



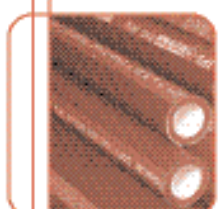
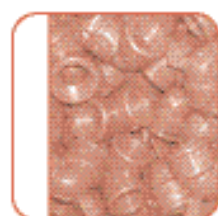
## IPS THREAD TECHNICAL DOSSIER

### Summary

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## Introduction

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## **1. IPS, Quality piping for the world.**

*As always, IPS continues to generate exclusive services for its commercial and professional customers and users.*

*In the following pages, you will find a comprehensive guide to good works practice. The contents of this latest version have been updated and reviewed so that you, as a construction professional, can count on over half a century of leading experience in thermoplastic piping installation.*

*IPS, a world leading Argentine company.*





## *Standards, approvals and lab tests*





## 2. Standards, approvals and lab tests.

### 2.1 Quality, standardized processes, continuous improvement.

*IPS's Quality Management system including the design, manufacture, sales and technical assistance for products intended for fluid transportation has been certified under ISO 9001:2000 (International Organization for Standardization) by IRAM-IQNet (Instituto Argentino de Racionalización de Materiales, or in English Argentine Institute for the Rationalization of Materials).*

*It is certified that IPS has an organizational structure that, based on the prevention concept, acts on each of the documented stages primarily aimed at meeting its customers' needs.*

*The scope of said certification means that IPS is periodically audited and that its Quality Management system is efficient. This confirms that IPS:*

- Takes into account customers' suggestions in order to improve the standards of its products and services.
- Measures with a self-control system by means of internal audits so as to improve processes from beginning to conclusion.
- Has a formal method for the follow-up of continuous improvement procedures (corrective and preventive actions).
- Sets quality improvement goals and specific actions to reach those goals.
- Trains its employees on an ongoing basis.
- Selects suppliers that prove to have an adequate capacity and performance in accordance with the corresponding specifications.





## 2.2 Technology, design and dimensioning

IPS-Thread products (Pipes and Fittings) are manufactured according to the following international dimensioning and tests standards:

Technical Standards	IRAM	DIN	ISO	BSPT
IPS Thread Fittings	13.478-1	2999	7/1 RC	Withworth
	13.478-2	16.962		Gas Conical
	5.063			
Threaded Pipes	13.473	8077	161-2	
	13.479	8078		

**ISO** International Organization for Standarization

**DIN** Deutsches Institut fur Normung, Germany

**IRAM** Instituto Argentino de Racionalización de Materiales

**ASTM** American Society for Testing and Materials

**BSPT** British Standard Pipe Taper

■ IPS - IRAM member No 2862

IPS actively participates in IRAM. It has promoted the approval of several standards for the manufacturing of products for the transportation of fluids in the Argentine Republic. For these standards, the guiding principles of the German DIN standards have always been taken into account.

## 2.3 Tests, national and international approvals

■ Approval for the transportation of liquids for human consumption.

### Health Qualification

The supplies and raw material used to produce IPS piping systems are suitable for contact with drinking water and food, complying with the specifications set forth by:

- **European Directive UE/90/128**
- **BGA Bundesgesundheitsamt - Germany**
- **FDA Food and Drugs Administration CFR 177.1520 - USA**
- **Código Alimentario Nacional (National Food Code), Resolution N° 1543 Argentina**

■ **National approvals for IPS Thread System**

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**I.R.A.M. Instituto Argentino de Racionalización de Materiales**

Description: Authorized to use the IRAM seal

IRAM Standard No 13.478

Result: Approved

Date 01/99

Products:

IPS-Thread - Elbow, 1/2", 3/4" and 1"

Tee, 1/2", 3/4" and 1"

Coupling, 1/2", 3/4" and 1"

**OSN Approvals**

O.S.N. Obras Sanitarias de la Nación (Argentine State-owned Water Company)

Description: Approval tests, file 11.835-88-1

Result: Approved

Date: 11/30/88

Product: Threaded Piping

Obras Sanitarias de la Nación

Description: Approval Tests, file 7229-91-7

Result: Approved

Date: 12/16/91

Product: IPS Threaded fittings

■ **Foreign tests and approvals**

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**South Africa: JASWIC Program for Acceptance of Water Conduction Components**

Description: Approval of water supply installation pipeline

Result: Approved

Date: 04/14/98

Product: IPS Thread Fittings

**South Africa: SABS -South Africa Bureau of Standards**

Result: Approved

**Bolivia: Cooperativa de Servicios de Agua y Alcantarillado de Tarija (Tarija Water Supply and Sewer Cooperative)**

Description: Approval for plumbing works.

Result: Valid

Date: 04/17/98

Product: IPS-Thread System and Threaded pipes



**Mexico: INFONAVIT Instituto del Fondo Nacional de la Vivienda para los Trabajadores (National Institute for Workers Housing Fund)**

Description: Approval for use in hot and cold-water pipelines

Result: Valid

Date: 04/24/98

Product: IPS Thread Fittings

**Brazil: La Falcao Bauer - Technological Center for Quality Control, Sao Paulo**

Description: Dimension checks, water-tightness and internal pressure strength test, according to NBR standard No 5685

Report No E/ 50.090/96

Result: Satisfactory

Date: 07/02/96

Product: IPS Thread Fittings

**Panama: Dirección General de Normas y Tecnología Industrial (General Secretariat of Standards and Industrial Technology)**

Result: Satisfactory

Date: 03/28/04

Approval Certificate No 087

Product: IPS-Thread Pipes and Fittings

**Russian Federation: Gosstandart Russia**

Result: Approved

Date: 10/03

Product: IPS-Thread System

**Cuba: Research Laboratory of Tropicalization  
Center of Product Certification**

Description: Report of Homologation

According to DIN 50017:82 and ASTM D 452999 Standards.

Result: Approved

Date: 25/08/03

Product: IPS-Thread Fittings.

## 2.4 Awards



- INTERNATIONAL GOLD STAR FOR QUALITY '99 granted by BID-Business Initiative Directors, 24th Convention.
- Aguas Argentinas (Argentine Water Company) honored IPS as a member of "Club Amigos del Agua" (Water Friends Club) year 2002.

**Special Awards received in "Exposanitarios" (International Exposition of Products for Fittings, Gas and related Installations)**

Company image in 1998 and 1999, in the following categories:

- Plastic pipes threaded joints.
- Water conduction system by interfusion
- Polyethylene for irrigation.



## *IPS Thread System*





### 3. IPS Thread System

#### 3.1 Characteristics

IPS Threaded Pipes and accessories are manufactured with Homopolymer Polypropylene of high molecular weight (PP-H). This material was specially selected due to its high resistance to high pressures and temperatures. Besides its high elasticity unit, it provides threads with the necessary rigidity so that these do not go out of shape due to mechanical pressure.

■ This raw material has the following characteristics:

- **Chemical resistance**

Homopolymer Polypropylene is a PP-H of high molecular weight; thus, it is more resistant to chemical contents (such as acid or basic substances, lime, cement or gypsum) . See charts 3.6 for chemical resistance to different products according to international standards.

- **Resistant to parasitic currents**

- **Excellent electric insulator**

- **Acoustic insulation**

Homopolymer Polypropylene's (PP-H) elasticity easily enables the absorption and almost the total elimination of the vibrations usually found in metallic pipes. Thus, a better acoustic insulation is obtained at no additional charge.

- **Low thermal conductivity**

Homopolymer Polypropylene's low conductivity (PP-H) (0.21W/mK) or (0.18Kcal/mC) reduces heat dissipation of the fluid that circulates inside the system. Moreover, the usual condensation found under specific conditions on the external surface of metallic pipes is not present.

- **Low loss of head**

PP-H's inside surface is smoother than that of other products, with few irregularities (0,0070mm roughness), allowing a lower loss of head. These characteristics also impede the accumulation of scale buildup on its interior avoiding the reduction of flow volume in the system.

- **Non-toxicity**

Raw material used in the manufacturing of IPS-Thread system is completely non-toxic and complies with the corresponding national and international standards.

- **Easy-use working tool**

IPS-Thread system provides a full and integral system for fluid transportation. It includes pipe wrenches, threading tools, thread sealant paste, cross over pipes, mini-valves, flanges with joints and a great variety of fittings. If users follow our recommendations for a correct installation, it is almost impossible to make installation errors.



### 3.2 Advantages of the System

*The IPS-Thread System is designed to transport cold and hot water for the following uses:*

- *Portable plumbing systems*
- *Air conditioning and heating systems*
- *Compressed air systems*
- *Sewage transportation*
- *Industrial applications*

*This system has all the necessary components to complete any installation. The IPS-Thread system overcomes the corrosion problems due to the features of the raw material used in its manufacturing.*

*It has a wide application scope due to its great resistance to high temperatures and working pressures. Its high chemical resistance makes it suitable for all type of industrial applications. See charts.*

*It is a recyclable material that does not produce environmental pollution; thus, it is environmentally healthy. It is not susceptible to galvanic corrosion or parasitic currents. It does not impart odor or taste to the transported fluid.*

*IPS guarantees its IPS-Thread system for 50 years of useful life in constant use. This is possible because IPS relies on the raw material used and due to the unique additives used during the production process, which retard thermoplastic aging.*

### 3.3 IPS Thread system's useful life

*This guarantee is given by:*

- *The quality of raw materials (documented control of each piece)*
- *The quality of the moulds*
- *The machinery*
- *The latest technology*
- *Highly trained personnel*
- *Constant quality controls*

*Besides, raw materials are combined with:*

- *Non-toxic stabilizer that preserves the product from premature aging due to high working temperatures.*
- *ANTI UV, compound that extends the useful life of pipes exposed to sunrays.*

*These additional compounds extend the functional life of the product.*

### 3.4 Physical properties of raw material

#### General Characteristics of HOMOPOLYMER or Type 1 of high molecular weight

General Properties		Test Method	Unit	Value
Density at 23°		ISO 1183	g/cm3	0.902
Fluid rate MFR 230°C/2, 16 Kg		ISO 1183	g/10 min	≤ 0,5
Elasticity Unit		ISO 527	MPa	1200
Tension to conventional limit of elasticity		ISO 527	MPa	33
Elongation to conventional limit of elasticity		ISO 527	MPa	10
Hardness due to Ball Penetration		ISO 2039/ 1	N / mm²	70
Impact resistance	23°C	ISO 179/ 1eU	KJ/m²	N/R
	0°C	ISO 179/1eU	KJ/m²	200
	-23°C	ISO 179/1eU	KJ/m²	2
Softening Temperature				
Vicat 9,8 N		DIN ISO 306	° C	150
Linear expansion coefficient between 20° and 90°		DIN 35 752	K-1	1,1.104
Thermal conduction at 20 °C		DIN 52612	W /mK	0,21

#### Properties of thermoplastic isolator foam

Characteristics	Test Method	Unit	Value
Cell's structure			Closed
Density	ASTM 1622	g / cm <sup>3</sup>	250
Thermal Conductivity	DIN 52612	W / mK	0,054
Permeability to Water	Dir.EUAtc		Impermeable
Water absorption	IRAM 1582	V / V	1,2%
Permeability to water steam	ASTM E-96	gr/m <sup>2</sup> h	0,33
Insulation to impact noises	IRAM 4063	dBA	19

#### Properties of 4x4 PLUS Pipe

Characteristic	According to Values	Unit	Valor
Thermal Conductivity at 20°C	DIN 56612	W/mK	0,0684





### 3.5 Chemical resistance - Tables

The following table has been provided by Hoechst Germany and was prepared taking into account standards DIN ISO 175. This information is based on raw material manufacturer's knowledge and experience.

However, this does not imply a legal obligation or responsibility whatsoever on IPS S.A.I.C. y F., nor on the raw material manufacturer. We have the right to make modifications according to the technological process or future developments. Users of our products bear the responsibility of carefully inspecting and testing the products received for further use. Mentioning commercial names does not imply recommendation whatsoever made by IPS S.A.I.C. y F.

IPS recommends complying with convenient precaution regulations as regards the use of aggressive products.

Likewise, we note that Polypropylene is highly resistant to aggressive fluids and thus is specially recommended for its application in specific cases. The values of this chart are to be applied on PP and not on metallic inserts; for the latter the user will have to ask for advice about the particular case. Should there be any doubts or queries we suggest communicating with our technical department.

#### Symbols used in this chart:

**Classification:** \* : respective boiling point      V : possible discoloration  
**Resistance:** + : high      / : limited      - : no resistance

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
2 - butendiol - 1.4	technically pure	+		+	+	
2 - butendiol - 1.4	technically pure	+		+		
2 - methyl butane - 2	technically pure	+	/			
Acetacetic acid		+				
Acetaldehyde + Acetic acid	90/10	+				
Acetaldehyde	technically pure	+	/	/		
Acetamide		+	+	+	+	
Acetic acid (100% Glacial acetic acid)	technically pure	+	/ V	+	/ V	-
Acetic acid	100%	+	/ V	+	/ V	-
Acetic trioxide	technically pure	+	/	/	-	
Acetone	technically pure	+	+	+	+	
Acetophenone		+	+	+	/	
Acetyl		+				
Acid for accumulators (batteries)		+	+	+	+	
Acronal - Dispersion	current use	+	/			
Acrylic viscosifier	current use	+		+	+	
Acrylonitrile		+	+	+		
Activine (aqueous chloramine 1%)						
Adipic acid ester		+	/			
Aguardiente (liquor)		+	+	+	+	
Air	technically pure	+	+	+	+	+
Alcohol		+		+	+	+
Alcoholic drinks		+		+		
Allylic acetate		+	+bis/	+	+	
Allylic alcohol (2 - Propenol - 1)	96%	+	+	+	+	
Allylic chloride		/	-			
Alum	indistinct	+	+	+	+	
Aluminum fluoride	high	+	+			

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Aluminum hydroxide		+	+	+	+	
Aluminum metaphosphate		+	+	+	+	
Aluminum metaphosphate		+	+	+	+	
Amino acid		+	+	+	+	
Ammonium essence	saturated	+	+	+	+	
Ammonium thiocyanate		+	+	+	+	
Amyl acetate	technically pure	+	+	/	-	
Amyl alcohol	technically pure	+	+	+	+	+
Amyl chloride	100%	/	-			
Amyl phthalate		+	/			
Aniline	indistinct	+	+	+	+	
Animal oil		+	/	+	/	
Animal oil		+	+	+	+	
Anis essence		/	-			
Anisyl		/	/bis-	/	/	
Anodic chromic clay		+	+	+		
Antifoam		+	+bis/	+		
Antifreeze (Kfz)	current use	+	+	+	+	+
Antimony anhydrous chloride		+	+	+	+	
Antimony pentachloride		+	+	+	+	
Antimony trichloride		+	+	+	+	
Apple wine (cider)		+	+	+	+	
Apple wine		+	+	+	+	
Aqua regia	100%	-		-	-	
Aqueous acetaldehyde	indistinct	+	/	+	+	
Aqueous acetic acid	70%	+	+	+	+	+
Aqueous adipic acid		+	+	+	+	
Aqueous aluminum chloride	indistinct	+	+	+	+	+
Aqueous aluminum sulfate	saturated	+	+	+	+	+
Aqueous ammonia fluoride	saturated	+	+	+	+	
Aqueous ammonia nitrate	indistinct	+	+	+	+	+
Aqueous ammonia phosphate	indistinct	+	+	+	+	+
Aqueous ammonia	indistinct	+	+	+	+	
Aqueous ammonium acetate	indistinct	+	+	+	+	+
Aqueous ammonium carbonate	indistinct	+	+	+	+	+
Aqueous ammonium chloride	indistinct	+	+	+	+	+
Aqueous ammonium hydrosulfide	indistinct	+	+	+	+	
Aqueous ammonium sulfate	indistinct	+	+	+	+	+
Aqueous ammonium sulfide	indistinct	+	+	+	+	
Aqueous aniline hydrochloride	indistinct	+	+	+	+	
Aqueous anthraquinonsulfonic acid (Susp.)		+	+	+		
Aqueous arsenic acid	indistinct	+	+	+	+	
Aqueous barium hydroxide	indistinct	+	+	+	+	
Aqueous barium salts	indistinct	+	+	+	+	+
Aqueous benzaldehyde	indistinct	+	+bis/	+		
Aqueous benzoic acid	indistinct	+	+	+	+	+
Aqueous borax	saturated	+	+	+	+	+
Aqueous boric acid	indistinct	+	+	+	+	+
Aqueous bromhydric acid	50%	+	+	+	+	
Aqueous butanediol	indistinct	+	+	+	+	
Aqueous butyric acid	indistinct	+	/	+		
Aqueous calcium chlorate	saturated	+	+	+	+	
Aqueous calcium chloride	saturated	+	+	+	+	+
Aqueous calcium hypochlorite (Susp.)	indistinct	+	+	+	+	
Aqueous calcium nitrate	50%	+	+	+	+	
Aqueous calcium sulfide	<= 10%	/	/			
Aqueous carbonic acid		+	+	+	+	
Aqueous carboniferous solution		+V	/ V	+V	/ V	
Aqueous chloral hydrate	indistinct	+	+V	/	-	
Aqueous chloramine	saturated		+		+	
Aqueous chloric acid	1%	+	+	+	/	-
Aqueous chloric acid	10%	+	+	+	/	-
Aqueous chloric acid	20%			+	-	
Aqueous chloroacetic acid	<= 85%	+	+	+	+	
Aqueous chrome salts	indistinct	+	+	+	+	
Aqueous chrome trioxide	50%	/	-V	/ V	-V	



Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Aqueous chromic acid	50%	/	-V	/ V	-V	
Aqueous citric acid	saturated	+	+	+	+	+
Aqueous cooking salt	indistinct	+	+	+	+	
Aqueous copper chloride	saturated	+	+	+		
Aqueous copper cyanide (I)	saturated	+		+	+	
Aqueous copper fluoride	saturated	+	+	+		
Aqueous copper nitrate	30%	+	+	+	+	
Aqueous copper salts	saturated	+	+	+	+	
Aqueous copper sulfate	indistinct	+	+	+	+	
Aqueous creosole	diluted	+	+V	+	+V	
Aqueous dextrine	18%	+	+	+	+	
Aqueous diglycolic acid	30%	+	+	+	+	
Aqueous ephetin	10%	+	+	+	+	+
Aqueous ferric chloride	indistinct	+	+	+	+	
Aqueous fertilizing salts	indistinct	+	+	+	+	
Aqueous fluorboric acid		+	/			
Aqueous fluorhydric acid	40% - 85%	+	/	+		
Aqueous formic acid	10%	+	+	+	+	
Aqueous formic acid	85%	+	+	+	/	
Aqueous fructose (fruit sugar)	indistinct	+	+	+	+	+
Aqueous glucose	indistinct	+	+	+	+	+
Aqueous glycerin	indistinct	+	+	+	+	+
Aqueous glycol	current use	+	+	+	+	+
Aqueous glycolic acid	up to 70%	+	+	+		
Aqueous hexacyanoferrate (III)	saturated	+	+			
Aqueous hexafluorsilic acid	40%	+	+			
Aqueous hydrochloric acid		+	+	+V	+V	/ V
Aqueous hydrofluorsilic acid	indistinct	+	+			
Aqueous hydrogen sulfide	saturated	+	+	+	+	
Aqueous hydrogenous ammonium carbonate	saturated	+	+	+	+	
Aqueous hydrosulfite	up to 10%	+	+	+	+	
Aqueous hydroxylammonia sulfate	12%	+	+	+	+	
Aqueous iron chloride (II)	saturated	+	+	+	+	
Aqueous iron chloride (III)	saturated	+	+	+	+	+
Aqueous iron nitrate (III)	saturated	+	+	+	+	
Aqueous iron sulfate (II)	saturated	+	+	+	+	
Aqueous iron sulfate (III)	saturated	+	+	+	+	
Aqueous lactic acid	indistinct	+	+	+	+	+
Aqueous lead acetate	indistinct	+	+	+	+	
Aqueous magnesium chloride	indistinct	+	+	+	+	
Aqueous magnesium salts	indistinct	+	+	+	+	+
Aqueous magnesium sulfate	indistinct	+	+	+	+	
Aqueous magnesium sulfate	indistinct	+	+	+	+	+
Aqueous malic acid	up to 100%	+	+	+	+	
Aqueous methylamine	32%	+		+		
Aqueous monochloroacetic acid		+	+	+	+	
Aqueous monochloroacetic acid	indistinct	+	+	+	+	
Aqueous nickel salts		+	+	+	+	
Aqueous nickel sulfate	indistinct	+	+	+	+	
Aqueous oxalic acid	indistinct	+	+	+	+	+
Aqueous oxygen peroxide	10%	/	-	+	/	
Aqueous oxygen peroxide	30%	/	-	+	/	
Aqueous perchloric acid	20%	+	+	+	+	
Aqueous perchloric acid	50%	+	/			
Aqueous perchloric acid	70%	+	-			
Aqueous phosphoric acid	50%	+	+	+	+	+
Aqueous phosphoric acid	80% - 95%	+	/ V	+	+V	+V
Aqueous phytosanitary products	practical use	+	+	+		
Aqueous picric acid	1%	+		+		
Aqueous polymer phosphate	indistinct	+	+	+	+	
Aqueous potassium bicarbonate	saturated	+	+	+	+	
Aqueous potassium bisulfate	saturated	+	+	+	+	+
Aqueous potassium bisulfite	saturated	+	+			
Aqueous potassium borate	1%	+	+	+	+	
Aqueous potassium bromate	up to 10%	+	+	+	+	+
Aqueous potassium bromide	indistinct	+	+	+	+	+

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Aqueous potassium carbonate	indistinct	+	+	+	+	
Aqueous potassium chlorate	indistinct	+	+	+	+	+
Aqueous potassium chloride	indistinct	+	+	+	+	+
Aqueous potassium chromate	40%	+	+	+	+	+
Aqueous potassium chrome sulfate	saturated	+	+	+	+	
Aqueous potassium cyanide	indistinct	+	+	+	+	
Aqueous potassium cyanide	indistinct	+	+	+	+	
Aqueous potassium dichromate	saturated	+	+	+	+	
Aqueous potassium dichromate	indistinct	+	+	+	+	
Aqueous potassium ferric sulfate	saturated	+	+	+	+	
Aqueous potassium ferricyanide	indistinct	+	+	+	+	
Aqueous potassium ferrocyanide	indistinct	+	+	+	+	
Aqueous potassium fluoride	indistinct	+	+	+	+	
Aqueous potassium hexacyanideferroic	indistinct	+	+	+	+	
Aqueous potassium hydrosulfate	saturated	+	+	+	+	+
Aqueous potassium hydrosulfide	saturated	+	+			
Aqueous potassium hydroxide	indistinct	+	+	+	+	
Aqueous potassium hypochlorite	saturated	/	-			
Aqueous potassium iodide	indistinct	+	+	+	+	
Aqueous potassium perborate		+	+			
Aqueous potassium perchlorate	1%	+		+	+	
Aqueous potassium perchlorate	up to 10%	+	/			
Aqueous potassium permanganate	to 6%	+	+V	+	+V	
Aqueous potassium persulfate	indistinct	+	+	+	+	
Aqueous potassium phosphate	saturated	+	+			
Aqueous potassium sulfate	indistinct	+	+	+	+	
Aqueous potassium sulfide	saturated	+	+	+	+	
Aqueous potassium sulfite	saturated	+	+	+	+	
Aqueous potassium tetracyanide	saturated	+	+			
Aqueous potassium thiosulfate	saturated	+	+	+	+	
Aqueous propanol	7%	+	+	+	+	
Aqueous silicic acid	indistinct	+	+	+	+	
Aqueous silver nitrate	indistinct	+	+	+	+	+
Aqueous silver salts	saturated	+	+	+	+	
Aqueous soap solution	indistinct	+	+	+	+	
Aqueous soda (sodium carbonate)	indistinct	+	+	+	+	+
Aqueous sodium acetate	indistinct	+	+	+	+	+
Aqueous sodium benzoate	36%	+	+	+	+	
Aqueous sodium benzoate	indistinct	+	+	+	+	
Aqueous sodium bicarbonate	saturated	+	+	+	+	+
Aqueous sodium bisulfate		+	+	+	+	
Aqueous sodium bisulfate	saturated	+	+	+	+	
Aqueous sodium bisulfite	saturated	+	+	+	+	
Aqueous sodium carbonate	indistinct	+	+	+	+	+
Aqueous sodium chlorate	saturated	+	+	+	+	
Aqueous sodium chloride	indistinct	+	+	+	+	+
Aqueous sodium chlorite	50%	+		+	/	
Aqueous sodium hexa - metaphosphate	saturated	+		+	+	
Aqueous sodium hydrocarbonate	saturated	+	+	+	+	+
Aqueous sodium hydroxide	indistinct	+	+	+	+	
Aqueous sodium hypochlorite with 12.5% active chlorine		/	-	/	/	-
Aqueous sodium nitrate	indistinct	+	+	+	+	
Aqueous sodium nitrite	indistinct	+	+	+		
Aqueous sodium perborate	indistinct	+	/	+	+	+
Aqueous sodium perchlorate	indistinct	+	+	+	+	+
Aqueous sodium peroxide	saturated	+	+			
Aqueous sodium peroxide	10%	+	+			
Aqueous sodium phosphate	saturated	+	+	+	+	+
Aqueous sodium silicate	indistinct	+	+	+	+	
Aqueous sodium sulfate	indistinct	+	+	+	+	
Aqueous sodium sulfate	indistinct	+	+	+	+	+
Aqueous sodium sulfate	saturated	+	+	+	+	+
Aqueous sodium sulfhydrate	saturated	+	+	+	+	
Aqueous sodium sulfide	saturated	+	+	+	+	
Aqueous sodium sulfite	indistinct	+	+	+		
Aqueous sodium tetraborate	saturated	+	+	+	+	+





Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Aqueous sodium thiosulfate	40%	+	+	+	+	
Aqueous starch	indistinct	+	+	+	+	
Aqueous succinic acid	50%	+	+	+	+	
Aqueous sugar cane	indistinct	+	+	+	+	
Aqueous sulfate aluminum potassium	indistinct	+	+	+	+	+
Aqueous sulfur dioxide	indistinct	+	+	+	+	
Aqueous sulfuric acid	70%	+	+	+	/	
Aqueous sulfuric acid	80%	+	+	+	/	
Aqueous sulfuric acid	98%	/	-	/	-	
Aqueous sulfuric acid	up to 50%	+	+	+	+	
Aqueous tannic acid	10%	+	+	+	+	
Aqueous tannin	10%	+	+	+	+	
Aqueous tartaric acid	indistinct	+	+	+	+	
Aqueous tin chloride (II)	indistinct	+	+	+	+	
Aqueous tin chloride (IV)	saturated	+	+	+	+	
Aqueous toilet solution	technically pure	+	+	+	+	
Aqueous trichloroacetic acid	50%	+	+	+	+	
Aqueous trietanolamine	indistinct	+	/	+		
Aqueous trietanolamine o		+	/	+		
Aqueous trimethylpropane		+	+	+	+	
Aqueous urea	up to 33%	+	+	+	+	
Aqueous urea	up to 33%	+	+	+	+	
Aqueous zinc chloride	indistinct	+	+	+	+	
Aqueous zinc salts	indistinct	+	+	+	+	
Aqueous zinc sulfate	indistinct	+	+	+	+	+
Aromatic oil		/	-	/	/bis-	
Arsenic trioxide		+	+	+	+	
Ascorbic acid		+	+	+	+	
Asphalt		+	/ V	+	/ V	
Aspirin		+		+		
Beer		+	+	+	+	
Beeswax		+	/bis-	+	/bis-	
Beet juice		+	+	+	+	+
Benzaldehyde in isopropyl alcohol	1%	+	+			
Benzene chlorine		/	-	/	-	
Benzene	technically pure	/	-	/	-	
Benzoil chloride		/	/	/		
Benzolic mix	80/20	+	/	/	-	
Benzolsulfonic acid		+	+	+	+	
Benzyl chloride		/	-	/	-	
Benzylic alcohol		+	+	+	+	
Bismuth salts		+	+	+	+	
Bleach bisulfite		+	+	+	+	
Boron trifluoride		+	+bis/			
Bovine fat		+	+bis/	+	+	
Brake fluid		+	+	+	+	
Brewer's yeast	current use	+	+	+	+	
Brine		+	+	+	+	
Bromic acid	high	-		/		
Bromine vapors		-		-		
Bromine water	saturated	+		/		
Butadiene	technically pure	/	-	/	-	
Butane	indistinct	+	+	+		
Butanone		+	/bis-	+	/	
Butanotriol	indistinct	+	+	+	+	
Butene - Glycol fluid	technically pure	+	+	+		
Butoxyl		+	/	+		
Butter		+		+	+	
Butyl - Glycol	technically pure	+		+		
Butyl acetate	technically pure	+	/	/	-	
Butyl acetic ester		+	/	+	/	
Butyl Acrylate		+	/	+		
Butyl Benzylphtalate		+	+			
Butyl phenol	technically pure	+	+	+		
Butylic alcohol		+	+	+		
Butylphenone	technically pure	-		-		

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Calcium carbide		+	+	+	+	
Calcium carbonate (Lime)		+	+	+	+	+
Calcium carbonate		+	+	+	+	+
Calcium hydroxide		+	+	+	+	
Calcium oxide		+	+	+	+	
Calcium phosphate		+	+	+	+	
Calcium sulfate		+	+	+	+	
Camphor oil		-		-		
Camphor		+	/	+		
Carbazole		+	+	+	+	
Carbolic acid		+	+V	+	+V	
Carbolic Oil (Phenol)		+	+V	+	+V	
Carbolineum	current use	+		+		
Carbon dioxide	technically pure	+	+	+	+	
Carbon sulfide		/		/		
Caustic potash	50%	+	+	+	+	+
Caustic soda						
Cetylic alcohol		+	+	+		
Chloral (Trichloroacetaldehyde)	technically pure	+	+	+	+	
Chlorated lime chloride		+	+	+	+	
Chlorhydringlycerin		+	+	+		
Chloric acid, see perchloric acid						
Chlorine leach		/	-	/	/	-
Chlorine water	saturated	+	/	/	-	
Chlorine, aqueous solution	saturated	+	/	/	-	
Chlorine, dry gas		/	-	-		
Chlorine, liquid		-		-		
Chlorine, wet gas		/	-	-		
Chlorocarbonic acid ester		+	/			
Chloroform	technically pure	/bis-	-	/	-	
Chloropicrin		+bis/	-			
Chlorosulfonic acid	technically pure	-		-		
Chlorous acid		+bis/	/	+bis/	/	
Chrome alum	saturated	+	+	+	+	
Chucrut (fermented cabbage)		+	+	+	+	+
Ciclane	current use	+	+	+	+	
Citric juice		+	+	+	+	
Cliclahexanone		+	/	+	/	
Clophen A 50 y A 60		+	/bis-	+	/	-
Coconut fat alcohol		+	/	+	/	
Coconut oil		+		+		
Cod-liver oil	(not purified)	+	/	+		
Coffee extract		+	+	+	+	
Cognac		+		+		
Coloring		+V	+V			
Concentrated cola		+	+	+	+	
Condensed steam		+	+	+	+	
Consistent aluminum chloride		+	+	+	+	
Consistent aluminum sulfate		+	+	+	+	
Cotton-seed oil	technically pure	+	+	+	+	
Coumarone resin		+	+	+		
Creosole	100%	+	/ V	+	/ V	
Creosote		+	+V	+	+V	
Crotonaldehyde	technically pure	+	/	+		
Crude oil		+	/	+	/	
Cyclohexane		+	+	+		
Cyclohexanol		+	+	+	+	
Cyclohexanone		+	/	+	/	
Dekalin	technically pure	+	/	/	/	
Demineralized alcohol	96% (Vol.)	+		+		
Destabilizer		+	+	+	+	
Detergent		+	+	+	+	
Detergent, synthetic	high	+	+	+	+	
Detergent, usual		+	+	+	+	
Dextrine	18%	+	+	+	+	
Dextrose		+	+	+	+	



Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Dibromoethane		/	-	/		
Dibutyl ether		+bis/	-	/	-	
Dibutyl phthalate	technically pure	+	/	+	/	
Dibutyl sebacate		+	/	+		
Dibutylphthalate	technically pure	+	/	+	/	
Dichloroacetic acid	50%	+	+	+		
Dichloroacetic acid	technically pure	+	/V	+		
Dichlorobenzene		/	-	/		
Dichlorodiphenyl - trichloro - ethane		+	+	+	+	
Dichloroethane		/	/	+		
Dichloroethilene	technically pure	-		-		
Dichloromethyl stearic acid		+	+	+	+	
Dichloropropane		/	-			
Dichloropropene		/	-			
Dichromate - Sulfuric acid	high	-		-		
Diesel oil		+	/	+	/	
Diethanolamine	technically pure	+		+		
Diethyl ether		+bis/	/*	/		
Diethylene glycol		+	+	+	+	
Diethyl phthalate	technically pure	+	/			
Diisobutylcetone	technically pure	+	/bis-	+	-	
Diisodecylphthalate	technically pure	+	/	+	/	
Di-isopropyl ether		+bis/	-			
Dimethylamine		+	/	+		
Dimethylformamide	technically pure	+	+bis/	+	+	
Dinolyl phthalate	technically pure	+	/	+	/	
Dioctyl phthalate		+	/	+	/	
Dioxane		+	+	+	/	-
Diphenyl oxide		+	/			
Diphenylamine		+	/			
Disodium phosphate		+	+	+	+	
Disodium sulfate		+	+	+	+	
Distillated water		+	+	+	+	+
Dodecyl sulfuric - benzene (Toluene)		+	/	+		
Drinking water, contains chlorine		+	+	+	+	+
Dry carbonic acid		+	+	+	+	
Emulsion (photographic)		+	+	+	+	
Enamel-remover		+	/	+	/	
Epichlorhydrine		+	+	+		
Ester, aliphatic	technically pure	+	+bis/			
Estirol		/	-	/	-	
Ethane diamine	technically pure	+	+	+	+	
Ethane		+	+			
Ethanol	96%	+	+	+	+	+
Ethanolamine	technically pure	+		+		
Ether		+bis/	/*	/		
Etheric oil		/	-	/	-	
Ethyl acetate	technically pure	+	/	+	/	
Ethyl chloride	technically pure	/*		-		
Ethyl ether	technically pure	+bis/	/*	/		
Ethylbenzene	technically pure	/		/	-	
Ethylene chlorine	technically pure	/		-		
Ethylene diamine	technically pure	+	+	+	+	
Ethylene dichloride		/	-	/		
Ethylene glycol		+	+	+	+	+
Ethylene hydrochloric	technically pure	+	+	+	+	
Ethylene		+	+			
Ethylenedibromure		/	-			
Ethyleneglycolmonobutylether	technically pure	+		+		
Ethylic alcohol + Acetic acid	industrial use	+	+	+	+	
Ethylic alcohol	96%	+	+	+	+	+
Ethylic chlorine	technically pure	+	+V	+	+V	
Euro B		/	/			
Euro G		+	+			
Fat	technically pure	+	+	+	+	
Fatty acid amides		+	/	+		

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Fatty acid		+	+bis/	+	+	
Fatty alcohol		+	/	+		
Fixing coating	current use	+		+	+	
Flavored molasses		+	+	+	+	
Fluorosilicic acid	indistinct	+	+			
Formaldehyde	up to 40%	+	+	+	+	
Formamide sulfoxide		+	+			
Formamide		+	+	+	+	
Frigen 12 (Freon 12)	100%	/	-	/		
Fruit pulp		+	+	+	+	
Fruit sauce, fermented		+	+	+	+	
Fruit sauce, unfermented	indistinct	+	+	+	+	+
Fruit syrup	indistinct	+	+	+	+	+
Fuel oil		+	/	+	/	
Fuming nitric acid		+	+	+	-	
Furfural alcohol		+	+V	+	/ V	
Furfural		+	/			
Galvanic coating for electrolysis		+bis/	/			
Gaseous ammonia		+	+	+	+	
Gaseous bromhydric acid	technically pure	+	+			
Gaseous bromine methane	technically pure	-		-		
Gaseous butane		+		+	+	
Gaseous carbon monoxide		+	+			
Gaseous chloromethane	technically pure	/		-		
Gaseous ethyl oxide	technically pure	+	+	+		
Gaseous fluoride		-		-		
Gaseous hydrogen sulfide		+	+	+	+	
Gaseous methyl bromide	technically pure	-		-		
Gaseous methyl chloride	technically pure	/		-		
Gaseous phosgene		/		/	/	
Gaseous propane	technically pure	+		+		
Gaseous sulfur dioxide		+	+	+	+	
Gaseous, wet and dry hydrochloric		+	+	+	+V	
Gasoline	technically pure	+	/	/	-	
Gelatin		+	+	+	+	
Genantin		+	+	+	+	+
Gin		+		+		
Glucose		+	+	+	+	
Glue		+	+	+		
Glutin glue	current use	+	+	+	+	
Glycoll		+	+	+	+	
Glycol acid butyl ester		+	+			
Glysantine		+	+	+	+	+
Grisiron 8302		/	/			
Grisiron 8702		+	+			
Halothane		/	/bis-			
Heptane		+	/	/	/	
Hexaethanol		+	/	+		
Hexane		+	/	+	/	
Honey		+	+	+	+	
Hydraulic liquid		+	/			
Hydrazine hydrate		+	+	+		
Hydroquinone		+V	+V	+V		
Hypochloric acid		+	/	+bis/	/	
Iodine - potassium iodide 3% iodine		+	+	+	+	
Iso - propanol		+	+	+	+	
Isoamylic alcohol	technically pure	+	/			
Isobutylic alcohol		+	+	+		
Isobutyric acid	technically pure	+	/			
Isooctane		+	/	+	/	
Isopropanol (isopropyl alcohol)	technically pure	+	+	+	+	+
Isopropyl acetate	100%	+	/			
Isopropyl ether	technically pure	+bis/	-	/	-	
Javelle	cologne	+bis/	-	+bis/	/	
Kerosene		+	/	/	/	-
Kerosene		+bis/	/bis-	+bis/		





Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Ketone diethyl		+	/			
Labarraque cologne		+bis/		+bis/	/	
Lactose		+	+	+	+	
Lanoline		+	+	+	/	
Latex		+	+	+	+	
Lavatory water		+	+	+	+	
Lead tetraethyl		+		+		
Lemon juice		+	+	+	+	
Lighting gas	current use	+		+		
Lime water		+	+	+	+	
Linseed oil	technically pure	+	+	+	+	+
Liquid ammonia		+		+		
Liquid bromine	100%	-		-		
Liquid butylene	technically pure			/		
Liquid phosgene	100%	-		-		
Liquid soap		+	+	+	+	
Liquor		+		+		
Lisol		+	/	+	/	
Lithium bromide		+	+	+	+	
Lubricant oil	technically pure	+	+bis/	+		
Magnesium carbonate		+	+	+	+	
Magnesium fluorosilicate		+	+			
Magnesium hydroxide		+	+	+	+	
Magnesium iodide		+	+	+	+	
Malic acid	50%	+	+	+	+	
Malt		+	+	+	+	
Malt fermentation	current use	+	+	+	+	
Malt oil		+	/	+	/	
Manganese sulfate		+	+	+		
Margarine		+	+	+	+	
Marmalade		+	+	+	+	+
Mayonnaise		+		+		
Mercury chloride		+	+			
Mercury salts		+	+	+	+	
Mercury		+	+	+	+	
Metal corrosive		+				
Metallic soap		+	+	+		
Methacrylic acid		+	+	+	+	
Methane chlorine bromine		-		-		
Methanol	technically pure	+	+	+	+	
Methoxybutanol		+	/	+		
Methyl - 4 - pentanol - 2		+	+bis/V	+		
Methyl acetate	technically pure	+		+	+	
Methyl benzoic acid	saturated	/				
Methyl boric acid		+	/bis-			
Methyl metacrylate		+	+			
Methyl salicylate		+	/	+		
Methyl sulfuric acid	50%	+	+	+	+	
Methylacrilate		+	+			
Methylbenzene		/	-	/	-	
Methylcyclohexane		/	/bis-	/		
Methylene chloride		/	/*	/	-*	
Methylethylcetone	technically pure	+	/	+	/	
Methylglycol		+	+	+	+	
Methyl alcohol		+	+	+	+	
Methylisobutylamine		+	+bis-	+		
Methylpropylcetone		+	/	+		
Methylpyrrolidone		+	+			
Metoxybutyl acetate		+	/	+		
Milk serum		+	+	+	+	
Milk		+	+	+	+	+
Mineral oil	no additives	+	+	+	/	-
Mineral water		+	+	+	+	+
Mint essence		+		+		
Mint		+	/	+		
Molasses		+	+	+	+	

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Monochlorinebenzene		/	-	+		
Monochloroacetic acid ethyl ester		+	+	+	+	
Monochloroacetic acid methyl ester		+	+	+	+	
Morphine		+	+	+	+	
Mowilith - Dispersion		+	+	+		
Mustard		+	+	+		
Naphtha		+	/	+	/	
Naphthalene		+	/	+		
Natural gas	technically pure	+		+		
Nickel chloride		+	+	+	+	
Nickel nitrate		+	+	+	+	
Nicotine		+	+			
Nicotinic acid	< = 10%	+		+		
Nitro - propanol		+	+	+	+	
Nitrobenzene		+	/	+	+	
Nitrocellulose		+		+		
Nitrotoluene		+	/	+	/	
Nonialcohol		+	+	+		
Normal benzene DIN 51635		+	/	/	-	
Nut oil		+	/	+	+	
Octyl Creoslate	technically pure	/	-	/	-	
Oil for combustion engines		+	+bis/	+	/	
Oil for machinery		+	/	+	/	-
Oil for spindles		+bis/	/	+	-	
Oil for two-stroke engines		+	/	+		
Oil of turpentine	technically pure	+bis/	/	-		
Oleic acid		+	/	+	/	-
Oleo	indistinct	-		-		
Olive oil		+	+	+	+	+
Optical bleach		+	+	+	+	
Orange juice		+	+	+	+	
Oxygen		+	+	+	+	
Ozone	50 pphm	/	-	+	/	
Palm oil		+		+		
Palmitic acid		+	+	+	+	
Palmitilalcohol		+	+	+	+	
Paraffin - Emulsion	current use	+	/	+	+	
Paraffin oil		+	+	+	/	-
Paraformaldehyde		+	+	+		
Peanut oil	technically pure	+		+	+	
Pentanol		+		+		
Perchlorethelene		/	-	/	-	
Petroleum ether		+	/	+	/	
Petroleum		+	/	/		
Phenol resin		+	+	+	+	
Phenol		+	+V	+	+V	
Phenyl ethyl acetate		+	+	+		
Phenyl hydrazine	technically pure	/	/bis-	/		
Phenyl sulphonate		+	+	+	+	
Phenylhydrazinehydrochloride		+	-	+		
Phosphorus oxychloride		+	/	+	/	
Phosphorus pentoxyde	100%	+	+	+		
Phosphorus trichloride		+	/	+		
Photograph developer		+V	+V	+V	+V	
Phthalate acid dibutyl ester	technically pure	+	/	+	/	
Phthalate acid ester		+	+bis/	+	+	
Phthalate acid	50%	+	+	+	+	
Phthalate hexidietyl		+	/	+	/	
Pine essence		+		+	+	
Pine oil		+		+	+	
Pineapple juice		+	+	+	+	
Piridine		+	/	/	/	
Poliglycol		+	+	+	+	
Polyacrylic acid		+	+			
Polyester acid		/	-	/		
Polyester laminator		+	+bis/	+		



Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Polysolvan O		+	+			
Potassium nitrate	indistinct	+	+	+	+	
Potassium permanganate		+	+	+		
Propargyl alcohol	indistinct	+	+	+	+	
Propionic acid	100%	+	+	+	+	
Propylene dichloride		-	-			
Propylene glycol		+	+	+	+	
Propylenoxide		+	+			
Prussic acid		+	+	+	+	
Pseudocumol		/	/			
Quinine		+	+	+	+	
Residual gas with sulfuric acid	indistinct	+	+	+	+	
Residual gas, carboniferous dioxide	indistinct	+	+	+	+	
Residual gas, carboniferous monoxide	indistinct	+	+	+	+	
Residual gas, carbonipheric acid	indistinct	+		+	+	
Residual gas, with fluoramine	Traces	+	+			
Residual gas, with hydrochloride acid (humid)	indistinct	+	+	+	+	
Residual gas, with nitrose	Traces	+	+			
Residual gas, with sulfur trioxide	Traces	-		-		
Residual gas, with sulfurile	low	+	+	+	+	
Residual gases, dry	indistinct	+	+	+	+	
Resin oil	indistinct	+	+	+	+	
Sagrotan	25%	+	/	+	/	
Salicylic acid	indistinct	+	+	+	+	
Scented acid	50%	+	+	+	+	
Sea water		+	+	+	+	+
Shoe polish		+	+	+	+	
Silicone - emulsion	current use	+	+	+	+	
Silicone oil	technically pure	+	+	+	+	+
Silver nitrate		+	+	+	+	
Soda leach	saturated	+	+	+	+	+
Sodium borate		+	+	+	+	
Sodium bromide		+	+	+	+	
Sodium chromate		+	+	+	+	
Sodium cyanide		+	+	+	+	
Sodium dichromate		+	+	+	+	
Sodium dodecylbenzoatosulfur		+	+	+	+	
Sodium ferricyanide		+	+	+	+	
Sodium fluoride		+	+	+	+	
Sodium hexacyanide (II)		+	+	+	+	
Sodium hydroxide, solid		+	+	+	+	
Sodium hydroxyl		+	+	+	+	
Soft soap		+	+	+	+	
Solid toilet solution		+	+	+	+	
Solvent gasoline	technically pure	+	/	/	-	
Soy oil		+	+	+	/	
Spot-remover		+bis/	/			
Stearic acid		+	/	+	/	
Sulfate aluminum sodium		+	+	+	+	
Sulfate aqueous solution	indistinct	+	+	+	+	
Sulfate iron ammonia	saturated	+	+	+	+	
Sulfur chloride	technically pure	-		-		
Sulfur ether		+bis/	/*	/		
Sulfur trioxide		-		-		
Sulfur		+	+	+	+	+
Sulfuric chromic acid		-		-		
Sulfurile chloride		-		-		
Sulfurous acid		+	+	+	+	
Sweet syrup		+	+	+	+	+
Tanning extract, vegetal	current use	+		+	/	
Tar oil		+V	/ V	+V		
Tar		+	/ V	+	/ V	
Tetrabromemethane		/bis-	-	/bis-		
Tetrachlorinemethane	technically pure	/	-	-		
Tetrachlorinethane		/bis-	-	/	-	
Tetrachlorinethylene		/bis-	-	/	-	

Material	Concentration	Temp. of PE		Temp. of PP		
		20°C	60°C	20°C	60°C	100°C
Tetractilendiamine acid		+	+	+	+	
Tetrahydrofurane	technically pure	/bis-	-	/	-	
Tetrahydronaphtalene (Tetralin)	technically pure	+	-	-	-	
Thinner		+	/	+	/	
Thioglycolic acid		+	+	+	+	
Thionyl chloride		-	-	-	-	
Thiophene		/	-	/	-	
Tincture of iodine, DAB 6	current use	+	/ V	+		
Tincture		+	+	+	+	
Toluic acid	saturated	/				
Toluol	technically pure	/	-	/	-	
Tomato juice		+	+	+	+	
Transformers oil	technically pure	+	/	+	/	
Tributylphosphate		+	+	+	+	
Trichlorethylene phosphate		+	+	+		
Trichloroacetic acid	technically pure	+	/bis-	+		
Trichloroacetaldehyde	technically pure	+	+	+	+	
Trichlorobenzene		-	-			
Trichloroethylene	technically pure	+bis/	-	/	/	
Tricreil - phosphate		+	+	+	/	
Trietanolamine	saturated	+	+V	+	+V	
Trietilenglicol		+	+	+	+	
Trilon		+	+			
Trimethylborate		+	/bis-			
Trioctylphosphate		+	/	+		
Triolhexane		+	+	+	+	+
Trisodium phosphate		+	+	+	+	
Tutogen U		+	+	+	+	
Tween 20 and 80		+	-	+	+	
Uric acid		+	+	+	+	
Urine		+	+	+	+	
Varnish	high	+	+bis/			
Vaseline oil	technically pure	+bis/	/	+	/	-
Vaseline	technically pure	+bis/	/	+	/	
Vegetable and animal oil		+	+bis/	+	+bis/	
Vinegar (wine vinegar)	current use	+	+	+	+	
Vinilidenchloride	technically pure	-	-	-	-	
Vinyl acetate		+	+	+	/	
Viscose solution		+	+	+	+	
Viscosifiers		+	+	+	+	
Vitamin C		+		+		
Vitamin pharmaceutical preparation, dry		+		+		
Water glass		+	+	+	+	
Water vapor		+	+	+	+	
Wax alcohol		/	/	/	-	
Wax		+	+bis/	+	+bis/	
Whale sperm		+	/	+		
Whisky		+		+		
Whitening leach with 12.5% active chlorine		/	-	/	/	-
Wine vinegar	current use	+	+	+	+	
Wine		+		+	+	
Xylol		/	-	-		
Yeast		+	+	+		
Zinc carbonate		+	+	+	+	
Zinc chloride		+	+	+	+	+
Zinc fat		+	+	+	+	
Zinc oxide		+	+	+	+	
Zinc stearate		+	+	+	+	+





### 3.6 Definitions for the standardized design of IPS 4 x 4 pipes

**Service pressure:** The maximum pressure a pipe intended for fluid conduction can stand in continuous service.

**Nominal Pressure (NP):** Alphanumeric designation related to the mechanical properties of a piping system components. It is used with referential purposes and its denomination is ISO 161-1:1996 standardized.

**Safety Coefficient (C):** Specified according to the material and the application area. IPS applies DIN 8077:99 service conditions. IPS applies in the manufacturing of its system.

**SDR (Relación Dimensional Standard or in English, Standard Dimensional Relation):** The value that links the pipe's dimensions and is obtained from the quotient's calculation between the pipe's external diameter and its thickness.

$$SDR = \frac{\text{ext D}}{\text{Thickness}}$$

**Series (S):** Adimensional number used to name the different types of pipes. This is done pursuant to ISO 4065:1996 Norm.

$$S = \frac{SDR - 1}{2}$$

■ Comparison between Series (S) and Nominal Pressure (PN) DIN 8077:1999 Norm.

NP	SDR	S
6	17,6	8,3
10	11	5
16	7,4	3,2
20	6	2,5
25	5	2

■ Nominal and continuous service pressure for 50 years.

IPS product	Service pressure and working temperature	Maximum resistance at pressure	NP	S
IPS Thread Fittings	18.6 Kgf/cm <sup>2</sup> at 20°C	120 Kgf/cm <sup>2</sup>	16	3,2
IPS Thread	11,7 Kgf/cm <sup>2</sup> at 20°C	100 Kgf/cm <sup>2</sup>	10	5
4x4 Plus	11,7 Kgf/cm <sup>2</sup> at 20°C	100 Kgf/cm <sup>2</sup>	10	5

### 3.7 Table of pressures and temperatures over time

■ Work pressures for homopolymer pipes. According to DIN 8077: 1999-07 Norm

Temperature °C	Years of use	8.3	5.0	3.2	2.5
		Nominal Pressure (NP)			
		6.0	10	16	20
		Standard Dimension Ratio (SDR)			
		17.6	11	7.4	6.0
Acceptable work pressure - Safety coefficient 1.7					
10	1	10.2	17.0	27.0	34.0
	5	9.4	15.6	24.7	31.1
	10	9.0	15.0	23.8	30.0
	25	8.6	14.3	22.7	28.6
	50	8.3	13.7	21.8	27.4
	100	8.0	13.3	21.0	26.5
20	1	8.8	14.7	23.3	29.3
	5	8.0	13.4	21.2	26.7
	10	7.8	12.9	20.5	25.8
	25	7.3	12.2	19.3	24.4
	50	7.1	11.7	18.6	23.4
	100	6.8	11.3	17.9	22.5
30	1	7.6	12.6	19.9	25.1
	5	6.8	11.4	18.0	22.7
	10	6.6	10.9	17.3	21.8
	25	6.2	10.3	16.4	20.6
	50	5.9	9.9	15.6	19.7
	100	5.7	9.5	15.1	19.0
40	1	6.4	10.7	16.9	21.3
	5	5.8	9.6	15.3	19.2
	10	5.5	9.2	14.5	18.3
	25	5.2	8.7	13.8	17.3
	50	4.9	8.2	13.0	16.4
	100	4.7	7.9	12.5	15.7
50	1	5.4	8.9	14.1	17.8
	5	4.8	8.0	12.6	15.9
	10	4.6	7.6	12.1	15.2
	25	4.3	7.2	11.3	14.3
	50	4.1	6.8	10.8	13.6
	100	3.9	6.5	10.2	12.9
60	1	4.4	7.4	11.7	14.8
	5	4.0	6.6	10.4	13.1
	10	3.8	6.3	10.0	12.6
	25	3.5	5.9	9.3	11.7
	50	3.3	5.5	8.7	11.0
70	1	3.6	6.0	9.5	11.9
	5	3.2	5.3	8.4	10.5
	10	3.0	5.0	8.0	10.1
	25	2.5	4.1	6.5	8.2
	50	2.1	3.5	5.6	7.0
80	1	2.9	4.8	7.6	9.6
	5	2.5	4.1	6.5	8.2
	10	2.0	3.4	5.4	6.8
	25	1.6	2.7	4.3	5.4
95	1	2.0	3.4	5.4	6.8
	5	1.3	2.2	3.5	4.4
	10	1.1	1.9	3.0	3.7

PN is expressed in 0,1 Mpa (kgf/cm<sup>2</sup>)

**NOTE:** All data is reliable with regards to updated regulation.

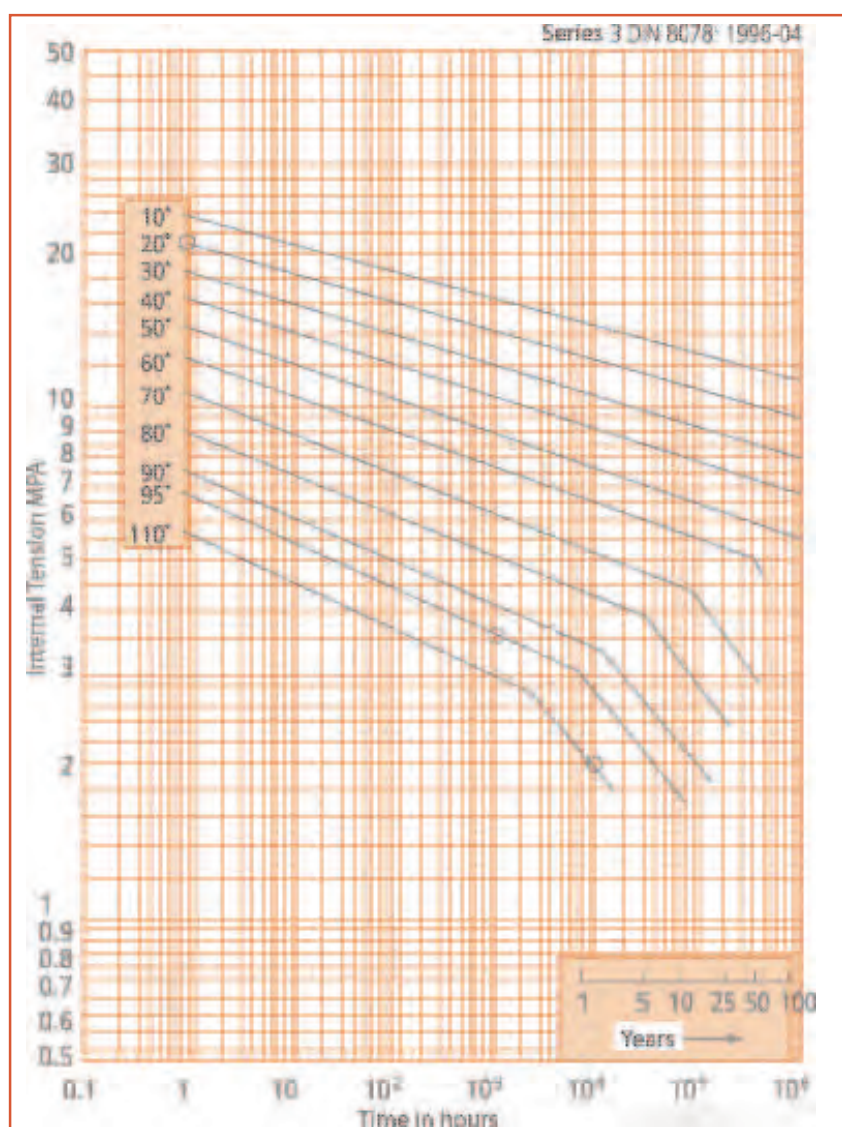
■ Calculation done by extrapolation in the regression curve according to DIN 8078

Temperature °C	Years of use	NP 6	NP 10
		Acceptable work pressure Security coefficient 1.7	
80 °C	50	1.44	2.41
90 °C	50	0.98	1.63

NP is expressed in 0,1 Mpa (kgf/cm<sup>2</sup>)

**NOTE:** All data is reliable with regards to updated regulation.

■ Pressure of constant use during 50 years





## Products of IPS Thread System





### 4. IPS Thread System Products

#### 4.1 Pipes

##### ■ IPS 4x4



*It is a PP-H pipe of four layers produced by our exclusive coextrusion system, through which we concentrate the properties provided by the additives where they are really needed.*

- *The white internal layer has the antioxidant additive to avoid the pipe's premature aging and extend its useful life at high temperatures.*
- *The red layer is of high molecular weight, providing excellent mechanical properties: impact, traction, threading firmness.*
- *The white layer is a material of greater fluency allowing the thread engraving in the third layer.*
- *The external brown layer has a high concentration of additives that protect the degradation effect produced by UV rays.*

##### ■ IPS 4x4 PLUS



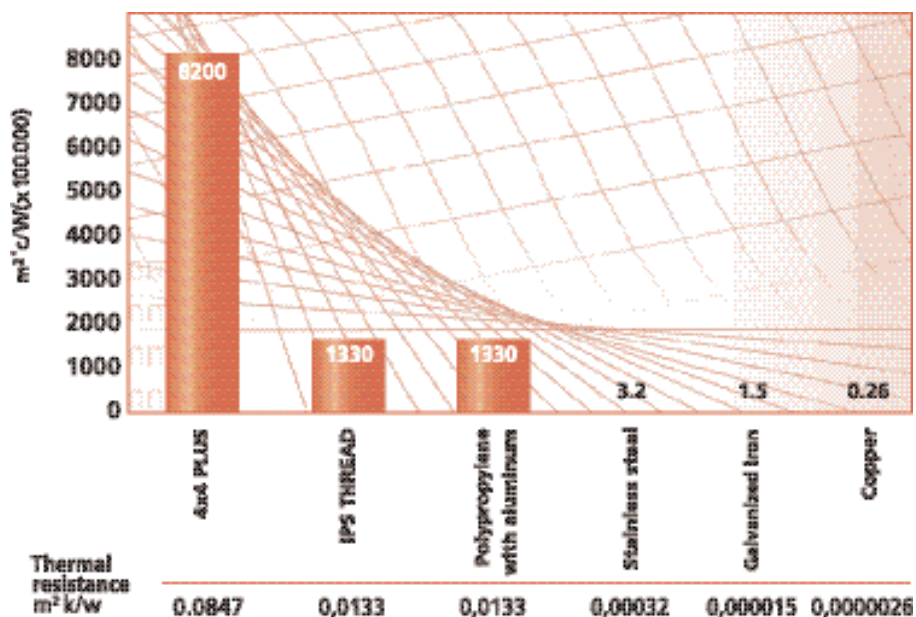
*Due to its constant innovation, IPS has designed this pipe for radiator and hot-water heating installation: it is the same four-layer PP-H pipe, with the extrusion of thermoplastic foam of closed cells as an external coating. This external foam coating enhances the pipe's thermal properties and provides important protection against mechanical wear.*

#### **Main advantages**

##### • **Excellent thermal insulation**

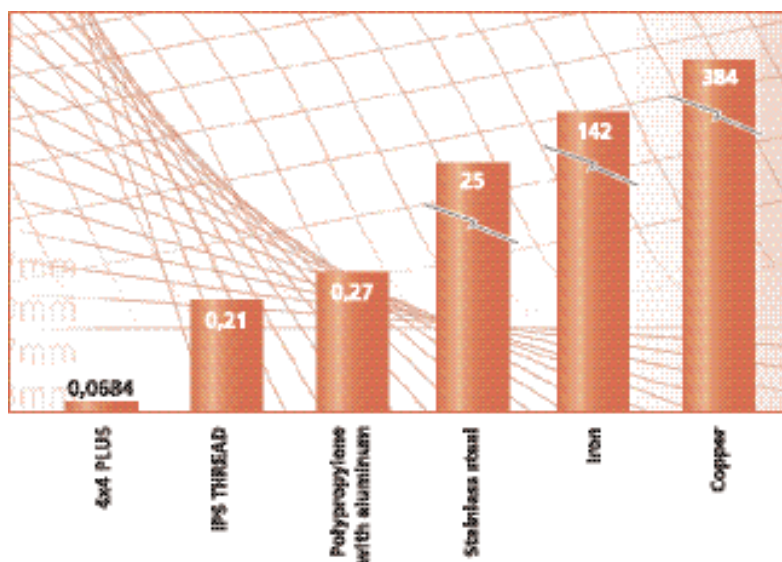
*4x4 PLUS has a thermal resistance 30.000 times superior to copper and between 5 and 6 times superior to other polypropylene pipes with no insulation, thus reducing to a minimum the heat loss of the transported fluid.*

- **Thermal resistance of different piping of ½"**



*It is possible to achieve important gas, electricity, water and time savings thanks to this insulation since the piping acts as a thermos in itself, allowing it to rapidly reach the desired temperature.*

- **Thermal conductivity ( $\lambda=W/mk$ ) of different piping**



- **Higher resistance to impact**

*4X4 PLUS' thermoplastic foam coating constitutes an effective cushion and protective barrier against impact, effectively protecting the pipes from bad handling or damage during transportation or installation. This not only reduces material waste but also repairing time.*

- **Better behavior at extreme temperatures**

The range between low and high temperatures is extended.

- **Acoustic insulation**

4x4 PLUS considerably reduces the noises caused by "water hammer" vibration and turbulent flows, negating any possible vibrations.

- **Lack of condensation**

Thermal insulation prevents the condensation of humidity on the pipe's surface and consequently stops water from spreading towards the wall's exterior.

Because of its manufacturing system, there are no gaps between thermoplastic foam and the pipe, preventing any possible condensation.

- **Easy installation**

4x4 PLUS' thermoplastic foam coating avoids the need to cover the piping, allowing free dilation. In addition, offers the higher thermal resistance with the smallest external diameter in the market, avoiding the need for large gutters.

### 4.2 Fittings

IPS injected fittings have the highest technical development level in the country. They are developed for a NP of 16 Kg/cm<sup>2</sup> with smaller dimensions, an advantage to both installation and performance.

Also, IPS produces an extensive selection of exclusively developed fittings with hardened metal inserts manufactured with a copper alloy covered in nickel, allowing union compatibility with any other piping system, either of devices or metallic piping.

### 4.3 Accessories

#### IPSOLAR Strip

This is placed strip that protects piping and fittings from sun exposure.

The protection material is Anti UV laminated aluminum. It is placed helicoidally, covering with each turn the end of the prior turn, with a superposition of no less than 5mm at a 60° angle, which increases along with the pipe's diameter. If its use is exposed, it can be applied following the pipe's direction. After applying, the covered sections must be pressed by hand to avoid air bubbles.



Pipe diameter	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Strip yield in m	4,5	4	3	2,5	2	1,5	1	0,5



#### ■ IPSOBAND Strip

Self-adhesive strip that protects piping and fittings from sun exposure or low temperatures. It provides thermo-acoustic insulation due to its closed cell thermoplastic foam coating.

**UV Protection:** Laminated aluminum

**Thermo-acoustic insulation:** Foam with approximately 2mm of thickness.

**Insulation index:** 0,09 Kcal/hm°C

It must be installed in a helicoidal manner without any gaps, superposing layers by no less than 5mm at a 60° angle, which increases along with the pipe's diameter. Once applied, the adhesive sticks over time.



Pipe's diameter	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"
Strip yield in m	4	3,5	3	2,5	2	1,5	1	0,5

#### ■ Clamps

They are manufactured with an incorporated wall plug. It is sold with the corresponding screw. The curved support follows the curve of the pipe. The width of its body, as well as the use of titanium dioxide greatly extends its outdoor life. It is rust-proof and enables the attachment of the pipe to the wall. Diameters of 1/2" to 1 1/2".



#### ■ IPS Plus Sealant

It is applied to threaded fittings of pipes and fittings and their combination with metallic threads, both in threaded systems or joints with sanitary devices. The exclusive PLUS formula includes hemp fibers that provide external elasticity, it is non-degradable and it safely covers the space in the threads. It has an excellent resistance to boiling water. It handles pressures of up to 60 Kg/cm<sup>2</sup>.

This sealant should be exclusively used (with no sealing strip) for fittings up to 1".

It is recommended to add hemp fibers to the sealing paste for bigger sizes.



#### Approximate yield of a 125 cm<sup>3</sup> bottle

Diameter	Amount of Joints per Bottle
1/2"	356
3/4"	128
1"	64
1 1/4"	51
1 1/2"	42
2"	32
2 1/2"	17

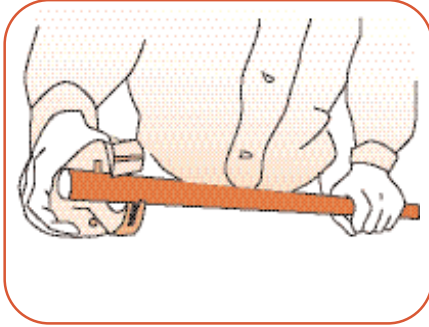


## *Installation*



## 5. Installation

### 5.1 IPS Thread System Process



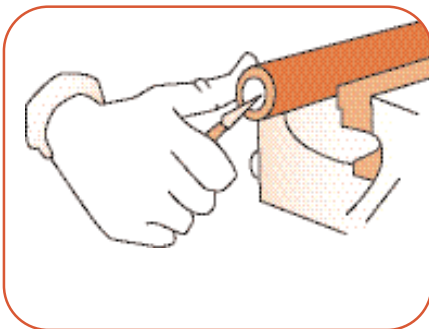
**1-** Measure the necessary length of the pipe's section to be used. When measuring, it is important to bear in mind the thread's length for each measure and in both ends of the pipe.

**2-** Make a 90° cut up to 1" on the IPS Thread pipe using the appropriate pipe cutter.

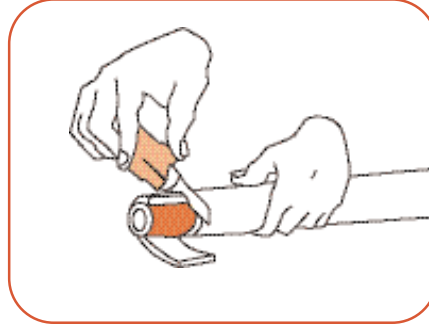
**3-** For sizes above 1" use a bow saw, for which you must secure the pipe near the cutting area.

**4-** For large sizes where the blade may bend, we recommend to rotate the pipe while making the cut.

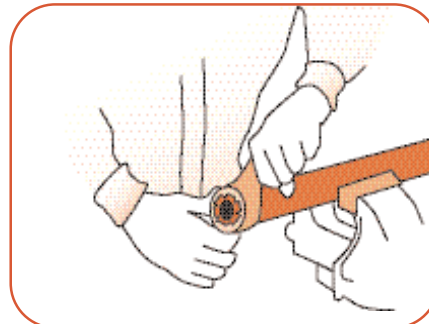
**5-** In both cases, the cut must be straight and perpendicular.



**6-** Make sure no burs or shavings remain.



**7-** If IPS 4X4 PLUS pipes are used, remove with a cutter a portion of the outer foam insulation layer corresponding to the thread's length and the threading machine guide's length and strip it off.



**8-** Tightly grab the pipe from a point near the end of the pipe to be threaded.

**9-** Use IPS's threading machine to thread the pipe, place the guide leaving the cutting dye over the pipe's end.

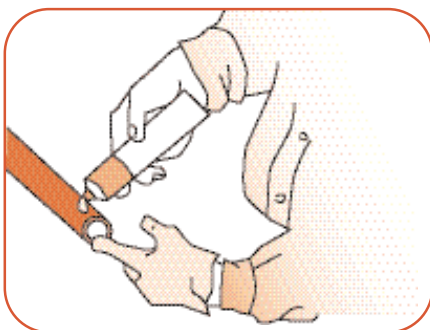
Gently pressure it by hand so the tool fits over the 4X4 pipe cover and make the first turn with one hand, the following ones with both hands.

**10-** After the first turns, an anticlockwise turn can be done so as to cut the shavings. Then keep turning clockwise.

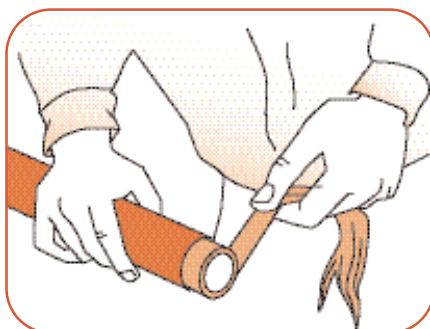
**11-** Bear in mind that the thread length should not exceed the length of the threading machine dye.

**12-** Once it has reached the limit, make a quick turn clockwise and anticlockwise to cut the shavings and easily remove the tool. Remember to remove the shavings before making the anticlockwise turn.

**13-** Make sure no burs or shavings remain on the pipe, cleaning it with a cutter.



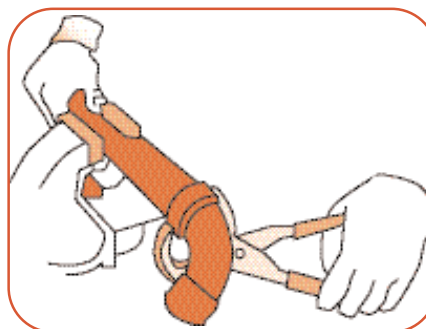
**14-** Remove any dust or grease from the surface to be threaded, place the pipe in the grabbing tool and spread IPS PLUS Sealant over the male thread following the thread direction and completely covering the recesses. Any excess will be gently swept away when threading the female fitting.



**15-** We recommend you use hemp fibers only for fittings over 1", for which we will place the fibers over the IPS PLUS Sealant, not exceeding the thread valleys and we then apply another layer of sealant, over the fibers.



**16-** Screw the fitting into the pipe up to the thread's limit.



**17-** For larger sizes, use a Stylson tool or similar.

**18-** If IPS PLUS 4X4 pipes were used, place the cover that had been kept away after you have made a new cut. Eliminate the piece corresponding to the thread.

## 5.2 Concealed piping

To mount a concealed installation with IPS-Thread, it is recommended to leave a gap for any piping movements due to expansion and contraction of the installation. For this we recommend to wrap the installation with paper and leave a gap for any movements in the changes of direction.

When mounting a concealed IPS-Thread installation, the thickness of the wall where the fitting will be placed must be taken into consideration. If the wall is wide enough for the fitting, this can be done with minimum plastering equal to the diameter of the piping to be concealed, without the need of a strong mixture or coating.

If the wall is thin, the increase in the height of the gutter must be taken into account in order to adequately separate the hot and cold water pipes. This gap must be equal to the diameter of the piping to be concealed and the coating must be strong enough to fit both pipes.

## 5.3 Exposed piping

Table of recommended distances between clamps in exposed horizontal stretches (expressed in cm, flexion less than 2 ‰) for different WORKING TEMPERATURES (temperature in °C).

∅	0°	20°	40°	60°	80°	100°
½"	66	61	57	54	49	43
¾"	74	69	63	60	55	49
1"	87	81	75	71	63	57
1 ¼"	97	90	84	80	71	64
1 ½"	105	97	90	86	78	69
2"	119	111	103	98	88	79
2 ½"	135	125	116	111	100	90
3"	150	140	130	125	115	100
4"	172	153	148	140	126	113

To place an exposed IPS-Thread installation, it is necessary to stiffen the derivation knots, placing a fixed clamp under the Ts derivation.

In vertical runs, it is suggested that the distance between fixed points does not exceed three meters. Place a mobile point in between two fixed points. Remember that fixed clamps must hold the piping without damaging it (use IPS clamps, designed for that purpose).



\*\*\*\*\*



## 6. Calculation

### 6.1 Piping dilation

■ Lineal dilation formula for IPS hot water piping.

$$\Delta l = a \Delta t \times L$$

$\Delta l$  Longitudinal variation between two fixed points (mm).

$a$  Lineal dilation coefficient IPS: 0.11 mm/m°C.

$\Delta t$  Temperature difference between:  
Room temperature on piping installation day and  
normal working temperature (°C).

$L$  Length of the piping between two fixed points (m).

■ Lineal dilation table for IPS-Thread System piping

$\Delta t$	10°C	20°C	30°C	40°C	50°C	60°C	70°C	80°C	90°C	100°C
$L$										
0,1m	0,1	0,2	0,3	0,4	0,6	0,7	0,8	0,9	1,0	1,1
0,2m	0,2	0,4	0,7	0,9	1,1	1,3	1,5	1,8	2,0	2,2
0,3m	0,3	0,7	1,0	1,3	1,7	2,0	2,3	2,6	3,0	3,3
0,4m	0,4	0,9	1,3	1,8	2,2	2,6	3,1	3,5	4,0	4,4
0,5m	0,6	1,1	1,7	2,2	2,8	3,3	3,9	4,4	5,0	5,5
0,6m	0,7	1,3	2,0	2,6	3,3	4,0	4,6	5,3	5,9	6,6
0,7m	0,8	1,5	2,3	3,1	4,2	4,6	5,4	6,2	6,9	7,7
0,8m	0,9	1,8	2,6	3,5	4,4	5,3	6,2	7,0	7,9	8,8
0,9m	1,0	2,0	3,0	4	5,0	5,9	6,9	7,9	8,9	9,9
1m	1,1	2,2	3,3	4,4	5,5	6,6	7,7	8,8	9,9	11,0
2m	2,2	4,4	6,6	8,8	11,0	13,2	15,4	17,6	19,8	22,2
3m	3,3	6,6	9,9	13,2	16,5	19,8	23,1	26,4	29,7	33,0
4m	4,4	8,8	13,2	17,6	22,0	26,4	30,8	35,2	39,6	44,0
5m	5,5	11,0	16,5	22,0	27,5	33,0	38,5	44,0	49,5	55,0
6m	6,6	15,5	19,8	26,4	33,0	39,6	46,2	52,8	59,4	66,0



## 6.2 Advisable speeds depending on pressure

Table A

m.c.a.	Pressure kg/cm <sup>2</sup>	Speed m/s
01 to 05	up to 0,5	0,50 to 0,60
05 to 10	0,5 to 1	0,60 to 1,00
10 to 20	1 to 2	1,00 to 1,50
20 or above	2 or above	1,50 or above

## 6.3 Loss of head and diameter verification for IPS-Thread System piping

- The loss of head indicates the loss of pressure of a piping installation design due to friction and direction changes.

### Factors that increase load loss:

- Very reduced internal layout.
- Large extension installation layout design.
- Pipes with rough internal walls, incrustations or scale.
- Sudden direction changes.
- Sudden diameter reductions.

### Total load loss calculations in an installation

The following formulas and tables apply to all IPS polypropylene pipes, regardless of the union system used, whether they are coated or not.

### To calculate the piping's total loss of head the following must be added:

1. Amount of meters of installed piping, differentiating the various diameters.  
(Example: 20 m of ½", 12 m of ¾" and 5 m of 1").
2. Add to each piping size stretch the equivalent in meters of the installation localized resistances of each similar size, as direction changes and reductions (calculated according to table B and C).
3. Establish loss of head per diameter according to the table D nomogram.
4. Add the obtained values = Total loss of head.

Table B

**Diameter reductions**

a / de	¾"	1"	1 ¼"	1 ½"	2"	2 ½"
½"	0,10m	0,18m	0,21m	0,24m	0,31m	0,32m
¾"		0,12m	0,2m	0,25m	0,30m	0,32m
1"			0,17m	0,23m	0,26m	0,28m
1 ¼"				0,22m	0,24m	0,25m
1 ½"					0,19m	0,20m
2"						0,18m

Table C

**Direction changes**

The values resulting from tables are approximate and they are expressed in equivalent longitudinal meters in one pipe.

	½"	¾"	1"	1 ¼"	1 ½"	2"	2 ½"
<b>90° elbow</b>	0,4m	0,5m	0,6m	0,8m	1,0m	1,2m	1,4m
<b>45° elbow</b>	0,2m	0,2m	0,3m	0,4m	0,5m	0,7m	0,9m
<b>90° elbow</b>	0,2m	0,3m	0,3m	0,4m	0,4m	0,5m	0,6m
<b>90° T direct link</b>	0,2m	0,3m	0,3m	0,4m	0,5m	0,7m	0,9m
<b>90° T lateral exit</b>	0,5m	0,6m	0,7m	0,9m	1,2m	1,5m	1,7m
<b>90° T bilateral exit</b>	0,4m	0,5m	0,7m	0,8m	1,0m	1,3m	1,6m

Table D

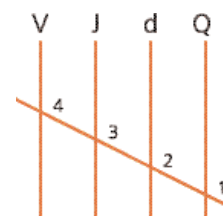
### Nomogram guide to the load loss nomogram and diameter verification

#### Load loss calculation for localized resistance.

<b>J</b>	Load loss mm.c.a. per meter of piping length.
<b>Q</b>	Desired flow (l/s).
<b>L</b>	Piping length (m).
<b>d</b>	Pipe's inner diameter (mm).
<b>V</b>	Speed (m/s).

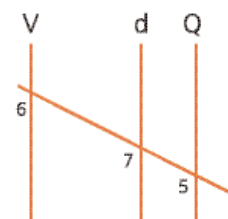
#### a) Load loss

1. Place in the first Q scale the estimated flow. Point 1.
2. Determine the pipe's inner diameter. Point 2.
3. Join both points with a ruler. This line intersects J and V.
4. Establish the load loss in mm.c.a. per ml. of piping in J. Point 3.
5. Verify the speed, Point 4, according to Table A.



#### b) Diameter verification

1. Do not consider line J.
2. With flow Q, establish Point 5.
3. Consider the desired speed, according to Table A.
4. Join 5 and 6 with a straight line.
5. Determine point 7, check the diameter.



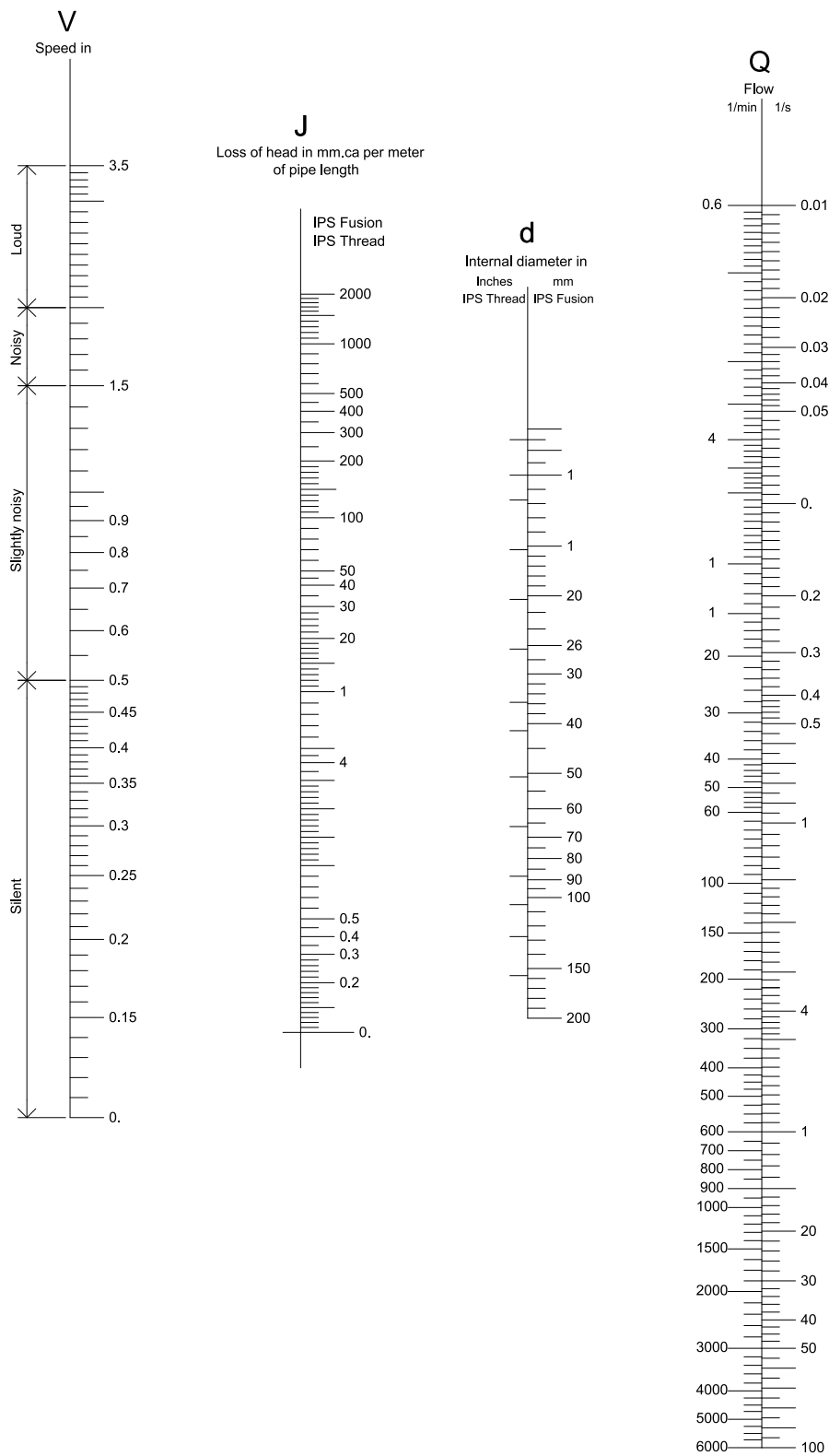
#### ADVICE:

In the event of minimal flows, the section will have to be increased by one diameter in the following cases:

- In horizontal stretches, every 24 meters of installation.
- In columns, in stretches from 20 to 25 meters.

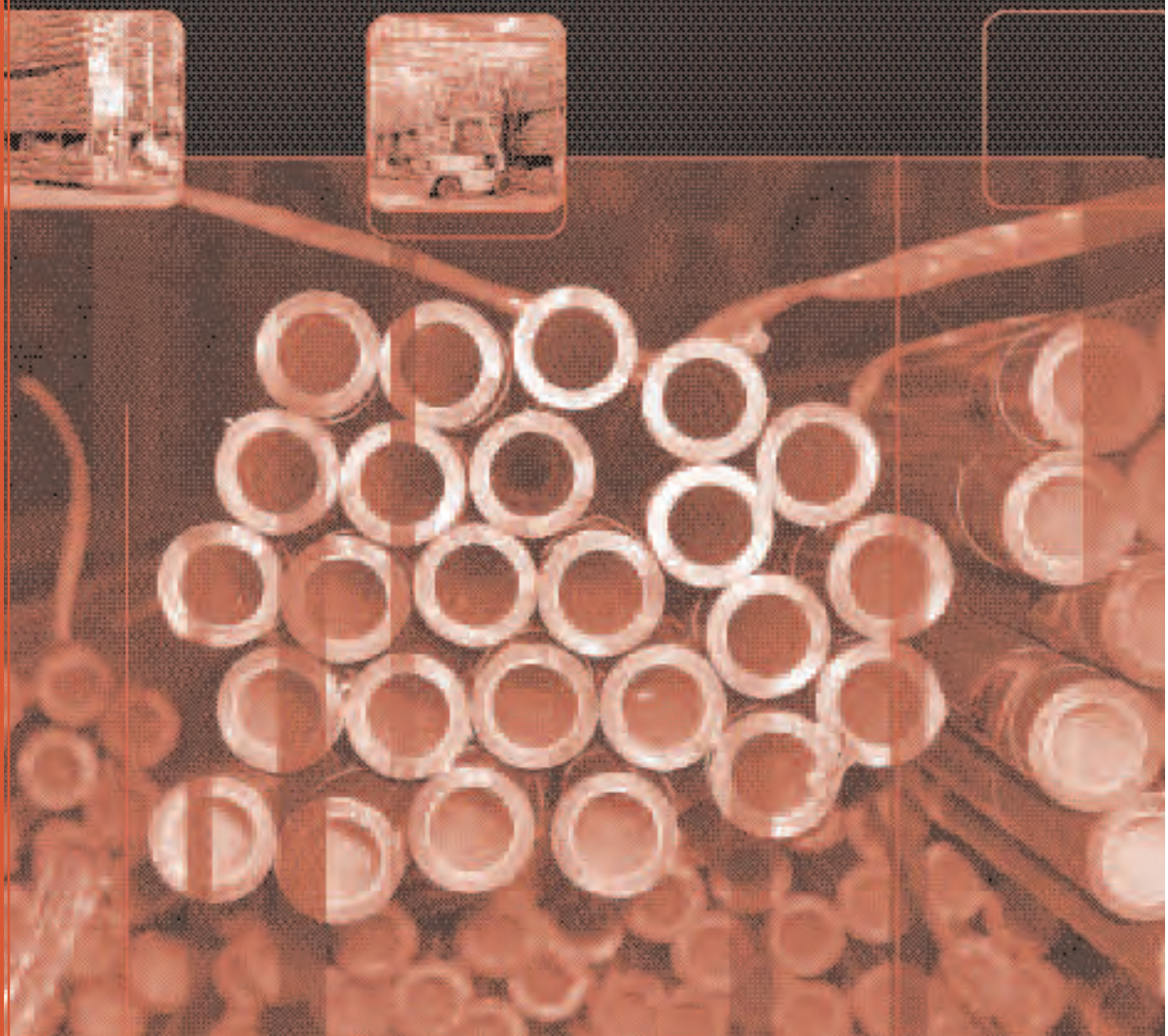


## Loss of head and diameter verification nomogram





## Recommendations





## **7. Recommendations**

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**1** - We recommend to use a cloth soaked in turpentine to wash your hands after using IPS PLUS Sealant.

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**2** - Verify if the threading machine is clean. You can add a drop of oil or Vaseline for a better turn when threading.

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**3** - The correct thread measure is up to the limit of the metallic dye, an excessive length may produce water leaks.

---

**4** - Do not use pressure tools to force the threads with sizes from ½" up to 1". Remember that a thread with undue pressure may have unscrewing problems over time.

---

**5** - In the event of water leaks, solve the problem with a better use of the recommended tools, not by over tightening the threads.

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**6** - We recommend to leave the IPS-Thread installation for 2 hours at 20° C before putting any pressure on it. This way, the sealant will have time to dry.

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**7** - Never use Teflón R with sealant.

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## *IPS Thread System Components*







#### IPS 4X4 PLUS

##### Isolamento compacto

(Apto rosca ou fusão  
c/ conexão fusão  
em polegadas)

	1/2"	3/4"	1"
Nº Artigo	2721	2722	2723
M. x faixa	6 mts / faixa		
Espessura da parede em mm	6,9	7,4	8,4
Normas			



#### IPS 4X4

##### Máxima resistência

Quádruplo camada  
Água quente

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"	3"	4"
Nº Artigo	2701	2702	2703	2704	2705	2706	2707	2708	2709
M. x faixa	6 mts / faixa								
Espessura da parede em mm	3,4mm	3,9mm	4,9mm	5mm	6,3mm	7,5mm	9mm	10,3mm	12,7mm
Normas									



#### Cotovelo 90°

HH  
MCU

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
Nº Artigo	301	302	303	304	305	306	307
L. x Bolsão	750	450	180	42	30	24	18
L. x bolso	50	30	12	7	5	4	3
Normas	+	+	+	+	+	+	+



#### Cotovelo 90°

MH  
MCUMH

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Nº Artigo	321	322	323	324	325	326
L. x Bolsão	900	525	255	60	48	24
L. x bolso	60	35	17	10	8	4
Normas	+	+	+	+	+	+



#### Cotovelo 45°

HH  
MCA

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Nº Artigo	331	332	333	334	335	336
L. x Bolsão	360	180	108	60	30	24
L. x bolso	60	30	18	10	5	4
Normas	+	+	+	+	+	+



#### Curva 90°

HH  
MBU

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Nº Artigo	581	582	583	584	585	586
L. x Bolsão	525	300	150	36	30	18
L. x bolso	35	20	10	6	5	3
Normas	+	+	+	+	+	+




#### Curva 90°

MH  
MBUMH

	1/2"	3/4"	1"
Nº Artigo	571	572	573
L. x Bolsão	210	120	60
L. x bolso	35	20	10
Normas	+	+	+






Peca de ligação

MM

MSCB

Nº Artigo	811	812	813
U. x Bolsão	60	48	30
U. x bolso	10	8	5
Normas	✦	✦	✦




Te 90°

HHH

MTU

Nº Artigo	351	352	353	354	355	356	357
U. x Bolsão	450	225	150	36	24	18	12
U. x bolso	30	15	10	6	4	3	2
Normas	✦	✦	✦	✦	✦	✦	✦




Cruzeta

HHHH

MCZ

Nº Artigo	351	352	353	354	355	356
U. x Bolsão	120	72	60	36	24	12
U. x bolso	20	12	10	6	4	2
Normas	✦	✦	✦	✦	✦	✦




Tampão

H

MTH

Nº Artigo	511	512	513	514	515	516
U. x Bolsão	900	420	240	120	96	60
U. x bolso	150	70	40	20	16	10
Normas	✦	✦	✦	✦	✦	✦




Tampão

M

MTM

Nº Artigo	501	502	503	504	505	506	507
U. x Bolsão	1080	600	360	240	180	90	48
U. x bolso	180	100	60	40	30	15	8
Normas	✦	✦	✦	✦	✦	✦	✦




União dupla

HH

MUD

Nº Artigo	341	342	343	344	345	346	347
U. x Bolsão	600	360	150	30	18	12	12
U. x bolso	40	24	10	5	3	2	2
Normas	✦	✦	✦	✦	✦	✦	✦




União dupla

MH

MUDMH


Nº Artigo	911	912	913
U. x Bolsão	150	120	60
U. x bolso	25	20	10
Normas	✦	✦	✦



Adaptador para tanque

MATA

Nº Artigo	381	382	383	384	385	386
U. x Bolsão	90	60	36	30	24	18
U. x bolso	15	10	6	5	4	3
Normas	✦	✦	✦	✦	✦	✦



Flange

H com junta M5J

Nº Artigo	521	522	523	524	525	526
U. x Bolsão	240	210	144	108	90	60
U. x bolso	40	35	24	18	15	10
Normas	✦	✦	✦	✦	✦	✦

**União para tanque**  
**Peças de reposição**  
**JU**

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Nº Artigo	541	542	543	544	545	546
U. x Bolsão	300	300	240	180	180	120
U. x bolso	50	50	40	30	30	20
Normas	*	*	*	*	*	*

**União**  
**HH**  
**MC**

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
Nº Artigo	391	392	393	394	395	396	397
U. x Bolsão	1200	600	375	72	36	24	18
U. x bolso	80	40	25	12	6	4	3
Normas	+	+	+	+	+	+	+

**União**  
**MH**  
**MCMH**

	1/2"	3/4"
Nº Artigo	591	592
U. x Bolsão	180	120
U. x bolso	30	20
Normas	+	+

**União rosca**  
**MM**  
**ME**

	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	2 1/2"
Nº Artigo	411	412	413	414	415	416	417
U. x Bolsão	1500	900	525	156	96	48	36
U. x bolso	100	60	35	26	16	8	6
Normas	+	+	+	+	+	+	+

**Niple**  
**com porca**  
**MM**  
**MN**

	1/2"	5 cm 3/4"	1"	1 1/2"	8 cm 3/4"	1"	
Nº Artigo	451	452	453		461	462	463
U. x Bolsão	480	300	216		360	216	144
U. x bolso	80	50	36		60	36	24
Normas	+	+	+		+	+	+

10 cm							12 cm		15 cm					
1/2"	3/4"	1"	1 1/4"	1 1/2"	2"		1/2"	3/4"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
471	472	473	474	475	476		481	482	491	492	493	494	495	496
360	210	120	90	60	30		240	168	210	120	90	60	30	18
60	35	20	15	10	5		40	28	35	20	15	10	5	3
+	+	+	+	+	+		+	+	+	+	+	+	+	+

**Cotovelo 90°**  
**HH**  
**MCUIH**  
**com inserto metálico**

	1/2"	3/4"	1"	3/4" x 1/2" mH
Nº Artigo	1301	1302	1303	1308
U. x Bolsão	90	72	60	60
U. x bolso	15	12	10	10
Normas	+	+	+	+


**Cotovelo 90°**  
**HH**  
**MCUIH**  
**com inserto metálico**

	1/2"
Nº Artigo	2301
U. x Bolsão	120
U. x bolso	20
Normas	+

**Cotovelo 90°**  
**MH**  
**MCUIH**  
**com inserto metálico**

	3/4"	1"
Nº Artigo	1322	1329
U. x Bolsão	60	60
U. x bolso	10	10
Normas	+	+





Te 90° - IM


HMH

MTUIM

com inserto

metálico

	1/2"	3/4"	1"
N° Artigo	1763	1764	1765
U. x Boição	60	60	60
U. x boiço	10	10	10
Normas	◆	◆	◆



Te 90° - IH


HHH

MTUIH

com inserto

metálico

	1/2"	3/4"	1"	3/4"x1/2" rede
N° Artigo	1361	1362	1364	1368
U. x Boição	60	60	60	60
U. x boiço	10	10	10	10
Normas	◆	◆	◆	◆



Luva


HH

MCIM

com inserto

metálico

	1/2"	3/4"	1"	1/2"x3/8"	3/4"x1/2"	1"x3/4"
N° Artigo	1391	1392	1393	1399	1398	1394
U. x Boição	90	72	48	120	60	48
U. x boiço	15	12	8	20	10	8
Normas	◆	◆	◆	◆	◆	◆



Luva


MH

MCIM

com inserto

metálico

	1/2"	3/4"
N° Artigo	1591	1592
U. x Boição	72	72
U. x boiço	12	12
Normas	◆	◆




Cotovelo 90°

HH

MCU rede

	1/2"x3/8"	3/4"x1/2"	1"x1/2"	1"x3/4"
N° Artigo	311	308	310	309
U. x Boição	150	450	108	90
U. x boiço	25	30	18	15
Normas	◆	◆	◆	◆




Te 90°

HHH

MTU rede

	1/2"x3/4"	3/4"x1/2"	1"x1/2"	1"x3/4"
N° Artigo	372	371	368	373
U. x Boição	120	120	300	120
U. x boiço	20	20	20	12
Normas	◆	◆	◆	◆




Luva

HH

MC rede

	1/2"x3/8"	3/4"x3/8"	3/4"x1/2"	1"x1/2"	1"x3/4"
N° Artigo	390	389	398	400	399
U. x Boição	240	150	240	120	120
U. x boiço	40	25	40	20	20
Normas	◆	◆	◆	◆	◆




Luva

HH

MCMH rede

	1/2"x3/4"
N° Artigo	598
U. x Boição	180
U. x boiço	30
Normas	◆



Unidades rosçadas

HH

ME rede

	3/4"x1/2"	1"x1/2"	1"x3/4"
N° Artigo	418	420	419
U. x Boição	420	270	240
U. x boiço	70	45	40
Normas	◆	◆	◆



**Mancel**  
MH  
MB rede

	1/2"x3/8"	3/4"x3/8"	3/4"x1/4"	3/4"x1/2"	1"x1/2"	1"x3/4"	1 1/4"x1/2"	1 1/4"x3/4"
N° Artigo	421	436	422	428	430	429	438	437
U. x Bolsão	750	180	180	1650	360	360	210	210
U. x bolso	50	30	30	110	60	60	35	35
Normas	◆	◆	◆	◆	◆	◆	◆	◆

1 1/4"x1"	1 1/2"x1/2"	1 1/2"x3/4"	1 1/2"x1"	1 1/2"x1 1/4"	2"x1/2"	2"x3/4"	2"x1"	2"x1 1/4"	2"x1 1/2"	2 1/2"x1 1/2"	2 1/2"x2"
432	441	440	439	433	445	444	443	442	434	447	435
210	180	180	180	180	120	120	120	120	120	36	36
35	30	30	30	30	20	20	20	20	20	6	6
◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆	◆

IPS-Thread Water Valves - With Anti UV and antioxidant additives



**Torneira de  
passagem  
com forma de  
sino cromado**  
HH  
CLLP

	1/2"	3/4"
N° Artigo	771	772
U. x Bolsão	48	30
U. x bolso	8	5
Normas	◆	◆



**Torneira de  
passagem**  
HH  
MLLP

	1/2"	3/4"	1"
N° Artigo	561	562	563
U. x Bolsão	210	150	90
U. x bolso	14	10	6
Normas	◆	◆	◆



**Mini-válvula  
Esférica**  
MM  
MESF

	1/2"	1 1/4"
N° Artigo	1701	1702
U. x Bolsão	-	-
U. x bolso	30	30
Normas	◆	◆



**Tubo flexível  
com válvula**  
BACHIC

N° Artigo	1684
U. x Bolsão	180
U. x bolso	30
Normas	◆

Norms

- ★ IRAM 13470 y 13471  
DIN 8076 y 8078
- IRAM 13472-1 y 13472-2  
DIN 16962
- ◐ IRAM 13472-1 y 13472-2  
DIN 16962  
IRAM 5063  
DIN 2999  
BSPT  
ISO 7/1 Rc
- ◆ IRAM 13472-1 y 13472  
DIN 16962  
IRAM 13478-1 y 13472-2  
IRAM 5063  
DIN 2999  
BSPT  
ISO 7/1 Rc

- ☆ DVS 2208
- ✱ IPS QUALITY NORMS
- ▲ IRAM 13330 y 13346
- ◆ IRAM 13478-1 y 13478-2  
DIN 16962  
IRAM 5063  
DIN 2999  
BSPT  
ISO 7/7 Rc
- ✚ IRAM 13478-1 y 13478-2  
DIN 16962  
IRAM 5063  
DIN 2999  
BSPT  
ISO 7/1 Rc

- ▮ IRAM 13473 y 13479  
DIN 8077 y 8078  
IRAM 5063  
DIN 2999  
BSPT  
ISO 7/1 Rc
- ▼ ASTM D-2609
- ✧ ASTM D-2609  
IRAM 5063  
DIN 2999  
BSPT  
ISO 7/1 Rc
- ❖ IRAM SEAL  
IRAM 13470 y 13471  
DIN 8077 y 8078

