MANARCO

Manarco Pipes Manufacturing Company

PPR

علامة الجودة
SASO
QUALITY MARK

www.almanarplastic.com

INTRODUCTION

Al-Manar Pipes Factory is an ISO Certified company, established in 2003 that develops, manufactures and distribute a wide range of plastic piping systems such as UPVC, CPVC, PE, and PP.R pipes and fittings. With a vision of being a global leader of producing high quality pipes and fittings, it made us one of the most preferred manufacturers and exporters in the region.

Al-Manar Pipes come with various ranges of classes, shapes and sizes to meet all infrastructural needs as our target market consist of diverse lines of businesses. Companies involved in water and sewerage system, energy and power distribution, construction, industrial applications even telecommunications, Al-Manar caters them all.

At Al-Manar, our mission is to improve the quality of life by providing cost-effective solutions for the protection and flow of water and energy, definitely assuring that our products are manufactured in accordance to international quality standards and specifications such as BS, DIN and ASTM standards. In addition, Al-Manar just received the Water Regulations Advisory Scheme (WRAS) certification for our products, which without doubt elevated the company to greater heights, locally and internationally.

المقدمة

أنشئ مصنع أنابيب المنار للصناعات البلاستيكية في عام ٢٠٠٣م لتصنيع المنتجات البلاستيكية على مختلف أنواعها ، ومن أهم منتجاته الأنابيب البلاستيكة UPVC ,CPVC ,HDPE , PPR والتي تحمل العلامة التجارية المنار وكذلك القطع البلاستيكية والتى تحمل العلامة التجارية منارکو والتي أصبحت البديل الأمثل لفعاليتها وسهولة نقلها وتركيبها وعدم تعرضها للصدأ ومقاومتها للعناصر الكيماوية يفضل هذه المميزات فإنها الرد المثالي على تحديات العصر الحديث والحل الأفضل لمشكلاته الفنية المستعصية .

إن لأنابيب مصنع أنابيب المنار استخدامات في كل المجالات المهمة خصوصا في تمديدات خطوط المياه ذات الضغط العالي والمنخفض وتمديدات المجاري والصرف الصحي وتمديدات الهاتف والكهرباء والإتصالات .

ويقوم مصنع أنابيب المنار بإنتاج هذه الأنابيب طبقا لأحدث المواصفات العالمية المقررة ووفقا للمتطلبات الهندسية وتخضع الأنابيب بنوعيتها وأحجامها للمواصفات المقررة من قبل الهيئة العربية السعودية للمواصفات والمقاييس SASO ويتم مراقبة الإنتاج وفقا لنظام دقيق في مختبرات مراقبة الجودة بواسطة أحدث وسائل التكنولوجيا والمعدات الحديثة لضمان جودة ونوعية عالية من الإنتاج . لذا تمكن مصنع أنابيب المنار من الحصول على

شهادتي :

ISO QMS 2008 :9001

Water Regulations Advisory Scheme (WRAS)

كنتيجة طبيعية لأسلوبها الإداري المتميز وتبنيها مبدأ الجودة في منتجاتها . وتتوفر أنابيب مصنع أنابيب المنار بكل المقاسات والسماكات والتي تناسب كل الضغوط ، ويتم تسويق منتجات مصنع أنابيب المنار من الأنابيب على نطاق واسع في السوق المحلية في جميع أنحاء المملكة العربية السعودية

CERTIFICATION


INTERCERT
CERTIFICATE OF REGISTRATION
INTERCERT hereby certifies that the Quality Management System of
AL-MANAR PIPES INDUSTRY COMPANY
STREET No 20. AL-KHARJ INDUSTRIAL CITY, P.O.BOX 20559, AL-KHARJ 11465, KINGDOM of SAUDI ARABIA.
Has been successfully assessed as per the requirements of
ISO 9001:2015
For the scope of
MANUFACTURING AND SALES OF UPVC, CPVC, PPR & HDPE PIPES AND FITTINGS of VARIOUS SIZES.
Initial Certification Date : May 07, 2022
Certificate Issue Date : May 07, 2022
Surveillance Validity Date : May 06, 2023
Recertification Date : May 06, 2025
Registration Number: IC-QM-2205026
Issued on behalf of InterCert Head - Certifications


INTERCERT
CERTIFICATE OF REGISTRATION
INTERCERT hereby certifies that the Occupational Health & Safety Management System of
AL-MANAR PIPES FACTORY COMPANY
STREET NO. 20, AL-KHARJ INDUSTRIAL CITY, P.O.BOX 20559, AL-KHARJ 11465, KINGDOM OF SAUDI ARABIA
Has been successfully assessed as per the requirements of
ISO 45001:2018
For the scope of
Manufacturing And Sales of UPVC, CPVC, PPR & HDPE Pipes And Fittings of Various Sizes.
Initial Certification Date : February 02, 2022
Certificate Issue Date : February 02, 2022
Surveillance Validity Date : February 01, 2023
Recertification Date : February 01, 2025
Registration Number: IC-OS-2202017
Issued on behalf of InterCert Head - Certifications

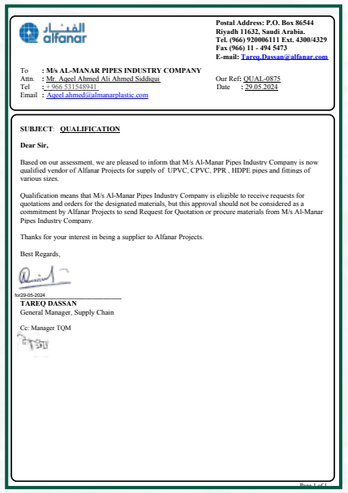

INTERCERT
CERTIFICATE OF REGISTRATION
INTERCERT hereby certifies that the Environmental Management System of
AL-MANAR PIPES FACTORY COMPANY
STREET NO. 20, AL-KHARJ INDUSTRIAL CITY, P.O.BOX 20559, AL-KHARJ 11465, KINGDOM OF SAUDI ARABIA
Has been successfully assessed as per the requirements of
ISO 14001:2015
For the scope of
Manufacturing And Sales of UPVC, CPVC, PPR & HDPE Pipes And Fittings of Various Sizes.
Initial Certification Date : February 02, 2022
Certificate Issue Date : February 02, 2022
Surveillance Validity Date : February 01, 2023
Recertification Date : February 01, 2025
Registration Number: IC-EM-2202016
Issued on behalf of InterCert Head - Certifications


SASO
شهادة ترخيص باستعمال علامة الجودة
License For Use of The Quality Mark


WRAS
WATER REGULATIONS APPROVAL SCHEME LTD. (WRAS)
MATERIAL APPROVAL
POLYPROPYLENE: COMPONENTS.


Approved: Supplier registration with NEOM
NEOM
Registration with NEOM.
Congratulations! We are pleased to inform you that NEOM has approved your supplier registration. Al-Manar Pipes Industry Company has now been included in the supplier database of NEOM.
Please user your vendor ID : S10601345 for all future communications with NEOM.
From now onwards, your company may receive request(s) to participate in tenders (RFP/RFQ) for Goods and/or Services and/or Projects in line with your competencies. However, please do not read into this email that it constitutes a guarantee that you will receive any such requests, as those are dependent on many factors evaluated according to our discretion as needs arise.
You will be notified when next steps of the supplier onboarding process require your attention.
We appreciate your interest in becoming A NEOM supplier and look forward to the opportunity to work with you.

CERTIFICATION



alfanar

Postal Address: P.O. Box 86544
Riyadh 11632, Saudi Arabia.
Tel. (966) 920006111 Ext. 4300/4329
Fax (966) 11 - 494 5473
E-mail: Tareq.Dassan@alfanar.com

To : **M/s AL-MANAR PIPES INDUSTRY COMPANY**
Attn. : Mr. Aqeel Ahmed Ali Ahmed Siddiqui
Tel : +966 5315489941
Email : Aqeel.ahmed@almanarplastic.com

Our Ref: QUAL-0875
Date : 29.05.2024

SUBJECT: QUALIFICATION

Dear Sir,

Based on our assessment, we are pleased to inform that M/s Al-Manar Pipes Industry Company is now qualified vendor of Alfanar Projects for supply of UPVC, CPVC, PPR , HDPE pipes and fittings of various sizes.

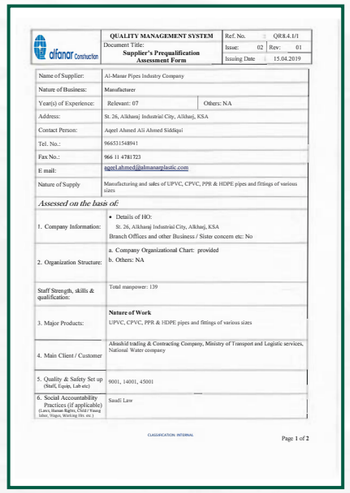
Qualification means that M/s Al-Manar Pipes Industry Company is eligible to receive requests for quotations and orders for the designated materials, but this approval should not be considered as a commitment by Alfanar Projects to send Request for Quotation or procure materials from M/s Al-Manar Pipes Industry Company.

Thanks for your interest in being a supplier to Alfanar Projects.

Best Regards,

29-05-2024
TAREQ DASSAN
General Manager, Supply Chain

Cc: Manager TQM



alfanar construction

QUALITY MANAGEMENT SYSTEM	Ref No. : QR8.4.1/1
Document Title: **Supplier's Prequalification Assessment Form**	Issue: 02 Rev: 01
	Issuing Date : 15.04.2019

Name of Supplier:	Al-Manar Pipes Industry Company		
Nature of Business:	Manufacturer		
Year(s) of Experience:	Relevant: 07	Others: NA	
Address:	St. 26, Alkhaaj Industrial City, Alkhaj, KSA		
Contact Person:	Aqeel Ahmed Ali Ahmed Siddiqui		
Tel. No.:	966531548941		
Fax No.:	966 11 4781723		
E mail:	aqeel.ahmed@almanarplastic.com		
Nature of Supply	Manufacturing and sales of UPVC, CPVC, PPR & HDPE pipes and fittings of various sizes		

Assessed on the basis of:

1. Company Information:	• Details of HO: St. 26, Alkhaaj Industrial City, Alkhaj, KSA Branch Offices and other Business / Sister concern etc: No
2. Organization Structure:	a. Company Organizational Chart: provided b. Others: NA
Staff Strength, skills & qualification:	Total manpower: 139
3. Major Products:	**Nature of Work** UPVC, CPVC, PPR & HDPE pipes and fittings of various sizes
4. Main Client / Customer	Alnahid trading & Contracting Company, Ministry of Transport and Logistic services, National Water company
5. Quality & Safety Set up (Staff, Equip, Lab etc)	9001, 14001, 45001
6. Social Accountability Practices (if applicable) (Laws, Human Rights, Child / Young labor, Wages, Working Hrs. etc.)	Saudi Law

CLASSIFICATION: INTERNAL

Page 1 of 2

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QUALITY MANAGEMENT SYSTEM	Ref No. : QR8.4.1/1
Document Title: **Supplier's Prequalification Assessment Form**	Issue: 02 Rev: 01
	Issuing Date : 15.04.2019

7. Financial Worth / Standing:	Good			
a. Bank Details	Name & Address:	Account No.:	Swift Code/IBAN#	
b. Annual Account Statement, profit & Balance Sheet	Details are not provided			
8. Trade License & Certificates	CR, GOSI, Chamber of commerce, Zakat, VAT			
9. References (Please Name, Value, Dealer, location etc. for previous three years)	Some approvals provided			

Overall Observations & Remarks:

Companies has 07 years of experience and good customer base. It is prequalified by first one, SEDAS and different governmental sectors. Moreover, It is authorized to use quality mark by SASO.

+ve findings: Keen to work with Alfanar. Valuable customer base.

-ve findings:

On the basis of above Approved as Alfanar Supplier: Yes / NO.

Remarks: *M/s Al-Manar Pipes industry Company has good potential and experience in its field. Can be included in the approved list of Alfanar Subcontractor. Initially small work shall be given, and performance shall be monitored for further business.*

Prepared by: (Name, Design & Sign)	Yasser Allafir Sr. QA/QC Engineer	Date	28-05-2024
Recommended by: (Name, Design & Sign)	Waqar Ahmed Atta Ullah Manager, QA/QC	Date	29-05-2024
Approved by: (Name, Design & Sign)	Kalimullah khan Manager, TQM	Date	

ملحق شهادة ترخيص باستعمال علامة الجودة
Appendix (License For Use of The Quality Mark)

ملحق شهادة ترخيص باستعمال علامة الجودة
Appendix (License For Use of The Quality Mark)

Red Sea Global

Registration with Red Sea Global.

Vendor Name: **AL MANAR PIPES FACTORY COMPANY**

Registered Vendor ID: **S10345302**

Congratulations! We are pleased to inform you that your application for vendor registration with Red Sea Global has been successfully approved. You have been added to our database and you will be notified when the next step of onboarding is required.

We look forward to working with you and building a successful partnership.

Red Sea Global

SAP Ariba

Vendor Registry

Registration Approval Letter

10-May-2024

Attention	: Al Manar Pipes Factory Company
CR Num.	: 1011024305
VAT Num.	: 311152783600003
Location	: **Saudi Arabia**

Dear Sir :
We are pleased to inform you that Al Manar Pipes Factory Company is Now registered in **Al-RASHED TRADING AND CONTRACTING** supplier Management system , Under Vendor No : 11524 , provided to your company continues to meet all RTCC standards .

This registration ,however ,should not be constructed as commitment by RTCC to purchase from you, but your company will have opportunity along with other approved sources to respond to requests for submitting proposals in accordance with RTCC established policies and procedures .

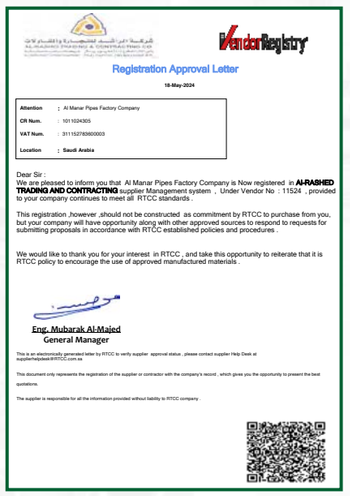
We would like to thank you for your interest in RTCC , and take this opportunity to reiterate that it is RTCC policy to encourage the use of approved manufactured materials .

Eng. Mubarak Al-Majed
General Manager

This is an electronically generated letter by RTCC to verify supplier approval status , please contact supplier Help Desk at supplierhelpdesk@RTCC.com.sa

This document only represents the registration of the supplier or contractor with the company's record , which gives you the opportunity to present the best quotations.

The supplier is responsible for all the information provided without liability to RTCC company .



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AL-MANARCO
PP-R PIPES AND FITTINGS

1.RAW MATERIAL

1.1 Specification of raw material used in production

Pipes and fittings of system are made of polypropylene random copolymer, type 3 (PP-R) This material is known for its strength, stability and resistance to high temperatures. Physical and chemical properties of the material meet the special requirements of drinking water supply and heating systems.

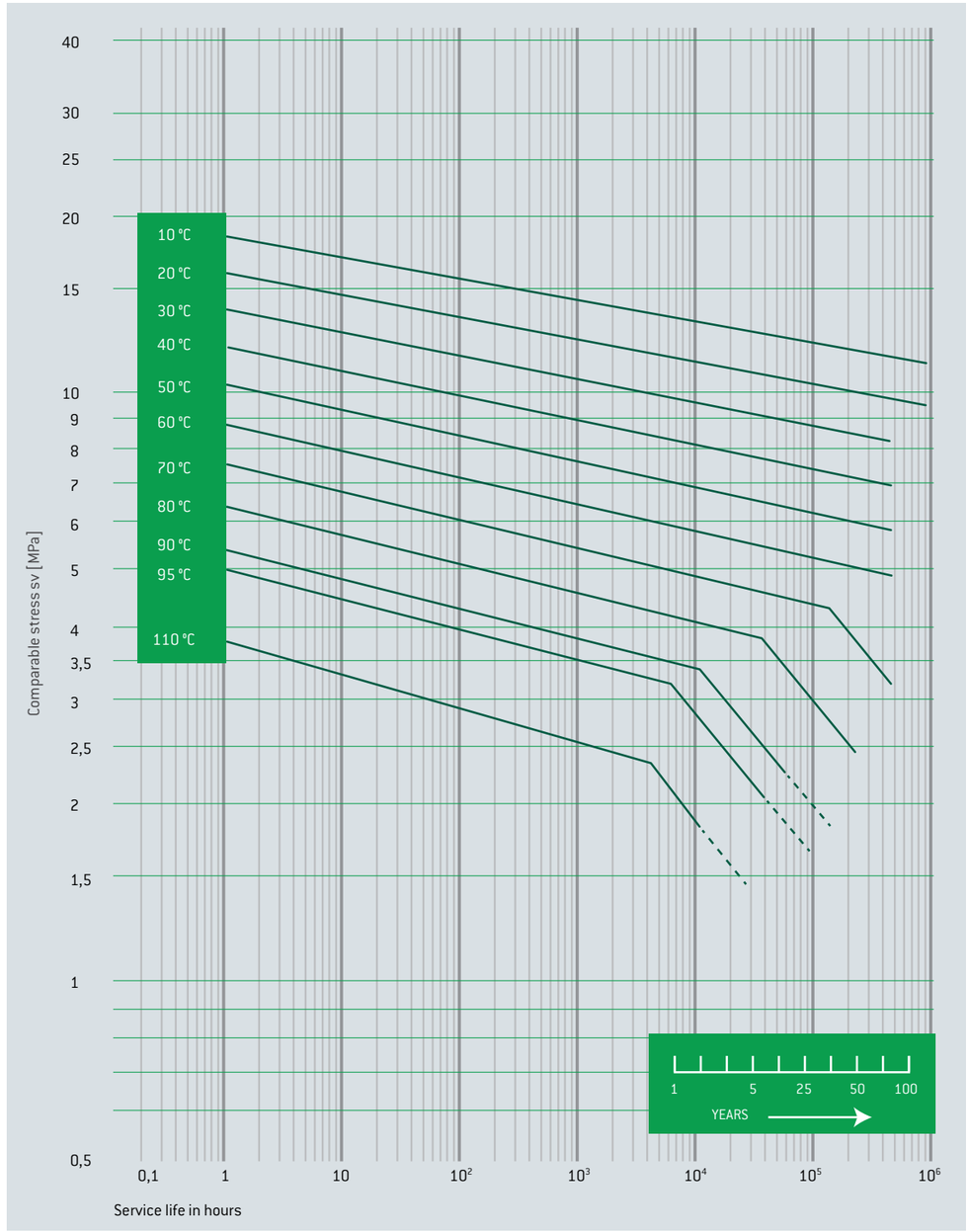
1.2 PP-R selected technical features

Properties of Unit PP-R value	Unit	PP-R value	Test method
Density	g/cm3	0.9	ISO 1183
Met Flow Rate (°230C/2,16kg)	g/10min	0.30	"ISO 1133
Coefficient of Linear Thermal Expansion	1/K	1.5x4-10	Condition 12 "
Thermal Conductivity	W/m K	0.24	DIN 53752
Modulus of Elasticity in tension (1mm/min)	MPa	900	DIN 52612
Charpy's Impact Strenght, notched °23+C	kJ/m2	20	ISO 527
°0C	kJ/m2	4	ISO 179
°23-C	kJ/m2	2	

1.3 Advantages of Smart Therm products

1. Long life service – even 50 years
2. Corrosion resistance
3. Low thermal conductivity 0,22 W/m°K
4. High resistance to inner pressure
5. Low pipe friction- low roughness rate low flow resistance
6. High surface smoothness – lack of lime scale formation as in other systems
7. Quick, easy and clean assembly
8. Total reliability and leak tightness of joints
9. Low price when compared to other materials 10. Resistance to many chemical agents
11. Weight low
12. Esthetic appearance
13. Vibration and noise suppression
14. Good electric current insulator
15. Sterility
16. Environmental friendliness (recycling)
17. No harmful gas emission from burning
18. Light impermeability no risk of algae development
19. One type of pipe connectors to all pipes
20. Non-toxic
21. Smell and taste neutral.
22. Very good welding applications
23. Resistance to abrasion
24. No change in organoleptic properties of water 25. High cracking resistance under stress

1.4 Service life of Smart Therm system



Termination of an isotherm indicates maximum service life also at lower tension. The isotherms in the chart do not extended.

2.PRODUCT RANGE

Pipes and fittings of Smart Therm PP-R system are produced in the following sizes:
110 ,90 ,75 ,63 ,50 ,40 ,32 ,25 ,20 ,16mm.The pipe types are produced in various combinations of operating pressures and temperatures in separate pressure lines various wall thicknesses):
- **SDR 11 (PN 10) -** generally for cold water and floor heating
- **SDR 7,4 (PN 16) -** generally for hot water and floor heating
- **SDR 6 (PN 20) -** generally for hot water and central heating

PPR piping system is designed for cold and hot water installations as well as in floor and central heating systems.
piping systems can also be used for distribution owing to their chemical resistance and other properties.
Fittings (adapting pipes) are manufactured jointly for all piping types in the highest PN 20 pressure range and in various design types:

- Ä All-plastic fittings (sockets, elbows, T-pieces reduced and full-sized, reductions, cross- pieces).
- Ä Combined fittings with brass threads for threaded joints (reducing sleeves with metal thread,
- Ä T-pieces, elbows for wall mounting.
- Ä Special elements (crossovers, compensation pipes, clips)

2.1 Marking

Smart Therm produce in compliance with German standards DIN 8077, DIN 8078.
Pipes and fittings are marked during the manufacturing process enable future tracing. All elements are marked in the following way:
Pipes: Smart Therm GERMANY DIN 8078 / 8077 * Made in Saudi Arabia ENISO15874 *
Fittings: ST PPR, size. Separate fitting packages are fitted with packat labels containing, except the element type marking, also date production and releasing inspector identification.
The possibility to identify each element in a system is an important vehicle of quality control management as well as an evidence for potential settlements of guarantee claims.

PN	S	SDR
10	5	11
16	3,2	7,4
20	2,5	6

SDR – Standard Dimension Ratio SDR = 2xS1+ = d/s
d - external diameter of pipe,
s - wall thickness

3. APPLICATION AREAS

Operating conditions according to EN ISO 15874
In terms of pressure and temperature for pipes and fittings, the operating conditions set forth in ISO 15874 are taken as the basic conditions.Water supply and heating systems are classified according to ISO 15874 in the following way:

Appl. class	Design temp. TD	Time at TD	Max.design temp.	Time at TMAX	Emerg. temp.	Time at Temerg	Scope of application
	°C	°C	°C	years	°C	hours	
1	60	49	80	1	95	100	Hot water supply (°60C)
2	70	49	80	1	95	100	Hot water supply (°70C)
4	20 40 60	2,5 20 25	70	2,5	100	100	Floor heating Low temp. radiators
5	20 40 60	14 25 10	90	1	100	100	High-temperature heating

TD. Design temperature defined by the application.
T max. Maximum design temperature, with its time-limited exposure.
Temerg Emergency temperature arising under emergencies due to troubles in control systems.

Maximum service life of pipelines for every class of application is determined by total performance time of pipeline under temperatures of TD, Tmax. and Temerg. and it amounts to 50 years.
Other classes of application may be established; however the value of temperatures shall not exceed those provided for Class 5.ISO 15874 determines admissible maximum operating pressure for every type of pipeline made of PP-R material.

Proper and correct determination of the required pipeline type during engineering work is required. It shall be, based on operational data, i.e. application class and operating pressure. Calculated series Smax shall be series S, indicated on pipes and in technical documents of Smart Therm

Example:
Pressure lines PN 20 = s 2.5 series:
according to the table, S ≤ Scalc max must apply With use for hot water (max. temp, of hot water of 60 °C - scald protection) - Class 1 : can be operated at the pressure of 10 bar (49 ,(3.1 ≥2.5 years durability at a temp, of 60 °C, one year at a temperature of 80 °C (sudden temp, increase) and 100 hours at a temperature of 95 °C (emergency conditions). The same applies to other classes. This information is indicated on pipes as class 10/1 bars, 8/2 bars, 10/4 bars, 6/5 bars.

Design pressure PD	Application			
Bar	calculated series Smax			
	Class 1	Class 2	Class 3	Class 4
4	6,9	5,3	6,9	4,8
6	5,2	3,6	5,5	3,2
8	3,9	2,7	4,1	2,4
10	3,1	2,1	3,3	1,9

4. MOUNTING GUIDELINES

4.1 Basic principles of routing and fixing polypropylene pipes

1. Pipe installation should be carried out by licensed and qualified people.
2. PP pipes in water supply installations inside buildings should not be laid above gas and electric supply systems.
3. Minimum distance between PP pipes and heat pipes shall be 10 cm counting from the pipes' surface 0therwise an insulation should be applied.
4. In case of warm domestic water installations it is recommended to insulate a riser and horizontal piping whereas in central heating installations to insulate a riser piping in wall channels and a horizontal piping running through unheated spaces.
5. Pipes in water supply installations inside buildings should be laid in such a way that they are protected against mechanical damage.
6. All elements of the installation directly adjoining plastics shall be equipped with an elastic separator.
7. Where the pipes are laid through a building wall, protective sleeves, at least 2 cm longer than wall thickness, should be applied. The space be- tween a pipe and a sleeve should be filled with an elastic material.
8. Clamps used to fix PP pipes should allow the pipe a free sliding movement.
9. Thermal elongation of a pipe should be taken into account and a self-compensation should be applied.
10. PP pipes should be joined by welding and by means of connectors.
11. During welding adequate welding parameters determined for a certain material should be ob- served.
12. The system components must be protected against radiation UV. Long-term exposure to sunlight can degrade the operating properties of the system. When the elements are installed unprotected on outdoor wall surface they must be co- vered with suitable insulation.

4.3 Maximum distances between supports

Ø pipe (mm)	Temperature of medium in °C at density 1g/cm3					
	20	30	40	50	60	80
16	70	50	50	50	50	45
20	80	75	70	70	65	60
25	85	85	85	80	75	70
32	100	95	95	90	85	75
40	110	110	105	100	95	85
50	125	120	115	110	105	90
63	140	135	130	125	120	105
75	155	150	145	135	130	115
90	170	170	160	160	145	135
110	190	185	180	175	160	155

Maximum spacing of between supports enabling allowing the pipe expansion for of vertical conduits is the same as for in case of horizontal conduits but it may be increased by 30 %. If medium density is higher than 1g/cm3, then the reducing coefficient should be applied.

4.4 Linear expansion

Type to enter text Polypropylene has a considerable coefficient of linear expansion = 0.18-0.13 mm/m°K (depending on the temperature of the material). Consequently, during the mounting the system, pipe linear expansion, resulting from the change of temperature should be taken into account. The expansion of a pipe section is calculated with the following formula:

$\Delta L = \alpha \times L \times \Delta t$

Where: ΔL - linear expansion (mm)

α is coefficient of linear expansion {mm/m°K}

L - is initial length of a pipe {m}

Δt - is temperature difference {°K}

The compensation of elongation is done by means of a flexible arm, an expansion loop and U-shape compensator.

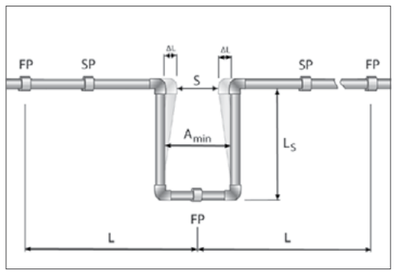
The length of a flexible arm may be calculated with the following formula:

$Ls = kx \quad \Delta L .D$

Where: Ls - the length of flexible arm {mm}

K - material constant for polypropylene PP-R is 20 ΔL - expansion of a pipe {mm}

D - outer diameter {mm}



FP – fixed point, SP- Sliding point

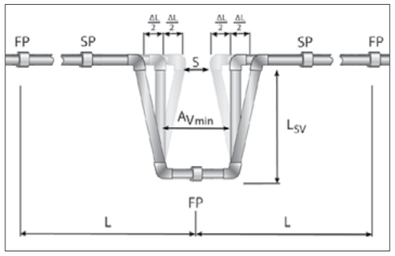
In order to make U-shape compensator outside flexible arm, the width of compensator should be known i.e. the distance between the arms S = 2 x ΔL + Amin (Amin. – Safety Width – assigned as 150mm)

In order to minimize the dimensions of compensators during assembly the initial wire tension is used.

The assembly along with initial tension ensures aesthetic appearance of a system.

Length of initial tension = $\Delta L/2$

Length of flexible arm with initial tension may be calculated in the following way:



Linear expansion of Hydro-Plast standard pipes

Length of pipeline L(m)	Difference in temperatures Δt (°C)						
	10	20	30	40	50	60	70
1	1,5	3,0	4,5	6,0	7,5	9,0	10,5
2	3,0	6,0	9.0	12,0	15,0	18.0	21,0
3	4,5	9,0	13,5	18,0	22,5	27,0	31,5
4	6,0	12,0	18,0	24,0	30,0	36,0	42,0
5	7,5	15,0	22,5	30,0	37,5	45,0	52,5
6	9,0	18,0	27,0	36,0	45,0	54,0	63,0
7	10,5	21,0	31,5	42,0	52,5	63,0	73,5
8	12,0	24,0	36,0	48,0	60,0	72,0	84,0
9	13,5	27,0	40,5	54.0	67,5	81,0	94,5
10	15,0	30,0	45,0	60.0	75,0	90,0	105.0
15	22,5	45,0	67,5	90,0	112,5	135,0	157,5
20	30,0	60,0	90,0	120	150	180,0	210,0

Example:

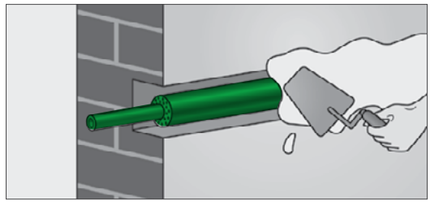
Symbol	Name	Value	Unit
a	Coefficient of linear expansion	0,15	mm/ m°C
L	Length of pipe	10	m
tp	Operating Tempe- rature	60	°C
tm	Temperature during mounting	20	°C
Δt	Temperature diffe- rence Δt=tp-tm	40	°C

4.5 Pipe fixing

Pipes should be installed with a minimum gradient of 0.5 % towards the lowest system points where system emptying by drain faucet or shut off valves with outlet is made possible.
The piping system must be divided into separate parts that can be closed, if necessary. Straight valves and plastic ball taps are used for this purpose. For build in installation the shut off valves or ball taps are used. It is recommended to test fitting functions (closing/opening) before they are installed. A wall mounting group with tap connectors is recommended to be used in a termination place where valve mixers are installed.

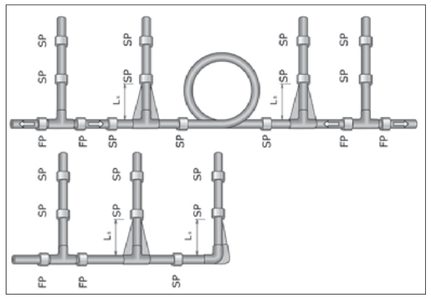
Routing of Smart Therm inlet piping

WInlet piping systems are made mainly of 20 - 16 mm diameters that are usually laid in wall channels. The channel of insulated pipe routing must be free of obstacles and allow for expansion. Beside its thermal properties the insulation system also protects the pipe against mechanic damage as well as a layer making piping expansion more easy. An insulation system of expanded polystyrene or polyurethane (foam) is recommended. Before the piping system is bricked in the pipes must be thoroughly fixed to the channel (using plastic or metal pipe-straps or by plastering at some places, etc.).
If water supply piping systems are installed inside stack partitions then they must be fixed in a suitable way - such as with a system of metal clamps and supporting elements. The systems must be insulated and positioned allowing for expansion. If water supply /distribution piping systems are installed inside floor/ ceiling structures then flexible plastic protective sleeves (made of polyethylene) are used forType to enter text protection against mechanic damage while the air layer between the sleeve and pipe works as a thermal insulation. Piping systems freely laid are rarely used for short distances rarely used for short distances in areas where visual appearance is not a priority (laundry, building service areas, etc.). Supporting elements must be positioned with a necessary care to fix the piping and consider a compensation of pipe expansion in connecting sections where the pipes are covered as well as to apply a good insulation system to the pi- ping, (if, for instance, a cold water pipe is led freely on-wall in a heated area then a risk of surface condensation will be considerable). Piping systems may be led freely on-wall where there is no risk of mechanic damage while in normal operation.



Routing of Smart Therm riser piping

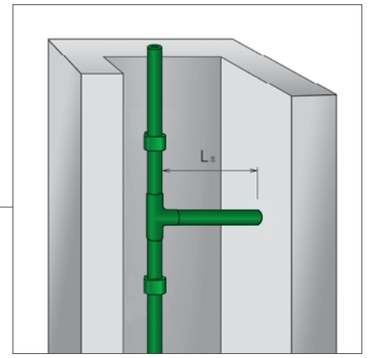
In the case of riser piping it is necessary to consider precisely the layout of fixed points and sliding mounts as well as creation of a suitable expansion compensation system. The adjustments for expansion in riser piping systems are provided as follows:



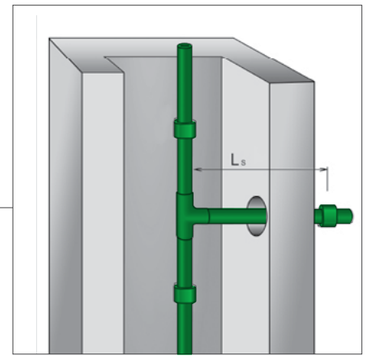
4.6 Installation in ducts

If it is necessary to divide the riser into several expansion sections then it can be achieved by placing fixed points. The riser fixed points are always fixed under and over T-pieces at a branch pipe or socket which, at the same time, prevents the riser to fall. The pipe expansion must accounted for between these fixed points as follows:

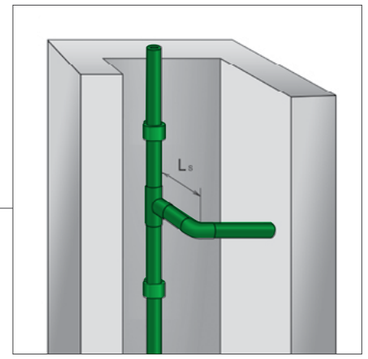
In branching off feeder piping it is necessary to allow for the riser expansion by:



creating a possibility of branch pipe movement in the wall pass through point.



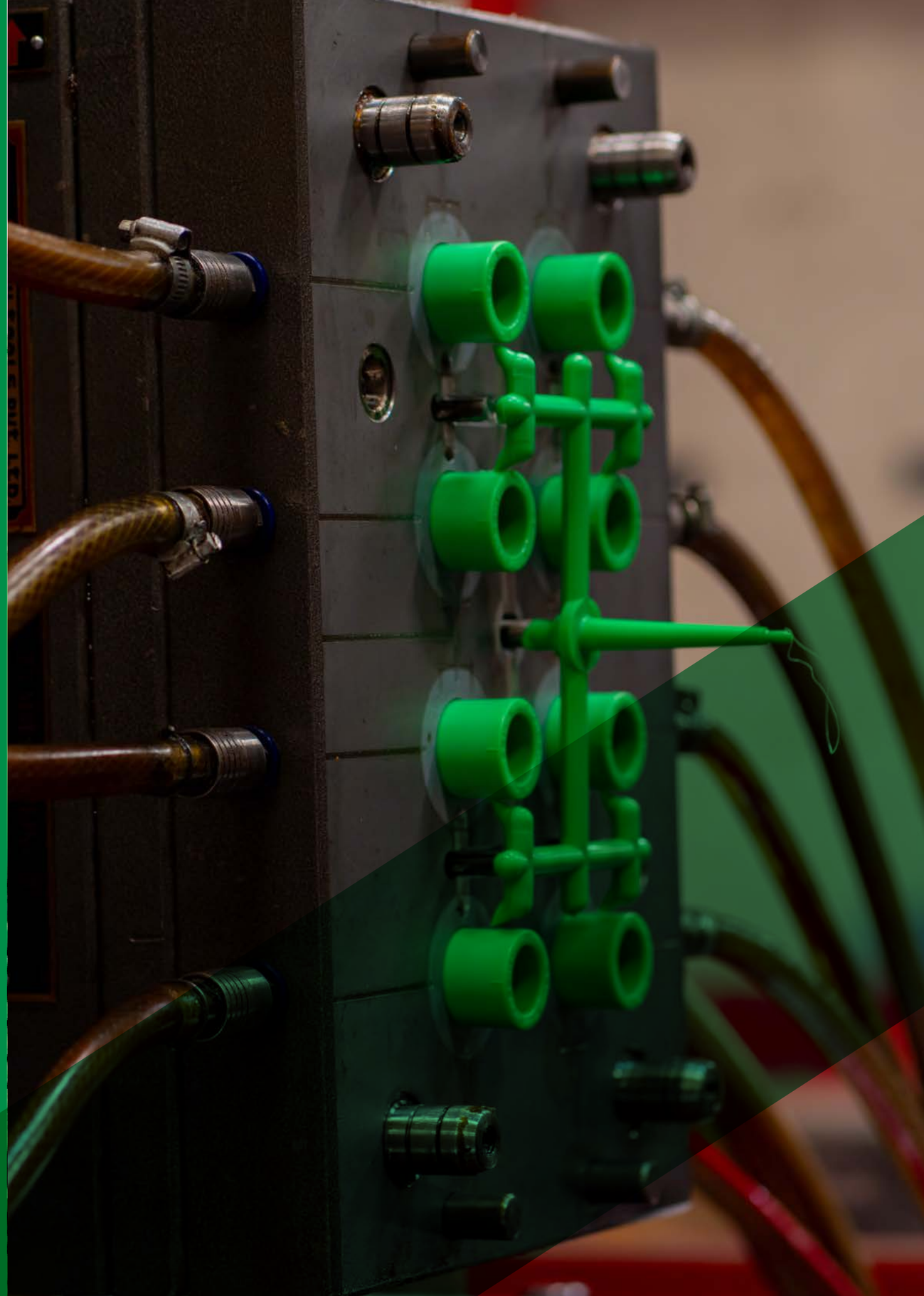
creating a compensating length allowing for expansion at the riser normal line.



Pipe diameter (mm)	Heating time (s)		Welding time (seconds)	Cooling time (seconds)	Welding Depth (mm)
	SDR7 4 SDR6 PN 16 PN 20	SDR11 SDR10			
16	5		4	120	13
20	5	3	4	120	14
25	7	4	4	120	15
32	8	4	6	240	16
40	12	6	6	240	18
50	18	9	6	240	20
63	24	12	8	360	24
75	30	15	10	480	26
90	40	20	10	480	29
110	50	25	10	480	32,5

5.2 General requirements for welding

Ä Only the same kind of material can be welded together.
Ä Pipes and fittings should be heated simultaneously and not more than once.
Ä All operations during a welding process shall be performed without turning a pipe against a fitting and welding ends.
Ä It should be taken into account that welding time differs depending on elements' diameters.
Ä Welding time for PN 10 pipes is shortened by about half.
Ä The recommended surrounding temperature during welding shall be above 5oC. In lower temperature the welding time should be incre- ased by %50 and the level of heating of the welding ends should be constantly checked. Welding below 0oC should be avoided.
Ä Double, even flash on the whole weld surface indicates a good quality of a joint.



6. INSULATION

While hot water piping systems and heating systems are insulated against heat losses, the cold water ones are conversely insulated against heat gains and pipe sweating. From the point of view of drinking water health requirements, the insulation of a cold water system is important to keep the temperature level under 20 °C as well as keeping hot water at the upper limit (given by the standard of protection against scalding) - both cases are concerned with bacteria effect reduction. Keeping hot water at the required temperature level together with properly functioning circulation are important parts of protection against bacteria (such as: Legionella pneumophila) beside some other technical solutions (such as thermal sterilisation).

The thickness and kind of insulation layers are determined on the basis of thermal resistance of the insulation system to be used, air humidity in the area of the piping system and a difference between the room temperature (air) and that one of flowing water. The whole piping system, along its whole route including fittings and valves, must be insulated, It is necessary to maintain a minimum insulation layer thickness along both pipe diameter and pipe- line route (this means that insulation types that are wrapped over the pipes as cut lengthwise must be, after the installation, bonded again into a uniform profile (e.g. using an adhesive, clamps or a sealing tape).

Minimum thermal insulation layer for cold water system - example

Placement / routing of pipes	insulation layer thickness X = 0,040 W/mK
freely laid pipes in unheated areas (such as: basement areas)	4 mm
freely laid pipes in heated areas	9 mm
pipes in crawlways without a hot water line running in paralle	4 mm
pipes in crawlways with a hot water line running in parallel	13 mm
independently running underpla- ster pipe	4 mm
underplaster pipes (in channels) running in parallel with a hot wa- ter line s (in channels)	13 mm
pipes cast over with concrete	4 mm

Remark: the above thickness values must be re-calculated for other thermal characteristics

If hot water is transferred then it should be taken into consideration that plastic pipes posses better thermal insulation properties than metal ones. An application of plastic pipes in such systems may therefore mean a significant cost-saving solution! In systems of high demand (such as: bathrooms, bath- tubs, washing machines, etc.) heat losses in plastic pipes with flowing water are 20 % compared to metal ones. Another 15 % can be saved by a thorough insulation. In systems of small and/or short-time demand where pipes are not heated to operating temperatures regularly, only 10 % of savings can be expected, however, 20 % can be expected at peak demand.

The insulation layer thickness for hot water systems usually fluctuates in the range of 9 through 15 mm at the value of thermal resistance: A. = 0.040 W/ mK.

7. SERVICE LIFE OF PLASTIC SANITARY INSTALLATIONS.

Service life depends on the intensity of plastic material aging process under temperature. Permissible temperature is the one which does not cause polymer degradation or destruction of a particular structure.
In the case of low-temperature installations where the temperature of heating water does not exceed 65oC, plastic aging process goes so slowly that a -50year service life of an installation may easily be expected. It is tantamount to a service life of a building before a complete refurbishment.
Temperature used in central heating has been re- cently reduced from 95o/70o to 80o/60o.New central heating installations and also those modernized should be designed, if possible such a way to allow operating temperature of heating water, not higher than 70oC. Keeping the temperature at a certain level may be achieved by increasing the surface of heaters in the premises.
Life service is determined experimentally by defi- ning its survivability in the function of temperatu- re and water pressure. Such testing is conducted in water bathtubs in closed chambers or bathtubs allowing to control pressure and temperature. The samples used in tests are having closed outlets. Standard tests take 1000 or 8000 hours, that is approximately 40 to 320 days. As a result of aging plastic is losing its flexibility and becomes brittle and is also losing its original mechanical properties.

First visible sign of aging may be:

- Ä change of color – turning yellow, white or dull.
- Ä possible occurrence of excessive conduit sagging.
- Ä likely appearance of pores and micro-cracks on the surface of the pipe resulting in stress corrosion.
- In extreme cases the pipe may suddenly break (burst).
- When the aging symptoms appear the installation should be instantly evaluated and the samples tested.

Guarantee covers Hydro-Plast pipes and fittings for a period 15 years from the date of purchase to a sum of 500,000 SR per incident and up to a maxi- mum of 3,000,000 iSR n a year. We have effected a product liability insurance with the Allianz insurance company .
Compensation is paid for damages that arise from the product's liability and our liability due to the defectiveness of the above products, and as far as exclusive Smart Therm pipes and fittings were used. The guarantee is valid under conditions of proper operation, compliance with proper rules of engineering, installation, storage and transportation. Smart Therm is required, in case of damage, to co- ver costs connected the specific goods and repair any direct damage caused by its products, under its direction or undertake their expenses, after Smart Therm checks and approves the estimated liability.

Test procedure A

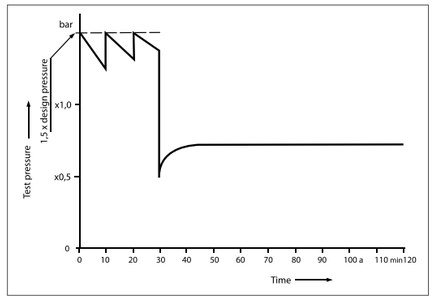
To use Procedure A to apply the hydrostatic test pressure conduct the procedure as follows:

A. Open the venting system;
B. Purge the system with water to expel all air that can be removed thereby. Stop the flow and close the venting system;
C. Apply the selected hydrostatic test pressure equal to 1,5 times the design pressure by pumping according to Figure 12 during the first 30 min, during which time an inspection should be carried out to identify any obvious leaks with the system under test;
D. Reduce the pressure by rapidly bleeding water from the system to 0,5 times design pressure according to Figure 12;
E. Close the valve. The recovery of a constant pressure, which is higher than 0,5 times the design pressure, is indicative of a sound system. Monitor the situation for 90 min. Vi-sually check for leaks. If during that period there is a drop in pressure, this indicates a leak within the system;
F. The test result should be recorded.

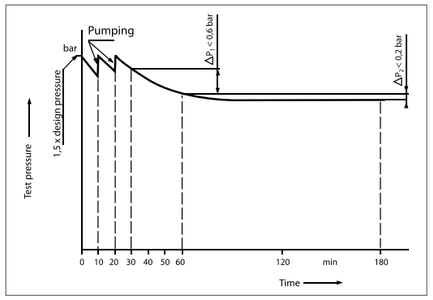
Test procedure B

To use Procedure B to apply the hydrostatic test pressure, conduct the procedure as follows:

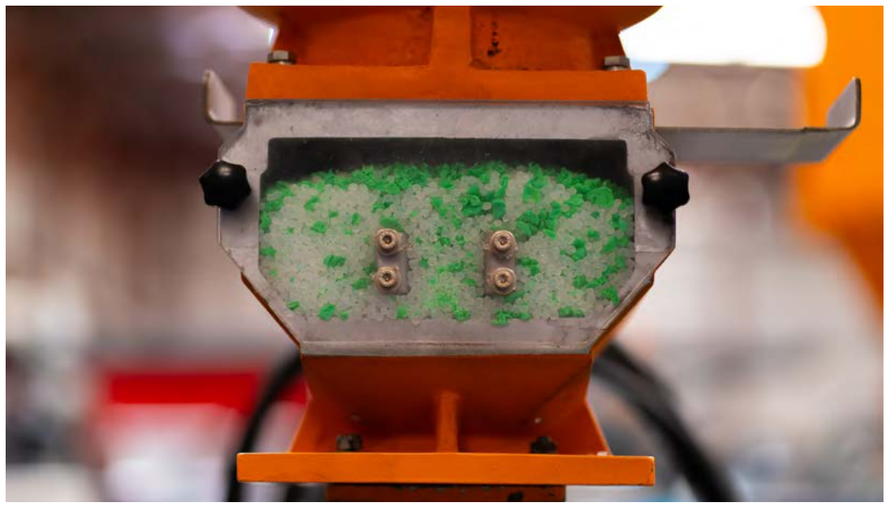
A. Open the venting system;
B. Purge the system with water to expel all air that can be removed thereby. Stop the flow and close the venting system;
C. Apply the selected test pressure equal to 1,5 times the design pressure by pumping according to Figure 13 during the first 30 min;
D. Read the pressure when the first 30 min have elapsed;
E. Read the pressure after another 30 min and visually check for leaks. If the pressure has dropped by less than 0,6 bar conclude the system has no obvious leakage and continue the test without further pumping;
F. Visually check for leaks and if during the next 2 h, the pressure drops by more than 0,2 bar this indicates a leak within the system;
G. The test result should be recorded.aFor smaller sections of an installation the test Procedure B may be reduced to only stages a) to e) and g).



Testing for water tightness — Test procedure A



Testing for water tightness — Test procedure B



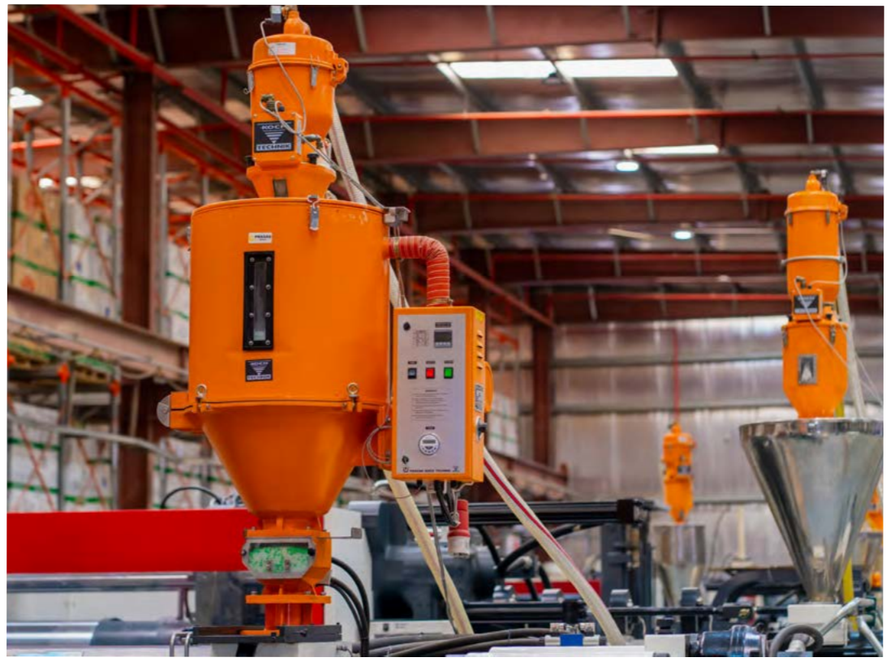
9. QUALITY ASSURANCE

Smart Therm is well-known for its high quality products. We produce in compliance with German standards DIN 8077, DIN 8078.The laboratory is well equipped with state-of-the-art devices to test raw materials, production process and end products.

- Ä The control of basic raw material i.e. polypropylene through determination of mass flow rate (MFR) and density measure.
- Ä Check of geometric parameters during the production process by means of inspection and electronic gauges
- Optical microscope testing – structure of raw material in end products, welded joints after tests and the quality of plastic connection with threaded inserts.
- Laboratory tests of end products - a reflection of the extreme conditions of use, among others, de- termination of inner pressure resistance.

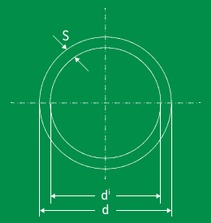
Standard applied in production:

- Ä DIN 8077 Polypropylene (PP) Pipes, Dimensions.
- Ä DIN 8078 Polypropylene (PP) Pipes,General Quality Requirements and Testing.
- Ä DIN16962 Pipe Joint Assemblies and Fittings for Polypropylene Pressure Pipes
- Ä EN ISO 15874 Plastic pipe systems for hot and cold water installation;



13. MANARCO THERM PIPE SDR 6

Structure of pipe: Single
Material: PP-R
Pipe series: SDR 6 /S 6 PN 20
Standards: DIN 78/8077
Colour: Green
Application:
Form supplied: ø 63-20 mm straight lengths 5.8 m
ø 160-90 mm straight lengths 5,8 m

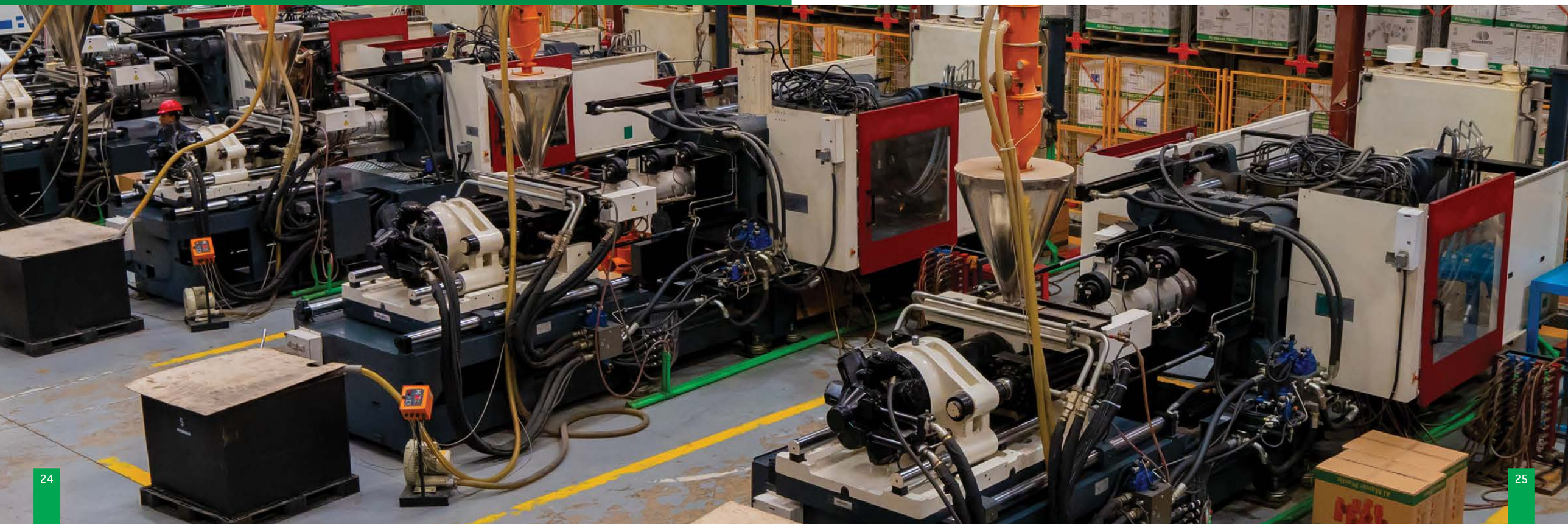


SDR 6	Dimension d [mm]	Wall thickness s [mm]	Internal diameter di [mm]	Water content [l/m]	Weight [kg]
6	Socket welding				
	20	3.4	13.2	0.137	0.172
	25	4.2	16.6	0.216	0.266
	32	5.4	21.2	0.353	0.434
	40	6.7	26.6	0.556	0.671
	50	8.3	33.4	0.866	1.04
	63	10.5	42	1.385	1.65
	75	12.5	50	1.963	2.34
	90	15	60	2.827	3.36
	110	18.3	73.4	4.208	5.01

14. MANARCO THERM PIPE COMPOSITE WITH FIBERGLASS LAYER

Structure of pipe: Single
Material: PP-R
Pipe series: SDR 6 /S 6 PN 20
Standards: DIN 78/8077
Colour: Green
Application:
Form supplied: ø 63-20 mm straight lengths 5.8 m
ø 160-90 mm straight lengths 5,8 m

Dimension d [mm]	Wall thickness s [mm]	Internal diameter di [mm]	Water content [l/m]	Weight [kg]
Socket welding				
20	2.8	14.4	0.163	0.159
25	3.5	18	0.254	0.247
32	4.4	23.2	0.423	0.395
40	5.5	29	0.66	0.61
50	6.9	36.2	1.029	0.95
63	8.6	45.8	1.647	1.49
75	10.3	54.4	2.323	2.115
90	12.3	65.4	3.358	3.03
110	15.1	79.8	4.999	4.53



15. MANARCO THERM PIPE FASER COMPOSITE UV RESISTANT WITH FIBERGLASS LAYER

Structure of pipe: Single
Material: PP-R
Pipe series: SDR 6 /S 6 PN 20
Standards: DIN 78/8077
Colour: Green
Application:
Form supplied: ø 63-20 mm straight lengths 5.8 m
ø 160-90 mm straight lengths 5,8 m

Dimension d [mm]	Wall thickness s [mm]	Internal diameter di [mm]	Water content [l/m]	Weight [kg]
Socket welding				
20	2.8	14.4	0.163	0.211
25	3.5	18	0.254	0.316
32	4.4	23.2	0.423	0.488
40	5.5	29	0.66	0.733
50	6.9	36.2	1.029	1.108
63	8.6	45.8	1.647	1.697
75	10.3	54.4	2.323	2.363
90	12.3	65.4	3.358	3.4
110	15.1	79.8	4.999	5.093

PP-R COUPLING

SIZE	Paking Pcs
20mm	20
25mm	20
32mm	20
40mm	10
50mm	8
63mm	6
75mm	2
90mm	2
110mm	1

PP-R TEE

SIZE	Paking Pcs
20mm	25
25mm	20
32mm	20
40mm	6
50mm	4
63mm	2
75mm	2
90mm	1
110mm	1

PP-R ELBOW 45

SIZE	Paking Pcs
20mm	10
25mm	10
32mm	10
40mm	10
50mm	4
63mm	3
75mm	2
90mm	2
110mm	1

PP-R END CAPE

SIZE	Paking Pcs
20mm	20
25mm	20
32mm	20
40mm	20
50mm	2
63mm	2
75mm	2
90mm	2

PP-R REDUCER TEE

SIZE	Paking Pcs
25X20X25mm	10
32X20X32mm	10
32X25X32mm	10
40X20X40mm	10
40X25X40mm	10
40X32X40mm	8
50X25X50mm	10
50X32X50mm	10
50X40X50mm	6
63X25X63mm	3
63X32X63mm	3
63X40X63mm	3
63X50X63mm	3
75X25X75mm	2
75X32X75mm	2
75X40X75mm	2
75X50X75mm	2
75X63X75mm	2
90X32X90mm	2
90X40X90mm	2
90X50X90mm	2
90X63X90mm	2
90X75X90mm	2
110X63X110mm	1
110X75X110mm	1
110X90X110mm	1

PP-R UNION

SIZE	Paking Pcs
20mm	10
25mm	10
32mm	5
40mm	4
50mm	4
63mm	2

PP-R F.T.A

SIZE	Paking Pcs
20X2/1”	20
25X2/1”	10
25X4/3”	10
32X1”	5
40X4/1 1”	4
50X2/1 1	2
63X2”	2
75X2/1 2”	4

PP-R Over Cross

SIZE	Paking Pcs
20mm	10
25mm	10
32mm	5

PP-R ELBOW 90º

SIZE	Paking Pcs
20mm	10
25mm	10
32mm	10
40mm	10
50mm	4
63mm	3
75mm	2
90mm	2
110mm	1

PP-R M.T.A

SIZE	Paking Pcs
20X2/1”	20
25X2/1”	10
25X4/3”	10
32X1”	5
40X4/1 1”	4
50X2/1 1	2
63X2”	2
75X2/1 2”	4

PP-R REDUCER

SIZE	Paking Pcs
25X20mm	10
32x20mm	10
32x25mm	10
40x20mm	10
40x25mm	10
40x32mm	10
50x20mm	4
50x25mm	4
50x32mm	4
50x40mm	4
63x20mm	4
63x25mm	4
63X32mm	4
63X40mm	4
63x50mm	4
75X20mm	2
75X25mm	2
75X32mm	2
75X40mm	2
75X50mm	2
75X63mm	2
90X32mm	2
90X63mm	2
90X75mm	2
110X63mm	1
110X75mm	1
110X90mm	1

PP-R M.T.TEE

SIZE	Paking Pcs
20X2/1”	
25X2/1”	10
25X4/3”	10
32X1”	10
40X4/1 1”	4
50X2/1 1	4

PP-R F. BRASS UNION

SIZE	Paking Pcs
20X2/1”	5
25X4/3”	5
32X1”	5
40X4/1 1”	5
50X2/1 1	4
63X2”	2

PP-R F.T.TEE

SIZE	Paking Pcs
20X2/1”	10
25X2/1”	10
25X4/3”	10
32X1”	5

PP-R M.T.ELBOW

SIZE	Paking Pcs
20X2/1”	10
25X2/1”	10
25X4/3”	10
32X1”	5

PP-R M. THREAD UNION

SIZE	Paking Pcs
20X2/1”	10
25X2/1”	10
25X4/3”	10
32X1”	5
40X4/1 1”	4
50X2/1 1	4
63X2”	2

PP-R CONCEALED VALVE

SIZE	Paking Pcs
20mm	1
25mm	1
32mm	1

PP-R M. THREAD PLUG

SIZE	Paking Pcs
2/1”	10

PP-R M. TESTING CAP

SIZE	Paking Pcs
2/1”	20

PP-R M. BALL VALVE

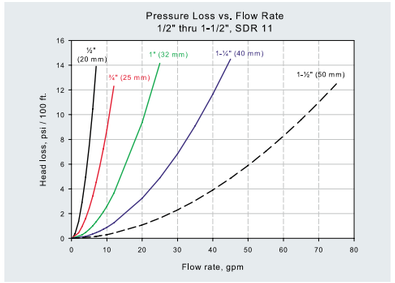
SIZE	Paking Pcs
20mm	5
25mm	5
32mm	5
40mm	4
50mm	2
63mm	1

PP-R M. STOP VALVE

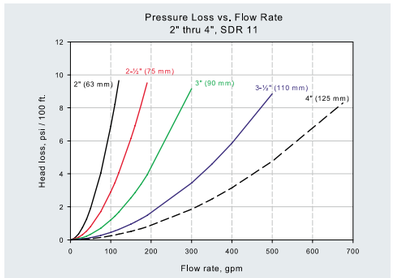
SIZE	Paking Pcs
20mm	1
25mm	1
32mm	1
40mm	1
50mm	1
63mm	1

12 Working Pressure

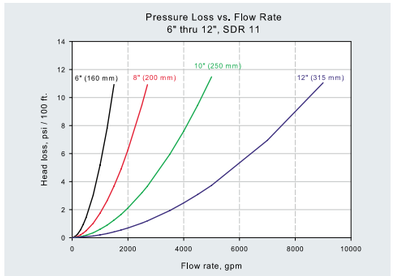
The working pressure tables illustrate the permissible working pressures of the Smart Therm piping systems. The balance between working pressure and operating temperature varies based on the wall thickness of the pipe as well as the presence of a faser layer. Smart Therm heat- stabilized PP-R negates the effects of occasional, short-term increases in temperature, so these do not need to be taken into account. The burst pressure for the pipes is much higher.



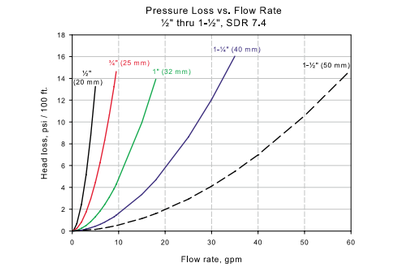
The tables with “constant operating parameters” assume a steady, year-round load. Their expected minimums are based on negligible material degradation during that time. The “seasonal peaks” table assumes that the system will only operate at full capacity in the coldest winter months and will operate at a lower, more efficient capacity during the rest of the year. The “compressed air” table assumes an air temperature under 100 °F and above 40 °F. For applications outside the parameters shown here. Smart Therm pipe may be used for vacuum applications up to 29.92 inHg.



These charts are based on the piping system using water or water mixed with propylene, ethylene glycol or glycerin. For applications using different fluids or operating conditions outside those given below please contact your local Smart Therm representative. Smart Therm pipes are not intended for operational temperatures colder than 5- °F, as the pipes begin to lose their resistance to impact.



Note: *Some of the ratings at lower temperatures in these tables have been reduced based on changes required by some European agencies. Others have* ***been modified slightly to round to the nearest*** *5 psi per typical ratings requirements in North America. There has been no change in the product and this was not the result of any performance-related issue.*



13. CHEMICAL RESISTANCE

Type to enter text+ = resistant
(+) - less resistant
0 = limited chemical resistance
(-) = poor resistance
- = not resistant⊠aq = aqueous solution
sat. = saturated solution at room temperature c = colour

These values apply to the PPR material. To be sure about the suitability of the Hydro-Plast system for your special application, please contact Smart Therm.

	Conc. %	Temp (°C)		
		20	60	100
A				
Acetic acid	100	+	0	-
(Glacial acetic acid)				
Acetic acid aq.	50	+	+	
(see also vineger)	10	+	+	+
Acetic anhydride	100	+		
Acetone*	100	+	0	
Alcoholic iodine		+	0	
Alum	sat	+	+	
Alums aq	any	+	+	
Aluminium salts aq	any	+	+	+
Ammonia gaseous	100	+	+	
Ammonia aq	cone	+	+	
	10	+	+	
Ammonium acetate aq.	any	+	+	+
Ammonium carbonate aq.	any	+	+	+
Ammonium chloride aq.	any	+	+	+
Ammonium nitrate aq.	any	+	+	+
Ammonium phosphate aq.	any	+	+	+
Ammonium sulphate aq.	any	+	+	+
Amly alcohol, pure		+	+	
Aniline	100	+	(+)	
Antifreeze agent. (cars)**		+	+	
Apple Juice		+	+	
Apple sauce		+	+	+
Aqua regia		+	-	
Asphall**		+	0	
ASPIRIN8		+		

	Conc. %	Temp (°C)		
		20	60	100
B				
Barium salts	any	+	+	+
Beef suet		+	+	
beer		+		
benzaldhyde	100	+		
Benzaldehyde aq.	sat.	+		
	0.3-			
Benzene	100	(-)	-	
Benzoic acid	100	+	+	
Benzoic acid aq.	sat	+	+	+
Bleaching solution		0	0	
(12.5 % active chlorine)				
Boneoi		+	(+)	
Borax aq	sat.	+	+	
Boric acid	100	+	+	
Boric acid aq.	sat. (4.9)	+	+	
Brake Fluid*		+	+	
Brendly		+		
Bromine, liquid	100	-		
Bromine, vapours	high	-	-	
	Low	0	+	
Bromine water	sat.	-	-	
Butene, gassous	100	+	+	
Butane, liquid	100	+		
Butter		+	+	
Buttermik		+		
Butylacetate	100	+	0	
n-Butyl alcohol |n-butanol	100	+	+	

	Conc. %	Temp (°C)		
		20	60	100
C				
Cake		+	+	(+)
Calcium chloride aq.	sat.	+	+	+
Calcium nitrate aq.	sat.	+	+	
Camphor		+		
Carbon bisulphide**	100	0		
Carbon tetrachlonde	100	0	-	
Caustic potash solution	50	+	+	
	25	+	+	
	10	+	+	
Caustic soda solution	50	+	+	+
	25	+	+	
	10	+	+	
Cheese		+		
Chloride of lite		+	+	
(aquesous suspension)				
Chlorine, gas, dry	100	-	-	-
Chlorine, gas humid	10	0		-
Chlorine, liquid	100	-		
Chlorine water	sat.	0		
Chlorobenzene	100			
Chloroform	100	(-)	-	
Chlrosulphonic acid	100	-	-	
Chromic acid	sat.	+	-	
	20	+	0	
Chromic/sulphuric acid		-	-	
Chromium plating solution*		+	+	
Chromium salts	sat.	+	+	
(bi-and trivalent) aq.				
Cinnamon (cane)		+		
Cinnamon (ground)		+		
Citric acid aa.	sat.	+	+	+
Clove oil		+	0	
Cloves				
Coca-cola®		+		
Cocoa (powdered)		+		
Cocoa		+	+	(+)
(ready-to-drink)				
Coconut oil		+	(+)	
Cod-liver oil		+	+	
Coffee (beans and ground)		+		
Coffee (ready-to-drink)		+	+	+
Common salt, driy		+	+	+
Copper salts aq.	sat.	+	+	+
Com seed oil		+	0	
Cream, whipped cream		+		
Cresol solution		+		
Cresol	100	+	0	
Cresols aq.	sat.	+	0	
	0.25-			
Curds		+		
Cyclohexane	100	+		
Cyclohexanol	100	+	+	
Cyclohexanone	100	+	-	

	Conc. %	Temp (°C) 20	60	100
D				
Decahydronaphthalene	100	0	-	-
Detergents. synhetic**	high ready for use	+	+	
Dibutylphthatate (see plasticizers)		+	+	+
Diesel oil, see Fuels				
Dimethylformamide	100	+	0	-
I .-4Dioxane	100			
Dish-washing agents, liquid*		+	+	+
DIXAN® solution	ready for use	+	+	+

	Conc. %	Temp (°C) 20	60	100
E				
Eggs |uncooked & cooked)	100	+	+	(+)
Ether* (diethylene ether)	100	0		
Ethyl acetate		0	0	
Ethyl alcohol not denatured	100	+		
Ethyl alcohol aa.. not denatured	96	+	+	
	50	+	+	
	10	+	+	
Ethyl benzene	100	0	-	
Ethyl chloride***	100	-		
Ethylene chloride	100	(-)		
-2Ethyl hexanoi	10	+		

	Conc. %	Temp (°C) 20	60	100
F				
Flxing salt (see also	100	+	+	
Sodium thiosulphat)				
Floor wax***		+	0	
Flour		+		
Flouric acid	40	+	+	
Folmaldehyde aq	40	+	+	
	30	+	+	
	10	+	+	
FORMALIN®		+	+	
Formie acid	98	+	0	
	90	+		
	50	+	+	
	10	+	+	+
FruitJuice		+	+	
Fruit salad		+		
Fuel				
Petrol normal		+	0	
according to DIN 635 1 5				
petrol, regular		(+)	-	
petrol, super		0	-	
Diesel oil*		+	0	
Fuel oil*		+	0	
Furniture pofeh*		+	0	

	Conc. %	Temp (°C) 20	60	100
G				
Gin	40	+		
Glycerine	100	+	+	
Glycerine aq.	high	+	+	
	low	+	+	+
Glycol	100	+	+	
Glycol aq.	high	+	+	
	low	+	+	+
Grapefruitjuice		+	+	
Gravy		+	+	(+)

	Conc. %	Temp (°C) 20	60	100
H				
Hair shampoo*		+	+	
Heptane	100	+	0	
Hexane	100	+	0	
Honey		+	+	
		+		
Hydrocloric,chloride gaseous	conc.	+	+	
	10	+	+	
Hydrogen perioxide aq.	high	+	+	
	low	+	+	
	90			
	30	+	0	
	10	+	+	
	3	+	+	+
Hydrogen sluphide**	low	+	+	

	Conc. %	Temp (°C) 20	60	100
I				
Ink*		+	+	
Iron salts aq.	sat.	+	+	+
Isooctone	100	+	0	
Isoproply alcohol	100	+	+	

	Conc. %	Temp (°C) 20	60	100
J				
Jam		+	+	(+)
Jelly		+	+	(+)

	Conc. %	Temp (°C) 20	60	100
L				
Lactic acid aq.	90	+	+	
	50	+	+	
	10	+	+	+
LANOLIN®		+	0	
Lard		+	+	0
Lemonadas		+		
Lemon arome		+		
Lemon peel		+	+	
Lemon peel oil		+		
Linseed oil		+		
LITEX®		+	+	
Liqueur	any	+		
LYSOL		+	0	

	Conc. %	Temp (°C) 20	60	100
N				
Nail polish*		+	0	
Nail polish remover*		+	0	
Naphtalane	100	+		
Nickel salts. aq.	sat.	+	+	
Nitric acid	50	0		
	25	+	+	
	10	+	+	
Nitrobenzene	1000	0	0	

	Conc. %	Temp (°C) 20	60	100
O				
Octane (see leoctane) Oil no. 3 according to ASTMD38059	100	+	0	-
Oil of bitter almonds		+		
Oleic acid	100	+		
Oleum	any	+	-	
Olive oil		+	+	
Orangejuice		+	+	
Orange peell		+		
Orange peel oil		+		
Oxalix acid aq.	sat	+	+	+
Ozone (0,5 ppm)		+	-	

	Conc. %	Temp (°C) 20	60	100
M				
Magnesiurn salts aq.	sat.	+	+	
Margarine		+	+	
MARLIPAL MG	50	+	+	
detergent)	100	+	+	
MARLOPHEN 83	20	+		
MARLOPHEN 89	100	+		
MARLOPHEN 810	5	+		
	100	+		
	20	+	+	
	5	+	+	(+)
Mashed potatoes		+	+	
Mayonnaise		+		
Menthol		+		
Mercurie salta aq.	sal.	+	+	
Mercury	100	+	+	
Methyl alcohol	100	+	+	
Methl alcohol aq.	50	+	+	
Methylene chloride*	100	0		
Methyl ethyl ketone	100	+		
Milk		+		
Milk food		+	+	(+)
Mineral oil (whitout aromat-ic hydrocarbons)**		+	0	
Moth bals***		+		
Motor oil (cars)** (see also Two-stroke oil and oil accor ding to ASTM)		+		
Mustard		+		

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