125	0,229	9,16	7,56	6,41	5,04
90	140	0,267	10,68	8,81	7,48	5,88
110	160	0,311	12,44	10,27	8,71	6,84
125	200	0,257	10,28	8,48	7,20	5,66
160	225	0,352	14,09	11,63	9,86	7,75
200	250	0,276	11,03	9,10	7,72	6,07
Aqua Plus Prins SDR 11 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
32	63	0,170	6,79	5,60	4,75	3,74
40	75	0,184	7,36	6,07	5,15	4,05
50	90	0,198	7,93	6,54	5,55	4,36
63	100	0,249	9,97	8,23	6,98	5,48
75	125	0,232	9,27	7,65	6,49	5,10
90	140	0,271	10,83	8,93	7,58	5,96
110	160	0,316	12,63	10,42	8,84	6,95
125	200	0,260	10,41	8,59	7,29	5,73
160	225	0,358	14,34	11,83	10,04	7,88
200	250	0,280	11,18	9,23	7,83	6,15
250	315	0,531	21,22	17,51	14,85	11,67
315	400	0,552	22,06	18,20	15,44	12,14
Aqua Plus Prins SDR 17 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
160	225	0,368	14,71	12,13	10,30	8,09
200	250	0,548	21,90	18,07	15,33	12,05
250	315	0,551	22,03	18,18	15,42	12,12
315	400	0,574	22,94	18,93	16,06	12,52

Tab.9 Cooling energy losses at ambient air temperature  $40^{\circ}\text{C}$ .  
<sup>(1)</sup>Basic production type of carrier pipe.  
<sup>(2)</sup>Optional carrier type upon request.

Cooling		Ambient temperature $\vartheta_{\text{a}}$ 25°C				
d <sub>PPR</sub>	D <sub>PVC</sub>	U-Value	Cooling energy loss $\phi$ [W/m]			
[mm]	[mm]	[W/m <sup>2</sup> K]	$\vartheta_{\text{med}}$ 0°C	$\vartheta_{\text{med}}$ 7°C	$\vartheta_{\text{med}}$ 12°C	$\vartheta_{\text{med}}$ 18°C
[mm]	[mm]	[W/m <sup>2</sup> K]	[W/m]	[W/m]	[W/m]	[W/m]
Aqua Plus SDR 7,4 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
20	63	0,103	2,57	1,85	1,34	0,72
25	63	0,124	3,11	2,24	1,61	0,87
32	63	0,162	4,05	2,92	2,11	1,11
40	75	0,176	4,40	3,16	2,29	1,24
50	90	0,186	4,65	3,35	2,42	1,30
63	100	0,237	5,92	4,26	3,08	1,66
75	125	0,222	5,54	3,99	2,88	1,55
90	140	0,258	6,44	4,64	3,35	1,80
110	160	0,299	7,47	5,38	3,89	2,09
125	200	0,250	6,24	4,49	3,25	1,75
160	225	0,339	8,48	6,11	4,41	2,37
200	250	0,269	6,72	4,84	3,49	1,88
Aqua Plus SDR 9 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
32	63	0,164	4,09	2,95	2,13	1,15
40	75	0,178	4,45	3,20	2,31	1,24
50	90	0,192	4,80	3,45	2,49	1,34
63	100	0,240	6,00	4,32	3,12	1,68
75	125	0,225	5,62	4,04	2,92	1,57
90	140	0,262	6,54	4,71	3,40	1,83
110	160	0,305	7,62	5,48	3,96	2,13
125	200	0,254	6,34	4,56	3,30	1,78
160	225	0,347	8,66	6,24	4,50	2,43
200	250	0,273	6,83	4,92	3,55	1,91
Aqua Plus SDR 11 PP-R 112 GF <sup>(1)</sup> & PP-RCT 125 GF <sup>(2)</sup>						
32	63	0,165	4,13	2,97	2,15	1,16
40	75	0,179	4,48	3,23	2,33	1,26
50	90	0,194	4,84	3,48	2,52	1,36
63	100	0,243	6,07	4,37	3,16	1,70
75	125	0,227	5,68	4,09	2,95	1,59
90	140	0,265	6,63	4,77	3,45	1,86
110	160	0,309	7,73	5,57	4,02	2,17
125	200	0,257	6,42	4,62	3,34	1,80
160	225	0,352	8,81	6,34	4,58	2,47
200	250	0,277	6,93	4,99	3,60	1,94
250	315	0,521	13,03	9,38	6,77	3,65
315	400	0,565	13,59	9,78	7,07	3,81
Aqua Plus SDR 17 PP-RCT 125 GF <sup>(1)</sup> & PP-R 112 GF <sup>(2)</sup>						
160	225	0,361	9,04	6,51	4,70	2,53
200	250	0,535	13,38	9,63	6,96	3,75
250	315	0,541	13,52	9,73	7,03	3,79
315	400	0,565	14,12	10,17	7,34	3,99

# Tehničke Informacije - Aqua Plus Prins



## Pre Insulated PP-R

### System combinations



### Linear expansion calculation

#### Above ground pipe

In visible heating and air conditioning networks, visual aesthetics, network stability, and the absence of trends are important factors for the construction.

Adherence to support distances as well as expansion joints prevent mechanical stresses on the grids, while ensuring longer life and excellent aesthetic effect.

The creation of expansion joints in the pre-insulated Aqua Prins system is applied to lines larger than 80mm or when the calculated linear expansion  $\Delta L$  is greater than 50mm.

Linear expansion is calculated according to the following formula:

$$\Delta L = \alpha \times L \times \Delta T$$

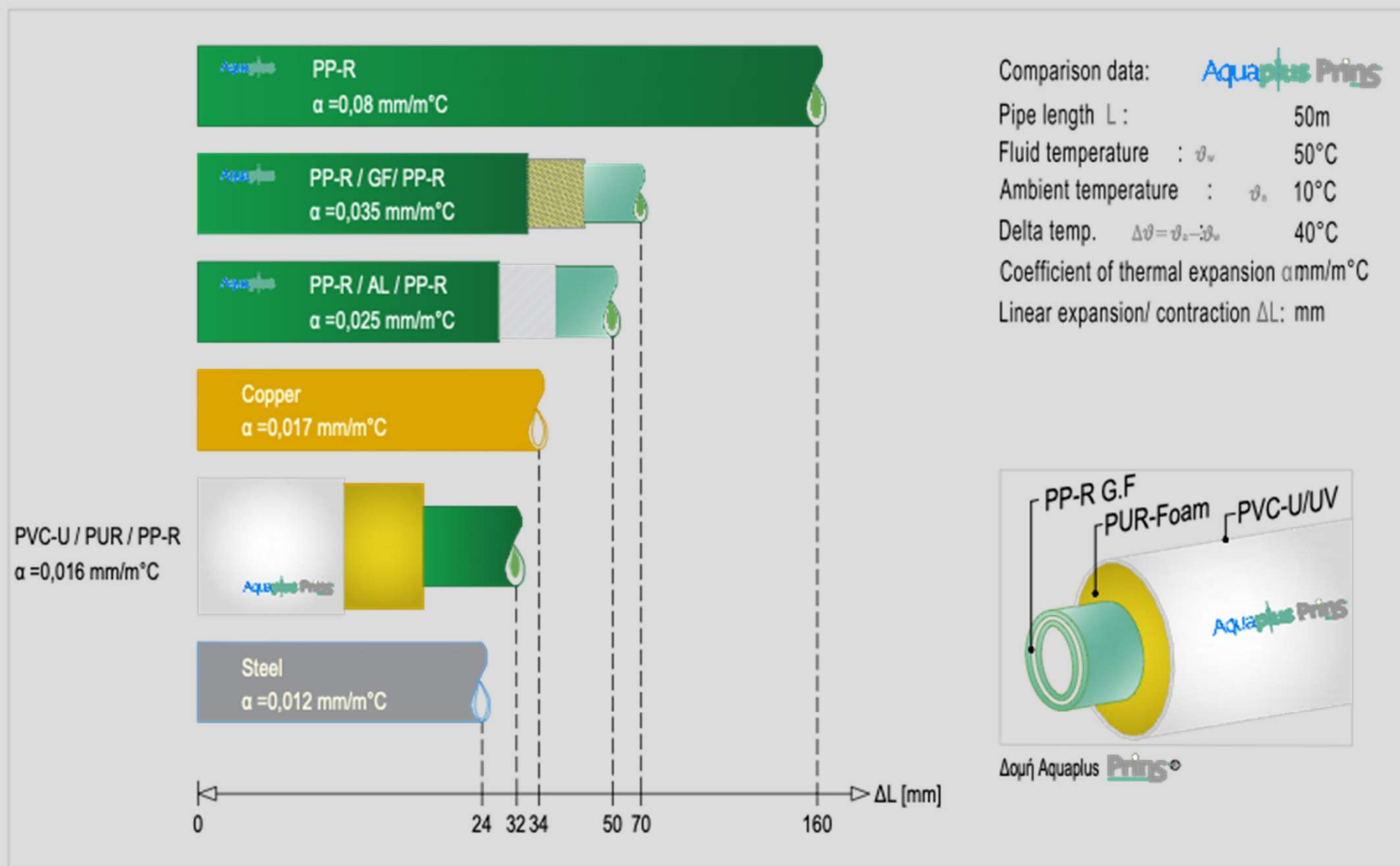
where:

- $\Delta L$  : Linear expansion length [mm]
- $\alpha$  : Linear expansion coefficient [mm/m°C]
- $L$  : Pipe length [m]
- $\Delta T$  : Temperature difference between fluid and ambient. [C°]

Table of Linear expansion  $\Delta L$  in [mm]: Aqua Plus Prins coefficient  $\alpha = 0.016 \text{ mm} / \text{m} \cdot \text{C}^\circ$

Pipe length	Temperature difference $\Delta T = T_{\text{Fluid temperature}} - T_{\text{Ambient temperature}}$							
	10 C°	20 C°	30 C°	40 C°	50 C°	60 C°	70 C°	80 C°
	Linear expansion $\Delta L$ in (mm)							
10 m	2	4	5	7	8	10	12	13
20 m	4	7	10	13	16	20	23	26
30 m	5	10	15	20	24	29	34	39
40 m	7	13	20	26	32	39	45	52
50 m	8	16	24	32	40	48	56	64
60 m	10	20	29	39	48	58	68	77
70 m	12	23	34	45	56	68	79	90
80 m	13	26	39	52	64	77	90	103
90 m	15	29	44	58	72	87	101	116
100 m	16	32	48	64	80	96	112	128

Tab.11 Linear expansion of Prins system



Niža linearna toplotna ekspanzija za 55% niža u uporedjenju s PP-R ojačanom cijevi od fiber staklenih primesa i niža od bakra (Prinsov koeficijent linearnog širenja  $\alpha = 0,016$  mm / m / C °).

**Patented**



# Nepropustljivost Vlage



Generalno kod podzemnih instalacija je potrebna velika pažnja za povezivanje spojeva da bi se izbegla velika količina vlage kod poliuretana. Interplast poseduje posebnu opremu za testiranje na nepropustnost vode u skladu sa atestom EN 489

# Jedan Sistem, Puno Mogućnosti



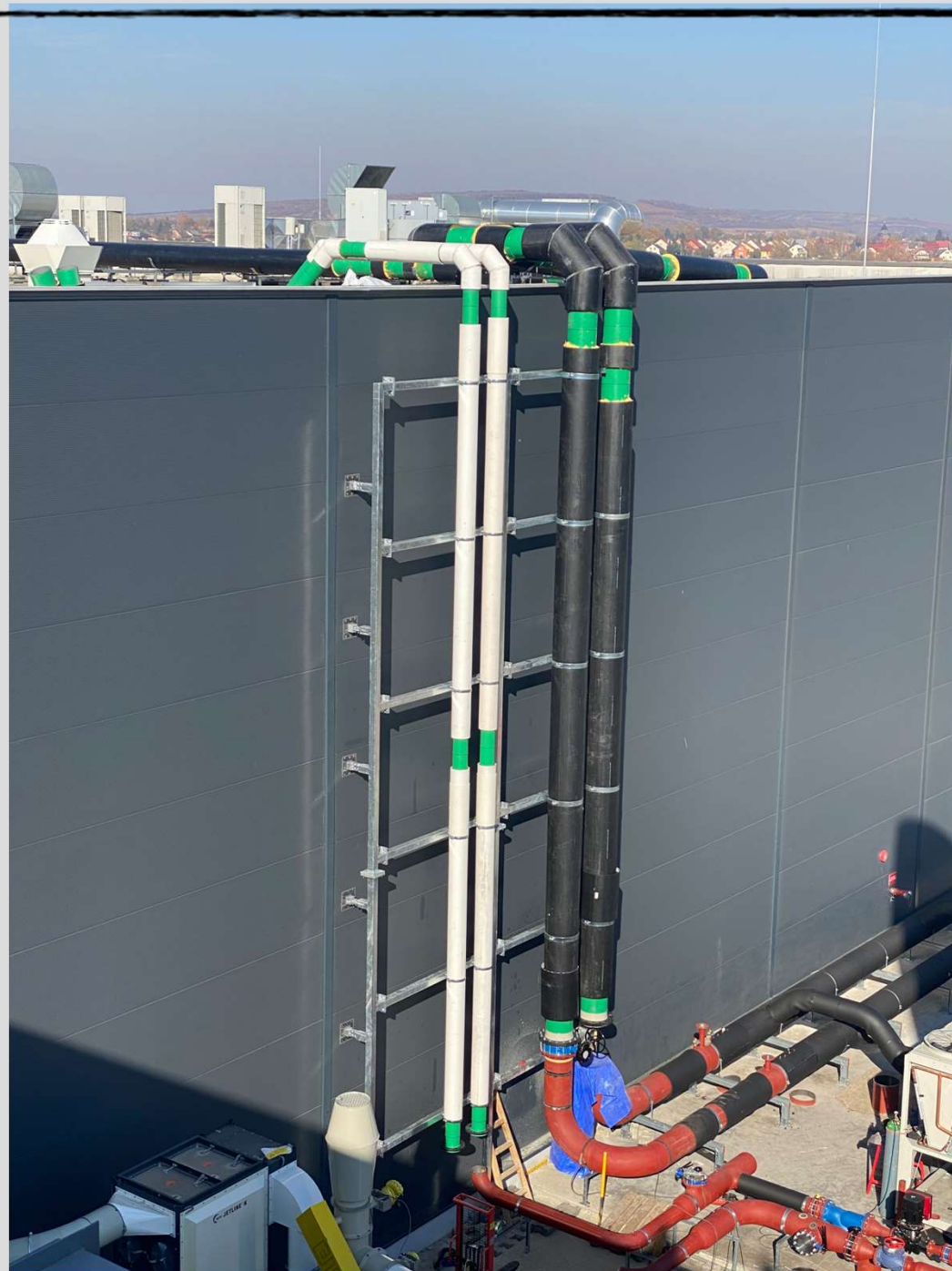


# Jedan Sistem, Puno Mogućnosti



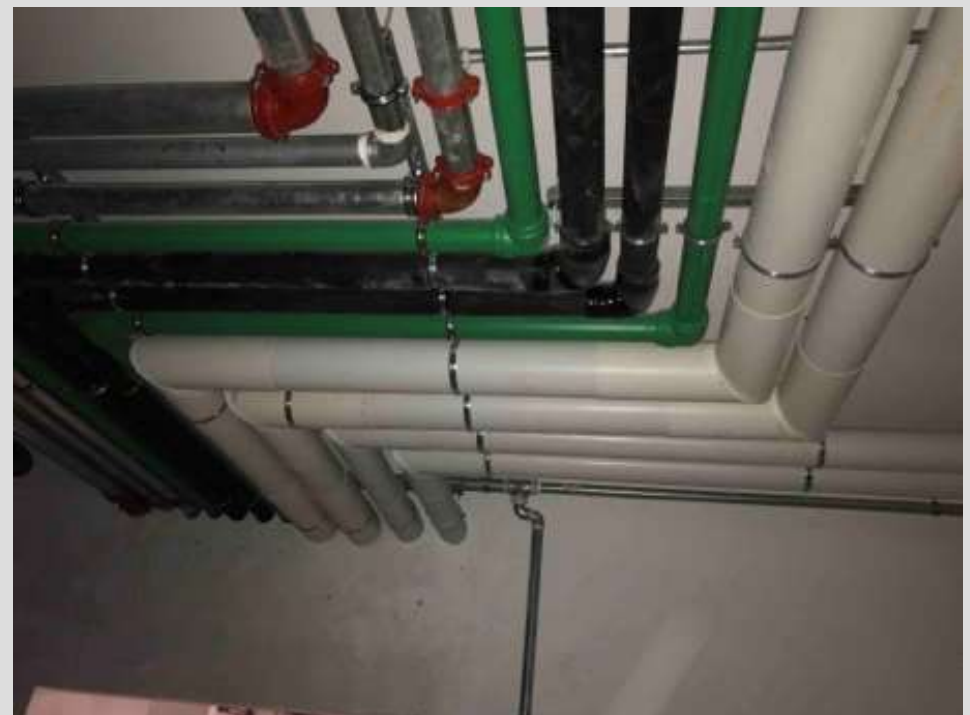


# Jedan Sistem, Puno Mogućnosti





# Jedan Sistem, Puno Mogućnosti



# Jedan Sistem, Puno Mogućnosti





# Jedan Sistem, Puno Mogućnosti



# Problemi sa kondenzacijom



Održavanje cevne izolacije svake decenije u cevovodnim mrežama, dugih dužina koje je potrebno održavati prema pratećim upustvima, košta jednako kao nove cevi.



# Aqua Plus Prins - HDPE - Podzemne mreže



- Specijalno rešenje za daljinsko grejanje i daljinsko hlađenje.
- Odlično energetski efikasan.
- Dostupan u 4m, 5.8m i 11.6m.
- Kompletan sertifikovan sistem od jednog proizvođača.
- 10 godina garancije.

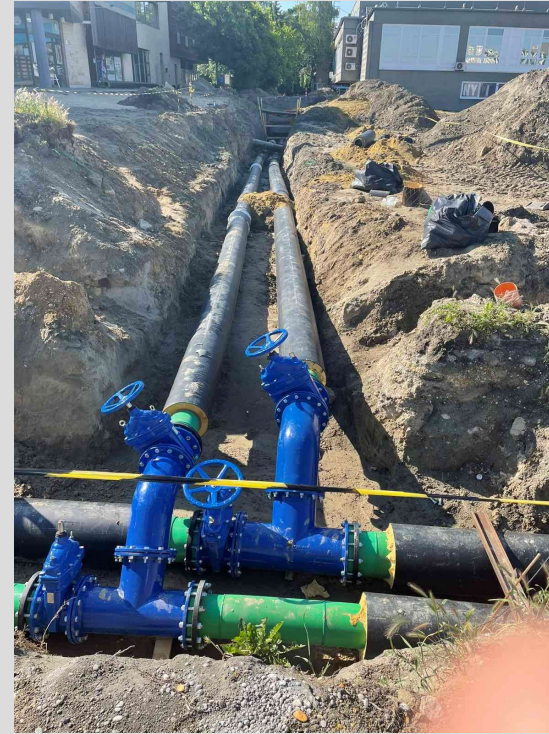
# Aqua Plus Prins - HDPE - Podzemne mreže



- Brza instalacija.
- Lako i bezbedno termičko zavarivanje.
- Brza isporuka.
- Sertifikovan sistem prema ICC (ASTM & NSF), ISO 50001 and EPD

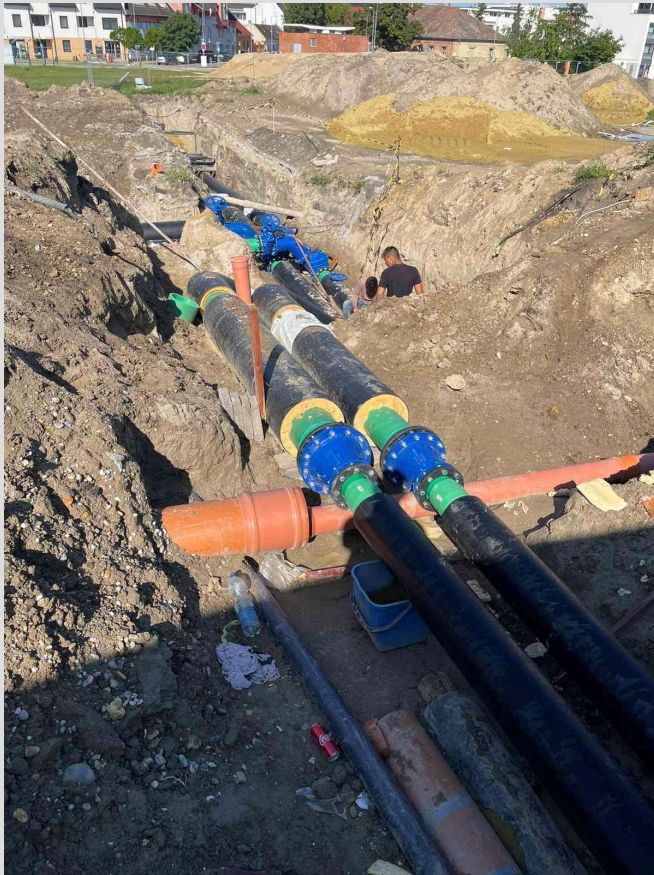


# Aqua Plus Prins - HDPE - Podzemne mreže





# Aqua Plus Prins - HDPE - Podzemne mreže



# Pre Insulated PP-R



## Dimensions



Fig.3 Aqua Plus Prins + EN253 section

## EN 253 Prins +

Dimensions							Weights				Water content			
Size	d <sub>pp</sub> [mm]	D <sub>PE</sub> [mm]	S <sub>PE</sub> [mm]	T <sub>insulation</sub> [mm]	X <sub>Free</sub> [mm]	L <sub>system</sub> [m]	SDR 7,4 [Kg/m] A	SDR 9 [Kg/m] B	SDR 11 [Kg/m] C	SDR 17 [Kg/m] D	SDR 7,4 [Kg/m] A	SDR 9 [Kg/m] B	SDR 11 [Kg/m] C	SDR 17 [Kg/m] D
20/90	20	90	3.0	32.0	150	4,0 or 11,6	1,35 Kg/m	-	-	-	0,163 l/m	-	-	-
25/90	25	90	3.0	29.5			1,41 Kg/m	-	-	-	0,254 l/m	-	-	-
32/90	32	90	3.0	26.0			1,52 Kg/m	1,47 Kg/m	1,42 Kg/m	-	0,423 l/m	0,483 l/m	0,539 l/m	-
40 /110	40	110	3.0	32.0			2,11 Kg/m	2,02 Kg/m	1,94 Kg/m	-	0,661 l/m	0,754 l/m	0,835 l/m	-
50 /110	50	110	3.0	27.0			2,37 Kg/m	2,22 Kg/m	2,11 Kg/m	-	1,029 l/m	1,182 l/m	1,307 l/m	-
63/125	63	125	3.0	28.0			3,13 Kg/m	2,92 Kg/m	2,72 Kg/m	-	1,647 l/m	1,869 l/m	2,075 l/m	-
75/140	75	140	3.0	29.5			3,98 Kg/m	3,67 Kg/m	3,38 Kg/m	-	2,324 l/m	2,659 l/m	2,961 l/m	-
90/160	90	160	3.0	32.0			5,22 Kg/m	4,78 Kg/m	4,38 Kg/m	-	3,359 l/m	3,825 l/m	4,254 l/m	-
110/200	110	200	3.2	41.8	225	5,8 or 11,6	7,73 Kg/m	7,04 Kg/m	6,45 Kg/m	-	5,001 l/m	5,725 l/m	6,362 l/m	-
125/225	125	225	3.4	46.6			9,94 Kg/m	8,87 Kg/m	8,11 Kg/m	-	6,475 l/m	7,386 l/m	8,203 l/m	-
160/250	160	250	3.6	41.4			13,70 Kg/m	12,28 Kg/m	11,04 Kg/m	8,99 Kg/m	10,605 l/m	12,109 l/m	13,437 l/m	15,614 l/m
200/315	200	315	4.1	53.4			21,21 Kg/m	18,99 Kg/m	17,02 Kg/m	13,86 Kg/m	16,559 l/m	18,908 l/m	21,021 l/m	24,383 l/m
250/400	250	400	4.8	70.2			-	-	26,61 Kg/m	21,65 Kg/m	-	-	32,878 l/m	38,151 l/m
315/450	315	450	5.2	62.3			-	-	37,07 Kg/m	29,25 Kg/m	-	-	52,198 l/m	60,524 l/m
355/500	355	500	5.6	66.9			-	-	46,14 Kg/m	36,25 Kg/m	-	-	66,326 l/m	76,748 l/m
400/560	400	560	6.0	74.0			-	-	57,83 Kg/m	45,18 Kg/m	-	-	84,187 l/m	97,646 l/m
450/560	450	560	6.0	49.0	11.6		-	-	65,58 Kg/m	49,55 Kg/m	-	-	106,48 l/m	123,54 l/m
450/630	450	630	6.6	83.4			-	-	73,00 Kg/m	56,97 Kg/m	-	-	106,48 l/m	123,54 l/m

Tab.5 Table of preinsulated system. Insulation sizes and insulation properties are according to EN 253 requirements.

- Non produced sizes or combinations.

The sum of columns e.g. A + A or B + B in corresponding lines are equal to total weight of system (Prins+water).

\* All dimensions can be produced in length 11.6m upon request.



HOUSE OF INNOVATION



# Pre Insulated PP-R



## System analysis

### Technical data of Aquaplast Prins system

Thermal operating conditions	- 40°C to + 80°C
Fluid temperature limits :	- 10°C to + 95°C
Linear expansion coefficient of system PPR / PUR / PE-LD :	→ = 0,016 mm/m·K

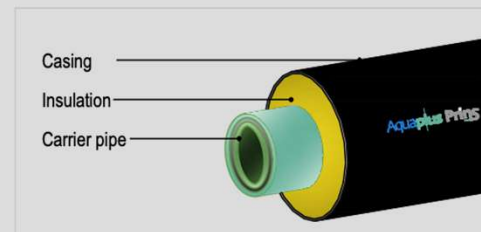


Fig.1 Aqua plus Prins®structure

### Carrier pipe

Description	Value	Standard
PP-R multilayer glass fiber	PP-R & PP-RCT	DIN8077/78
Thermal conductivity (λ) at 20°C	0,17 [W/m·K]	ISO 3146
Thermal conductivity (λ) at 50°C	0,24 [W/m·K]	EN 8497
Dimensions :		
Ø20-125mm straight length	4,0 [m]	-
Ø160-315mm straight length	5,8 [m]	-
Modulus of elasticity 10°C_1min	900-1200 [N/mm²]	ISO 527
Tensile strength	38 [N/mm²]	ISO 527-2
Tensile stress at break	> 430 [%]	ISO 527-2
Coefficient of linear expansion	0,035 [mm/m·K]	DIN 53752

Tab.1 Technical data for 3-layer carrier pipe

### Insulation

PUR rigid foam properties	Value	Standard
Thermal conductivity λ <sub>50</sub>	0,028 [W/m·K]	EN 15632
Density	60 [Kg/m³]	EN 253
Closed cell	> 90 [%]	EN 8497
Water absorption	< 10[%] Vol	EN 15632-1
Shearing resistance	> 0,12 [N/mm²]	-
Tangent shearing resistance	> 0,20 [N/mm²]	-
Compression strength 10% deformation	> 0,3 [N/mm²]	-

Tab.2 Technical data of PUR insulation acc.to EN 253

### Casing

Description	Value	Standard
Black coloured Polyethylene High density	PE-HD 100	EN 12201
Thermal conductivity of casing pipe (λ <sub>50</sub> )	0,43 [W/m·K]	DIN 52612
Modulus of elasticity	1100 [MPa]	ISO 527-2
Density	0,955 [Kg/m³]	ISO 1183
Stress crack resistance test	-	ISO 16770
Casing outside diameter & wall thickness	-	ISO 3126

Tab.3 Technical data of casing pipe

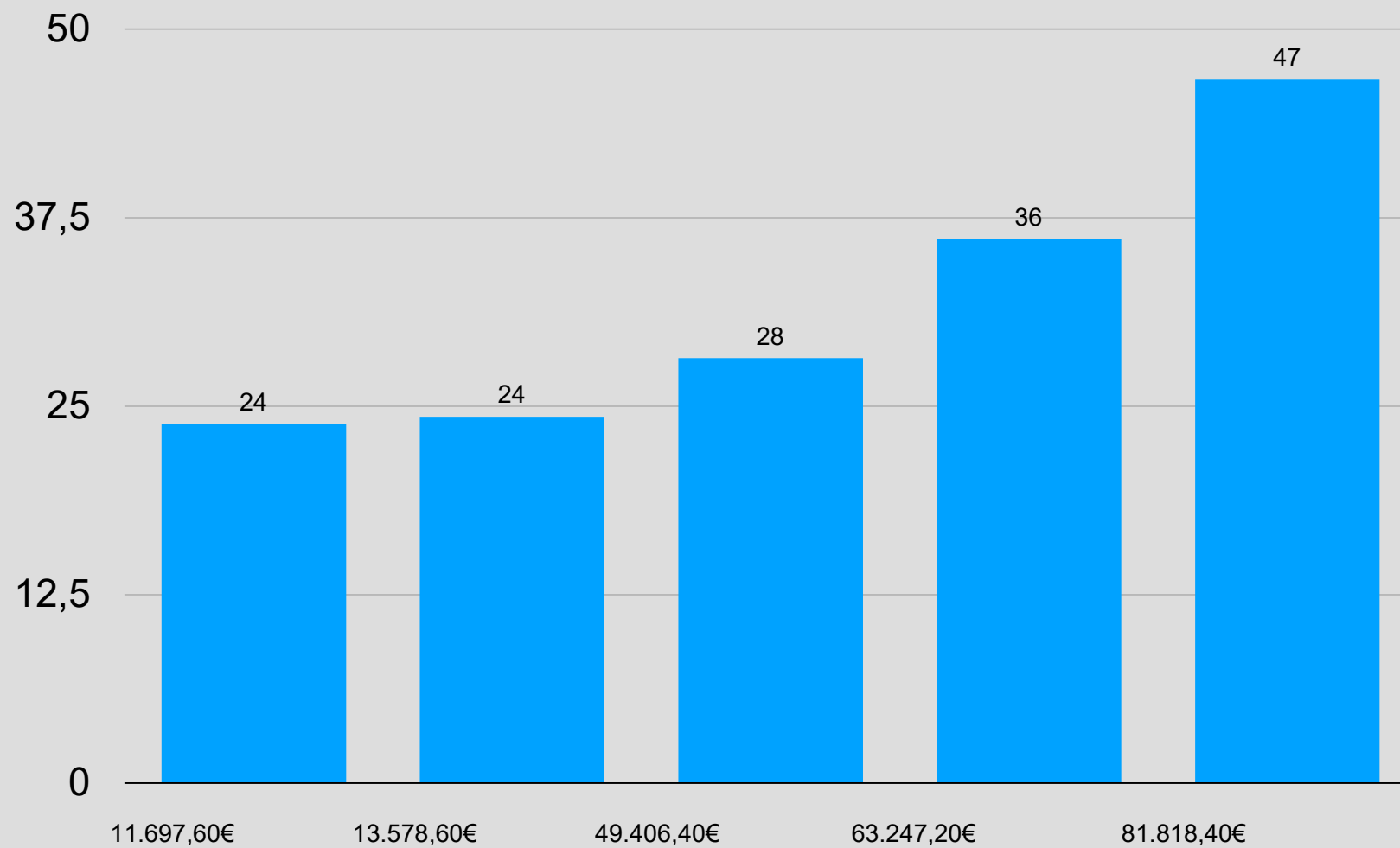


# Karakteristike materijala



- Tehnika toplotne fuzije (autogeno zavarivanje)
- Nema korozije
- Nema skaliranja
- Otpornost na mraz
- Ograničeni gubici toplote
- Nizak nivo buke
- Otpornost na habanje
- Otpornost na lutajućih struja
- Trajnost
- Lakoća

# EFIKASNOST PUMPE



# Poređenje težine

	METERS	HOTEL	weight PP SDR11	weight PP SDR 11/17	weight ST DIN 10220
1	2292m	Steel pipe, seamless, DIN EN 10220 33,7 x 2,6	630,30	630,30	4561,08
2	666m	Steel pipe, seamless, DIN EN 10220 42,4 x 2,6	182,70	182,70	1698,30
3	426m	Steel pipe, seamless, DIN EN 10220 48,3 x 2,6	339.70	339.70	1248,18
4	652m	Steel pipe, seamless, DIN EN 10220 60,3 x 2,9	992.58	992.58	3501,72
5	474m	Steel pipe, seamless, DIN EN 10220 76,1 x 2,9	421,74	421,74	2483,76
6	114m	Steel pipe, seamless, DIN EN 10220 88,9 x 3,2	627,80	627,80	770,64
7	64m	Steel pipe, seamless, DIN EN 10220 114,3 x 3,6	247,80	161,82	825,72
8	72m	Steel pipe, seamless, DIN EN 10220 139,7 x 4,0	509,03	344,88	964,08
9	252m	Steel pipe, seamless, DIN EN 10220 168,3 x 4,5	2683,43	1807,07	4581,36
10	228m	Steel pipe, seamless, DIN EN 10220 219,1 x 6,3	3701,31	2476,66	7537,68
11	186m	Steel pipe, seamless, DIN EN 10220 273,0 x 6,3	4968,36	3300,69	7707,84
12	54m	Steel pipe, seamless, DIN EN 10220 323,9 x 7,1	1719,52	1138,27	2995,38
	5700m	total PPR pipe SDR 11/17	15.692 kg	11.091 kg	
		total steel seemless DIN 10220			38.876 kg
		difference	247%	350%	



# Poređenje težine



- Manja težina donosi uštedu na strukturnim konstrukcijama ili šansu da se težina uloži u druga područja.
- Manji statički problemi u obnovi/renoviranje (industrija).
- Više materijala u svakom kamionu / kontejneru.
- Manja težina koja se prevozi unutar gradilišta, kao i instaliranje.



- Vrsta i efikasnost spoja
- Dostupne veličine
- Vreme instalacije
- Debljina izolacije protiv kondenzacije
- Otpornost na toplotu i zvuk
- Snagu udara
- Širenje pukotina
- Hemijska otpornost
- Higijena i pitkost
- Trajnost
- Ekološki prihvatljivost - Materijali koji se mogu reciklirati
- Troškovi instalacije
- Glatkoća površine i gubitak glave

# PPR vs STEEL

## PP-R pipe systems

1. Nekorozivno (+)
2. Bez održavanja (+)
3. Dugotrajna služba (+)
4. Dobro Opseg temperature / tolerancije pritiska
5. Linearno proširenje (-) (0.039-0.15 mm/mK) Obično za toplu aplikaciju
6. Povoljna toplotna provodljivost ( $\lambda = 0.15 \text{ W/mK}$ ) (+)
7. Modul elastičnosti 1200 Newton. Niske desetke usled linearnog ekspanzija
8. Mali otpor trenja (+)
9. Mala težina (+)
10. Fleksibilni materijal (proširenja zgrada, seizmički efekti) (+)

## Steel pipe systems

1. Korozivno (-)
2. Često održavanje (-)
3. Kraći životni vek (-)
4. Standardni opseg temperature / pritiska
5. Linearno proširenje (+) (0.012 - 0.165 mm/mK)
6. Nepovoljna toplotna provodljivost ( $\lambda = 50 - 385 \text{ W / mK}$ ) (-)
7. Modul elastičnosti 25.00 Newton. Stvaranje visokih desetica.
8. Velika otpornost na trenje (-)
9. Visoka težina (-)
10. Kruti materijal (-)



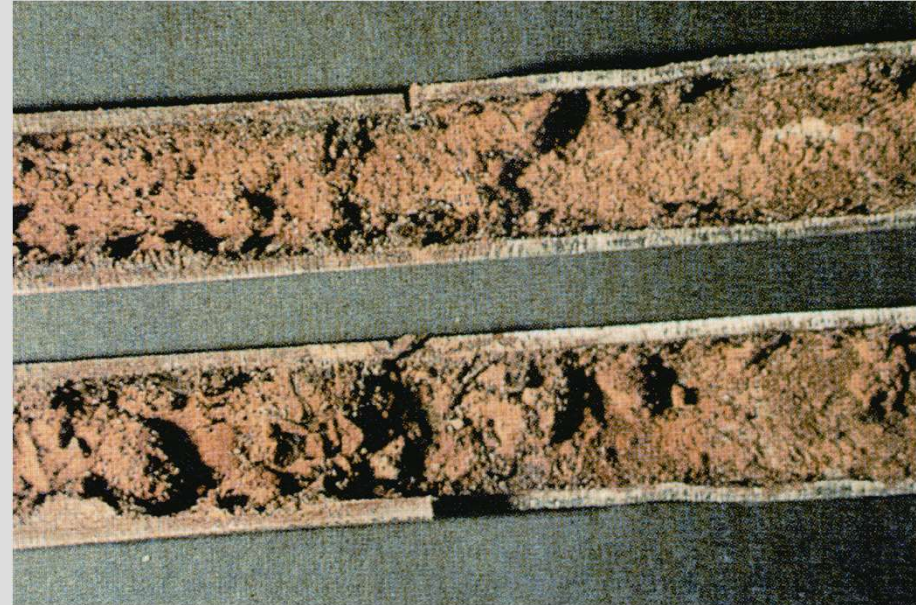
# PPR vs STEEL



- Plastične cijevi imaju izuzetnu otpornost na koroziju i skaliranje. Metalne cevi se ne mogu koristiti u područjima gde voda ima visoku koncentraciju soli.
- Takođe ne predstavljaju nikakvu elektrohemijsku koroziju, osim toga je vidljiva i elektroliza u metalnim cevima.

# PPR vs STEEL

- Nevladine organizacije kao Greenpeace preporučuje PPR cevi, kao odgovarajući materijal za pijaću vodu.
- Upotreba metalnih cevi u sanitarnim uređajima ima preduslove. Neutralan pH i mali utrošak soli vode.



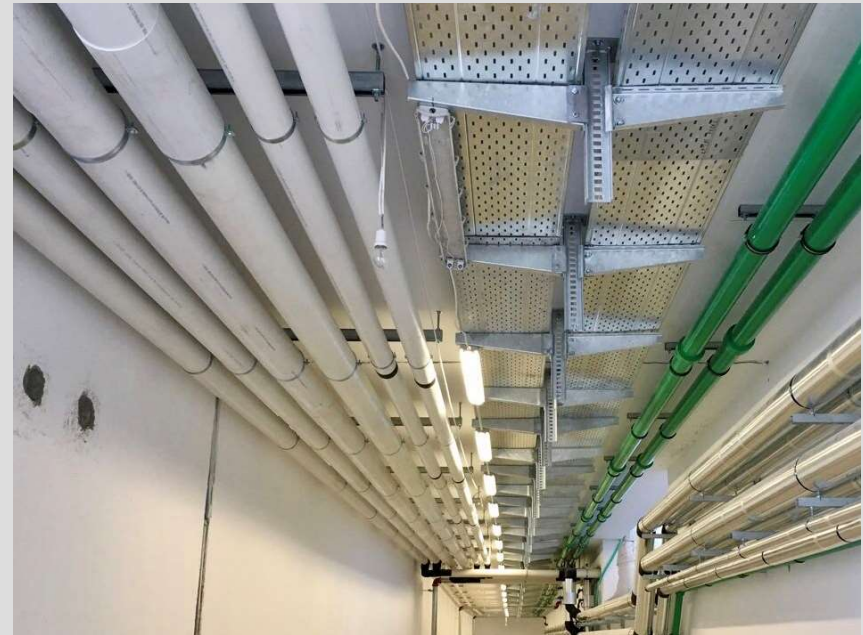


# PRINS vs STEEL





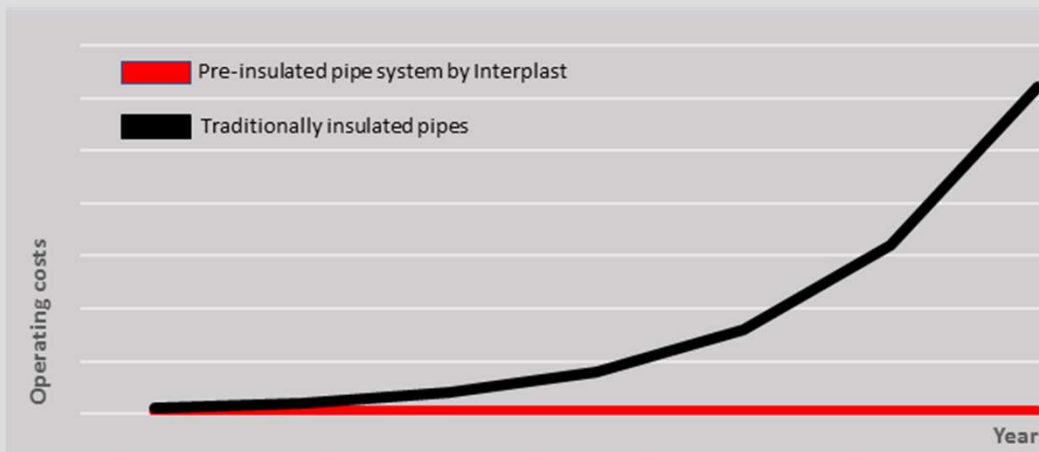
# PRINS vs STEEL



# Rešenje jednog problema : Aqua Plus Prins



- Gusta i jednostavno podršku zbog malih dimenzija (manje od bakra) i mali savijanja od pre izolovane cevi.
- Bez održavanja 50 godina.
- Stabilan  $\lambda$  (lamda) tokom godina.
- Ogromne uštede energije.
- Svake decenije potrošač će uštedeti dvostruku vrednost od održavanja i energije u poređenju sa vrednošću izolovanih cevi !!!!!



Aqua**plus** Prins

**Patented**



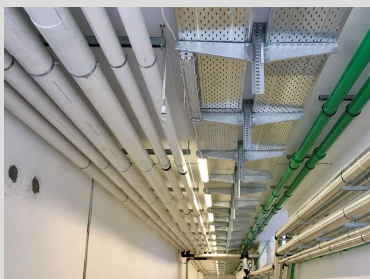


Uporedjenje je napravljeno na svakih 50 cm.

U tabelama ispod , pokazujemo troškove, na jedan metar dužine, za lakše upoređenje. Vrednosti iz tabele su realne cene, takođe u oba sistema kupac ostvaruje pravo na popustu, ali kao što se može videti troškovi su manji kod drugog sistem.

Poštovani,,

Završetkom hotelskog kompleksa u Irskoj predstavljamo dokaze koji dokazuju još jednu uspešnu primjenu u kojoj je sustav Aqua Plus Prins odabran za izgradnju toplotnih mreža, hlađenje i toplu vodu.



Posmatrajući fotografije videćete da:

Nosač je 40% manji, oslonci se postavljaju u osnovi osnovnog kućišta postizanjem termičkog prekida, nema fiksnih tačaka **u ravnim linijama do 100 m (!!!!!)** na temperaturi fluida 50°C. Nosači su jednostavno bez bilateralnih guma, udaljenosti između cevi ili između cevi i strukturnih elemenata su minimalne (min 2 cm); dostupna je snažna mehanička zaštita i zaptivanje izolatora; estetski rezultat je odličan

-Termička linearna ekspanzija je **0.016 mm / m / ° C**, manja od bakra

- Mala konstrukcija s malom strehom za savijanje (izvijanje) od PP-R /PUR / PVC-U.

-PVC-U premaz za jednostavno zaptivanje i zaptivanje naknadnih izolacijskih delova (krivulje, rukavci, t-spoj).

-Upoređivanjem na ekonomičnoj osnovi predizoliranog Aqua Plus Prins sistema sa sistemom koji se sastoji od polipropilenske cijevi i Armaflex izolacije, utvrdili smo da su troškovi gradnje niži ili isti. Ako se izračuna i dodatni trošak aluminijskog prekrivnog sloja, za istu meru uporedjenja, onda je drugi sistem skuplji do 30%.

#### TROŠKOVI ARMAFLEX(klasična crna instalacija)

Dimension	PPR PIPE SDR11	Support	Insulation	Aluminium	Final
110	24,00	19,72	18,00	21,60	<b>83,32</b>
125	31,28	19,60	24,60	24,50	<b>99,98</b>
160	51,04	29,72	31,60	31,40	<b>143,76</b>
200	87,30	38,64	39,40	39,20	<b>204,54</b>
250	135,70	45,52	49,60	49,00	<b>279,82</b>

#### TROŠKOVI PRED IZOLACIONE CEVI

Dimension	Pre-Insulated Pipe PPR SDR11	Support	Final
<b>110</b>	53,84	4,23	<b>58,07</b>
<b>125</b>	71,37	4,46	<b>75,83</b>
<b>160</b>	103,05	4,16	<b>107,21</b>
<b>200</b>	146,93	3,92	<b>150,85</b>
<b>250</b>	221,95	4,28	<b>226,23</b>



## Poređenje energije

Sa izolacijom od ekološki Kompaktne poliuretanske (udarac vodom) za unutrašnju upotrebu, gustina  $60\text{Kg/m}^3$ , sa termalnom provodljivost  $\lambda$ :  $0.021\text{ W/MK}$  u kombinaciji sa bezgranijom PVC sintetičke školjke, nenarezane kategorije B1 standarda DIN 4101-1, radimo u "proizvedeni" proizvod zadržava nepromenljiva svojstva na vreme, imun na vremensku prognozu. Sistem eliminiše bilo kakvo oštećenje, tako da nije potrebno održavanje. Naprotiv, projekat izolacije sa pojačanom termalnom provodljivosti  $\lambda = 0,04\text{ W/mK}$  i faktor kadrovske proizvodnje, posebno uz teške uslove apliciranja kao što je gradilište, prouzrokuje neuspeh na izolacioni efekat. Početna vrednost koeficijenta  $\lambda$  izolatora povećava se geometrično svake godine, što rezultira smanjenim otporom.



Izolaciona svojstva poliuretanske i posebno nizak koeficijenta  $\lambda$  obezbeđuje zaštitu od curenja i štedi ogromne količine energije.

Aqua**plus** Prins

**Patented**

## Primer

Primer se odnosi na zgradu u Atini sa različitom mrežom klimatizacije sa ukupnom dužinom od  $3.021\text{ m}$  i  $21,4\text{ m}^3$  od vodenih sadržaja. Ušteda energije u korišćenju Aqua plus Prins umesto polipropilena sa konvencionalnom izolacijom, biće najmanje €150.000 u poslednjih deset godina.

## Troškovi održavanja konvencionalnih sistema:

**Troškovi održavanja korišćenjem konvencionalne izolacije, za primer projekta, iznose €35.000 za cevi koje su instalirane u zatvorenim prostorima-suspendovane na plafone i €50.000 za cevne mreže na otvorenom (skloništa). Troškovi održavanja su znatno povećani kada su u pitanju podzemne rute.**

**Odatle se zaključuje da će na svakih 10 godina potrošač uštedeti duplo više vrednosti kao što su troškovi energenata i troškovi održavanja u odnosu na troškove nabavke izolovanih cevi!!!!**

## Budžet:

**Da biste izračunali uštedu energije i troškove održavanja vaše mreže, možete da pošaljete tehničkom odeljenju Interplast podatke koji se tiču, dužine cevi po sekciji .**

## Zaključak:

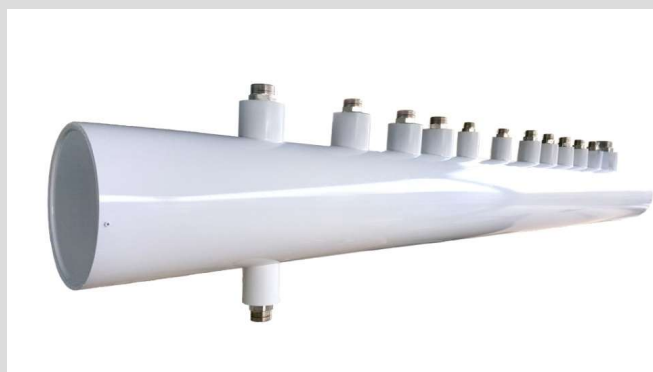
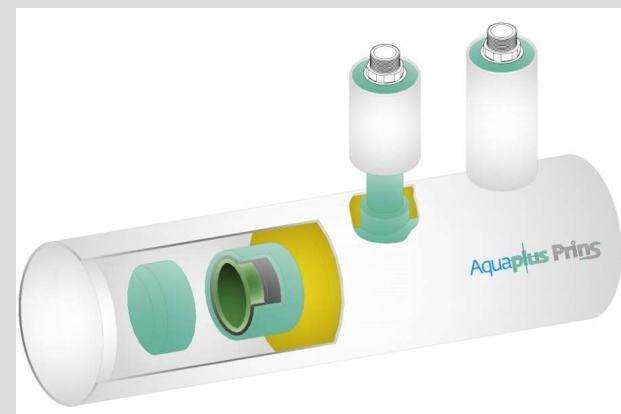
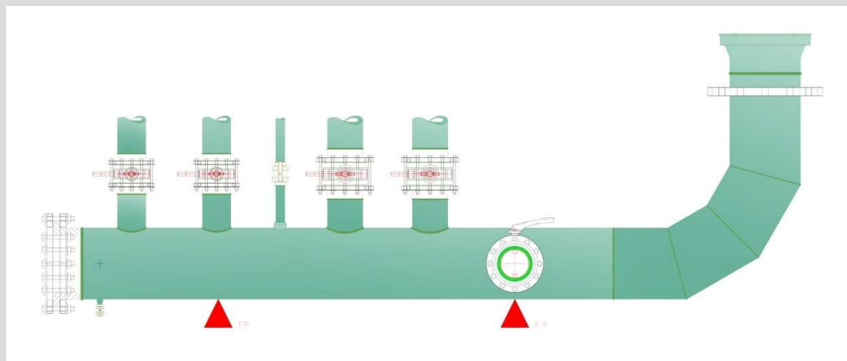
**Aqua plus Prins ima manje ili iste troškove u poređenju sa PPR cevi koje imaju aluminijske folije preko izolacije ili ravnih cevi sekcija veće od 30 metara.**

**To je uglavnom rezultat različite podrške i smanjenih odredbi o proširenju koje zahteva Aqua plus Prins.**

**U isto vreme, zbog manjih koeficijenta provodljivosti  $\lambda$  ostvarite 50% energije u poređenju sa konvencionalnim termosistemima bez održavanja bilo kakvih.**



# Fabrički proizvedeni kolektori



Aqua**plus** Prins

**Patented**



# Laboratorijski Test na-10°C



ΑΝΩΝΥΜΗ ΕΤΑΙΡΕΙΑ ΒΙΟΜΗΧΑΝΙΚΗΣ ΕΡΕΥΝΑΣ, ΤΕΧΝΟΛΟΓΙΚΗΣ ΑΝΑΠΤΥΞΗΣ  
& ΕΡΓΑΣΤΗΡΙΑΚΩΝ ΔΟΚΙΜΩΝ, ΠΙΣΤΟΠΟΙΗΣΗΣ ΚΑΙ ΠΟΙΟΤΗΤΑΣ  
MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

## ΕΚΘΕΣΗ ΕΡΓΑΣΤΗΡΙΑΚΩΝ ΔΟΚΙΜΩΝ LABORATORY TEST REPORT

Σχετικά πρότυπα για σύνταξη Έκθεσης ΕΛΟΤ EN ISO/ IEC 17025  
Standard relevant for drafting of the report: ΕΛΟΤ EN ISO/ IEC 17025

01. ΕΡΓΑΣΤΗΡΙΟ : ΕΡΓΑΣΤΗΡΙΟ ΠΟΛΥΜΕΡΩΝ ΚΑΙ ΕΛΑΣΤΙΚΩΝ  
TESTING LABORATORY : POLYMER & RUBBER TESTING LABORATORY
02. ΔΙΕΥΘΥΝΣΗ ΕΡΓΑΣΤΗΡΙΟΥ : ΒΙ.ΠΕ. ΣΙΝΔΟΣ 570 22  
LABORATORY ADDRESS : INDUSTRIAL AREA SINDOS 57 022
03. ΗΜΕΡΟΜΗΝΙΑ ΠΑΡΑΛΑΒΗΣ ΔΕΙΓΜΑΤΟΣ : 7/12/2018  
TEST ITEM DELIVERY DATE
04. ΟΝΟΜΑ ΠΕΛΑΤΗ : INTERPLAST S.A  
CLIENT NAME
05. ΔΙΕΥΘΥΝΣΗ ΠΕΛΑΤΗ : ΒΙ.ΠΕ. ΚΟΜΟΤΗΝΗΣ ΤΚ 69104  
CLIENT ADDRESS
06. ΚΩΔΙΚΟΣ ΕΡΓΟΥ : 013847/19  
PROJECT CODE No
07. ΚΩΔΙΚΟΣ ΕΙΣΕΡΧΟΜΕΝΟΥ ΑΝΤΙΚΕΙΜΕΝΟΥ : 1328/18 - 1329/18  
ITEM IDENTIFICATION No

### ΔΗΛΩΣΗ ΕΓΚΥΡΟΤΗΤΑΣ ΑΠΟΤΕΛΕΣΜΑΤΩΝ ΔΟΚΙΜΗΣ

Τα αποτελέσματα της παρούσας δοκιμής αφορούν αποκλειστικά και ΜΟΝΟΝ τα δείγματα που υποβλήθηκαν σε αυτήν την δοκιμή.

#### STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

### ΔΗΛΩΣΗ ΕΓΚΥΡΟΤΗΤΑΣ ΑΝΑΠΑΡΑΓΩΓΗΣ ΠΑΡΟΥΣΑΣ ΕΚΘΕΣΗΣ

Η παρούσα έκθεση επιτρέπεται να αναπαράγεται ΜΟΝΟΝ στο σύνολο των σελίδων της, χωρίς την έγκριση του εργαστηρίου. Επιμέρους αναπαραγωγή του παρόντος ενιαίου εγγράφου δεν έχει την ισχύ έγκυρης έκθεσης.

#### STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

This report shall not be reproduced, except in full, without the written approval of the testing laboratory. Any partial reproduction is NOT considered a valid document.

08. ΑΡΙΘΜΟΣ ΕΚΘΕΣΗΣ : PL/LT/TH/04 - 19/690  
TEST REPORT No
09. ΗΜΕΡΟΜΗΝΙΑ ΕΚΔΟΣΗΣ : 9/4/2019  
DATE OF ISSUE
10. ΗΜΕΡΟΜΗΝΙΑ ΕΚΤΕΛΕΣΗΣ : 26/2/2019 - 9/4/2019  
DATE OF TEST RUN
11. ΤΑΥΤΟΤΗΤΑ ΑΝΑΓΝΩΡΙΣΗΣ ΔΟΚΙΜΙΟΥ : ΩΣ ΣΥΝΗΜΜΕΝΟ ΠΙΝΑΚΑ ΤΑΥΤΟΤΗΤΩΝ  
SPECIMEN IDENTIFICATION CODE : ΑΝΑΓΝΩΡΙΣΙΣ  
SEE ATTACHED IDENTIFICATION CHART
12. ΥΠΕΥΘΥΝΟΣ ΔΕΙΓΜΑΤΟΛΗΨΙΑΣ : INTERPLAST S.A  
SAMPLING PERFORMED BY
13. ΜΕΘΟΔΟΣ ΔΕΙΓΜΑΤΟΛΗΨΙΑΣ : -  
SAMPLING ACCORDING TO
14. ΠΕΡΙΓΡΑΦΗ ΕΡΓΟΥ : ΥΔΡΑΥΛΙΚΗ ΔΟΚΙΜΗ ΚΑΤΑ ΑΠΑΙΤΗΣΗ ΠΕΛΑΤΗ  
PROJECT DESCRIPTION : RESISTANCE TO INTERNAL PRESSURE  
ACCORDING TO CUSTOMER DEMAND
15. ΣΤΟΙΧΕΙΑ ΕΡΓΟΥ ΠΕΛΑΤΗ :  
PROJECT DATA:
16. ΥΔΡΑΥΛΙΚΗ ΔΟΚΙΜΗ/INTERNAL PRESSURE TEST

Σελίδα 1 από 4

GP - LAB / EN01 (4.1.2/04.08)

PL/LT/TH/04-19/690

www.ebetam.gr

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Γραφείο Αθηνών: Πέλοπος/Χαλκίδα 76, ΓΡ 173 42 Αγρός Διεύθυνσης Αθηνών - Athens Office: Melinas Markouri 76, GR 173 42 Agros Directorate Athens, Tel.: +30 210 9964008, Fax: +30 210 9969850, E-mail: athens.office@ebetam.gr  
Γραφείο Θεσσαλονίκης: Βιομηχανική Περιοχή, 570 22 Θεσσαλονίκη - Thessaloniki Office: Industrial Area, GR 570 22 Thessaloniki, Tel.: +30 210 707887, Fax: +30 210 73307, E-mail: thess.office@ebetam.gr  
Παράρτημα Αθηνών: Ελ. Βενιζέλου 4, ΓΡ 76 Καλλιθέα - Athens Branch: El. Venizelou 4, GR 176 76 Kallithia, Tel.: +30 210 9234932, Fax: +30 210 9235603, E-mail: athens.branch@ebetam.gr  
Παράρτημα Θessaloniki: 770 χλμ. ΕΟ Αθηνών - Λαμίας, Τ.Θ. 18648, 341 00 Χαλκίδα - Thiva Branch: 77 km of Athens - Lamia N.R., P.O. Box 18648 GR 341 00 Chalkida, Tel.: +30 22620 7881-5, Fax: +30 22620 77446, E-mail: thiva.office@ebetam.gr  
Εργαστήριο Αθηνών: Λαμίας - Κηφισού 50, ΓΡ 33 Παρίστη - Athens Laboratories: Kifissou 50, GR 33 Paristhi, Tel.: +30 210 7283757, Fax: +30 210 5770556, E-mail: athens.lab@ebetam.gr



### 19. ΔΟΚΙΜΕΣ / TESTING

#### ΠΡΟΣΔΙΟΡΙΣΜΟΣ ΤΗΣ ΑΝΤΟΧΗΣ ΣΕ ΕΣΩΤΕΡΙΚΗ ΠΙΕΣΗ 1000h/95C RESISTANCE TO INTERNAL PRESSURE 1000h/95C

Κωδ. εισ./ Code	Πρότυπο/ Μέθοδος Standard/ Method	Θερμ./ Temp. (°C)	Περιφερ. τάση/ Stress Hoop (σ) (MPa)	Πίεση δοκιμής/ Test pressure (bar)	Χρόνος αντοχής υπό πίεση/ Test duration		
					Πρέπει/ Must (h)	Είναι/ Actual (h)	Περιγραφή/ Description
1328/18	-	-10	-	26,50	≥1000	1000	OK
Πάχος/ Thickness e:		-	mm	Χρόνος εγκλιματισμού/ Conditioning period h:		16	
OD:		-	mm	Τύπος κλείστρου/ End cap type:		A	
Μέσο/ Test type:		Προπυλενογλυκόλη- Προπυλενογλυκόλη / Propylene glycol/ Propylene glycol		Αριθμός δοκιμών/ Number of samples:		1	

#### ΠΡΟΣΔΙΟΡΙΣΜΟΣ ΤΗΣ ΑΝΤΟΧΗΣ ΣΕ ΕΣΩΤΕΡΙΚΗ ΠΙΕΣΗ 1000h/95C RESISTANCE TO INTERNAL PRESSURE 1000h/95C

Κωδ. εισ./ Code	Πρότυπο/ Μέθοδος Standard/ Method	Θερμ./ Temp. (°C)	Περιφερ. τάση/ Stress Hoop (σ) (MPa)	Πίεση δοκιμής/ Test pressure (bar)	Χρόνος αντοχής υπό πίεση/ Test duration		
					Πρέπει/ Must (h)	Είναι/ Actual (h)	Περιγραφή/ Description
1329/18	-	-10	-	26,50	≥1000	1000	OK
Πάχος/ Thickness e:		-	mm	Χρόνος εγκλιματισμού/ Conditioning period h:		16	
OD:		-	mm	Τύπος κλείστρου/ End cap type:		A	
Μέσο/ Test type:		Προπυλενογλυκόλη- Προπυλενογλυκόλη / Propylene glycol/ Propylene glycol		Αριθμός δοκιμών/ Number of samples:		1	

Τα αποτελέσματα των δοκιμών αφορούν στα δείγματα όπως αυτά περιγράφονται και προσδιορίζονται ακριβώς στον Πίνακα Κωδικών Εισερχομένων Αντικειμένων & Πίνακα Ταυτοτήτων Αναγνώρισης που προσκομίστηκαν στο Εργαστήριο Πολυμερών και Ελαστικών από την INTERPLAST S.A

The test results relate to the samples as described and defined exactly in Incoming Specimen Code Chart & Specimen Identification Chart, which were brought to the Polymer & Elastomer Testing Laboratory, by INTERPLAST S.A

Για το εργαστήριο / For the Laboratory

Ελέγχθηκε / Checked by

Μιχάλης Χασάπης / Michalis Chasapis  
Φυσικός MSc / Physicist MSc

Αθανάσιος Κουρτέσης / Athanasios Kourtesis  
Δ/ντης Β.Ελλάδας / Northern Greece Director

Θεσσαλονίκη / Thessaloniki 9/4/2019

Σελίδα 4 από 4

LABPOLYMERS-01/EN05(5.2-26.3.2019)

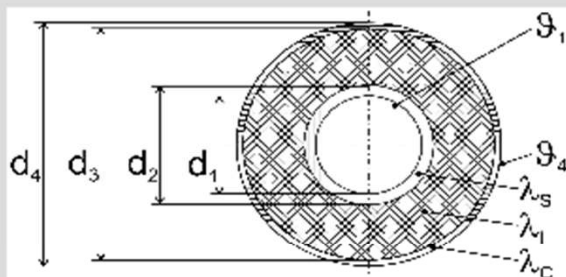
PL/LT/TH/04-19/690



# GUBITAK ENERGIJE



Thermal conductivity of pre-insulated pipe systems  
according to EN ISO 8497:1996



specimen № – order №	4831 – 5340				
orderer	Interplast S.A.				
label (imprint on casing)	Aqua Plus Prins Ø125 PPR/PUR/ECO U -PVC Free PB- UV Protection DIN 4102 B1- PATENTED 0407181414 -3-				
pipe assembly diameter nominal	[mm]×[mm]/[mm]		75×10,3/125		
test section length	L	[m]	2,000		
inner diameter of service pipe	d <sub>1</sub>	[mm]	53,0		
outer diameter of service pipe	d <sub>2</sub>	[mm]	75,5		
thermal conductivity of service pipe	λ <sub>s</sub>	[W·m <sup>-1</sup> ·K <sup>-1</sup> ]	0,24		
thermal conductivity of casing	λ <sub>c</sub>	[W·m <sup>-1</sup> ·K <sup>-1</sup> ]	0,23		
inner diameter of casing	d <sub>3</sub>	[mm]	120,0		
outer diameter of casing	d <sub>4</sub>	[mm]	125,1		
test temperature level	Θ <sub>1,set</sub>	[°C]	60	70	80
heat flow rate	Φ	[W]	19,8	26,17	32,54
ambient temperature	Θ <sub>amb</sub>	[°C]	23,3	23,2	23,2
temperature of service pipe inner surface	Θ <sub>1</sub>	[°C]	60,0	70,0	79,9
temperature of casing outer surface	Θ <sub>4</sub>	[°C]	30,3	31,9	33,8
mean temperature of the insulation	Θ <sub>av</sub>	[°C]	44,1	50,9	56,8
thermal conductivity of pipe system	λ <sub>sys</sub>	[W·m <sup>-1</sup> ·K <sup>-1</sup> ]	0,0455	0,0469	0,0482
thermal resistance of pipe system	R <sub>sys</sub>	[m·K·W <sup>-1</sup> ]	3,0014	2,9115	2,8333
thermal conductivity of thermal insulation	λ <sub>i</sub>	[W·m <sup>-1</sup> ·K <sup>-1</sup> ]	0,0269	0,0278	0,0287
thermal conductivity of pipe system at Θ <sub>av</sub> = 50 °C	λ <sub>sys</sub>	[W·m <sup>-1</sup> ·K <sup>-1</sup> ]	0,047		
thermal resistance of pipe system at Θ <sub>av</sub> = 50 °C	R <sub>sys</sub>	[m·K·W <sup>-1</sup> ]	2,924		
thermal conductivity of thermal insulation at Θ <sub>av</sub> = 50 °C	λ <sub>si</sub>	[W·m <sup>-1</sup> ·K <sup>-1</sup> ]	0,028		
test period:	13.08.2018-16.08.2018				
testing engineer:	Kraft				

PPR cev 75 mm sa spoljnim PVC slojem 125 mm, uspevamo da izgubimo manje energije od PPR cevi 75 mm sa spoljnim HDPE slojem 140 mm (brzina protoka toplote / 2 metra uzorka). Ovo se događa zbog visokog kvaliteta poliuretana i spoljnog PVC sloja.

# SERTIFIKAT PRINS – KVALITET POLIURETANA

## LABORATORY TEST REPORT

Standard relevant for drafting of the report: EAOT EN ISO/IEC 17025

01. TESTING LABORATORY : POLYMER & RUBBER TESTING LABORATORY  
02. LABORATORY ADDRESS : INDUSTRIAL AREA SINDOS 57 022  
03. TEST ITEM DELIVERY DATE : 14/10/2016  
04. CLIENT NAME : INTERPLAST S.A.  
05. CLIENT ADDRESS : INDUSTRIAL AREA OF KOMOTINI, 69100  
06. PROJECT CODE No : 5987  
07. ITEM IDENTIFICATION No : 824-825/16

### STATEMENT OF VALIDITY OF TEST RESULTS

The results of this test relate ONLY to the items that have been subjected to this test.

### STATEMENT OF VALIDITY FOR THE REPRODUCTION OF THIS REPORT

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08. TEST REPORT No : PL/LT/TH/10-16/333  
DATE OF ISSUE : 18/10/2016  
09. DATE OF PERFORMANCE OF TEST : 14/10/2016  
10. SPECIMEN IDENTIFICATION CODE : SEE ATTACHED IDENTIFICATION CHART  
11. SAMPLING PERFORMED BY : -  
SAMPLING ACCORDING TO : -  
12. PROJECT DESCRIPTION : MECHANICAL PROPERTIES TESTING OF INSULATION  
**PROJECT DATA:** COMPRESSION TEST OF PUR INSULATION ACCORDING TO EN 253  
13. ITEM DESCRIPTION : PLASTIC INSULATION  
ITEM MATERIAL : PUR  
14. PERSON ACCEPTING TECHNICAL RESPONSIBILITY : MICHALIS CHASAPIS  
15. TEST DESCRIPTION/SPECIMENT DESCRIPTION : VISUAL INSPECTION  
COMPRESSION TEST  
16. EQUIPMENT USED : MICROMETER  
HOUNSFIELD UNIVERSAL TESTING MACHINE  
17. STANDARDS/SPECIFICATIONS : EN 253, ISO 844  
18. NON-STANDARDIZED PROCEDURE : -

### Incoming Specimen Code Chart

Code	Description	Manufacturer	DN1	DN2
824/16	PLASTIC INSULATED PIPE	INTERPLAST	140	
825/16	PLASTIC INSULATED PIPE	INTERPLAST	140	

### Specimen Identification Chart

Code	Marking
824/16	Aqua Plus PRINS Φ140-
825/16	-free PB-UV protected-PATENTED-

### 19. Testing

#### Visual inspection

Code	Standard/Method	Number of samples/total mm	Surface condition	CONFORMS	
				YES	NO
824/16	EN 253	5/400mm			
		Results			
		Voids<6mm		X	

#### Compression test PUR

Code	Standard/Method	Test Conditions		ΣΥΜΠΕΡΙΦΟΡΑ		CONFORMS	
		Samples	Speed (mm/min)	Required compressive stress at 10%	Result (mean)	YES	NO
825/16	ISO 844	3	2	>0,3MPa	4,6	X	-

# SERTIFIKAT ZA NEPROPUSTLJIVOST VLAŽE



ΑΝΩΝΥΜΗ ΕΤΑΙΡΕΙΑ ΒΙΟΜΗΧΑΝΙΚΗΣ ΕΡΕΥΝΑΣ, ΤΕΧΝΟΛΟΓΙΚΗΣ ΑΝΑΠΤΥΞΗΣ  
& ΕΡΓΑΣΤΗΡΙΑΚΩΝ ΔΟΚΙΜΩΝ, ΠΙΣΤΟΠΟΙΗΣΗΣ ΚΑΙ ΠΟΙΟΤΗΤΑΣ  
MATERIALS INDUSTRIAL RESEARCH & TECHNOLOGY CENTER S.A.

## ΕΚΘΕΣΗ ΕΡΓΑΣΤΗΡΙΑΚΩΝ ΔΟΚΙΜΩΝ

Σχετικά πρότυπα για σύνταξη Έκθεσης ΕΛΟΤ EN ISO/ IEC 17025



01. ΕΡΓΑΣΤΗΡΙΟ : ΕΡΓΑΣΤΗΡΙΟ ΠΟΛΥΜΕΡΩΝ ΚΑΙ ΕΛΑΣΤΙΚΩΝ  
02. ΔΙΕΥΘΥΝΣΗ ΕΡΓΑΣΤΗΡΙΟΥ : ΒΙ.ΠΕ. ΣΙΝΔΟΣ 570 22  
03. ΗΜΕΡΟΜΗΝΙΑ ΠΑΡΑΛΑΒΗΣ ΔΕΙΓΜΑΤΟΣ : 19/1/2018  
04. ΟΝΟΜΑ ΠΕΛΑΤΗ : INTERPLAST S.A  
05. ΔΙΕΥΘΥΝΣΗ ΠΕΛΑΤΗ : ΒΙ.ΠΕ. ΚΟΜΟΤΗΝΗΣ ΤΚ 69100  
06. ΚΩΔΙΚΟΣ ΕΡΓΟΥ : Θ8707/18  
07. ΚΩΔΙΚΟΣ ΕΙΣΕΡΧΟΜΕΝΟΥ ΑΝΤΙΚΕΙΜΕΝΟΥ : 85/18

### ΔΗΛΩΣΗ ΕΓΚΥΡΟΤΗΤΑΣ ΑΠΟΤΕΛΕΣΜΑΤΩΝ ΔΟΚΙΜΗΣ

Τα αποτελέσματα της παρούσας δοκιμής αφορούν αποκλειστικά και ΜΟΝΟΝ τα δείγματα που υποβλήθηκαν σε αυτήν την δοκιμή.

### ΔΗΛΩΣΗ ΕΓΚΥΡΟΤΗΤΑΣ ΑΝΑΠΑΡΑΓΩΓΗΣ ΠΑΡΟΥΣΑΣ ΕΚΘΕΣΗΣ

Η παρούσα έκθεση επιτρέπεται να αναπαράγεται ΜΟΝΟΝ στο σύνολο των σελίδων της, χωρίς την έγκριση του εργαστηρίου. Επιμέρους αναπαραγωγή του παρόντος ενιαίου εγγράφου δεν έχει την ισχύ έγκυρης έκθεσης.

08. ΑΡΙΘΜΟΣ ΕΚΘΕΣΗΣ : PL/LT/TH/02 - 18/496.1  
09. ΗΜΕΡΟΜΗΝΙΑ ΕΚΔΟΣΗΣ : 9/2/2018  
10. ΤΑΥΤΟΤΗΤΑ ΑΝΑΓΝΩΡΙΣΗΣ : ΩΣ ΣΥΝΗΜΜΕΝΟ ΠΙΝΑΚΑ ΤΑΥΤΟΤΗΤΩΝ ΑΝΑΓΝΩΡΙΣΗΣ  
11. ΥΠΕΥΘΥΝΟΣ ΔΕΙΓΜΑΤΟΛΗΨΙΑΣ : -  
12. ΠΕΡΙΓΡΑΦΗ ΕΡΓΟΥ : ΔΟΚΙΜΗ ΑΝΤΟΧΗΣ ΣΤΗΝ ΕΙΣΡΟΗ ΥΔΑΤΟΣ EN 489 §5.2  
ΣΤΟΙΧΕΙΑ ΕΡΓΟΥ ΠΕΛΑΤΗ: ΔΟΚΙΜΗ ΑΝΤΟΧΗΣ ΣΤΗΝ ΕΙΣΡΟΗ ΥΔΑΤΟΣ ΠΡΟΜΟΝΩΜΕΝΟΥ ΣΩΛΗΝΑ ΚΑΤΑ EN 489 §5.2  
13. ΠΕΡΙΓΡΑΦΗ ΑΝΤΙΚΕΙΜΕΝΟΥ : ΠΛΑΣΤΙΚΟΙ ΠΡΟΜΟΝΩΜΕΝΟΙ ΣΩΛΗΝΕΣ  
ΥΛΙΚΟ : PVC ΜΑΝΔΥΑΣ  
14. ΥΠΕΥΘΥΝΟΣ ΔΟΚΙΜΗΣ : ΜΙΧΑΛΗΣ ΧΑΣΑΠΗΣ  
15. ΕΙΔΟΣ ΕΛΕΓΧΟΥ / ΔΟΚΙΜΗΣ ΣΤΟΙΧΕΙΑ ΔΟΚΙΜΙΟΥ : ΔΟΚΙΜΗ ΣΤΕΓΑΝΟΤΗΤΑΣ EN 489 §5.2  
16. ΣΥΣΚΕΥΕΣ ΠΟΥ ΧΡΗΣΙΜΟΠΟΙΗΘΗΚΑΝ : ΗΛΕΚΤΡΟΝΙΚΟΣ ΣΤΑΘΜΟΣ ΔΟΚΙΜΗΣ IPT  
17. ΠΡΟΤΥΠΑ / ΠΡΟΔΙΑΓΡΑΦΕΣ : EN 489 §5.2  
18. ΤΑΥΤΟΤΗΤΑ ΜΗ ΤΥΠΟΠΟΙΗΜΕΝΩΝ ΔΙΑΔΙΚΑΣΙΩΝ : -

Σελίδα 1 από 3

www.ebetam.gr GP - LAB / EN01 (4.1 / 2.04.08)

PL/LT/TH/02-18/496.1

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Παράρτημα Αθηνών: Ελ. Βενιζέλου 4, 176 76 Καλλιθέα - Athens Branch: El. Venizelou 4, GR 176 76 Kallithea, Tel.: +30 210 9234932, Fax: +30 210 9235603, E-mail: athens.branch@ebetam.gr  
Παράρτημα Θηβών: 72ο χλμ. ΕΟ Αθηνών - Λαμίας, Τ.Θ. 18646, 341 00 Χαλκίδα - Thiva Branch: 72 km of Athens - Lamia N.R., P.O. Box 18646 GR 341 00 Chalkida, Tel.: +30 22620 7181-5, Fax: +30 22620 71461, E-mail: thiva.office@ebetam.gr  
Εργαστήριο Αθηνών: Λεωφ. Κηφισού 50, 121 33 Περιστέρι - Athens Laboratories: Kifissou 50, 121 33 Peristeri, Tel.: +30 210 2283757, Fax: +30 210 5770556, E-mail: athens.lab@ebetam.gr



### Πίνακας Κωδικών Εισερχομένων Αντικειμένων

Κωδ. εις.	Περιγραφή	Κατασκευαστής	DN1	DN2
85 /18	Πλαστικός μανδύας PVC-U με συγκόλληση με γκρι κόλλα PVC & και εξωτερική επικάλυψη της ένωσης με λευκή ταινία	INTERPLAST Α.Ε.	63	

### Πίνακας Ταυτοτήτων Αναγνώρισης

Κωδ. εις.	Επισήμανση
85/18	No1

Σελίδα 2 από 3

LABPOLYMERS-01/EN05(5.1-11.5.2017)

PL/LT/TH/02-18/496.1



# ATESTI LINEARNE EKSPANZIJE



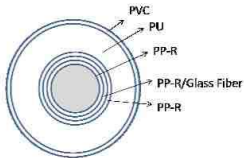
**Dimitrios Bikiaris**  
Professor  
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Chemistry Department  
Laboratory of Organic Chemistry and Technology  
541 24 Thessaloniki  
TEL.: +302310-997812, FAX: +302310-997769  
e-mail: [dbic@chem.auth.gr](mailto:dbic@chem.auth.gr)

Thessaloniki 07/10/2016

## Certificate of liner thermal expansion coefficient

Liner thermal expansion coefficient measurements of pipes under the brand name Aqua plus – PRINS by Interplast S.A., have been done in our Laboratory with Thermomechanical Analyzer (TMA).

The pipes is consisted from 5 different layers, as appear in the following figure. The inner pipe is consisted by 3 different PP-R layers, with glass fiber being added in the intermediate layer. These 3 different layers PP-R pipe was covered by Polyurethane as insulating layer and the outer layer is consisted from PVC.



From TMA measurements it was found that the linear thermal expansion coefficient of this 5 different layers pipe is 0.016 mm/m/°C.

Sincerely yours,

Dimitrios Bikiaris

Professor

- Predizolaciona cev zbog manje prezentuje male linearne ekspanzije , manje od bakra. Time su rešeni tehnički i estetski zahtevi.

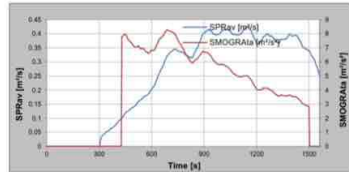
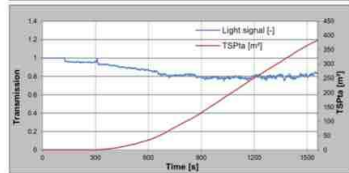
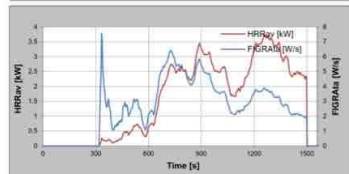
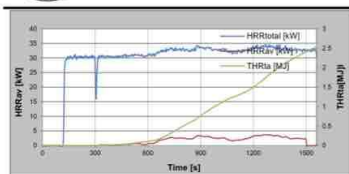
# SERTIFIKAT REAKCIJE NA POŽAR

## Appendix A: Test Report Sheet



National Technical University of Athens  
School of Mechanical Engineering  
Heterogeneous Mixtures & Combustion Systems

### SBI Test Report - EN 13823



FIGRA 0.2 [W/s]	5.85
FIGRA 0.4 [W/s]	5.85
FIGRA [W/s]	5.85
THR600s [MJ]	0.77

#### Heat Release

SMOGRA [m <sup>2</sup> /s <sup>2</sup> ]	8.29
TSP600s [m <sup>2</sup> ]	129.52

#### Smoke Production

Classification based on:  
Classic Construction Product

Standard used: EN 13823:2010 + A1:2014  
Date of test: 22/04/2019  
Full test duration/performed: No  
Smoke correction performed: No  
Report identification: 20190419-INT-02  
**Product**  
Product identification: Aquaplus Prins/S  
Sample number: 2  
Thickness [mm]: 0  
Mass per Area [kg/m<sup>2</sup>]: 0

#### Test Conditions

Conditioning respected: No  
Mounting by: 0  
Substrate: Standard GP A2  
Fixing: En 16000  
Orientation: 0

#### Laboratory

Laboratory identification: 0  
Operator: Kolaitis  
Filename: 20190419-INT-02\_2.xls

#### Specifications apparatus

Flow profile kt: 0.925333333  
Probe constant ktho: 1.08  
Duct diameter [m]: 0.315  
O<sub>2</sub> calibration delay time [s]: 24  
CO<sub>2</sub> calibration delay time [s]: 18

#### Pre-test conditions

Barometric pressure (Pa): 99800  
Relative humidity (%): 32  
Ambient temperature (°C): 18

#### Visual observations

LFSedge: No  
FDP (t ≤ 10s): No  
FDP (t > 10s): No

#### End of test conditions

Light transmission (%): 93.7  
X O<sub>2</sub> (%): 20.94  
X CO<sub>2</sub> (%): 0.055

#### Recorded events

Surface flash: No  
Falling of specimen parts: No  
Droplets <10s: No  
Droplets >10s: No  
Smokes not entering hood: No  
Mutual fixing of backing board fails: No  
Conditions justify early stop of test: No  
Tendency distortion/collapse: Yes  
Excessive RHR: No  
Excessive temperature: No

Estimated Class:

**B-S2,d0**

Heterogeneous Mixtures & Combustion Systems (<http://hmcs.mech.ntua.gr>)

Figure A.1: Test report sheet for specimen 1 (20190419-INT-02).



- Aqua Plus Prins je proizveden u skladu sa pravima koja su pomenuta u deklaraciji člana 41/2018. Izuzev ove tačke je svrstana u kategoriju B-s2,d0 što znači da je finalni proizvod bez halogena, što je veoma visok standard za polimer.

# SERTIFIKAT ZA NEPROPUSTLJIVOST KISEONIKA

Kiwa report LC 18081-1

## Determination the oxygen permeability

Plastics piping systems with an oxygen barrier layer



### Sample description

#### Pipe(s) :

Manufacturer : Interplast A.E.  
Production location : Komotini (GR)  
Type of material/construction : Aqua plus PPR/PPR GF/PPR 32x4.4mm sdr 7,4 pipe with insulation and U-PVC casing pipe.  
Nominal dimensions : 32 x 4,4 mm  
Marking : INTERPLAST S.A. GREEN LINE Aqua Plus Prins Ø63 PPR/PUR/ECO U-PVC – free PB-UV Protection -DIN 4102 B1 – PATENTED – 0312190708 -2- \*  
Date of production : Not specified  
Other aspects : -

#### Appearance

Colour inside/outside : Green/White  
Surface : Smooth  
Defects/damage : None  
Discolorations : None  
Remarks : None

#### Sampling information

Sampled by : Sent by Manufacturer  
Date of sampling : Not specified  
Received at Kiwa lab : 10-02-2020  
Registered by : Mr R. Boonstoppel

#### Assembly

Length of pipe (assembly) : (20 ± 0,5) m  
Number of fittings in assembly : 21



Kiwa report LC 18081-1

## Determination the oxygen permeability

Plastics piping systems with an oxygen barrier layer



### Overview test results

Characteristic	Test method	Requirement	Measured	Passed*
<b>Pipe or piping system</b>				
Oxygen permeability	ISO 17455	@80°C: $F_{O_2, day} \leq 3,6$ mg O <sub>2</sub> /m <sup>2</sup> ·day (ISO 21003-2)	@80°C: $F_{O_2, day} = 1,34$ mg O <sub>2</sub> /m <sup>2</sup> ·day	Yes

\* The conclusions are not part of the accreditation scope

Predizolacioni sistem je u skladu sa standardom EN 17455, EN 21003 za kiseoničku propustljivost. To je obeleženo i na cev takodje "Oxygen Tight" .



# ASHRAE STANDARDI

## ANSI/ASHRAE/IES Πρότυπο 90.1 - 2010 & 2012 IECC

Απαιτήσεις μόνωσης σωλήνων σε κτίρια



Πίνακας 6.8.3Α Ελάχιστο πάχος μόνωσης  
Συστήματα θέρμανσης και ζεστού νερού

Εύρος θερμ. λειτουργίας υγρού (C°) και χρήσης	Αγωγιμότητα μανωτικού		Ονομαστικό μέγεθος σωλήνα ή αγωγού (mm)				
	Συντελεστής αγωγιμότητας W/(m°C)	Μέση θερμοκρασία (°C)	<25	25 έως <40	40 έως <100	100 έως <200	≥ 200
Πάχος μόνωσης (mm)							
41 - 60 °C	0.032 - 0.040	38	25	25	40	40	40

Πίνακας 6.8.3Β Ελάχιστο πάχος μόνωσης  
Συστήματα ψύξης

Εύρος θερμ. λειτουργίας υγρού (C°) και χρήσης	Αγωγιμότητα μανωτικού		Ονομαστικό μέγεθος σωλήνα ή αγωγού (mm)				
	Συντελεστής αγωγιμότητας W/(m°C)	Μέση θερμοκρασία (°C)	<25	25 έως <40	40 έως <100	100 έως <200	≥ 200
Πάχος μόνωσης (mm)							
4 - 16°C	0.030 - 0.039	24	15	15	25	25	25

- a Για την μόνωση εκτός της αναφερόμενης περιοχής αγωγιμότητας, το ελάχιστο πάχος (T) θα καθορίζεται από τον ακόλουθο τύπο :  $T = r \{ (1 + t/r)^{K/k} - 1 \}$  όπου : T = ελάχιστο πάχος μόνωσης (mm), r = εξωτερική ακτίνα σωλήνα (mm), t = πάχος μόνωσης που παρατίθεται στον παρόντα πίνακα για την εφαρμοζόμενη θερμοκρασία του ρευστού και το μέγεθος του σωλήνα, K = αγωγιμότητα εναλλακτικού υλικού στη μέση τιμή της θερμοκρασίας που υποδεικνύεται για την εφαρμοζόμενη θερμοκρασία υγρού (W / m ° C), και k = η ανώτερη τιμή της περιοχής αγωγιμότητας που αναφέρεται στον πίνακα για την ισχύουσα θερμοκρασία του ρευστού.
- b Αυτά τα πάχη βασίζονται μόνο στις εκτιμήσεις της ενεργειακής απόδοσης. Ζητήματα όπως η διαπερατότητα των υδρατμών ή η συμπύκνωση επιφανείας απαιτούν ορισμένες φορές επιβραδυντές ατμών ή πρόσθετη μόνωση.

§ a Ειδικός υπολογισμός πάχους

$$T = r \{ (1 + t/r)^{K/k} - 1 \}$$

Όπου :

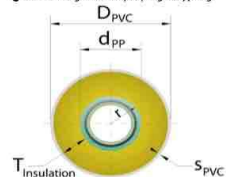
T = υπολογιζόμενο ελάχιστο πάχος μόνωσης σε mm

r = εξωτερική ακτίνα σωλήνα d<sub>pp</sub>/2 σε mm

t = προτεινόμενο πάχος μόνωσης βάσει Πιν.6.8.3Α & Πιν. 6.8.3Β σε mm

k = ανώτερη τιμή της περιοχής αγωγιμότητας βάσει Πιν.6.8.3Α & Πιν. 6.8.3Β σε W/m°C

λ ή K<sub>PMR</sub> = συντελεστής αγωγιμότητας πολυουρεθάνης σε W/m°C κατά EN ISO 8497: 1996



Πιν.1 Κατασκευαστικά στοιχεία προμονωμένου συστήματος Aqua Plus Prins

Πιν.2 Ισοδύναμο επιτρεπτό πάχος μόνωσης για λ=0,021 W/m°C Βάσει Πιν.6.8.3.Α&Β § a



Κατασκευαστικά στοιχεία

K.E.V.A.K Prins®

Size	d <sub>PP</sub>	D <sub>PVC</sub>	S <sub>PVC</sub>	T <sub>Insulation</sub>
mm				
20/63	20	63	2,2	19,3
25/63	25	63	2,2	16,8
32/63	32	63	2,2	13,3
40/75	40	75	2,2	15,3
50/90	50	90	2,2	17,8
63/100	63	100	2,5	16,0
63/110	63	110	2,5	21,0
75/125	75	125	2,5	22,5
90/140	90	140	3,2	21,8
110/160	110	160	3,2	21,8
125/200	125	200	3,5	34,0
160/225	160	225	4,5	28,0
200/250	200	250	4,5	20,5
250/315	250	315	6,0	26,5
315/400	315	400	8,2	34,3

Πιν.1

Πάχος Βάσει : Πιν.6.8.3.Α & Πιν. 6.8.3Β § a

T <sub>calculated</sub> λ=0,021	
41-60 °C	4 - 16 °C
mm	
9,3	✓ 6,4
9,8	✓ 6,6
10,2	✓ 6,8
10,6	✓ 7,0
16,3	✓ 11,3
	11,7
16,9	✓
17,4	✓ 11,9
17,8	✓ 12,1
18,3	✓ 12,3
18,5	✓ 12,4
19	✓ 12,6
19,3	✓ 12,8
19,6	✓ 12,9
19,9	✓ 13,0

Πιν.2

Debljina izolacionog zida Aqua Plus Prins, je u potpunosti kontabitalan sa standardom 90.1-2010 & 2012 ASHRAE što je preduslov za dobijanje atesta LEED.

## REFERENCE LIST AQUA-PLUS PRINS



### Hotels

- Kuda Villingili Resort 5\*, Maldives
- Iveagh Gardens Hotel 4\*, Dublin, Ireland
- Tribe Hotel 5\*, Kenya
- Riverview Hotel 3\*, Kenya
- Ayia Napa Marina, Ayia Napa, Cyprus
- Adams Beach 5\*, Ayia Napa, Cyprus
- Aliathon Hotel 5\*, Pafos, Cyprus
- Atlantica Mare Village Ayia Napa 5\*, Ayia Napa, Cyprus
- Atlantica Mare Village Pafos 5\*, Pafos, Cyprus
- Chrysomare Beach Hotel 5\*, Ayia Napa, Cyprus
- Cypria Maris Beach Hotel 4\*, Pafos, Cyprus
- Melpo Antia Hotel 4\*, Ayia Napa, Cyprus
- Le Meridien 5\*, Limassol, Cyprus
- Radisson Blu 5\*, Limassol, Cyprus
- Radisson Larnaca Beach Hotel 5\*, Larnaka, Cyprus
- Hotel Butrinti 5\*, Sarande, Albania
- Arethusa Boutique Hotel 4\*, Athens
- Ever Eden Beach Resort 4\*, Anavissos, Athens
- HapiMag Resort 4\*, Porto Heli, Athens
- MGallery Collection - Athens Capital Hotel 5\*, Athens
- The Stanley 4\*, Karaïskaki Sq., Athens
- Linden Apartments, Potos, Thasos
- Hyatt Regency Thessaloniki 5\*, Thessaloniki
- Regina Mare Hotel Club 5\*, Perdika, Thesprotia
- Epirus Palace Hotel Congress & Spa 5\*, Ioannina
- Limneon Resort & Spa 5\*, Kastoria
- Ikos Dassia 5\*, Dassia, Corfu
- MarBella Corfu 5\*, Agios Ioannis Peristeron, Corfu
- Cactus Beach 5\*, Stalida, Crete
- Domes of Elounda, Luxury Hotel 5\*, Elounda, Crete
- Lyttos Beach 4\*, Hersonissos, Crete
- Nana Imperial Hotel 5\*, Hersonissos, Crete
- The Royal Blue Resort 5\*, Rethymno, Crete
- Robinson Club 5\*, Ierapetra, Crete
- Atlantica Porto Bello Beach 4\*, Kardamaina, Kos
- Blue Lagoon City Hotel 5\*, City of Kos, Kos
- Caravia Beach Hotel 4\*, Marmari, Kos
- Ikos Aria 5\*, Kefalos, Kos
- Robinson Club Daidalos 4\*, Fortress of Antimachia, Kos
- Horizon Beach Resort 4\*, Mastihari, Kos
- Aleomandra, Luxury Villa, Ornos, Mykonos
- Sunset Hotel 5\*, Mykonos
- Punda Beach Resort 5\*, Punda, Paros
- Amathus Beach 5\*, Ixia, Rhodes
- Atlantica Imperial Resort 5\*, Kolymbia, Rhodes
- Atlantica Sensatori Resort 5\*, Gennadi, Rhodes
- Atlantica Princess Hotel 4\*, Ixia, Rhodes
- Atlantica Aegean Blue Resort 5\*, Kolymbia, Rhodes

- Lindos Princess Beach Hotel 4\*, Lardos, Rhodes
- Maya Exclusive Resort & Spa 5\*, Kiotari, Rhodes
- Lindian Village 5\*, Lardos, Rhodes
- Olympic Palace Hotel 5\*, Ixia, Rhodes
- Rodos Palace 5\*, Ixia, Rhodes
- Rodos Palladium Leisure & Wellness 5\*, Faliraki, Rhodes
- Sunwing Kallithea Beach 4\*, Kallithea Ave., Rhodes
- Sun Beach Resort 4\*, Ialisos, Rhodes
- The Ixia Grand Hotel 5\*, Ixia, Rhodes
- Olympic Palace 5\*, Ixia, Rhodes
- Virginia Family Resort 3\*, Kallithea, Rhodes
- Kassadra Bay Resort 5\*, Vasilias, Skiathos
- Xenia Hotel 5\*, Koukounaries, Skiathos
- Antigoní Beach Resort 4\*, Ormos Panagias, Halkidiki
- Anthemus Sea Beach 5\*, Elia, Halkidiki
- Eagles Palace 5\*, Ouranopoli, Halkidiki
- Ikos Oceania Resorts 5\*, Nea Moudania, Halkidiki
- Lagomandra Beach Hotel 4\*, Nikiti, Halkidiki
- Porto Carras Resort 5\*, Porto Karras, Halkidiki
- Sani Club 5\*, Halkidiki
- Sani Dunes 5\*, Halkidiki
- Sani Beach Hotel 5\*, Halkidiki



### Prefabricated Buildings

- Refugee Hot Spot, Thiva

### Airports

- Airport of Mykonos (JMK), Mykonos
- Rhodes International Airport "Diagoras" (RHO), Rhodes
- Skiathos International Airport "Alexandros Papadiamantis" (JSI), Skiathos

### Wineries & Breweries

- Domain Analiotas, Nicosia, Cyprus
- Konstantinopoulos Winery (AMPELAKI), Marathia, Amaliada
- Kostas Lazaridis Estate, Adriani, Drama
- Macedonian Brewery, Drama
- Aslanis Estate, Nea Mixaniona, Thessaloniki
- Giannis Boutaris Winery, Naoussa Imathias
- Tsantiris Winery, Ano Proespera, Ikaria
- Ampeloos Winery, Nea Peramos, Kavala
- Vivlia Xora Estate, Kokkinoxori, Kavala
- Charalampaki Estate, Heraklion, Crete
- Zafeiraki Estate, Tyrnavos, Larissa

- D. Migas Estate, Tyrnavos, Larissa
- Vourvoukellis Estate, Avdira, Xanthi
- Santo Wines, Pyrgos, Santorini
- Vassaltis Winery, Vourvoulos, Santorini
- Giannis Boutaris Winery, Amyntaio, Florina
- Amyntaio Agricultural Cooperative Winery, Amyntaio, Florina
- Chios Distillery, Chios



### Packaging – Dry Aging

- Argo Merchants, Packaging plant and Preservation chambers, Dublin, Ireland
- Fruit Packaging plant, Argos
- PAPADAKIS, Cooling chambers of Dry Aging of Bananas, Crete
- ALKYON, Fruit packaging plants, Industrial Area of Kavala
- ANATOLI, Fruit packaging plant, Imathia
- BOURAKIS, Preservation chambers, Anchialos, Thessaloniki
- TSAKIRIS FAMILY S.A., Food Industry, Neochorouda, Thessaloniki
- Wonderplant, Tomato Hydroponics Greenhouse, Petrousa, Drama
- Escarcom, Processing of Frozen Fruits and Vegetables, Skydra, Pella
- PROTOFANOUSIS A.E., Fruit Preservation, Nea Efesos, Pieria



### Schools

- Simplex, Data Center, Limassol, Cyprus
- Deree College, Agia Paraskevi, Athens
- Theodoropoulou Private School, Korakies Chanion, Crete
- Democritus University of Thrace, Xanthi

### Hospitals

- Marousi Medical Center, Marousi, Athens
- Peristeri Medical Center, Peristeri, Athens
- Papanikolaou Hospital, Thessaloniki
- Thessaloniki Psychiatric Hospital, Office building, Stavroupoli, Thessaloniki

### Industries

- Esti Foods, Food Industry, New Jersey, USA
- Allergan Pharmaceuticals, Pharmaceutical Industry, Dublin, Ireland
- Coca Cola, Cyprus
- Genepharm, Pharmaceutical Industry, Pallini, Athens
- Style Glass, Glass Industry, Industrial Area of Thessaloniki, Thessaloniki
- Tsakiris Family S.A., Food Industry, Neochorouda, Thessaloniki
- Thrace Plastics
- Ellinika Lipasmata, Kavala
- Tomas, Animal Food Production Industry, Karitsa, Katerini
- 3P, Food Industry, Karditsa
- KOLIOS S.A., Milk Industry, Kilkis
- TORRE COOPERLAT, Ice Cream Industry, Kilkis
- SEKAP, Tobacco Industry, Xanthi
- Vitalic, Pharmaceutical Industry, Portugal
- Biodiesel Production Plant, Serres

### Public & Private Buildings

- Al Wathba Stable Compound, Abu Dhabi, United Arab Emirates (UAE)
- Tent Majlis, Camel Farm, Abu Dhabi, United Arab Emirates (UAE)
- Paphos District Court, Paphos, Cyprus
- Areeba, Office Building, Beirut, Lebanon
- Residence Complex, Mauritius
- Residence Complex, Uppsala, Sweden
- Konaki Mount Athos, Romanian skete of Great Lavra, Mount Athos
- M-MARITIME, Shipping Company Offices, Athens
- Ilioupoli District Court, Athens
- Office Building Polyeco S.A., Aspropyrgos, Athens
- OTE TV Building, Kifisia, Athens
- Obstetrics Clinic MITERA, Marousi, Athens
- International Olympic Academy Building, Ancient Olympia, Ilia
- Esperides Villa, Residence complex, Koutouloufari, Heraklion, Ilia
- Private District Heating Network, Kozani
- Luxurious Villa of 2.500m<sup>2</sup>, Lefkada
- Luxurious residence 2.000m<sup>2</sup>, Mykonos
- Navarino Bay, Construction Site, Pylos, Messinia





# Aqua<sup>plus</sup> Prins



Aqua Plus Prins dodeljuje se za period 2018-2019 od Grčke akademije za marketing kao najinovativniji grčki proizvod. Za period 2020-2021, serija je nagrađena srebrnom medaljom industrijske izvrsnosti.

Aqua Plus Prins je u potpunosti sistem pomoću kojeg uspevamo da postignemo manja proširenja, savršeni estetski i energetske rezultate, premašujući LEED-ovu građevinsku sertifikaciju, brzu ugradnju, ekonomičnu skalu i u skladu je sa EN 17455 za propusnost