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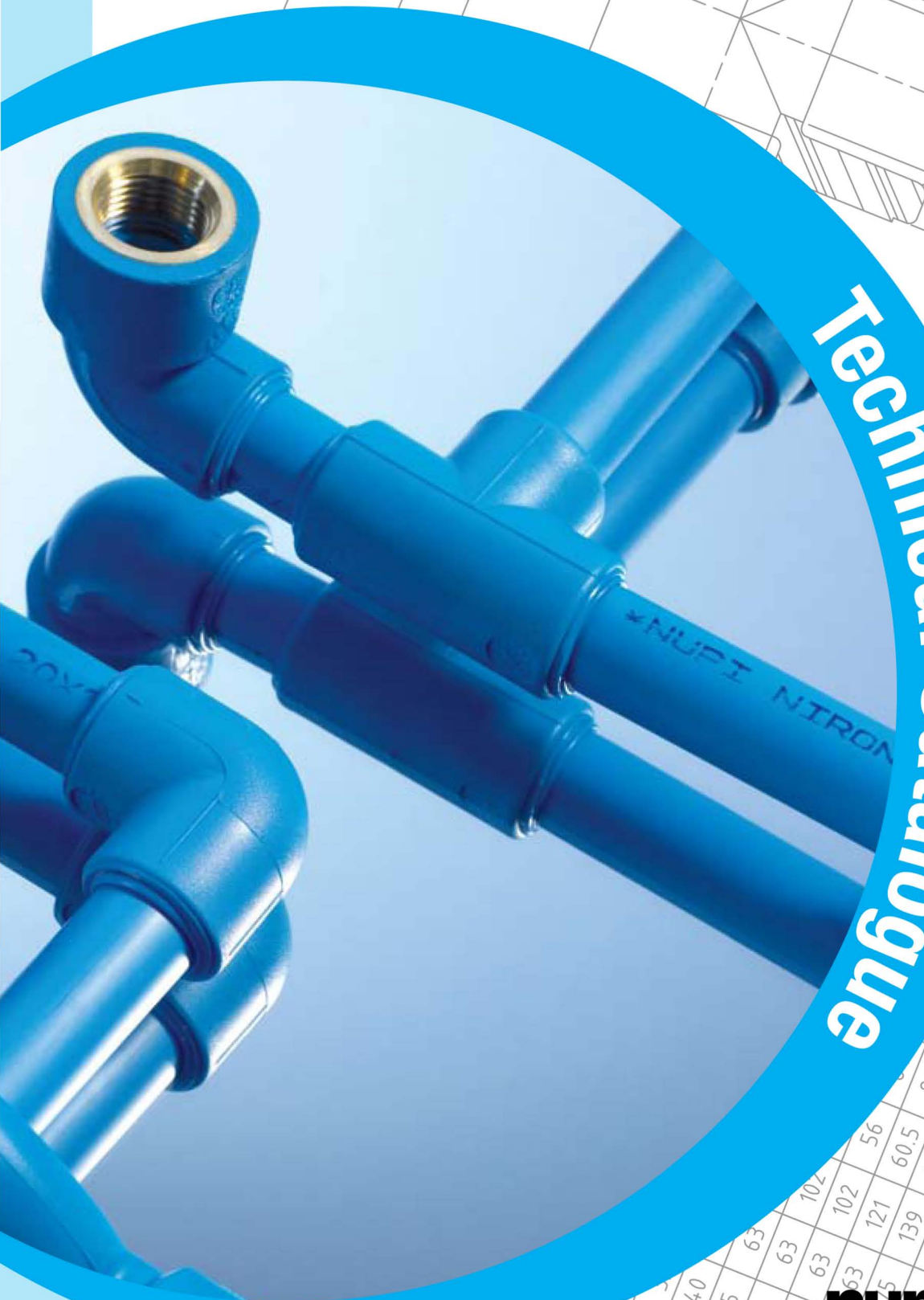


Technical Catalogue

nupigeco

INTERNATIONAL QUALITY CERTIFICATES

TABLE OF CONTENTS

NIRON - RANDOM POLYPROPYLENE COPOLYMER PIPES AND FITTINGS

The use of plastic materials is increasingly common in every field of our everyday life; the excellent mechanical, chemical and physical properties of the most advanced polymers have made them outstandingly successful in a wide range of applications.
Starting from the Eighties, the use of plastic materials in the pipe-making industry has grown exponentially, and today, they are used for a huge variety of applications, including heating and air conditioning system inlet and outlet pipes – to the ever growing appreciation of installers and end users.
For over thirty years, NUPIGECO S.p.A. have been leaders in advanced polymer processing to make pipes for conveying pressurised hot and cold water, gas and oil derivatives.
Considerable investment on research and development, constant technological updating and a fully equipped quality control laboratory have made NUPIGECO S.p.A. one of the most prominent European manufacturers in its market segment.
Regular retraining courses and effective after-sales service have helped NUPIGECO S.p.A. build a solid, professional partnership with its customers.

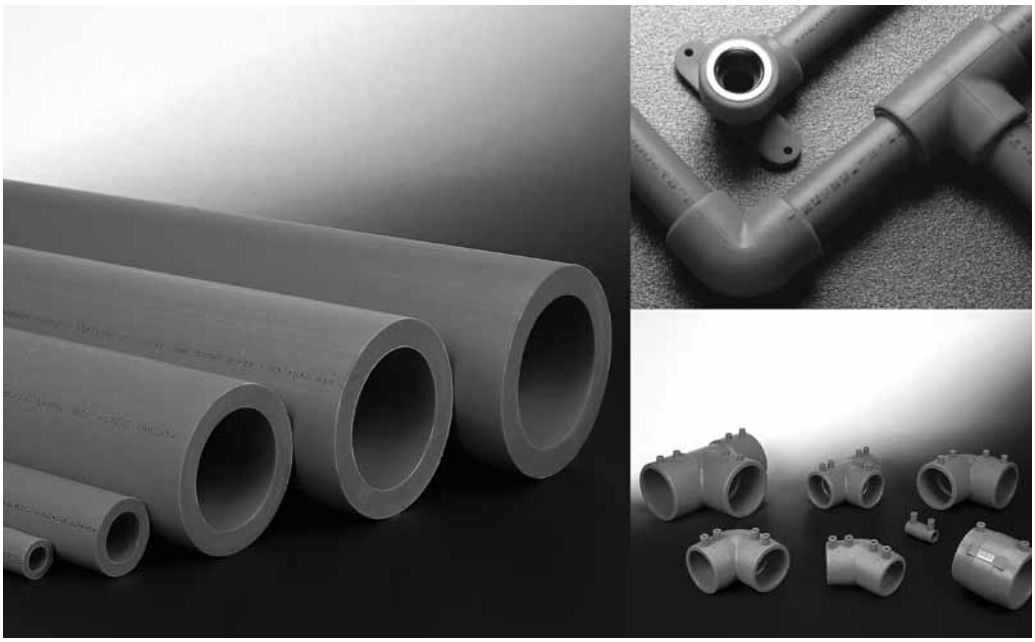
ABOUT THE NIRON SYSTEM

NIRON is a Random Polypropylene Copolymer pipe and fitting system which stands out among other plumbing and sanitary piping systems thanks to its quality and reliability. The chemical and physical properties of the material used and the fact that the various elements are joined by hot melting ensure that the systems are perfectly watertight even in the most demanding conditions of use.

The polypropylene used for the NIRON System is a special type of Random Copolymer with high molecular weight. The special copolymer molecular structure and the special additives used ensure high mechanical strength and prolonged life. Being very lightweight and easy to process, the material is efficiently used to make a complete NIRON system for installations built in 30 to 50% less time than it takes to build installations from metallic materials.

An already vast range of products has been completed with exclusive NIRON parts specially designed and manufactured to meet any possible installation requirements.

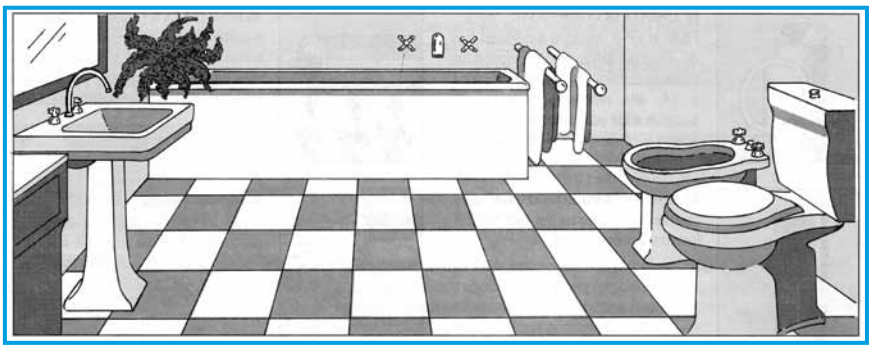
The consistently increasing success of the NIRON System, both in Europe and elsewhere, is the right recognition for a company whose corporate strategy is based on research, quality and technological innovation.

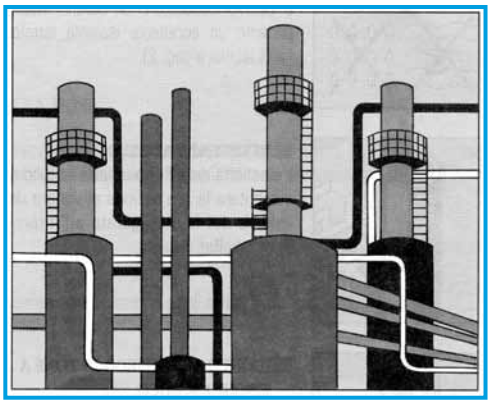


FIELDS OF USE

The NIRON System is commonly used in **houses and large condominiums, hotels, hospitals, shopping malls, gyms, cruiser and cargo ships** for several different types of installation including:

- **Plumbing systems**
  Risers
  Branching to sanitary fittings
- **Heating systems**
  (max temperature 70°)
- **Air Conditioning systems**
- **Water supply systems to pools**
- **Spa water systems**





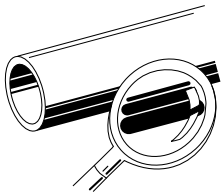
The System is also used in industrial installations:

- **Plant engineering in general**
- **Compressed air installations**
- **Thermal power plants**

Such extreme application versatility is only possible thanks to the superior technology used in our NIRON System.

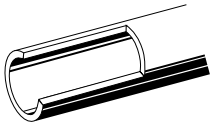
1.1 NIRON SYSTEM MAIN CHARACTERISTICS

The Polypropylene used for the NIRON System is a special type of Random Copolymer with high molecular weight. The special copolymer molecular structure and the special additives used ensure high mechanical strength and prolonged life. Being very lightweight and easy to process, the material is efficiently used to make a complete NIRON system for installations built in 30 to 50% less time. Here is a list of the most obvious advantages obtained by comparing PP-R pipes with traditional metal (steel and copper) pipes:



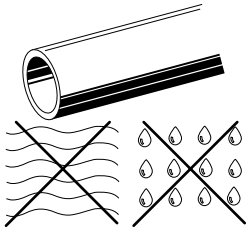
NO CORROSION

PP-R pipes withstand any degree of water hardness and chemical substances with pH values comprised between 1 and 14. They are therefore highly resistant to chemical etching by acid and alkaline agents within a wide range of concentrations and temperatures.



NO SCALING

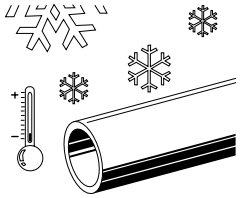
The pipes have mirror-finished insides to prevent scaling.



LIMITED HEAT LOSS AND CONDENSATE

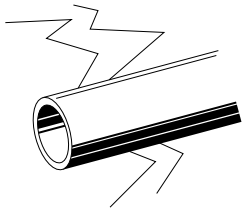
Like all plastic materials, PP-R is a poor heat conductor and therefore behaves as an excellent thermal insulator

(See the Charts on page 21)



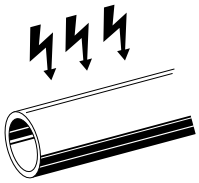
FROST RESISTANCE

The PP-R material elasticity allows the pipe cross-section to expand as the volume of the frozen liquid inside the pipe increases.



SUITABLE FOR USE IN SEISMIC RISK AREAS

Suitability acknowledged by international commissions of experts thanks to the role played by an elastic material like polypropylene inside building structures.

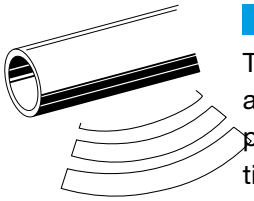


STRAY CURRENT RESISTANCE

Polypropylene is a very poor electric conductor, preventing the risk of punctured pipes or fittings due to stray currents..

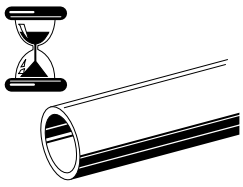
LOWER FLOW RESISTANCE

The NIRON pipes offer decreased flow resistance because of their smooth surfaces designed to prevent scaling (see chart on page …)



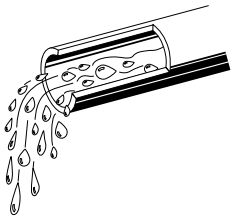
LOWER NOISE OPERATION

The material elasticity and sound-absorbent properties prevent the propagation of noise and vibration caused by water flowing and fluid hammer.



LONG LIFE

Over 50 years, according to working temperatures and pressures.



ABRASION RESISTANCE

The NIRON pipes are highly abrasion-proof for fast water flows without any erosion problems.

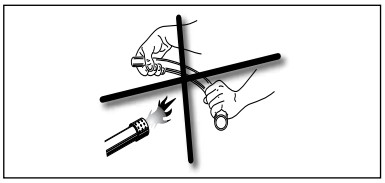
COMPLETELY NON-TOXIC: the polypropylene used to make NIRON System products is completely non-toxic and in compliance with the health and hygiene regulations in force in Italy and in other countries.

10 YEARS' GUARANTEE: The NIRON System is covered by a third party liability insurance in compliance with the EEC directives 85/374 and D.P.R. n. 244 of 24/05/88.

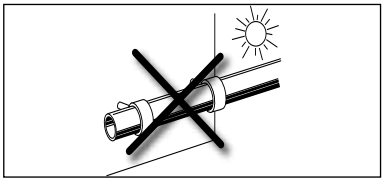
1.2 DIRECTIONS FOR USE

In order not to affect the NIRON System reliability over time, the following installation instructions should be carefully followed.

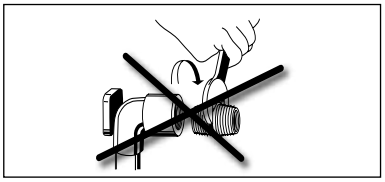
Recommendations



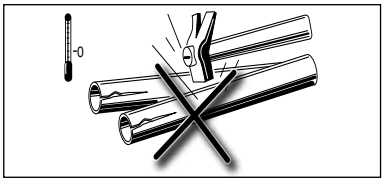
Do not use flames to work the pipes and obtain bends or crossovers, as being unable to control temperatures may lead to polypropylene molecular structure damage. Max 90° pipe bending angles can be obtained by cold bending, ensuring that the curvature radius is not smaller than 8 times the pipe diameter.



Always use the NIRON System under chase or wherever it is protected against weathering, to prevent damages mainly caused by short wave UV radiation combined with atmospheric oxygen. For this reason, pipes and fittings are supplied contained in suitable plastic bags or cardboard boxes.

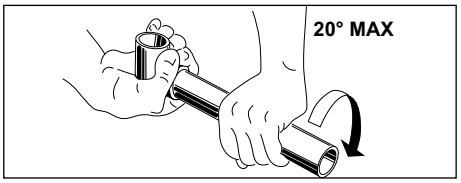


We recommend to avoid jointing by cast iron conical or non-calibrated threads as high tightening torques would break female brass unions. To ensure tightness, we recommend to interpose Teflon. The use of hemp packing in the right amount is also acceptable.

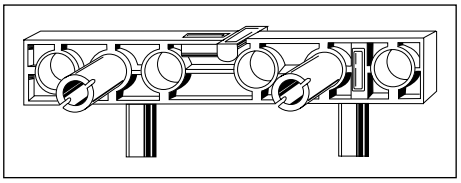


At temperatures lower than 0°, prevent impacts (especially against pipe ends), excessive loads, crushing or bending. Do not use pipes that are broken, cracked or dented.

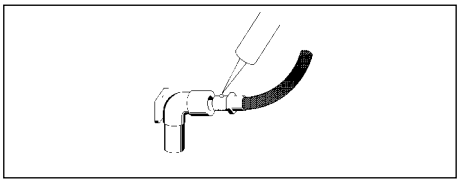
Installation instructions



Any alignment implying pipe or fitting rotation must be carried out during or immediately after insertion without exceeding 20°.



Use the specially designed templates to obtain correct alignment of the connectors in under chase installations.



If liquid sealant is used to ensure tightness (art. NSF), remember to wait 1 hour at 20°C and 3 hours at –10°C before testing.

Always test all installations as described on page 39

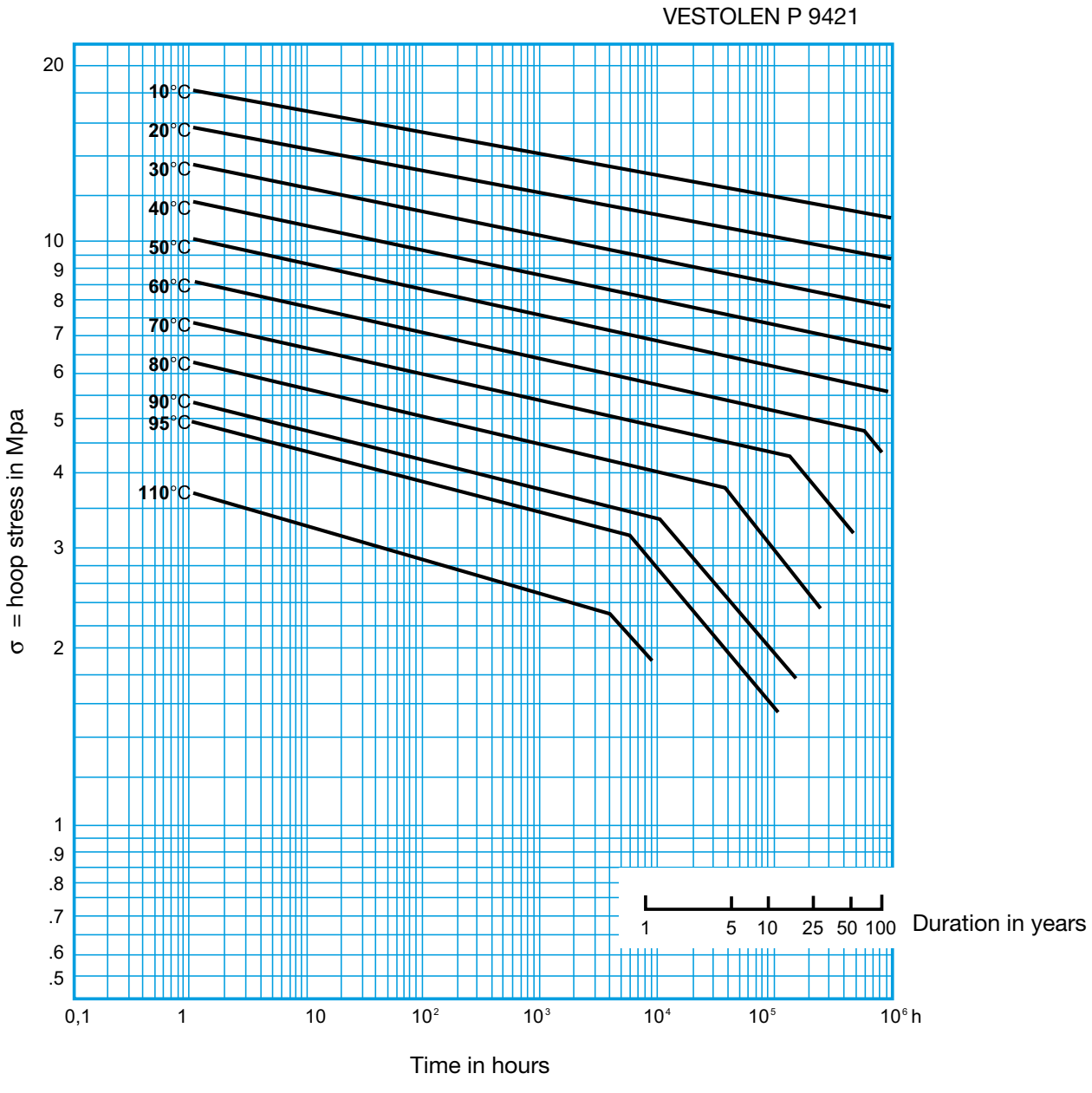
2 REGRESSION CURVES

Regression curves show the behaviour of a pipe according to the existing pressure and working temperatures. These curves describe pipe life as a function of the hoop stress on pipe walls (σ) resulting from this pressure.
Hoop stress σ is linked with internal pressure as shown by the following formula

$$\sigma = p \frac{d-s}{2s}$$

where

σ = hoop stress in Mpa
p = Max constant pressure in bars
d = pipe outside diameter
s = pipe wall thickness



3 PIPES

The NIRON System pipes are manufactured in compliance with the currently applicable European standards EN-ISO15874 and can be divided into:

- **SINGLE WALL PIPES**
- **COMPOSITE PIPES**
- **MULTILAYER PIPES**

The pipes are calculated and sized to perfectly respond to the application requirements of the different types of installation.
The max constant pressure in bars is the result of the following formula:

$$PN = \frac{20 \times \sigma}{SDR - 1}$$

Where:
PN = Nominal Pressure (bars)
σ = hoop stress (for PPR80, this value is 63 kg/cm2 -6,3 MPa- at 20°C)
SDR = Standard Dimension Ratio (Diameter/Thickness Ratio)

The European regulation EN-ISO 15874 has also standardised the plumbing and sanitary water piping classification; the NIRON System complies with the standard requirements by guaranteeing the levels of performance corresponding to classes 1, 2 and 4 in the table here below.

Class	$_{Wrk}T$ (°C)²	Years at $_{Wrk}T$	Pressure Bars	T_{max} (°C)²	Years at $_{Wrk}T$	$_{mal}T$ (°C)²	Hours at $_{mal}T$	Fields of use
1	60	49	10	80	1	95	100	Hot water (60°C)
2	70	49	8	80	1	95	100	Hot water (70°C)
4	20 Followed by 40 Followed by 60	2,5 20 25	10	70	2,5	100	100	Floor heating and heating at max temperature of 70°C
5	20 Followed by 60 Followed by 80	14 25 10	10	90	1	100	100	High temperature heating systems

Note 1: *if several working temperatures appear in a single class, times should be combined.*
E.g. the profile working temperature for 50 years and for one class 2 is: 70°C for 49 years combined with 80°C for 1 year and 95°C for 100 hours.

Note 2: *for $_{wrk}T$ (working temperature), T_{max} (max working temperature) and $_{mal}T$ (malfunctioning temperature) higher than the values shown in the table these standards are not applicable.*

3.1 RELIABILITY OVER TIME

The permitted working pressures according to water temperatures and to the SDR pipes series are specified by the DIN 8077:1997 Seite 14 Standard and can be checked in the following table:

Tmax (°C)	Working Years	SINGLE WALL – COMPOSITE – MULTILAYER PIPES			
		SDR 11	SDR 9*	SDR 7,4	SDR 6
		Safety coefficient = 1.5 - Average water rate 1.5 m/s			
		Extra working pressure in bar			
10	1	17,6	22,2	27,8	35,0
	5	16,6	21,1	26,4	33,2
	10	16,1	20,4	25,5	32,1
	25	15,6	19,8	24,7	31,1
	50	15,2	19,2	24,0	30,3
20	1	15,0	19,0	23,8	30,0
	5	14,1	17,8	22,3	28,1
	10	13,7	17,4	21,7	27,3
	25	13,3	16,9	21,1	26,5
	50	12,9	16,3	20,4	25,7
30	1	12,8	16,2	20,2	25,5
	5	12,0	15,2	19,0	23,9
	10	11,6	14,6	18,3	23,1
	25	11,2	14,2	17,7	22,3
	50	10,9	13,8	17,3	21,8
40	1	10,8	13,7	17,1	21,5
	5	10,1	12,8	16,0	20,2
	10	9,8	12,5	15,6	19,6
	25	9,4	12,0	15,0	18,8
	50	9,2	11,6	14,5	18,3
50	1	9,2	11,6	14,5	18,3
	5	8,5	10,8	13,5	17,0
	10	8,2	10,5	13,1	16,5
	25	8,0	10,1	12,6	15,9
	50	7,7	9,8	12,2	15,4
60	1	7,7	9,8	12,2	15,4
	5	7,2	9,3	11,6	14,3
	10	6,9	8,8	11,0	13,8
	25	6,7	8,4	10,5	13,3
	50	6,4	8,1	10,1	12,7
70	1	6,5	8,2	10,3	13,0
	5	6,0	7,6	9,5	11,9
	10	5,9	7,4	9,3	11,7
	25	5,1	6,4	8,0	10,1
	50	4,3	5,4	6,7	8,5
80	1	5,5	6,9	8,6	10,9
	5	4,8	6,1	7,6	9,6
	10	4,0	5,0	6,3	8,0
	25	3,2	4,1	5,1	6,4
95	1	-	-	6,1	7,7
	5	-	-	4,0	5,0

* Not specified by the DIN 8077:1997 Page 14 Standard

HEATING SYSTEMS

Working conditions	Tmax (°C)	Working Years	NIRON FG NIRON SDR 6	NIRON SDR 7,4	NIRON FG NIRON SDR 6	NIRON SDR 7,4
			Safety coefficient = 1.5 as per DIN 8077 standard		Safety coefficient = 1.5 as per EN ISO 15874 standard	
			Extra working pressure in bar			
Working pressure at a constant 70°C including 30 day per year with T=Tmax	75	5	13,84	11,30	11,54	9,41
		10	13,40	10,93	11,16	9,11
		25	11,56	10,93	9,64	8,26
		45	10,06	9,91	8,38	7,16
	80	5	13,39	10,92	11,16	9,10
		10	12,96	10,56	10,80	8,80
		25	11,00	9,43	9,17	7,86
		42,5	9,70	8,29	8,08	6,90
	85	5	12,52	10,19	10,44	8,49
		10	12,10	9,85	10,08	8,21
		25	10,08	8,63	8,40	7,19
		37,5	9,16	7,82	7,63	6,52
	90	5	11,52	9,36	9,60	7,80
		10	11,12	9,04	9,27	7,53
		25	8,88	7,60	7,40	6,33
		35	8,20	7,00	6,83	5,83
Working pressure at a constant 70°C including 60 day per year with T=Tmax	75	5	13,77	11,23	11,47	9,36
		10	13,32	10,87	11,10	9,06
		25	11,34	9,72	9,45	8,10
		45	9,87	8,42	8,22	7,02
	80	5	13,11	10,68	10,92	8,90
		10	12,68	10,33	10,56	8,61
		25	10,42	8,92	8,68	7,43
		40	9,32	7,96	7,77	6,63
	85	5	12,13	9,87	10,11	8,23
		10	11,72	9,54	9,77	7,95
		25	9,18	7,85	7,65	6,54
		35	8,47	7,23	7,06	6,03
	90	5	11,12	9,04	9,27	7,53
		10	10,74	8,73	8,95	7,27
		25	7,83	6,68	6,53	5,57
		30	7,50	6,39	6,25	5,33
Working pressure at a constant 70°C including 90 day per year with T=Tmax	75	5	13,70	11,18	11,42	9,31
		10	13,26	10,82	11,05	9,01
		25	11,14	9,54	9,29	7,95
		45	9,69	8,27	8,08	6,89
	80	5	12,91	10,52	10,76	8,77
		10	12,49	10,17	10,41	8,48
		25	9,97	8,53	8,31	7,11
		37,5	9,05	7,73	7,23	6,44
	85	5	11,90	9,68	9,92	8,07
		10	11,50	9,36	9,58	7,80
		25	8,58	7,33	7,15	6,11
		32,5	7,46	6,88	6,72	5,73
	90	5	10,90	8,86	9,08	7,38
		10	11,04	8,55	8,77	7,13
		25	8,18	6,15	6,01	5,12

FAN-COIL SYSTEMS

NIRON CLIMA PPR100-SDR11-PN16

Safety coefficient = 1.5

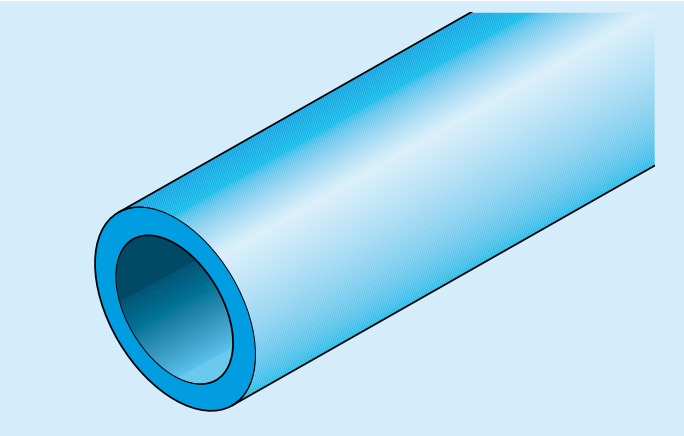
Tmax (°C)	Working Years	$P_{oper.}$ (bar)
10	1	21,9
	5	20,7
	10	20,2
	25	19,5
	50	19,0
20	1	18,8
	5	17,7
	10	17,2
	25	16,6
	50	16,2
30	1	16,0
	5	15,0
	10	14,6
	25	14,1
	50	13,7
40	1	13,6
	5	12,8
	10	12,4
	25	11,9
	50	11,6
50	1	11,6
	5	10,8
	10	10,5
	25	10,1
	50	9,8
55	1	10,7
	5	9,9
	10	9,6
	25	9,2
	50	9,0
60	1	9,8
	5	9,1
	10	8,8
	25	8,5
	50	8,2
70	1	8,3
	5	7,7
	10	7,4
	25	6,3
	50	6,9

$P_{oper.}$ = Extra working pressur

3.2 SINGLE WALL PIPES (EN ISO 15874 PART 2)

The **NIRON single wall** pipes are suitable for all **under-chase** and/or **wall** installations (as long as they are protected from direct UV irradiation). More than 200,000 kilometres have been manufactured over 25 years. They can be used for a huge variety of applications.

These pipes are manufactured by using the most advanced models of extruder with fully electronically controlled production cycles.
The range goes from diam. 16 mm to diam 160 mm in different pressure classes (PN 20, PN 16 and PN 10).



Uses

- Hot and cold sanitary water (risers and connections)
- Heating systems (thermal power plants, delivery to floors, connection to radiators)
- Compressed air circuits
- Water supply to swimming pools
- Air conditioning systems
- Irrigation systems
- Industrial pipelines

Advantages

- Corrosion resistance
- Scaling resistance
- Limited heat dissipation
- Reliability over time and long life
- Lower flow resistance
- Stray current resistance
- Lower noise operation

Dimensional figures

Characteristics	NIRON SDR6 PN20 Pipe – class 2/8 bars – class 1/10 bars										
Outside diameter (mm)	**16**	**20**	**25**	**32**	**40**	**50**	**63**	**75**	**90**	**110**	**125**
Inside diameter (mm)	10,6	13,2	16,6	21,2	26,6	33,2	42,0	50,0	60,0	73,2	83,4
Thickness (mm)	2,7	3,4	4,2	5,4	6,7	8,4	10,5	12,5	15,0	18,4	20,8
Bar length (m)	4	4	4	4	4	4	4	4	4	4	4
Weight per metre (kg/m)	0,11	0,17	0,26	0,43	0,66	1,03	1,62	2,29	3,3	4,92	6,3
Water content (l/m)	0,088	0,137	0,216	0,353	0,555	0,865	1,385	1,963	2,826	4,206	5,460
Packaging (m/package)	100	100	100	60	40	20	16	12	8	8	4

Characteristics	NIRON SDR7,4 PN16 Pipe – class 2/6 bars – class 1/8 bars									
Outside diameter (mm)	**25**	**32**	**40**	**50**	**63**	**75**	**90**	**110**	**125**	**160**
Inside diameter (mm)	18	23,2	29,0	36,2	45,6	54,2	65,0	79,6	90,8	116,2
Thickness (mm)	3,5	4,4	5,5	6,9	8,7	10,4	12,5	15,2	17,1	21,9
Bar length (m)	4	4	4	4	4	4	4	4	4	4
Weight per metre (kg/m)	0,23	0,37	0,57	0,88	1,39	1,99	2,83	4,25	5,41	8,79
Water content (l/m)	0,254	0,423	0,660	1,029	1,632	2,306	3,317	4,974	6,472	10,599
Packaging (m/package)	100	60	40	20	16	12	8	8	4	4

Characteristics	NIRON SDR11 PN10									
Outside diameter (mm)	**32**	**40**	**50**	**63**	**75**	**90**	**110**	**125**	**160**	**200**
Inside diameter (mm)	26,2	32,6	40,8	51,4	61,4	73,6	90,0	102,2	130,8	163,6
Thickness (mm)	2,9	3,7	4,6	5,8	6,8	8,2	10,0	11,4	14,6	18,2
Bar length (m)	4	4	4	4	4	4	4	4	4	4
Weight per metre (kg/m)	0,26	0,4	0,63	0,99	1,37	1,99	2,96	3,84	6,22	9,30
Water content (l/m)	0,539	0,834	1,307	2,074	2,959	4,259	6,359	8,199	13,430	21,00
Packaging (m/package)	60	40	20	16	12	8	8	4	4	4

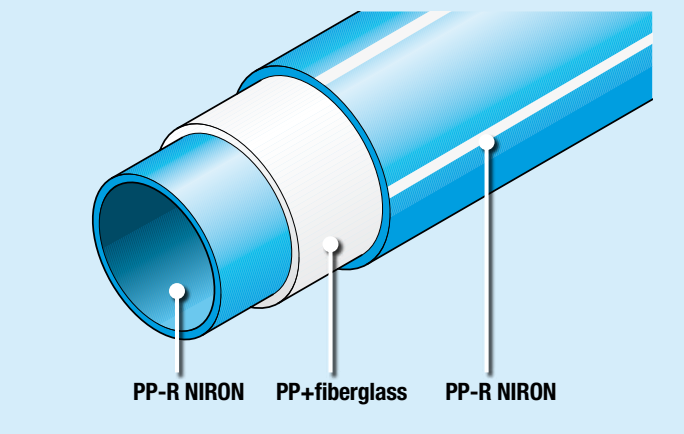
3.3 COMPOSITE PIPES

NIRON FG

The **NIRON FG composite pipes** are suitable for all **under-chase** and/or **wall installations** (as long as they are protected from direct UV irradiation). Working pressure/working temperature being the same, they offer increased water flow rate and considerably lower linear expansion.

They are made according to an innovative co-extrusion technology producing three homogeneous layers simultaneously, having however different mechanical characteristics:

- 1/3 of NIRON PPR80 on the inside (important in contact with water)
- 1/3 of polypropylene copolymer reinforced with fibreglass in the middle (essential to contain linear thermal expansion)
- 1/3 of NIRON PPR80 on the outside (important to ensure perfect hot-melting with the various range fittings)



Uses

- Hot and cold sanitary system water
- Heating systems
- Compressed air circuits
- Water supply to swimming pools
- Air conditioning systems
- Industrial pipelines

Advantages

- Linear expansion reduced by up to 73% ($\Delta l = 0.04$ mm x m x Δt)
- Flow rate increased by 20% thanks to thinner walls (pipe thickness PN16 but featuring the same resistance as PN20)
- High stability
- Increased shock resistance
- Quick installation (welded as standard NIRON pipes)

Dimensional figures

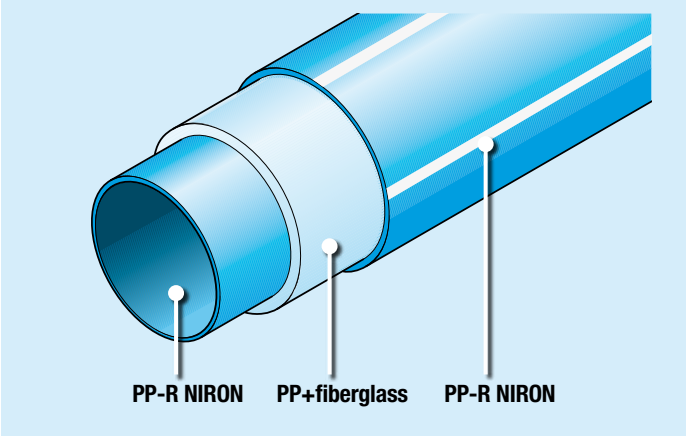
Characteristics	NIRON FG SDR7,4 – PN20 - Pipe class 2/8 bars – class 1/10 bars										
Outside diameter (mm)	**20**	**25**	**32**	**40**	**50**	**63**	**75**	**90**	**110**	**125**	**160**
Inside diameter (mm)	14,4	18	23,2	29,0	36,2	45,6	54,2	65,0	79,6	90,8	116,2
Thickness (mm)	2,8	3,5	4,4	5,5	6,9	8,7	10,4	12,5	15,2	17,1	21,9
Bar length (m)	4	4	4	4	4	4	4	4	4	4	4
Weight per metre (kg/m)	0.16	0,25	0,40	0,61	0,94	1,49	2,11	3,01	4,47	5,60	8,79
Water content (l/m)	0,163	0,254	0,423	0,660	1,029	1,632	2,306	3,317	4,974	6,472	10,599
Packaging (m/package)	100	100	60	40	20	16	12	8	8	4	4

NIRON CLIMA

The **NIRON CLIMA** composite pipes are suitable for all under-chase and/or wall installations (as long as they are protected from direct UV irradiation) in **Fan Coil systems with fan convectors.**
These installations are characterised by low operating pressures but considerable temperature differences between summer and winter time; dimensional stability is consequently of the essence.

These pipes are made according to the same technology used for NIRON FG, but using PPR100 to a lower overall thickness and with differently layered components:

- 1/4 of NIRON PPR100 on the inside (important in contact with water)
- 2/4 of polypropylene copolymer reinforced with fibreglass in the middle layer (essential to contain linear thermal expansion)
- 1/4 of NIRON PPR100 on the outside (important to ensure perfect hot-melting with the various range fittings)



Uses

- Air conditioning systems
- Heating systems

Advantages

- Linear expansion reduced by up to 73% ($\Delta l = 0.04$ mm x m x Δt)
- Flow rate increased by over 30% thanks to thinner walls
- Light weight
- High stability
- Quick installation (welded as standard NIRON pipes)

Dimensional figures

Characteristics	Characteristics NIRON CLIMA pipe										
SDR / PN	PPR100 - SDR11 - PN16 – class 1/6 bars										
Outside diameter (mm)	**32**	**40**	**50**	**63**	**75**	**90**	**110**	**125**	**160**	**200**	**250**
Inside diameter (mm)	26,2	32,6	40,8	51,4	61,4	73,6	90,0	102,2	130,8	163,6	204,6
Thickness (mm)	2,9	3,7	4,6	5,8	6,8	8,2	10,0	11,4	14,6	18,2	22,7
Bar length (m)	4	4	4	4	4	4	4	4	4	4	4
Weight per metre (kg/m)	0,28	0,43	0,67	1,04	1,44	2,08	3,10	4,10	6,50	10,21	15,78
Water content (l/m)	0,42	0,83	1,30	2,07	2,96	4,25	6,36	8,20	13,43	21,00	32,86
Packaging (m/package)	60	40	20	16	12	8	8	4	4	4	4

3.4 CHEMICAL, PHYSICAL AND MECHANICAL PROPERTIES

Characteristics	Testing method	Values	Unit of Measure
Volumic mass	ISO 1183	**0,898**	g/cm^3
Yield strength	ISO 527	**23**	N/mm^2
Elongation at break	ISO 527	**> 500**	%
Modulus of elasticity	ISO 527	**700**	N/mm^2
Liquidity index MFI 190/5	ISO 1133 Procedure 18	**0,5**	g/10 min
Heat conductivity (λ)	DIN 52612	**0,24**	W/mk
Linear thermal expansion coefficient	VDE 0304	**$1,5 \times 10^{-4}$**	K^{-1}
Melting range	DIN 53736b2	**150 - 154**	°C
Impact strength (Charpy) +23°	ISO 179/1 e A	**No break**	KJ/m^2
-30°C	ISO 179/1 e A	**50**	KJ/m^2
Volumic strength	IEC 93	**$>10^{15}$**	Ω cm
Dielectric strength	IEC 243/1	**75**	KV/mm
Loss factor	DIN 53483	**$< 5 \times 10^{-4}$**	
Fire resistance		**B2**	

3.5 THERMAL EXPANSION

Linear thermal expansion depends on the conveyed fluid temperature. It is an inherent factor of all (plastic and ferrous) materials. The higher the modulus of elasticity, the greater the linear thermal expansion ΔI which can be quantified as follows for NIRON pipes:

Single wall pipe	**ΔI = 0,15 mm x I x Δt**
Composite pipe	**ΔI = 0,04 mm x I x Δt**

Where:
- **ΔI** = Length variation in millimetres
- **Δt** = Temperature difference in °C
- **I** = Pipe length in metres

Linear expansion will only turn out to be a minor aesthetic problem, as horizontal or vertical pipes will not be as linear as expected.

The following solutions can be applied to make up for the effects of linear expansion according to the different types of installation:

- **INSTALLATION INSIDE WALLS**
- **INSTALLATION ON CONTINUOUS HORIZONTAL SUPPORTS**
- **FREE INSTALLATION**

INSTALLATION INSIDE WALLS

- **Non insulated pipe:** expansion will propagate to the inside of the pipe
- **Insulated pipe:** expansion will slightly compress the insulating material to make up for elongation

This is the type of installation traditionally recommended for PP-R single wall pipes. It prevents direct exposure to sun rays. It is also less likely to undergo thermal expansion as the pipe outside wall is entirely in contact with a large exchange surface.

- The pipe can be walled in direct contact with plaster, lime and cement.

- Expansion will not be strong enough to cause tiles to come off and/or break the plaster.

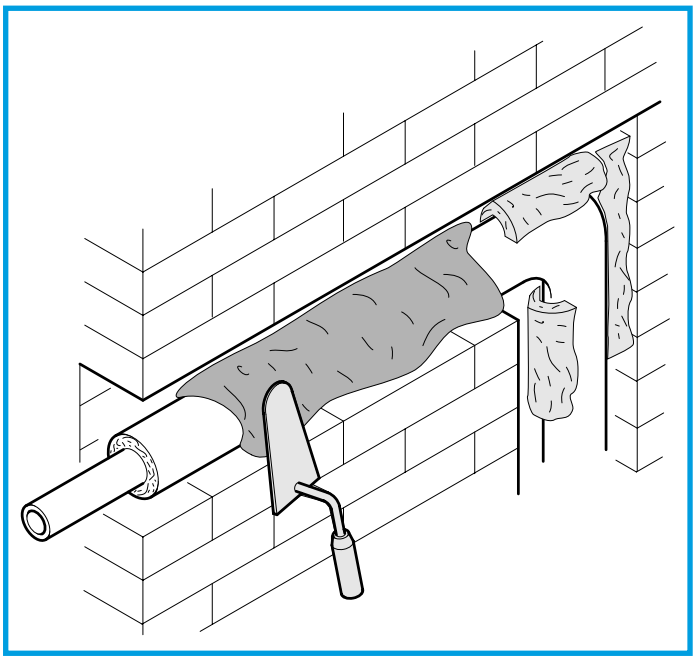


Figure 1 *– Inside wall pipe laying*

INSTALLATION ON CONTINUOUS HORIZONTAL SUPPORTS (E.G. CABLE RAILS)

- Non insulated/insulated pipe: provide fixed point at each change of direction.
- Provide sufficiently large cable rails to allow the pipe bending.

This type of installation (Fig. 2) is especially recommended for water supply in large buildings (hotels, hospitals, shopping malls etc.) where a considerable amount of pipes needs to be routed.

- it helps saving time and supports/fixings

Recommended for both single wall and composite pipes.

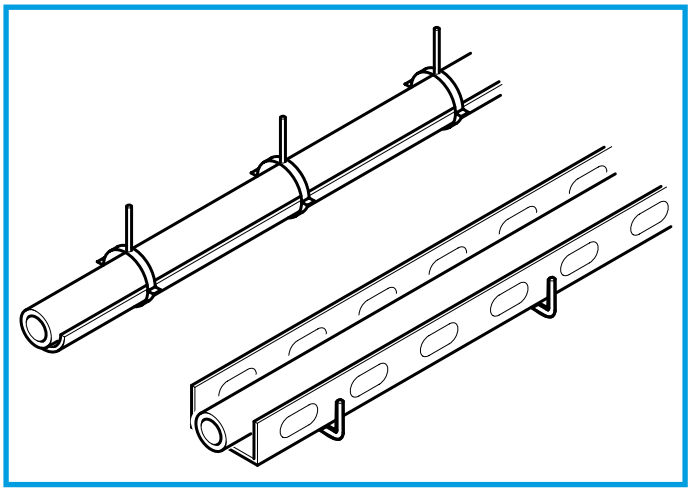


Figure 2 – *Installation on horizontal supports*

INSTALLATION WITH COLLARS

- For straight pipelines, provide solid collars acting as fixed points at the same time (Figure 3). In this way, overall expansion will be split over several smaller stretches along the whole space between fixings. The collars will be submitted to two equal and opposed stress forces, cancelling one another out. Free expansion will only occur in the final stretch.

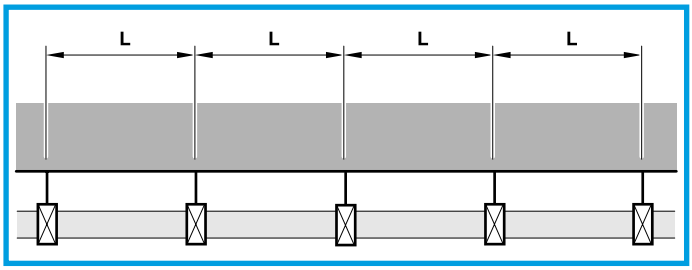


Figure 3 – *Free installation*

- For pipeline stretches containing changes of direction or lateral branches, always provide fixed points connected with the fittings (Figure 4). Expansion must only affect the pipe and not the fittings.

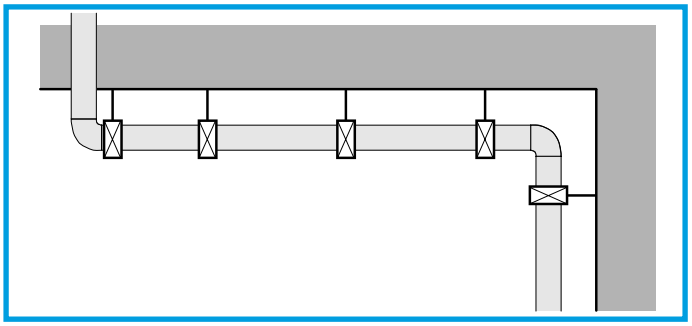


Figure 4 – *Free installation*

- If there are Valves, Meters etc., always use solid collars acting as fixed points at the same time (Figure 5).

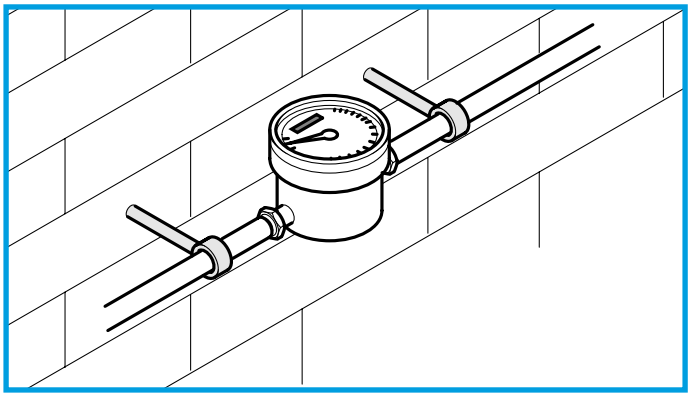


Figure 5 – *Valve and meter fixing*

If sliding collars (or poor quality fixings) are used, a double offset expansion U bend must be used in the middle of the pipeline (Figure 6).

The dimensioning values for the various parts of the U bend can be worked out by using the formula:

$$Lc = 20 \sqrt{d} \times \Delta l$$

where:
Lc = *L1 + L2 + L1* (U bend Length)
L2 = *0,5 L1*
d = pipe outside diameter in mm
Δl = expansion of pipe section

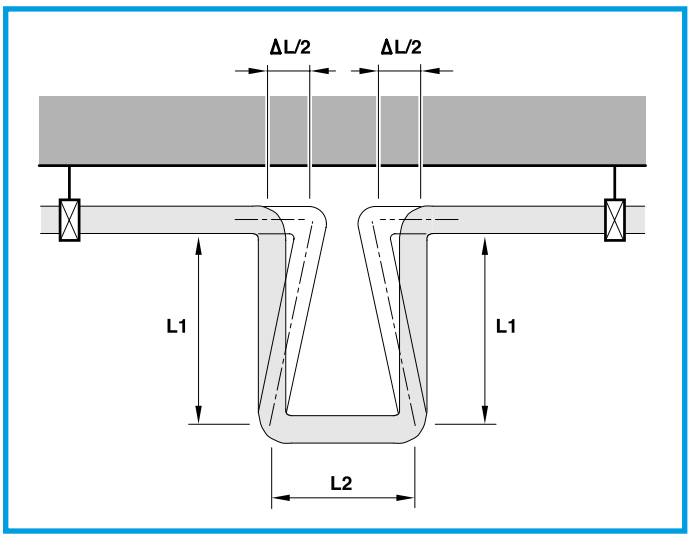


Figure 6 – *Free installation*

When sliding collars are used, a flexible arm expansion joint can also be used (Figure 7).

The values to use to obtain correct dimensioning are:

$$Lc = 20 \sqrt{d} \times \Delta l$$

where:
Lc = Expansion joint length
d = pipe outside diameter in mm
Δl = expansion of pipe section

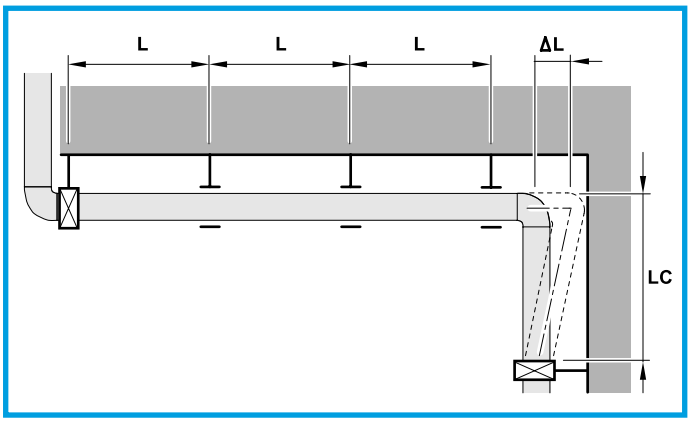


Figure 7 – *Free installation*

If we are working with risers, to 'branch off' to the various floors we will have to:

- Provide a through-hole in the wall larger than 50% of the pipe outside diameter (Figure 8).

- Go in with a pipe section and a 90° elbow (Figure 9)

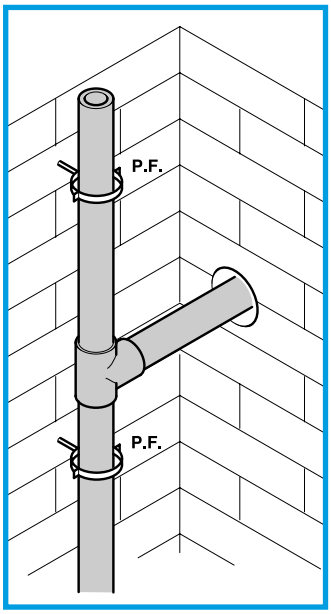


Figure 8 – *Free installation*

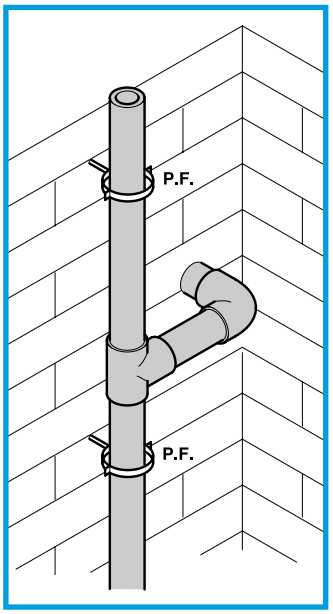
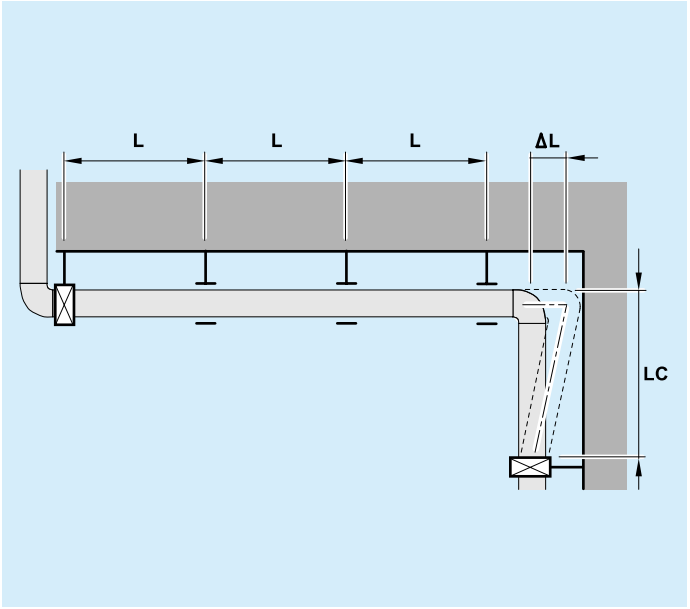


Figure 9 – *Free installation*

3.6 HANGERS FOR EXTERNAL INSTALLATION (prEN806-4/ENV12208)

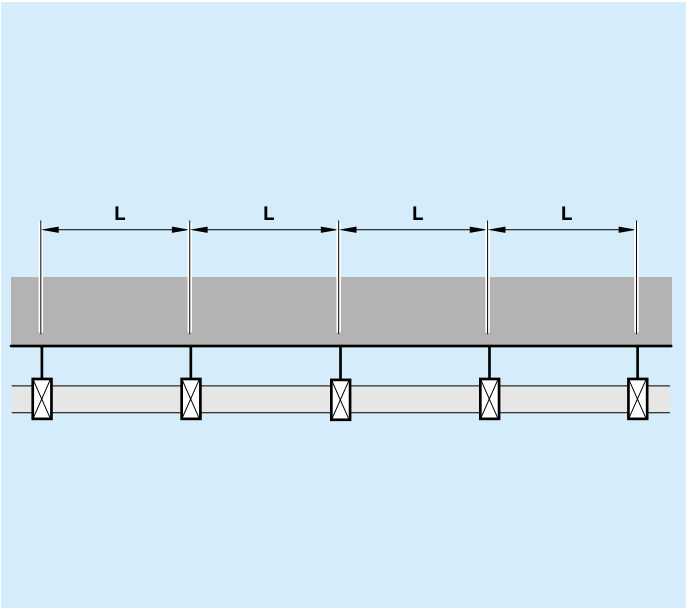
SLIDING COLLAR DISTANCE

Pipe O.D. mm	L DISTANCE in metres	
	COLD water (1°C - 30°C)	HOT water (31°C - 70°C)
20	0,85	0,60
25	1,00	0,65
32	1,10	0,80
40	1,25	1,00
50	1,40	1,20
63	1,50	1,30
75	1,65	1,45
90	1,90	1,60
110	2,10	1,85
125	2,30	2,05
160	2,50	2,30
200	2,80	2,50
250	3,00	2,70



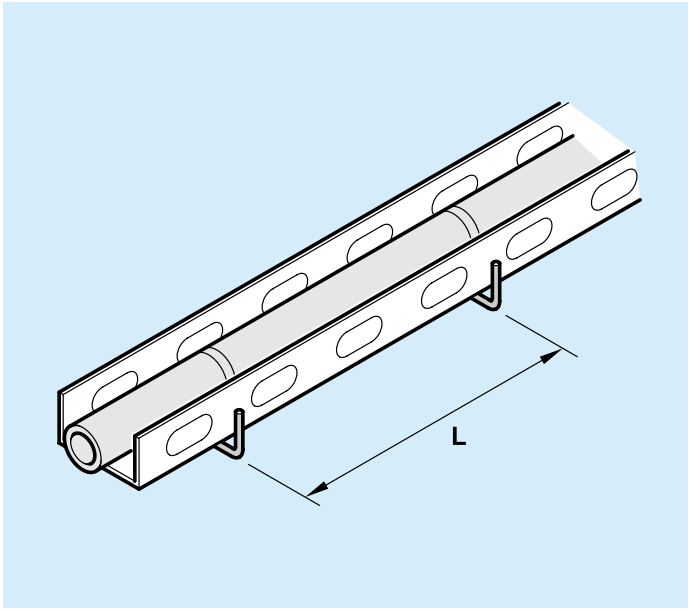
FIXED COLLAR DISTANCE

Pipe O.D. mm	L DISTANCE in metres	
	COLD water (1°C - 30°C)	HOT water (31°C - 70°C)
20	0,80	0,55
25	0,90	0,60
32	1,00	0,70
40	1,10	0,90
50	1,20	1,10
63	1,30	1,20
75	1,50	1,30
90	1,70	1,50
110	1,90	1,65
125	2,10	1,80
160	2,30	2,00
200	2,50	2,30
250	2,70	2,50



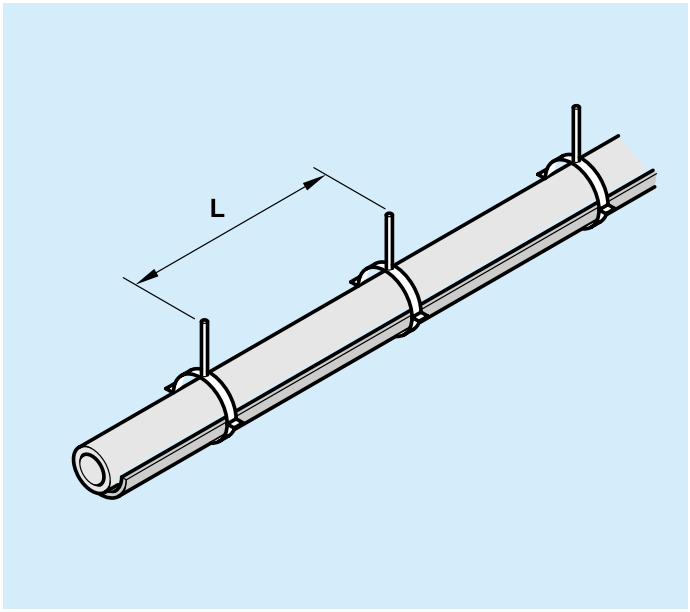
DISTANCE BETWEEN PIPE SUPPORTS INSTALLED IN CONTINUOUS RAILS

Pipe O.D. mm	L DISTANCE in metres	
	COLD water (1°C - 30°C)	HOT water (31°C - 70°C)
< 20	1,5	1,0
> 20 ÷ < 40	1,5	1,2
> 40 ÷ < 75	1,5	1,5
> 75 ÷ < 110	2,0	2,0
>110 ÷ <200	2,2	2,2
>200 ÷ <250	2,3	2,3



DISTANCE BETWEEN PIPE FIXINGS INSTALLED IN SEMICIRCULAR DUCTS

Pipe O.D. mm	L DISTANCE in metres	
	COLD water (1°C - 30°C)	HOT water (31°C - 70°C)
20	0,50	0,30
25	0,75	0,40
32	0,75	0,60
40	0,75	0,75
50	0,75	0,75
63	0,75	0,75
75	1,00	1,00
90	1,00	1,00
110	1,00	1,00
125	1,20	1,20
160	1,50	1,50
200	1,80	1,80
250	2,00	2,00



4 ENERGY SAVING

4.1 ENERGY SAVING

Using the NIRON System instead of traditional metal pipelines for hot sanitary water supply allows the user to save energy in two different ways:

- Under pseudosteady conditions (bath/shower or washing machine using hot water), the decreased heat loss will ensure passive loss reduction by approximately 20% on a non insulated pipe.
- Under transient conditions (washing hands or washing small items), the decreased heat conductivity will enable to supply sufficiently hot water even when the pipe has not yet reached steady state conditions. In this case, the energy saving connected with the NIRON pipelines will exceed 12% peaking up to 26% (see chart).

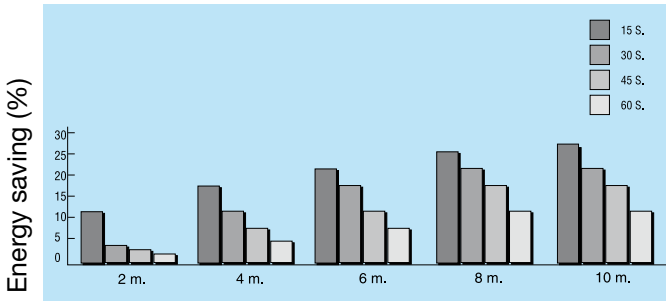


Figure 10 – *PER CENT ENERGY SAVING UNDER TRANSIENT CONDITIONS*

Under transient conditions, energy saving will also translate into considerable water saving as shown below.

Pipe Length	IRON		COPPER		NIRON		WATER SAVING (LITRES)	
m	Time sec.	Litre con-	Time sec.	Litre consumpt	Time sec.	Litre consumpt	Niron/Iron	Niron/Copper
2	5,0	0,5	2,4	0,24	**1,3**	**0,13**	0,37	0,11
4	10,3	1,03	4,8	0,48	**2,7**	**0,27**	0,76	0,21
6	15,2	1,52	7,2	0,72	**3,9**	**0,49**	1,13	0,33
8	20,1	2,01	10,6	1,06	**6,0**	**0,60**	1,41	0,46
10	24,4	2,44	14,3	1,43	**8,5**	**0,85**	1,59	0,58

The chart here above shows the time to water delivery at 40°C with a flow rate of 360 l/h according to the material used.

4.2 NIRON PIPE EXTERNAL TEMPERATURE

Thanks to their low thermal conductivity, NIRON pipes have an outside temperature considerably lower than the inside temperature of the conveyed water.
The pipe outside temperature is the result of the following variables:

- Water temperature inside the pipe
- Pipe thickness
- Ambient temperature

Here are a few example situations:

Pipe diam. 32 x 5,4			Pipe diam 63 x 5,4			Pipe diam Ø 90 x 5,4		
Water T (°C)	Ambient T (°C)	Pipe T (°C)	Water T (°C)	Ambient T (°C)	Pipe T (°C)	Water T (°C)	Ambient T (°C)	Pipe T (°C)
	15	39,7		15	32,5		15	30,9
	20	41,9		20	35,5		20	34,1
60	25	44,2	**60**	25	38,6	**60**	25	37,4
	30	46,5		30	41,6		30	41,9
	35	48,7		35	44,7		35	43,8

For any other value in our range please contact our After Sales Service.

4.3 HEAT LOSS

The UNI 9182 italian standards in force allow a maximum temperature difference of 2°C between the point of preparation and the point furthest away in a hot water supply circuit. The Italian Law 10/91 provides that the sanitary hot water temperature at the point of use must be 40°C and prescribes insulation for all the piping.
The insulating material thickness is a function of its heat conductivity and pipe diameter.
The (non insulated and insulated) NIRON pipes feature extremely low heat loss falling within the prescribed range of values – as shown by the tables here below.

NON INSULATED PIPE
Water temp. 40°C – Rate 2 m/s

Ø mm	SDR	Ambient Temperature		
		10°C	15°C	20°C
		Heat Loss °C for each 10m of pipe		
20	6	0,25	0,21	0,17
25	6	0,18	0,15	0,12
32	6	0,13	0,11	0,09
40	6	0,09	0,08	0,06
50	6	0,07	0,06	0,05
63	6	0,05	0,04	0,03
75	6	0,04	0,03	0,02
90	6	0,03	0,02	0,02
110	6	0,02	0,02	0,02
125	6	0,02	0,01	0,01

NON INSULATED PIPE
Water temp. 40°C – Rate 2 m/s

Ø mm	SDR	Ambient Temperature		
		10°C	15°C	20°C
		Heat Loss °C for each 10m of pipe		
25	7,4	0,17	0,14	0,11
32	7,4	0,12	0,10	0,08
40	7,4	0,09	0,07	0,06
50	7,4	0,07	0,06	0,05
63	7,4	0,05	0,04	0,03
75	7,4	0,04	0,03	0,02
90	7,4	0,03	0,02	0,02
110	7,4	0,02	0,02	0,01
125	7,4	0,02	0,01	0,01
160	7,4	0,01	0,01	0,00

INSULATED PIPE
Water temp. 40°C – Rate 2 m/s

Ø mm	SDR	Insulating matl 0,038 W/mk	Ambient Temperature		
			10°C	15°C	20°C
			Heat Loss °C for each 10m of pipe		
20	6	6	0,10	0,08	0,07
25	6	9	0,05	0,05	0,04
32	6	9	0,04	0,03	0,03
40	6	9	0,03	0,02	0,02
50	6	12	0,02	0,02	0,01
63	6	15	0,01	0,01	0,01
75	6	15	0,01	0,00	0,00
90	6	17	0,00	0,00	0,00
110	6	18	0,00	0,00	0,00
125	6	18	0,00	0,00	0,00

INSULATED PIPE
Water temp. 40°C – Rate 2 m/s

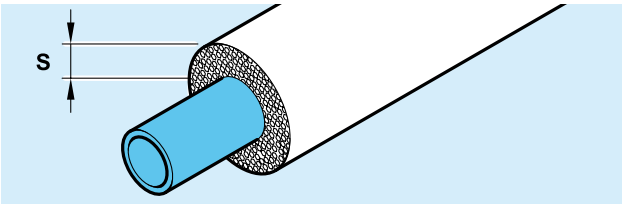
Ø mm	SDR	Insulating matl 0,038 W/mk	Ambient Temperature		
			10°C	15°C	20°C
			Heat Loss °C for each 10m of pipe		
25	7,4	9	0,05	0,04	0,03
32	7,4	9	0,04	0,03	0,02
40	7,4	9	0,03	0,02	0,02
50	7,4	12	0,02	0,01	0,01
63	7,4	15	0,01	0,00	0,00
75	7,4	15	0,01	0,00	0,00
90	7,4	17	0,00	0,00	0,00
110	7,4	18	0,00	0,00	0,00
125	7, 4	18	0,00	0,00	0,00
160	7,4	18	0,00	0,00	0,00

Note: *Please check with our Technical Department for Heat Losses according to different water flow rates, pipe SDR, insulating material heat conductivity and ambient temperature.*

4.4 ANTI-CONDENSATE INSULATION IN AIR CONDITIONING SYSTEMS

The charts here below show the minimum insulator thickness required for NIRON pipes to prevent air humidity turning to dew on the pipes in air conditioning systems.

s = Insulating material thickness (in mm with 0.038 W/mk conductivity)
Te = Outside air temperature in °C
Ti = Water temperature inside the pipes in °C
60%/80% = Air relative humidity



PIPE Ø 20 x 3,4 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	3,7	3,9	4,1	4,3	4,6	4,8	5,0	5,3	5,5	
7	3,0	3,3	3,5	3,8	4,0	4,2	4,5	4,7	5,0	60
9	2,4	2,7	2,9	3,2	3,4	3,7	3,9	4,2	4,4	
5	10,5	10,9	11,3	11,7	12,1	12,4	12,8	13,2	13,6	
7	9,5	9,9	10,3	10,7	11,1	11,5	11,9	12,3	12,7	80
9	8,4	8,8	9,2	9,6	10,0	10,5	10,9	11,3	11,7	

PIPE Ø 25 x 4,2 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	3,6	3,8	4,1	4,3	4,6	4,8	5,1	5,3	5,6	
7	3,0	3,2	3,5	3,7	4,0	4,2	4,5	4,8	5,0	60
9	2,3	2,6	2,9	3,1	3,4	3,7	3,9	4,2	4,4	
5	10,9	11,3	11,7	12,1	12,5	12,9	13,3	13,7	14,1	
7	9,7	10,2	10,6	11,0	11,4	11,9	12,3	12,7	13,1	80
9	8,6	9,0	9,5	9,9	10,3	10,8	11,2	11,7	12,1	

PIPE Ø 32 x 5,4 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	3,5	3,8	4,0	4,3	4,5	4,8	5,0	5,3	5,5	
7	2,9	3,1	3,4	3,6	3,9	4,2	4,4	4,7	5,0	60
9	2,2	2,5	2,7	3,0	3,3	3,6	3,8	4,1	4,4	
5	11,1	11,6	12,0	12,4	12,9	13,3	13,7	14,1	14,6	
7	10,0	10,4	10,9	11,3	11,8	12,2	12,7	13,1	13,5	80
9	8,7	9,2	9,7	10,1	10,6	11,1	11,6	12,0	12,5	

PIPE Ø 40 x 6,7 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,4	3,6	3,9	4,4	4,7	4,9	4,9	5,2	5,5	
7	2,7	3,0	3,2	3,8	4,1	4,3	4,3	4,6	4,9	60
9	2,0	2,3	2,6	3,1	3,4	3,7	3,7	4,0	4,3	
5	11,3	11,8	12,3	13,2	13,6	14,1	14,1	14,5	15,0	
7	10,1	10,6	11,0	13,0	12,5	12,9	12,9	13,4	13,9	80
9	8,8	9,3	9,8	10,8	11,3	11,8	11,8	12,3	12,8	

PIPE Ø 50 x 8,4 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	3,1	3,4	3,7	4,0	4,2	4,5	4,8	5,0	5,3	
7	2,4	2,7	3,0	3,3	3,6	3,8	4,1	4,4	4,7	60
9	1,7	2,0	2,3	2,6	2,9	3,2	3,5	3,8	4,1	
5	11,5	11,9	12,4	12,9	13,4	13,8	14,3	14,8	15,3	
7	10,1	10,6	11,1	11,6	12,1	12,6	13,1	13,6	14,1	80
9	8,8	9,3	9,8	10,4	10,9	11,4	11,9	12,4	13,0	

PIPE Ø 63 x 10,5 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	2,8	3,1	3,4	3,7	4,0	4,2	4,5	4,8	5,1	
7	2,1	2,4	2,7	3,0	3,3	3,6	3,8	4,1	4,4	60
9	1,4	1,7	2,0	2,3	2,6	2,9	3,2	3,5	3,8	
5	11,5	12,0	12,5	13,0	13,5	14,0	14,5	15,0	15,5	
7	10,1	10,6	11,2	11,7	12,2	12,7	13,2	13,8	14,3	80
9	8,7	9,2	9,8	10,3	10,9	11,4	12,0	12,5	13,1	

PIPE 75 x 12,5 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	2,3	2,6	2,9	3,2	3,5	3,8	4,1	4,4	4,7	
7	1,6	1,9	2,2	2,5	2,8	3,1	3,4	3,7	4,0	60
9	0,9	1,2	1,5	1,8	2,1	2,4	2,7	3,0	3,3	
5	11,1	11,6	12,1	12,6	13,1	13,6	14,1	14,6	15,1	
7	9,7	10,2	10,7	11,2	11,7	12,2	12,7	13,2	13,7	80
9	8,2	8,8	9,4	10,0	10,6	11,2	11,8	12,4	13,0	

PIPE Ø 90 x 15 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	1,8	2,1	2,4	2,7	3,0	3,3	3,6	3,9	4,2	
7	1,1	1,5	1,7	2,0	2,3	2,6	2,9	3,2	3,5	60
9	0,3	0,6	0,9	1,2	1,5	1,8	2,1	2,4	2,7	
5	10,8	11,4	11,9	12,5	13,0	13,6	14,1	14,7	15,2	
7	9,4	10,0	10,5	11,1	11,6	12,2	12,7	13,3	13,8	80
9	7,9	8,5	9,0	9,6	10,1	10,7	11,2	11,8	12,3	

PIPE Ø 110 x 18,4 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	1,3	1,6	1,9	2,2	2,5	2,8	3,1	3,4	3,7	
7	0,5	0,8	1,1	1,4	1,7	2,0	2,3	2,6	2,9	60
9	0,0	0,1	0,4	0,7	1,0	1,3	1,6	1,9	2,2	
5	10,5	11,1	11,6	12,2	12,7	13,3	13,8	14,4	14,9	
7	9,0	9,6	10,1	10,7	11,2	11,8	12,3	12,9	13,4	80
9	7,5	8,1	8,7	9,3	9,9	10,5	11,1	11,7	12,3	

PIPE Ø 125 x 20,8 SDR 6

Ti \ Te	26	27	28	29	30	31	32	33	34	umidity%
5	0,8	1,1	1,4	1,7	2,0	2,3	2,6	2,9	3,2	
7	0,0	0,3	0,6	0,9	1,2	1,5	1,8	2,1	2,4	60
9	0,0	0,0	0,0	0,2	0,5	0,8	1,1	1,4	1,7	
5	10,2	10,8	11,3	11,9	12,4	13,0	13,5	14,1	14,6	
7	8,6	9,2	9,8	10,4	11,0	11,6	12,2	12,8	13,4	80
9	7,1	7,7	8,3	8,9	9,5	10,1	10,7	11,3	11,9	

PIPE Ø 20 x 2,8 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,8	4,0	4,3	4,5	4,7	5,0	5,2	5,4	5,6	
7	3,2	3,5	3,7	4,0	4,2	4,5	4,7	5,0	5,2	60
9	2,6	2,9	3,1	3,4	3,6	3,9	4,1	4,4	4,6	
5	10,6	11,0	11,4	11,8	12,2	12,6	13,0	13,4	13,8	
7	9,6	10,0	10,4	10,8	11,2	11,6	12,0	12,4	12,8	80
9	8,5	8,9	9,3	9,7	10,1	10,5	10,9	11,3	11,7	

PIPE Ø 25 x 3,5 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,8	4,0	4,3	4,5	4,7	5,0	5,2	5,4	5,7	
7	3,2	3,5	3,7	4,0	4,2	4,5	4,7	5,0	5,2	60
9	2,5	2,8	3,1	3,4	3,6	3,9	4,1	4,4	4,6	
5	10,9	11,3	11,7	12,1	12,5	12,9	13,3	13,7	14,1	
7	9,8	10,3	10,7	11,2	11,6	12,1	12,5	13,0	13,4	80
9	8,7	9,2	9,6	10,1	10,5	11,0	11,4	11,9	12,3	

PIPE Ø 32 x 4,4 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,8	4	4,3	4,5	4,7	5	5,2	5,4	5,7	
7	3,1	3,4	3,6	3,9	4,1	4,4	4,6	4,9	5,1	60
9	2,4	2,7	3	3,3	3,5	3,8	4	4,3	4,6	
5	11,3	11,8	12,2	12,7	13,1	13,6	14,0	14,5	14,9	
7	10,2	10,7	11,1	11,6	12,0	12,5	12,9	13,4	13,8	80
9	8,9	9,4	9,9	10,4	10,9	11,4	11,9	12,4	12,9	

PIPE Ø 40 x 5,5 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,6	3,9	4,1	4,4	4,6	4,9	5,1	5,4	5,6	
7	2,9	3,2	3,4	3,7	4,0	4,3	4,5	4,8	5,1	60
9	2,2	2,5	2,8	3,1	3,4	3,7	3,9	4,2	4,5	
5	11,5	12,0	12,4	12,9	13,4	13,9	14,3	14,8	15,3	
7	10,3	10,8	11,2	11,7	12,1	12,6	13,0	13,5	13,9	80
9	9,0	9,5	10,0	10,5	11,0	11,5	12,0	12,5	13,0	

PIPE Ø 50 x 6,9 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,5	3,8	4,0	4,3	4,5	4,8	5,1	5,3	5,6	
7	2,7	3,0	3,2	3,5	3,8	4,1	4,3	4,6	4,9	60
9	2,0	2,3	2,6	2,9	3,2	3,5	3,7	4,0	4,3	
5	11,7	12,2	12,7	13,2	13,7	14,2	14,7	15,2	15,7	
7	10,4	10,9	11,4	11,9	12,4	12,9	13,4	13,9	14,4	80
9	9,0	9,5	10,1	10,6	11,2	11,7	12,2	12,8	13,3	

PIPE Ø 63 x 8,7 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	3,2	3,5	3,8	4,0	4,3	4,6	4,9	5,2	5,4	
7	2,5	2,8	3,1	3,4	3,7	4,0	4,2	4,5	4,8	60
9	1,7	2	2,3	2,6	2,9	3,2	3,5	3,8	4,1	
5	11,8	12,3	12,8	13,3	13,8	14,3	14,8	15,3	15,8	
7	10,4	11,0	11,5	12,1	12,6	13,2	13,7	14,3	14,8	80
9	9,0	9,6	10,1	10,7	11,2	11,8	12,4	12,9	13,5	

PIPE Ø 75 x 10,4 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	2,5	2,8	3,1	3,4	3,7	3,9	4,2	4,5	4,8	
7	1,8	2,1	2,4	2,7	3,0	3,3	3,5	3,8	4,1	60
9	1,0	1,3	1,6	1,9	2,2	2,6	2,9	3,2	3,5	
5	11,4	11,9	12,4	13,0	13,5	14,0	14,5	15,0	15,6	
7	10,0	10,5	11,1	11,6	12,1	12,7	13,2	13,8	14,3	80
9	8,5	9,1	9,7	10,2	10,8	11,3	11,9	12,5	13,0	

PIPE Ø 90 x 12,5 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	2,6	2,9	3,2	3,5	3,8	4,1	4,4	4,7	5	
7	1,9	2,2	2,5	2,8	3,1	3,4	3,7	4	4,3	60
9	1,1	1,4	1,7	2,1	2,4	2,7	3	3,3	3,6	
5	11,8	12,3	12,9	13,4	13,9	14,5	15	15,6	16,1	
7	10,3	10,9	11,4	12	12,6	13,1	13,7	14,2	14,8	80
9	8,8	9,4	10	10,6	11,1	11,7	12,3	12,9	13,5	

PIPE Ø 110 x 15,2 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	2,3	2,6	2,9	3,2	3,5	3,8	4,1	4,4	4,6	
7	1,5	1,9	2,2	2,5	2,8	3,1	3,4	3,7	4	60
9	0,8	1,1	1,4	1,7	2,1	2,4	2,7	3	3,3	
5	11,5	12,2	12,8	13,4	13,9	14,5	15,1	15,6	16,2	
7	10	10,7	11,3	11,9	12,5	13,1	13,7	14,3	14,8	80
9	8,5	9,2	9,8	10,5	11,1	11,7	12,3	12,9	13,5	

PIPE Ø 125 x 17,1 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	2,2	2,5	2,8	3,1	3,4	3,7	4,0	4,3	4,5	
7	1,4	1,8	2,1	2,4	2,7	3,0	3,3	3,6	3,9	0,6
9	0,6	1,0	1,3	1,6	2,0	2,3	2,6	2,8	3,1	
5	11,3	12,0	12,6	13,2	13,7	14,3	15,0	15,5	16,0	
7	9,8	10,5	11,1	11,7	12,3	13,0	13,5	14,0	14,5	0,8
9	8,3	9,0	9,7	10,3	11,0	11,5	12,0	12,8	13,2	

PIPE Ø 160 x 21,9 SDR 7,4

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	0,8	1,1	1,4	1,7	2,0	2,3	2,6	2,9	3,2	
7	0,0	0,4	0,7	1,0	1,3	1,6	1,9	2,2	2,5	60
9	0,0	0,0	0,0	0,3	0,6	0,9	1,2	1,5	1,8	
5	10,5	11,1	11,7	12,3	12,9	13,5	14,1	14,7	15,3	
7	8,9	9,5	10,1	10,7	11,3	11,9	12,5	13,1	13,7	80
9	7,2	7,9	8,5	9,2	9,8	10,5	11,1	11,8	12,4	

PIPE Ø 200 x 18,2 SDR 11

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	1,7	2,0	2,3	2,6	2,9	3,2	3,5	3,8	4,1	
7	0,9	1,2	1,5	1,8	2,1	2,4	2,7	3,0	3,3	60
9	0,1	0,4	0,8	1,1	1,4	1,7	2,0	2,3	2,6	
5	11,5	12,2	12,8	13,5	14,1	14,7	15,3	16,0	16,6	
7	9,9	10,6	11,3	11,9	12,5	13,1	13,8	14,5	15,1	80
9	8,2	8,9	9,6	10,3	11,0	11,7	12,3	13,0	13,6	

PIPE Ø 250 x 22,7 SDR 11

Ti \ Te	26	27	28	29	30	31	32	33	34	umidità%
5	1,7	2,0	2,3	2,6	2,9	3,2	3,5	3,8	4,1	
7	0,9	1,2	1,5	1,8	2,1	2,4	2,7	3,0	3,3	60
9	0,1	0,4	0,8	1,1	1,4	1,7	2,0	2,3	2,6	
5	11,5	12,2	12,8	13,5	14,1	14,7	15,3	16,0	16,6	
7	9,9	10,6	11,3	11,9	12,5	13,1	13,8	14,5	15,1	80
9	8,2	8,9	9,6	10,3	11,0	11,7	12,3	13,0	13,6	

5 PRESSURE DROP

Unit pressure drop in NIRON SDR6 pipes with water temperature at 10°C

Flow rate		Ø	Ø	Ø	Ø	Ø	Ø	Ø
l/s	kg/h	16x2,7	20x3,4	25x4,2	32x5,4	40x6,7	50x8,4	63x10,5
	70	10 0,22	2 0,14	0,9 0,09	Pressure drop in mm/w.c. per m Average rate in m/s			
	140	33 0,44	8 0,29	3 0,18	1 0,11			
0,05	180	52 0,57	13 0,37	4 0,23	2 0,14			
	220	73 0,70	19 0,45	6 0,28	2 0,17			
	290	118 0,92	30 0,59	10 0,37	4 0,23	1,5 0,15	0,5 0,09	
0,1	360	164 1,11	42 0,71	15 0,45	6 0,28	2 0,18	0,7 0,11	
	430	234 1,36	61 0,88	21 0,55	8 0,34	3 0,22	1,07 0,14	0,33 0,09
	510		83 1,04	29 0,66	11 0,40	4 0,26	1,44 0,16	0,45 0,10
	580		104 1,18	37 0,75	14 0,46	5 0,29	1,8 0,19	0,56 0,12
	655		129 1,34	45 0,84	18 0,52	6 0,33	2,2 0,21	0,7 0,13
0,2	730		156 1,49	55 0,94	22 0,58	7,5 0,37	2,69 0,24	0,84 0,15
	830		290 1,65	69 1,07	27 0,66	9 0,42	3,3 0,27	1 0,17
	900		353 1,83	85 1,20	33 0,74	11 0,47	4,1 0,30	1,3 0,19
0,3	1.080			110 1,39	43 0,85	15 0,54	5,3 0,35	1,6 0,22
	1.280			149 1,65	59 1,01	20 0,64	7,1 0,41	2,2 0,26
0,4	1.430			270 1,85	71 1,13	24 0,72	8 0,46	2,7 0,29
	1.605				87 1,27	30 0,81	10 0,52	3,4 0,32
0,5	1.805				107 1,43	36 0,91	13 0,58	4,2 0,36
	2.005				135 1,55	44 1,01	15 0,65	5 0,40
0,6	2.155				172 1,70	50 1,08	17 0,69	5,7 0,43
	2.330				200 1,8	57 1,17	20 0,75	6,5 0,47
0,7	2.530				225 1,98	66 1,27	23 0,82	7,6 0,51
	2.705					74 1,36	26 0,87	8,5 0,54
0,8	2.880					83 1,45	29 0,93	9,5 0,58
	3.005					89 1,51	31 0,97	10 0,61
0,9	3.255					103 1,63	36 1,05	11 0,66

Flow rate		Ø	Ø	Ø	Ø	Ø	Ø	Ø	Ø
l/s	kg/h	32x5,4	40x6,7	50x8,4	63x10,5	75x10,5	90x12,5	110x15,2	125x20,8
1,0	3.600		143 1,8	43 1,16	14 0,73	7,9 0,5	2,8 0,35		
1,2	4.320		198 2,16	59 1,40	19 0,87	9,2 0,61	3,9 0,42		
1,3	4.680.			66 1,49	22 0,93	10,6 0,66	4,5 0,46		
1,4	5.040			76 1,62	25 1,01	12,1 0,71	5,1 0,50		
1,6	5.760			114 1,85	32 1,16	15,3 0,81	6,4 0,57		
1,8	6.480			141 2,08	40 1,32	18,8 0,92	7,9 0,64		
2,0	7.200			170 2,31	48 1,46	22,7 1,02	9,5 0,71	3,7 0,48	
2,2	7.920				57 1,60	26,9 1,12	11,3 0,78	4,4 0,52	
2,4	8.640				66 1,74	31,4 1,22	13,1 0,85	5,1 0,57	
2,6	9.360				76 1,88	36,1 1,32	15,1 0,92	5,9 0,62	3,1 0,48
2,8	10.080				87 2,02	41,2 1,43	17,3 0,99	6,7 0,67	3,6 0,51
3,0	10.800				1113 2,17	46,6 1,53	19,5 1,06	7,5 0,71	4,1 0,55
3,5	12.600				149 2,53	61,4 1,78	25,7 1,24	9,9 0,83	5,3 0,64
4,0	14.400					77,9 2,04	32,6 1,41	12,6 0,95	6,7 0,73
4,5	16.200					96,2 2,29	40,2 1,59	15,5 1,07	8,3 0,82
5,0	18.000					116,2 2,55	48,5 1,77	18,7 1,19	10,0 0,92
6,0	21.600					161,1 3,06	67,2 2,12	25,9 1,43	13,9 1,10
7,0	25.200						88,6 2,48	34,2 1,66	18,3 1,28
8,0	28.800						112,7 2,83	43,4 1,90	23,2 1,46
9	32.400						139,3 3,18	53,6 2,14	28,7 1,65
10	36.000							64,8 2,38	34,7 1,83
11	39.600							77 2,61	41,1 2,01
12	43.200							90,0 2,85	48,1 2,20
13	46.800							104,0 3,09	55,6 2,38
15	50.400								71,9 2,75
17	54.000								92,1 3,11

Unit pressure drop in NIRON SDR7,4 pipes with water temperature at 10°C

Flow rate		Ø	Ø	Ø	Ø	Ø	Ø	Ø
l/s	kg/h	25x4,2	32x4,4	40x5,5	50x6,9	63x8,7	75x10,4	90x12,5
0,10	360	16,9 0,39	5,2 0,24					
0,15	540	33,8 0,59	10,2 0,35	Pressure drop in mm/w.c. per m Average rate in m/s				
0,20	720	55,4 0,79	16,7 0,47					
0,25	864	81,4 0,98	24,5 0,59					
0,30	1.080	111,6 1,18	33,6 0,71	11,7 0,45				
0,35	1.260	145,9 1,38	43,9 0,83	15,3 0,53				
0,40	1.440	184,2 1,57	55,3 0,95	19,2 0,61	6,7 0,39			
0,45	1.620	226,3 1,77	67,9 1,06	23,6 0,68	8,3 0,44			
0,50	1.800	272,2 1,96	81,5 1,18	28,3 0,76	9,9 0,49			
0,55	1.980	321,7 2,16	96,3 1,30	33,4 0,83	11,7 0,53			
0,60	2.160		112,2 1,42	38,9 0,91	13,6 0,58			
0,65	2.340		129,0 1,54	44,7 0,98	15,6 0,63	5,2 0,40		
0,70	2.520		147,0 1,66	50,9 1,06	17,8 0,68	6,0 0,43		
0,75	2.700		165,9 1,77	57,4 1,14	20,0 0,73	6,7 0,46		
0,80	2.880		185,9 1,89	64,3 1,21	22,4 0,78	7,5 0,49		
0,85	3.060		206,8 2,01	71,5 1,29	24,9 0,83	8,3 0,52		
0,90	3.240		228,7 2,13	79,1 1,36	27,6 0,87	9,2 0,55		
1,00	3.600			95,2 1,51	33,1 0,97	11,1 0,61	4,9 0,43	
1,20	4.320			131,2 1,82	45,6 1,17	15,2 0,73	6,7 0,52	
1,40	5.040			172,3 2,12	59,9 1,36	20,0 0,86	8,8 0,61	3,7 0,42
1,60	5.760				75,8 1,55	25,2 0,98	11,1 0,69	4,7 0,48
1,80	6.480				93,3 1,75	31,1 1,10	13,6 0,78	5,7 0,54
2,00	7.200				112,5 1,94	2,00 1,22	16,4 0,87	6,9 0,60
2,20	7.920				133,2 2,14	44,3 1,35	19,4 0,95	8,2 0,66
2,40	8.640					51,6 1,47	22,7 1,04	9,5 0,72
2,60	9.360					69,5 1,59	26,1 1,13	11,0 0,78

Flow rate		Ø	Ø	Ø	Ø	Ø	Ø	Ø
l/s	kg/h	50x6,9	63x8,7	75x10,4	90x12,5	110x15,2	125x17,1	160x21,9
2,80	10.080		67,9 1,71	29,8 1,21	12,5 0,84	4,6 0,56		
3,00	10.800		76,7 1,84	33,6 1,30	14,1 0,90	5,4 0,60	2,9 0,46	
3,50	12.600		100,9 2,14	44,2 1,52	18,6 1,05	7,1 0,70	3,8 0,54	
4,00	14.400		128,0 2,45	56,0 1,73	23,5 1,21	8,9 0,80	4,8 0,62	
4,50	16.200		158,0 2,76	69,1 1,95	29 1,36	11,0 0,90	5,9 0,69	
5,00	18.000			83,4 2,17	35 1,51	13,3 1,00	7,1 0,77	2,2 0,47
5,50	19.800			98,9 2,38	41,5 1,66	15,7 1,11	8,4 0,85	2,6 0,52
6,00	21.600			115,6 2,60	48,4 1,81	18,4 1,21	9,8 0,93	3,0 0,57
6,50	23.400				55,9 1,96	20,6 1,29	11,3 1,00	3,5 0,61
7,00	25.200				63,8 2,11	24,2 1,41	12,9 1,08	4,0 0,66
7,50	27.000				72,2 2,26	27,3 1,51	14,6 1,16	4,5 0,71
8,00	28.800				81,0 2,41	30,7 1,61	16,3 1,24	5,0 0,75
9,00	32.400				100,0 2,71	97,9 1,81	20,2 1,39	6,2 0,85
10,00	36.000					45,8 2,01	24,4 1,54	7,5 0,94
11,00	39.600					54,3 2,21	28,9 1,70	8,9 1,04
12,00	43.200					63,5 2,41	33,8 1,85	10,4 1,13
13,00	46.800					73,3 2,61	39,0 2,01	12,0 1,23
14,00	50.400						44,5 2,16	13,6 1,32
15,00	54.000						50,4 2,32	15,4 1,41
16,00	57.600						56,6 2,47	17,1 1,50
17,00	61.200						63,1 2,63	19,3 1,60
20,00	79.200							25,9 1,89
30,00	108.000							53,8 2,83
40,00	144.000							
50,00	180.000							
60,00	216.000							

Unit pressure drop in NIRON SDR11 pipes with water temperature at 10°C

Flow rate		Ø	Ø
l/s	kg/h	200x18,2	250x22,7
10,00	36.000	1,46 0,48	0,50 0,30
11,00	39.600	1,73 0,52	0,59 0,33
12,00	43.200	2,02 0,57	0,69 0,36
13,00	46.800	2,33 0,62	0,80 0,40
14,00	50.400	2,65 0,67	0,91 0,43

15,00	54.000	3,00 0,71	1,03 0,46
16,00	57.600	3,37 0,76	1,16 0,49
17,00	61.200	3,75 0,81	1,29 0,52
18,00	64.800	4,16 0,86	1,43 0,55
19,00	68.400	4,58 0,90	1,57 0,58

20,00	72.000	5,02 0,95	1,72 0,95
25,00	90.000	7,49 1,19	2,56 0,76
30,00	108.000	10,40 1,43	3,56 0,91
35,00	126.000	13,73 1,66	4,69 1,06
40,00	144.000	17,47 1,90	5,97 1,22

45,00	162.000	21,61 2,14	7,38 1,37
50,00	180.000	26,14 2,38	8,92 1,52
55,00	12.600	31,07 2,62	10,60 1,67
60,00	14.400		12,40 1,82
66,00	16.200		14,74 2,01

70,00	18.000		16,39 2,13
75,00	21.600		18,58 2,28
80,00	25.200		20,88 2,43
90,00	18.000		25,86 2,74

5.1 FITTING PRESSURE DROP (DIN 1988)

Local resistance "r" coefficients for NIRON fittings

Figure	No.	Graphic symbol	Resistance coefficient r
90° Elbow	90		2,0
Male threaded elbow	90M		2,2
45° Elbow	120		0,6
Tee union Reduced Tee union	130 130R		1,8 3,6
Tee union Reduced Tee union	130 130R		1,3 2,6
Tee union Reduced Tee union	130 130R		4,2 9
Tee union Reduced Tee union	130 130R		2,2 5,0
Threaded Tee union	130F		0,8
Adapter up to 2 sizes Adapter from 3 sizes	241 241		0,55 0,85
Coupling	270		0,25
Male threaded union	270M		0,4
Reduced male threaded union	270RM		0,85

The table shows the pressure drop **z** with a coefficient **r** = 1 for water conveying at 10°C and at different **v** flow rate values (m/s).

Flow rate v m/s	0,1	0,2	0,3	0,4	0,5	0,6	0,7	0,8	0,9	1,0	1,1	1,2	1,3	1,4	1,5	1,6	1,7	1,8	1,9	2,0	2,1	2,2	2,3	2,4	2,5
Pressure loss z (mbar)	0,1	0,2	0,5	0,8	1,3	1,8	2,5	3,2	4,1	5,0	6,1	7,2	8,5	9,8	11,3	12,8	14,5	16,2	18,1	20,0	22,1	24,2	26,5	28,8	31,3

Flow rate v m/s	2,6	2,7	2,8	2,9	3,0	3,1	3,2	3,3	3,4	3,5	3,6	3,7	3,8	3,9	4,0	4,1	4,2	4,3	4,4	4,5	4,6	4,7	4,8	4,9	5,0
Pressure loss z (mbar)	33,8	36,5	39,2	42,1	45	48	51	55	58	61	65	68	72	76	80	84	88	92	97	101	106	110	115	120	125

1 mbar = 10,1 mm.w.c.

The local pressure drop **z** is the result of the following formula: $\mathbf{z} = 5\mathbf{v}^2 \bullet \sum \mathbf{r}$
The total system pressure drop will be the sum of the total distributed pressure drop r and of the total local pressure drops **z**.

6 SYSTEM DIMENSIONING

COLD WATER SUPPLY

To carry out correct system dimensioning, the Load Units (UC) that may be requested simultaneously must be known

Home use load units

Unit	Supply	Load units		
		Cold Water	Hot Water	Total Hot + Cold Water
Washbasin	Mixer unit	0,75	0,75	1,00
Bidet	Mixer unit	0,75	0,75	1,00
Bath tub	Mixer unit	1,50	1,50	2,00
Shower	Mixer unit	1,50	1,50	2,00
WC bowl	Cistern	3,00		3,00
WC bowl	Jet flush	6,00		6,00
Kitchen sink	Mixer unit	1,50	1,50	2,00
Washing machine	Cold water only	2,00		2,00
Dishwasher	Cold water only	2,00		2,00
Washer	Mixer unit	1,50	1,50	2,00
½" hydrant	Cold water only	2,00		2,00
¾" hydrant	Cold water only	3,00		3,00

Load units for home fixture combinations

Combinations	Load units		
	Cold Water	Hot Water	Total Hot + Cold Water
Washbasin + bidet + tub/shower + cistern bowl	4,50	2,25	5,00
Washbasin + bidet + tub/shower + cistern bowl + washing machine	5,50	2,25	6,00
Complete bathroom (cistern bowl) + kitchen	6,00	3,50	7,00

Load units for public or community building fixture combinations

Combinations	Load units		
	Cold Water	Hot Water	Total Hot + Cold Water
Hotel bathroom with cistern	6,00	3,50	7,00
Hospital bathroom with cistern	5,00	3,00	5,00
Hospital bathroom with jet flushing system	10,00	3,00	10,00

Calculation of the maximum simultaneous flow rate according to the **LU** Load Unit method, cold water and hot water (wc bowls with cisterns) for private home and collective building uses.

NIRON Risers with SDR 6 pipes (Max considered rate 2.5 m/s)

LU Load Unit	Flow rate F/r	NIRON pipe SDR 6
6	0,30	20
8	0,40	25
10	0,50	32
12	0,60	
14	0,68	40
16	0,78	
18	0,85	
20	0,93	
25	1,13	
30	1,30	50
35	1,46	
40	1,62	
50	1,90	
60	2,20	63
70	2,40	
80	2,65	
90	2,90	
100	3,15	
120	3,65	
140	3,90	75
160	4,25	
180	4,60	
200	4,95	
225	5,35	90
250	5,75	
275	6,10	
300	6,45	
400	7,80	
500	9,00	
600	10,00	110
700	11,00	
800	11,90	125
900	12,90	
1000	13,80	

NIRON Risers with SDR 7,4 pipes (Max considered rate 2.5 m/s)

UC Load Unit	Flow rate F/r	NIRON pipe SDR 7,4
6	0,30	25
8	0,40	
10	0,50	
12	0,60	32
14	0,68	
16	0,78	
18	0,85	
20	0,93	
25	1,13	40
30	1,30	
35	1,46	
40	1,62	
50	1,90	50
60	2,20	
70	2,40	
80	2,65	
90	2,90	63
100	3,15	
120	3,65	
140	3,90	63
160	4,25	
180	4,60	75
200	4,95	
225	5,35	
250	5,75	
275	6,10	90
300	6,45	
400	7,80	
500	9,00	
600	10,00	110
700	11,00	
800	11,90	
900	12,90	
1000	13,80	
1500	16,50	125
2000	20,50	160
2500	23,50	
3000	26,00	

This table shows that an OD 75 SDR 7,4 pipe can simultaneously supply 250 UC (250 / 7 = 35 living units with bathroom and kitchen)

6.1 HOT SANITARY WATER SUPPLY

To correctly dimension a 'central' hot sanitary water supply system according to UNI 9182, the max simultaneous hourly consumption of **40°C hot water** must be established.

The formula to use is: $$Qmax = \left[\frac{q1 \times N1}{d1} + \frac{q2 \times N2}{d2} + \frac{qn \times Nn}{dn} \right] \times f1 \times f2 \times f3$$

Where:

Qmax = Max hourly consumption
q1, q2, qn = Consumption for each reference unit (living unit, bathroom, fixture)
N1, N2, Nn = Number of reference units
d1, d2, dn = Duration corresponding to consumption q1 N1, q2 N2 ……
f1 = Factor for number of living units (multiplying factor – simultaneity)
f2 = Factor for number of rooms in each living unit (multiplying factor – simultaneity)
f3 = Factor for standard of living (multiplying factor – simultaneity)

q = Average daily requirement per person

Type of user	Litres per person/day
Standard type house	70 / 80
Luxury type house	150 / 200
Hotel	180 / 200
Offices	15 / 200
Hospitals	130 / 150
Sport centres	50 / 60
Company changing rooms	30 / 50

n = Average daily requirement per user

Fixture	Litres per person/day
Bath tub with shower head	160 / 200
Shower	50 / 60
Washbasin	10 / 12
Bidet	8 / 10
Kitchen sink	15 / 20

d = Duration of peak time

Type of user	h
Standard type house (up to 4 rooms)	2 / 2,5
Luxury type house (over 4 rooms)	3
Hotel	2,5 / 3
Offices	1
Hospitals	3 / 4
Sport centres	1
Company changing rooms	1

f1 – Multiplying factor for hot water requirements in litres/person-day according to the NUMBER OF LIVING UNITS

Number of living units	Multiplying factor
1	1,15
2	0,86
3	0,73
4	0,65
5	0,60
6	0,56
7	0,53
8	0,50
9	0,48
10	0,47
11	0,46
12	0,35
13	0,44
14	0,44
15	0,43
16	0.43
17	0,42
18	0,42
19	0,41
20	0,41
21	0,40
22	0,40
23	0,39
24	0,39
25	0,38
From 26 to 30	0,36
From 31 to 35	0,35
From 36 to 40	0,34
From 41 to 45	0,33
From 51 to 60	0,31
From 61 to 70	0,30
From 71 to 80	0,29
From 81 to 90	0,29
From 91 to 100	0,28
From 101 to 125	0,27
From 126 to 150	0,26
From 151 to 200	0,25

f2 – Multiplying factor for hot water requirements in litres/person-day according to the NUMBER OF ROOMS

Number of rooms	Multiplying factor
1	0,8
2	0,9
From 3 to 4	1
From 5 to 6	1,1
From 7 to 8	1,2
From 9 to 10	1,3
From 10 to 12	1,4
More	1,5

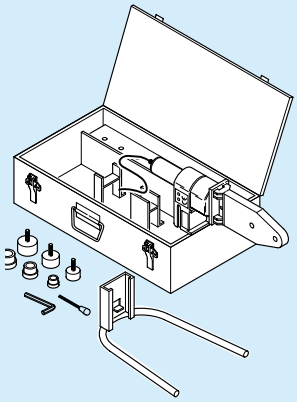
f3 – multiplying factor for hot water requirements in litres/person-day according to the STANDARD OF LIVING

Standard of living	Multiplying factor
Low	0,8
Fairly low	0,9
Average	1,0
Good	1,1
High	1,2

7 EQUIPMENT

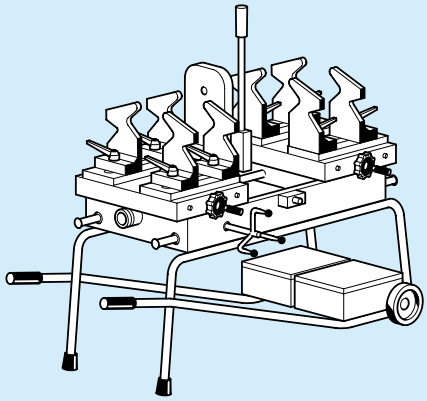
For a quick, efficient installation of the NIRON System, special equipment compliant with the DVS2207 standards must be available:

1



1 Welder 800 W - 230V a.c. - 50 Hz, model **00NSBEP** supplied in a special case, complete with diam. 20-25-32 pairs of dies. The welder is equipped with an automatic thermostat to keep the die temperature constant at 260 ±10°C.
110V and 48V versions available on request.

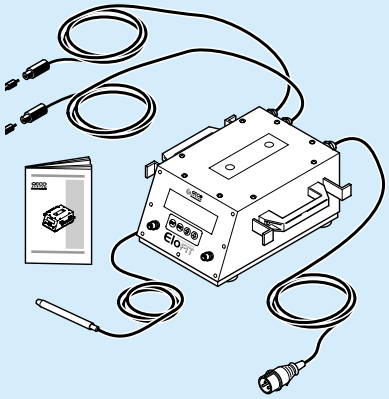
2



2 Welder on wheels (see drawing) 1400 W - 230V a.c. - 50 Hz, model **00STL125** supplied on pallet and complete with case and diam. 25 to diam. 125 dies and pipe support.

Supported welder 1000 W - 230V a.c. - 50 Hz, model **NSTL90** supplied in a wooden crate and complete with case and diam. 20 to diam. 90 dies and pipe support.

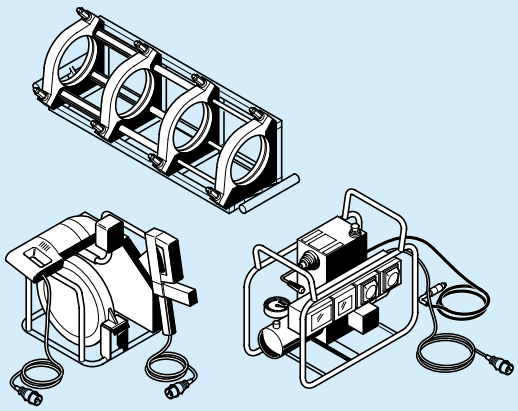
3



3 Multi-function welding for electric couplings, with optic pen, 230 V a.c. – 50 Hz – 3 KW, model **00E9001**

- input cable length 3.5 m
- connecting cable length 3 m
- weight 15 kg

4



4 “BUTT” welding machine (see drawing) for:

- diam 160 pipe model **00E10160**
- diam 200 pipe model **00E10250**

complete with:

- Basic Machine
- Heater element
- Hydraulic control unit
- Electric milling machine
- Hydraulic pipes
- Adapters

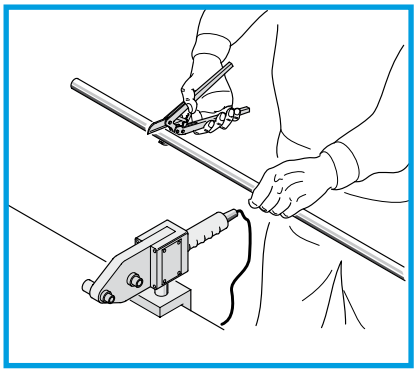
8 INSTRUCTIONS FOR WELDING

Thanks to its special characteristics, the NIRON System can be jointed to its fittings by:

- **Socket Fusion**
- **Electrofusion**

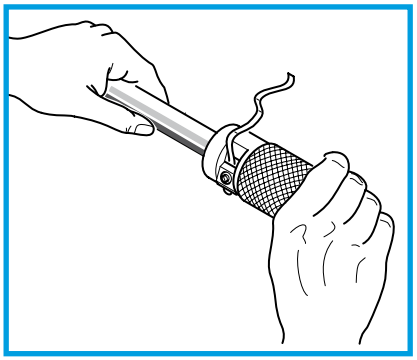
Both these jointing techniques use **heat** only to join the various system elements, creating **monolitical pieces** made to last in time.

8.1 NIRON AND NIRON-ALU PIPE WELDING INSTRUCTIONS



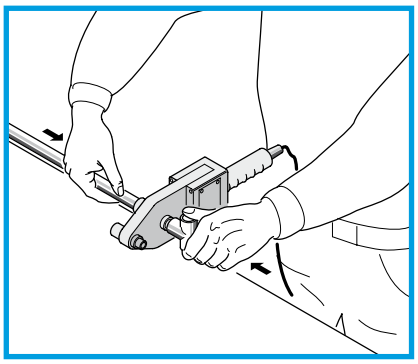
CUTTING

- Cut the pipe at right angles with the special nippers.
- Make sure that the pipe ends are perfectly clean before welding.



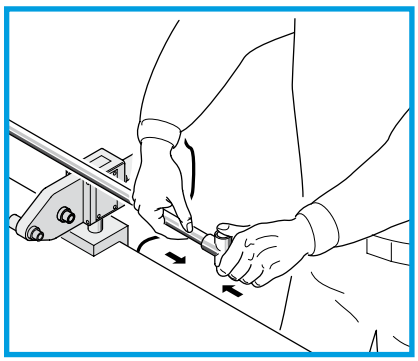
MILLING (for NIRON-ALU pipe only)

- Remove the aluminium coating with the special cutter. This operation will adjust the pipe outside diameter and can be carried out by hand or with a drill.



HEATING

- Install the dies corresponding to the pipe diameter to weld.
- Plug the welder into the 230 Vac mains.
- Wait for the welder to reach working temperature.
- Gently press the pipe and the fitting into their dies simultaneously.
- **After insertion**, heat both parts for the time indicated in the table below.



WELDING (SOCKET FUSION)

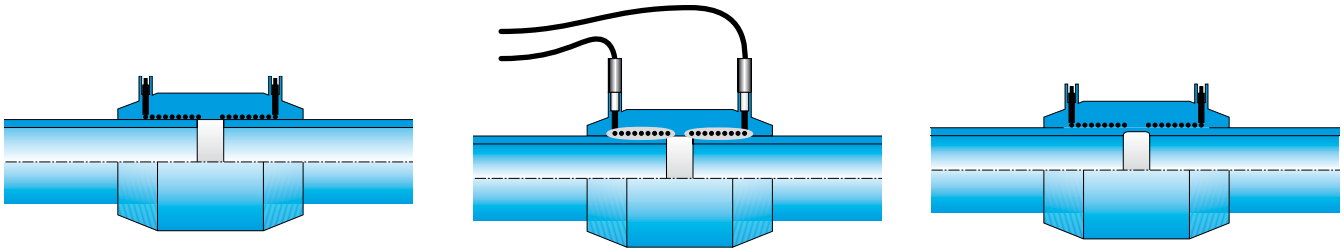
- After the prescribed heating time, quickly insert the pipe into its fitting by pressing lightly without turning.
- Any misalignment should be corrected promptly after insertion, in order to prevent tensions in the welding.
- This jointing technique (by molecular polymelting) ensures perfect sealing even in the hardest working conditions.

Table 1 *– Types of welding and welding procedures*

Ø	Heating sec	Assembly sec	Testing after min	Pipe insertion mm	Welding Procedures (DVS 2207 – TEIL 1-6.1 standards)
16	5	4	2	13	• Manually (NSBEP welder) or • With special equipment (NSTL welding machines) • With special equipment (NSTL welding machines)
20	5	4	2	14	
25	7	4	3	15	
32	8	6	4	17	
40	12	6	4	18	
50	18	6	4	20	
63	24	8	6	26	
75	30	8	6	29	
90	40	8	6	32	
110	50	10	8	35	
125	60	10	8	40	
160	Butt welding or electric coupling welding				• With special equipment
200					
250					

8.2 ELECTROFUSION

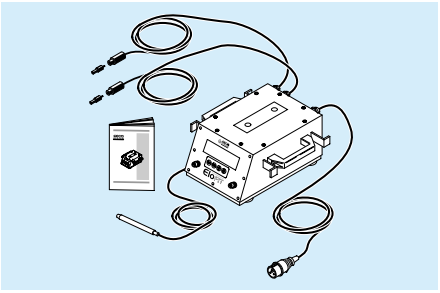
Electrofusion melting is a jointing technique performed on pre-assembled pipes and fittings having the same-diameter by applying heat obtained via a resistor contained in the fitting. The energy produced by resistor heating, thanks to the Joule effect, will soften the contact parts which melt into each other then re-crystallise during cooling.

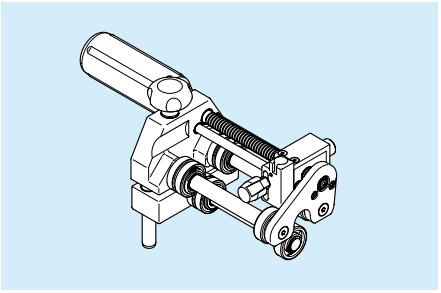


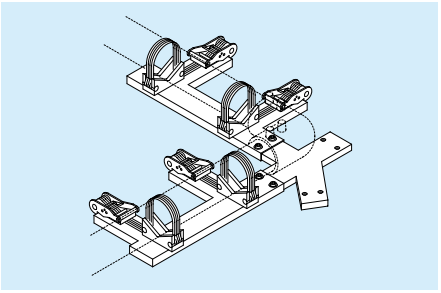
NUPIGECO was the first company in the world to produce a complete range of PPR electrofusion COUPLINGS, 45° ELBOW, 90° ELBOW and TEE.

To be able to use this innovative jointing technique, the following equipment must be available:

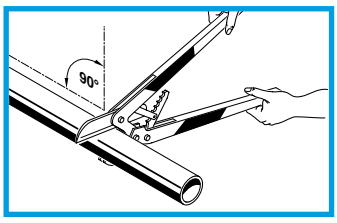
- Welding machine
- Scraper
- Aligner





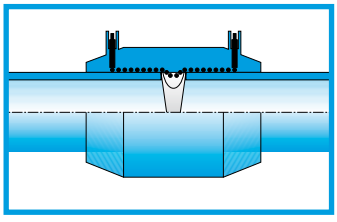


PIPE AND FITTING PREPARATION

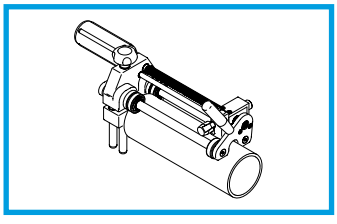


1 **CUTTING**

Cut the pipes at right angles with special nippers



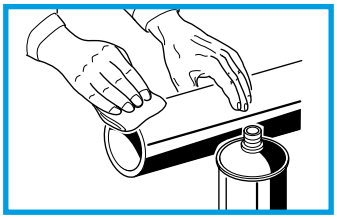
- If the cut is not at right angles, there may be molten material dripping into the electric part and blocking the passage.



2 **SCRAPING**

Scraping is essential for cleaning purposes because sealing is obtained by heat transmission from the fitting to the pipe.

- **Scrape the entire pipe surface which is to undergo welding with special scrapers** to remove the oxidised surface layer caused by atmospheric impurity catalising.

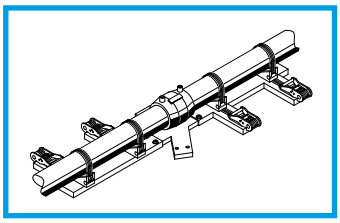


3 **CLEANING**

By using a clean cloth, degrease the parts that had previously been scraped with liquid detergent.

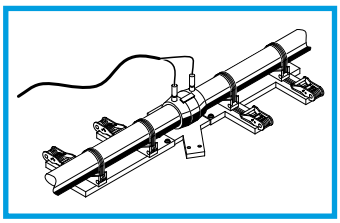
Do not use synthetic fibre cloths, glossy paper or dirty rags; do not use petrol or similar fluids as detergents. **Do not touch** the cleaned parts with your hands, to prevent leaving a greasy film.

JOINTING



4 **ASSEMBLY**

- Insert the pipes all the way into the electric coupling. This will prevent material dripping and possible clogging.
- Lock the pipes and fitting with the special aligner.



5 **ELECTROFUSION**

- Connect the two terminals to the pin on the coupling.
- Turn on the machine and follow the instructions on the interactive display.
- Finally, let the welded part cool down without moving it for the time specified in the bar code (cooling time).

8.3 ENVIRONMENTAL CONDITIONS

Checks to carry out on site

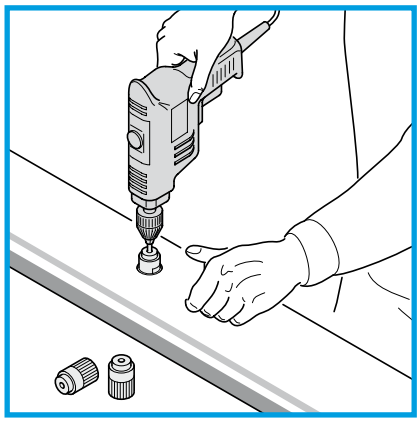
- The power source must have at least 3KW/h available. Universal bar code reading machines must be able to use
  3 – 4KW/h. If a generator is used, be sure that it is of the asynchronous type with minimum power of 3KW.
- The job site electric control panel must be of the asynchronous type and in compliance with the safety regulations in force in the country of use.
- The electric outlet in which the welder is plugged must be protected by a differential cutout switch and equipped with suitable grounding connection. The minimum protection class of the outlets on the panel must be at least IP44.
- Extensions (if any) must have a suitable cable cross section (see the welder operating manual).

Warning:

- Carefully follow any instructions contained in the operating manuals, especially as far as industrial safety is concerned.
- NIRON electric couplings have an adhesive label containing a 24 character bar code suitable for universal optic pen machine reading and specifying the welding voltage, welding time in seconds and cooling time in seconds.
- Electrofusion information is stored in the machine memory and can be either printed out immediately via a special printer or transferred to a computer.
- It is advisable to carry out heat fusion and/or electrofusion operations in a dry place sheltered from adverse weather conditions (rain, wind, dampness) at ambient temperature comprised between +5 and +40°C.

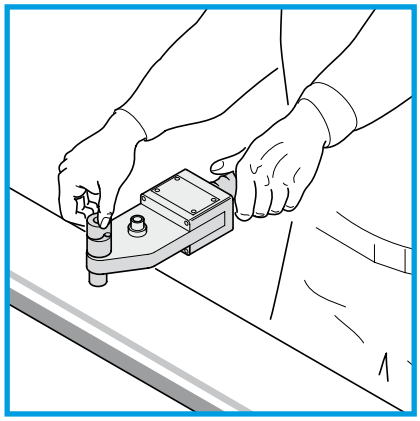
8.4 SADDLE JOINT

Saddle Joints (both threaded and non-threaded) allow to obtain connectors and branchings-off on large cross-section pre-installed pipes. They are also useful to make Batteries for Water Meters.



1 Drill the pipe with the special cutter (model NFGS) at the point where you wish to make a pipe connection.

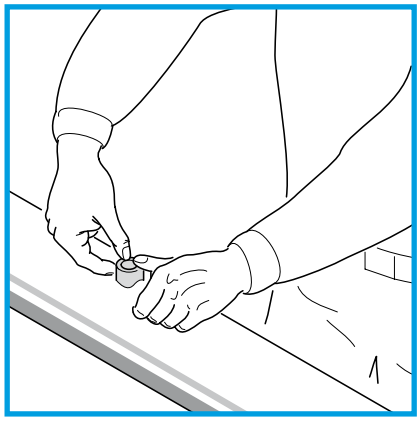
2 Ensure that the parts to weld (especially the pipe) are dry and clean.



3 Ensure that the welder and dies have reached the recommended working temperature (260°C).

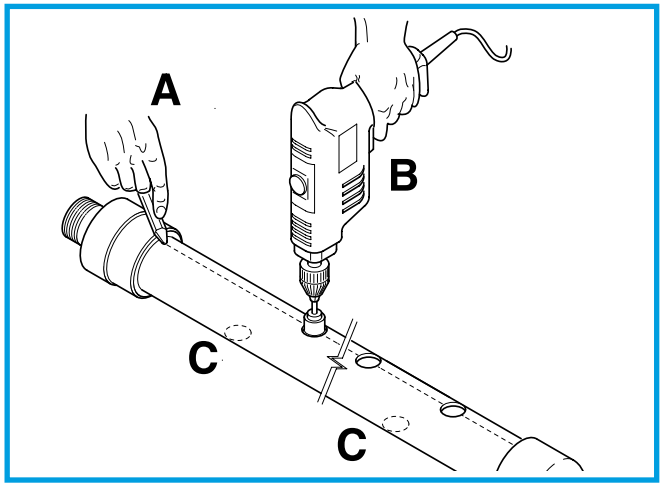
4 Insert the male die in the pipe hole until the hollow part touches the pipe outside surface.

5 Simultaneously insert the fitting in the female die. The contact parts between dies, fitting and pipe must be those specified in Table 1 on page 33.



6 After heating, promptly insert the saddle joint in the heated hole without turning. The fitting must be perfectly fixed and pressed against the pipe surface for about 30 seconds.

7 After 10 minutes' cooling, the new connector will meet working parameters.



To make 'double' batteries for water meters, we advise to:

A Mark the two opposed drilling axes in advance

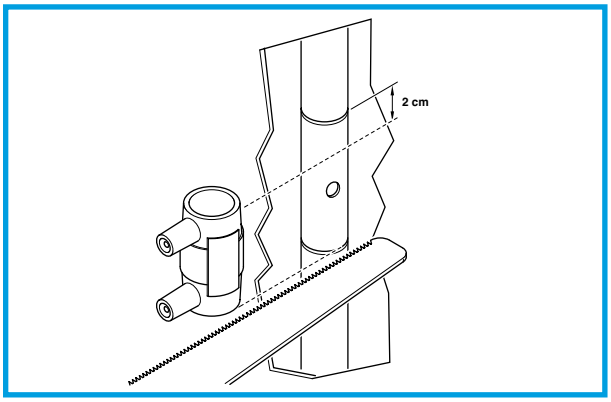
B Drill all the holes simultaneously with the special cutter.

C Make sure that the connections are offset.

8.5 REPAIRING A DAMAGED PIPE

We can repair a damaged pipe simply by using two electric couplings, while drilled pipes and/or fittings can also be repaired with the special hole plugs.

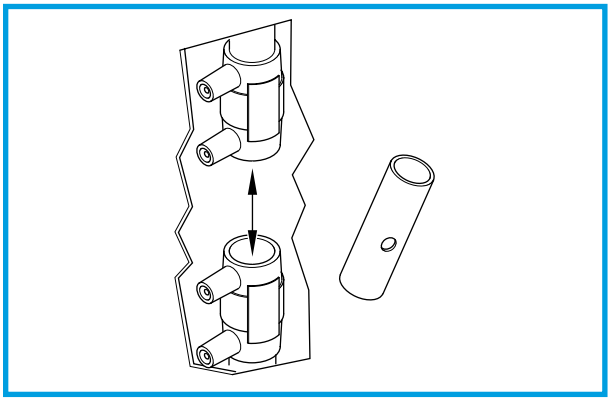
DAMAGED OR DRILLED PIPE



1 Cut the damaged or drilled pipe at right angles over a length equal to that of an electric coupling +2cm.

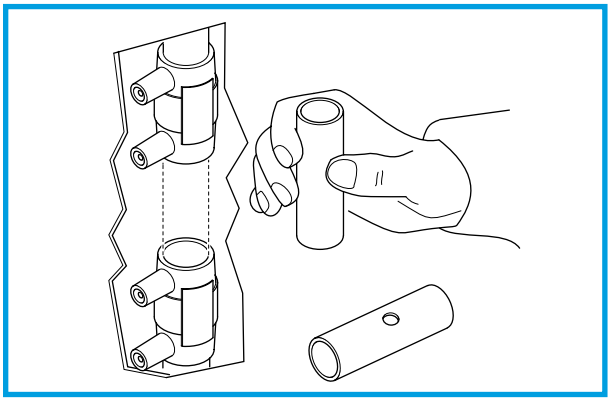
2 Remove the damaged section of the pipe.

3 Thoroughly scrape the two pipe section surfaces



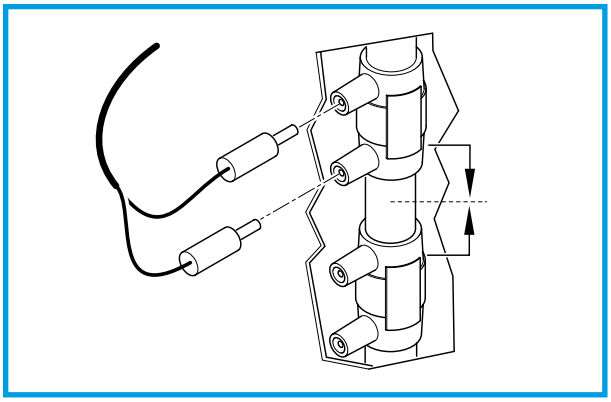
4 Remove the inner stops from 2 electric couplings by forcing out with a pipe.

5 Insert the two electric couplings without inner stops all the way into the pipe sections.
Cut a pipe section having the same diameter and length as the damaged section.
Thoroughly scrape it and mark the length corresponding to ½ a coupling on both sides.



6 Insert it to replace the previous section

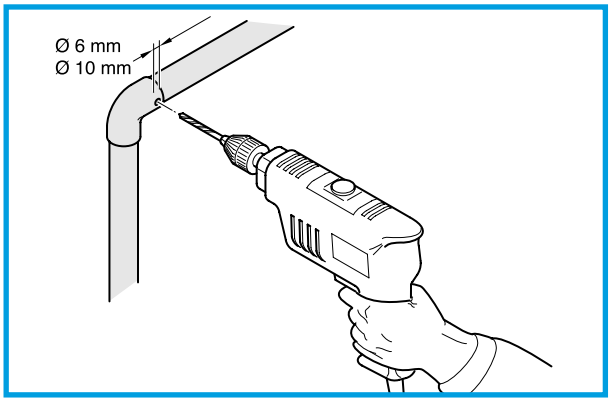
7 Move the two couplings towards the centre to reach the reference marks.



8 Weld the couplings as described in the operating manual of the welding machine.

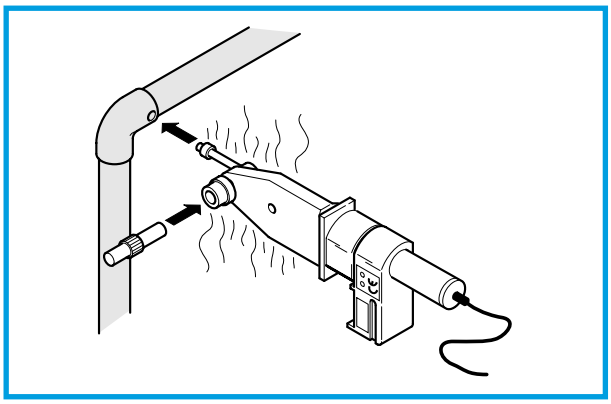
8.6 REPAIRING A DAMAGED FITTING

This system can be used when a pipe or a fitting have been drilled on one side only, perpendicularly to their axes.



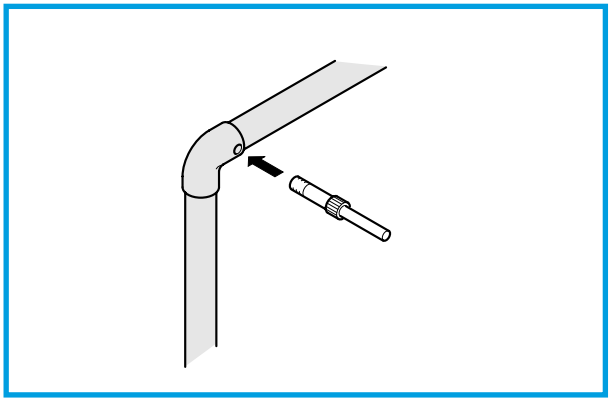
1 Use a sharp bit to make the hole bigger to a diameter of **6 mm or 10 mm.**
Make sure that the previous hole has not damaged the opposite lining of the pipe or fitting.

Install the special dies model NMARP and wait for them to fully heat up.

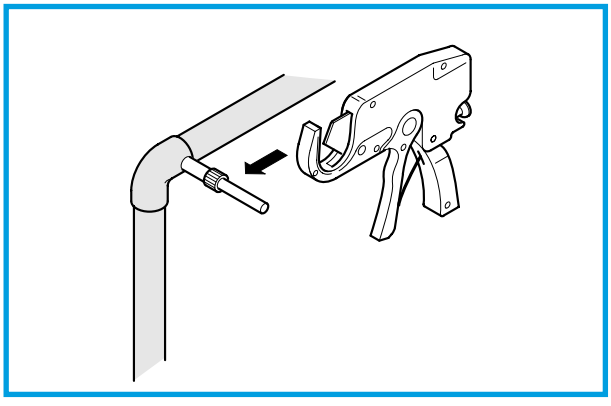


2 Insert the “male” die into the pipe hole and the repairing plug into the female die simultaneously.

After insertion, heat up for approximately **5 sec**.



3 After heating, insert the male plug into the hole without turning.

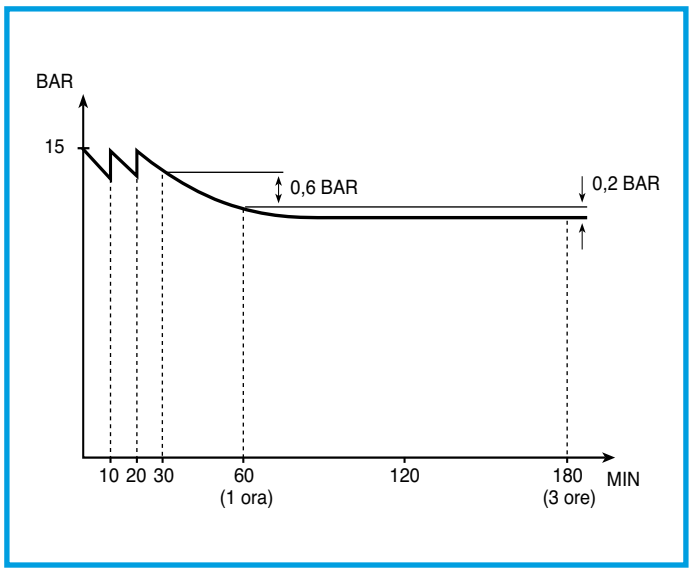


4 Wait 1 min for the assembly to cool down then cut the plug flush with the pipe.

9 SYSTEM TESTING

The hydraulic system test is carried out through checks and inspections during work (for those parts no longer accessible after works completion) and final checks and inspections in compliance with contract obligations.

The hydraulic cold test prescribed by the ENV 12108 European regulations must be carried out as follows:



1. Fill up the system gradually to **bleed it** (do not tighten the top plugs hard as they will be closed when water flows out steadily).
2. Bring the pressure to 15 bars, then repeat twice every 10 minutes.
3. Check the pressure after the first 30 minutes.
4. Check the pressure again after 30 more minutes (1 hour in total). If the measured difference is smaller than 0.6 bars, there are no leaks and the test can continue at the same pressure value for 2 more hours.
5. In the final 2 hours, the pressure should not go down by more than 0.2 bars.
6. The test result must be recorded.

Note: *the testing pressure must be reduced if there are radiators, taps or valves.*

It is also important to carry out:

- A cold water delivery test with cold water tapping from all the users to check flow rate and pressure.
- A hot water delivery test with hot water tapping from all the users to check flow rate, pressure and temperature.
- Noise level measurements according to the applicable standards in force.

10 QUALITY

10.1 STANDARDS

The NIRON system is manufactured according to the following product standards:

EN ISO 15874 - DIN8077/78 - DIN 16962

Welding (socket fusion) standards:

DVS2207 part 11 - DVS2208 part 1

Installation standards:

UNI9281 - DIN1988 - ENV12108 - EN806

and has been granted the most prestigious international hallmarks:

Note: *copies of the certificates of compliance can be supplied upon request.*

10.2 POTABILITY AND SUITABILITY FOR ALIMENTARY PURPOSES

NIRON, NIRON FG and NIRON CLIMA pipes fulfil the requirements indicated in the Italian Ministerial **Circular Letter 102** and **Decree 174 dated 06/04/2004** regarding drinking water conveying. These requirements are constantly monitored with specific analyses conducted by the Milan Politecnico Laboratory.

The NIRON System is manufactured in compliance with the Italian Law **Decree no. 31 dated 02/02/2001** – Implementation of the **directive 98/83/EC** regarding the quality of water suitable for human consumption. The pipes are tested according to the standard **UNI EN 1622:1999**: Water analysis – Measurement of the threshold odour number (TON) and threshold flavour number (TFN).

The NIRON System is food safe according to **Italian Decree 21/03/73**.

Moreover, the non-toxicity of the NIRON System is compliant with the requirements of the Laws presently in force in France, Germany, Russia, USA, Portugal etc.

Note: *copies of any certificate of conformity and non-toxicity can be downloaded for free from our website www.nupigeco.com*

10.3 QUALITY ASSURANCE

NUPIGECO S.p.A. guarantees the quality of their products by carrying out **rigorous checks** aimed at constantly monitoring not just products but also the production process.

Machine parameters are checked at regular time intervals, defined in the in-house quality assurance procedures, and dimensional inspections are carried out on the manufactured pipes, which are also submitted to visual inspection of their inside and outside surfaces and markings.

At the end of the production cycle, checking procedures become the responsibility of the NUPIGECO Quality Control Laboratory, which carries out all the mechanical, chemical and physical tests required by the in-house product Quality Plan – on the basis of the tests prescribed by the main quality product approvals.

The following tests are performed on each batch of produced material:

- Pressure test at 95°C for 1000hrs (with σ = 3.6 Mpa equivalent to approximately 15 bars)
- Pressure test at 20° for 1h (withσ = 16 Mpa equivalent to approximately 65 bars)
- Yield Stress test (> 23 N/mm2) with dynamometer
- Elongation test with dynamometer
- Homogeneity test with polarised light microscope
- Charpy pendulum impact test
- Measurement of residual internal tensions
- Dimensional checks according to standards DIN 16962

The following spot checks are also carried out:

- THERMAL CYCLES. The pipe + fitting system is submitted to temperature cycles designed to last 15 minutes at 95°C and 15 minutes at 20°C under a pressure of 10 bars for a total of 5000 cycles
- OIT (Oxidative Induction Time) = Determination of the percentage of anti-oxidants in the product after extrusion
- MFI (Melt Flow Index) at 230°C 2.16 kg, maximum difference between M.P. and the pipe = 20%
- Pressure test at 110° for 8760 h = 1 year (σ = 1.9 Mpa equivalent to approximately 7.7 bars)

Opacity

The manufactured pipes do not transmit more than 0.2% of visible light in agreement with the European standard 578.
All the above tests are kept constantly monitored (also via inspections by external laboratories) by the international product certifying bodies which granted NUPIGECO S.p.A. its quality hallmarks.

11 GUARANTEE

The NIRON System used for sanitary water systems in compliance with the installation directions contained in its Technical Manual is covered by an insurance policy taken out by NUPIGECO S.p.A. with a primary insurance company.

THE GUARANTEE TERMS ARE:

- The special guarantee card must be returned within a term of 10 days after installation completion.
- Pipes and fittings must be installed in accordance with the installation instructions, warnings and recommendations contained in the NIRON Technical Manual.
- The conditions of use (e.g. temperature and pressure) must fall within the technical limits acceptable for the material and specified in the NIRON Technical Manual.
- Pipes and fittings must exclusively be NUPIGECO-NIRON.
- The insurance coverage shall last 10 years from the production date stamped on the pipe; within this term, we undertake to refund damages up to 2,580,000 € caused to persons or property by NIRON pipe or fitting breaks due to manufacturing defects.

THE GUARANTEE SHALL NOT BE VALID IN THE FOLLOWING CASES:

- Connection of the pipe and fittings to heat sources characterised by temperature and pressure limits that are even accidentally not compatible with the characteristics of the material used to make NIRON System products.
- Failure to observe the manufacturer's operating instructions, warnings and recommendations contained in the Technical Manual.
- Use of obviously faulty materials (dented, cracked pipes and fittings etc.).
- Use of parts not manufactured by us to build a piping system.
- Welds carried out in a faulty manner or defective welds caused by the use of unsuitable equipment.

HOW TO OBTAIN SERVICE UNDER THE GUARANTEE:

- In the event of damages ascribable to a pipe and/or fitting and only in the cases described here above, the user is requested to send a registered letter to NUPIGECO S.p.A., specifying the type of fault and attaching a sample of the faulty pipe or fitting as well as a copy of the guarantee certificate mentioning:
  - the installation date and place
  - the installer name and address
  - the production date stamped on the pipe
- After receiving the customer's registered letter, and within a reasonable length of time, the manufacturer will carry out the required assessments and then hand over the relevant documentation to its Insurance company.
- Any costs incurred to carry out the above-mentioned assessments shall be covered by the applicant if the causes of the claimed break are not among those covered by the guarantee.

11.1 WELDER GUARANTEE

- The welders are guaranteed for a period of 12 months from the purchasing date. Evidence of the date of purchase shall be a document (e.g. an invoice, receipt, waybill etc.) issued by the seller.
- A copy of the above-mentioned document and the special guarantee card (provided at the back of the use and maintenance manual), suitably completed, must be sent to NUPIGECO S.p.A. within a term of 10 days from the purchasing date.
- For any additional guarantee conditions, see the back of the Use and Maintenance manual supplied with each welder.

POLYPROPYLENE CHEMICAL RESISTANCE

Not submitted to mechanical stress (pressure, static loads etc.)

S = Satisfactory **L** = Limited **NS** = Not satisfactory

Fluids unsuitable for conveying PP-R pipes

Reactant or product	Concentration	Temperature 20°C	60°C	100°C
Acetate (see under the acetate name)				
Acetic, glacial acid	96%	S	L	NS
Acetic, glacial acid	Up to 40%	S	S	-
Acetic, glacial acid	50%	S	S	L
Acetic anhydride	100%	S	-	-
Vinegar		S	S	-
Acetone	100%	S	S	-
Acid (see under the acid name)				
Distilled water	100%	S	S	S
Sea water		S	S	S
Brackish water		S	S	S
Mineral water		S	S	S
Drinking water		S	S	S
Chlorine water	Sat. Sol.	S	L	-
Acqua regia	HCl/HNO_3=3	NS	NS	NS
Hydrogen peroxide	Up to 10%	S	-	-
Hydrogen peroxide	Up to 30%	S	L	-
Acetophenone	100%	S	L	-
Acrylonitrile	100%	S	-	-
Alcohol (see under the alcohol name)				
Alum	Sol.	S	-	-
Amyl acetate	100%	L	-	-
Amyl alcohol	100%	S	S	S
Ammonia (gas)	100%	S	-	-
Ammonia (liquefied)	100%	S	-	-
Ammonia water	Up to 30%	S	-	-
Ammonium acetate	Sat. Sol.	S	S	-
Ammonium bicarbonate	Sat. Sol.	S	S	-
Ammonium chloride	Sat. Sol.	S	-	-
Ammonium fluoride	Sol.	S	S	-
Ammonium phosphate	Sat. Sol.	S	-	-
Ammonium hydroxide	Sol.	S	-	-
Ammonium metaphosphate	Sat. Sol.	S	S	S
Ammonium nitrate	Sat. Sol.	S	S	S
Ammonium sulphate	Sat. Sol.	S	S	S
Dry gaseous carbon dioxide	100%	S	S	-
Wet gaseous carbon dioxide		S	S	-
Dry gaseous sulphur dioxide	100%	S	-	-
Wet gaseous sulphur dioxide	100%	S	-	-
Aniline	100%	S	S	-
Anisole	100%	L	-	-
Silver	Sat. Sol.	S	S	L
Air		S	S	S
Barium carbonate	Sat. Sol.	S	S	S
Barium chloride	Sat. Sol.	S	S	S
Barium hydroxide	Sat. Sol.	S	S	S
Barium sulphate	Sat. Sol.	S	S	S
Benzene	100%	L	NS	NS
Gasoline (aliphatic hydrocarbons)		NS	NS	NS
Benzyl alcohol	100%	S	L	-
Benzoic acid	Sat. Sol.	S	-	-

Reactant or product	Concentration	Temperature 20°C	60°C	100°C
Borax	Sol.	S	S	-
Boric acid	Sat. Sol.	S	-	-
Hydrobromic acid	Up to 48%	S	L	NS
Bromine (liquid)	100%	NS	NS	NS
Bromine (dry vapours)		L	NS	NS
Butane	100%	S	-	-
Butanol	100%	S	L	L
Butyl acetate	100%	L	NS	NS
Butyl glycol	100%	S	-	-
Butyl phenol	Cold Sat. Sol.	S	-	-
Butyl phthalate	100%	S	L	L
Dibutyl phthalate	100%	S	L	NS
Calcium carbonate	Sat. Sol.	S	S	S
Calcium chloride	Sat. Sol.	S	S	S
Calcium hydroxide	Sat. Sol.	S	S	-
Calcium hypochlorite	Sol.	S	-	-
Calcium nitrate	Sat. Sol.	S	S	-
Carbon disulfide	100%	S	NS	NS
Liquid chlorine	100%	NS	NS	NS
Dry gaseous chlorine	100%	NS	NS	NS
Chloro-ethanol	100%	S	-	-
Chloroform	100%	L	NS	NS
Hydrochloric acid	2 to 7%	S	S	S
Hydrochloric acid	10 to 20%	S	S	-
Hydrochloric acid	30%	S	L	L
Hydrochloric acid	35 to 37%	S	-	-
Dry gaseous hydrochloric acid	100%	S	S	-
Chloroacetic acids (see monochlorine)				
Acetic, dichloroacetic, trichloroacetic acids	Sol.	S	-	-
Chlorosulphonic acid	100%	NS	NS	NS
Benzoyl chloride	100%	L	-	-
Ethyl chloride	100%	NS	NS	NS
(mono/di)Ethylene chloride	100%	L	L	-
Citric acid	10%	S	S	S
Cresol	>90%	S	-	-
Chromic acid	Up to 40%	S	L	NS
Chrome alum	Sol.	S	S	-
Cyclohexane	100%	S	-	-
Cyclohexanol	100%	S	L	-
Cyclohexanone	100%	L	NS	NS
Deca-hydronaphtalene	100%	NS	NS	NS

POLYPROPYLENE CHEMICAL RESISTANCE

Not submitted to mechanical stress (pressure, static loads etc.)

S = Satisfactory **L** = Limited **NS** = Not satisfactory

Fluids unsuitable for conveying PP-R pipes

Reactant or product	Concentration	Temperature 20°C	60°C	100°C
Dextrin	Sol.	S	S	-
Dextrose	Sol.	S	S	-
Dichloroacetic acid	100%	L	-	-
Dichloroethylene (a, b)	100%	L	-	-
Di-ethyl-ether	100%	S	L	-
Dimethylamine	100%	S	-	-
Dimethyl-formamide	100%	S	S	-
Di-octyl-phthalate	100%	L	L	-
Dioxane	100%	L	L	-
Heptane	100%	L	NS	NS
Hexane	100%	S	L	-
Ethanolamine	100%	S	-	-
Di-ethanolamine	100%	S	-	-
Petroleum ether (ligroin)		L	L	-
Ethyl acetate	100%	L	NS	NS
Ethylene glycol	100%	S	S	S
Diethylene glycol	100%	S	S	-
Ethyl alcohol (ethanol)	Up to 95%	S	S	S
Phenol	5%	S	S	-
Phenol	90%	S	-	-
Phosphoric acid	Up to 85%	S	S	S
Hydrofluoric acid	Sol. dil.	S	-	-
Hydrofluoric acid	40%	S	-	-
Formaldehyde	40%	S	-	-
Formic acid	10%	S	NS	NS
Formic acid	85%	S	NS	NS
Anhydrous formic acid	100%	S	-	-
Phosphorus oxychloride	100%	L	-	-
Fructose	Sol.	S	S	S
Gelatin	100%	S	S	-
Glycerine	100%	S	S	S
Glycolic acid	30%	S	-	-
Di-glycolic acid	Sat. Sol.	S	-	-
Glucose	20%	S	S	S
Hydrogen	100%	S	-	-
Iodine (alcoholic solution)		S	-	-
Iso-octane	100%	L	NS	NS
D-iso-octyl-phthalate	100%	S	L	-
Isopropyl alcohol	100%	S	S	S
Isopropyl ether	100%	L	-	-
Lactic acid	Up to 90%	S	S	-

Reactant or product	Concentration	Temperature 20°C	60°C	100°C
Lanolin		S	L	-
Milk		S	S	S
Magnesium carbide	Sat. sol.	S	S	S
Magnesium chloride	Sat. sol.	S	S	-
Magnesium sulphate	Sat. sol.	S	S	-
Malic acid	Sol.	S	S	-
Mercury	100%	S	S	-
Mercury (II) cyanide	Sat. sol.	S	S	-
Mercury (II) chloride	Sat. sol.	S	S	-
Mercury (I) nitrate	Sol.	S	S	-
Methyl amine	Up to 32%	S	-	-
Methyl alcohol	5%	S	L	L
Methyl acetate	100%	S	S	-
Methyl bromide	100%	NS	NS	NS
Methylene chloride	100%	L	NS	NS
Methyl-ethyl-ketone	100%	S	-	-
Monochloroacetic, acid	>85%	S	S	-
Naphtha		S	NS	NS
Nickel chloride	Sat. sol.	S	S	-
Nickel nitrate	Sat. sol.	S	S	-
Nickel sulphate	Sat. sol.	S	S	-
Nitric acid	10%	S	NS	NS
Nitric acid	30%	S	-	-
Nitrico, acido	40 to 50%	L	NS	NS
Fuming nitric acid (with nitrogen oxide)		NS	NS	NS
Nitrobenzene	100%	S	L	-
Oleic acid	100%	S	L	-
Oleum (sulphuric acid with 60% SO_3)		NS	NS	NS
Peanut oil		S	S	-
Camphor oil		NS	NS	NS
Cereal (maize) oil		S	L	-
Coconut oil		S	-	-
Almond oil		S	-	-
Peppermint oil		S	-	-
Olive oil		S	S	L
Paraffin oil (FL 65)		S	L	NS
Castor oil	100%	S	S	-
Cottonseed oil		S	S	-
Linseed oil		S	S	S
Silicone oil		S	S	S

POLYPROPYLENE CHEMICAL RESISTANCE

Not submitted to mechanical stress (pressure, static loads etc.)

S = Satisfactory **L** = Limited **NS** = Not satisfactory

Fluids unsuitable for conveying PP-R pipes

Reactant or product	Concentration	Temperature 20°C	60°C	100°C
Soybean oil		S	L	-
Oxalic acid	Sat. sol.	S	L	NS
Oxygen	100%	S	-	-
Perchloric acid	2N	S	-	-
Picric acid	Sat. sol.	S	-	-
Pyridine	100%	L	-	-
Potassium bicarbonate	Sat. sol.	S	S	-
Potassium borate	Sat. sol.	S	S	-
Potassium bromate	Up to 10%	S	S	-
Potassium bromide	Sat. sol.	S	S	-
Potassium carbonate	Sat. sol.	S	-	-
Potassium chlorate	Sat. sol.	S	S	-
Potassium chloride	Sat. sol.	S	-	-
Potassium chromate	Sat. sol.	S	S	-
Potassium cyanide	Sol.	S	-	-
Potassium fluoride	Sat. sol.	S	S	-
Potassium hydroxide	Up to 50%	S	S	S
Potassium iodide	Sat. sol.	S	-	-
Potassium nitrate	Sat. sol.	S	S	-
Potassium perchlorate	10%	S	S	-
Potassium permanganate	2N	S	-	-
Potassium persulfate	Sat. sol.	S	-	-
Potassium sulfate	Sat. sol.	S	-	-
Propane	100%	S	-	-
Propionic acid	>50%	S	-	-
Copper (II) chloride	Sat. sol.	S	S	-
Copper (II) nitrate	30%	S	S	S
Copper (II) sulphate	Sat. sol.	S	S	-
Caustic soda (see sodium hydroxide)				
Sodium acetate	Sat. sol.	S	S	S
Sodium benzoate	35%	S	-	-
Sodium bicarbonate	Sat. sol.	S	S	S
Sodium dichromate	Sat. sol.	S	S	S
Sodium bisulphate	Sat. sol.	S	S	-
Sodium bisulphite	Sol.	S	-	-
Sodium carbonate	Up to 50%	S	S	L
Sodium chlorate	Sat. sol.	S	-	-
Sodium chlorite	2%	S	L	NS
Sodium chlorite	20%	S	L	NS
Sodium chloride	10%	S	S	S
Sodium hydroxide	1%	S	S	S
Sodium hydroxide	10 to 60%	S	S	S
Sodium hypochlorite	5%	S	S	-
Sodium hypochlorite	10%	S	-	-
Sodium hypochlorite	20%	S	L	-
Sodium metaphosphate	Sol.	S	-	-
Sodium ortho-phosphate	Sat. sol.	S	S	S
Sodium nitrate	Sat. sol.	S	S	-
Sodium perborate	Sat. sol.	S	-	-

Reactant or product	Concentration	Temperature 20°C	60°C	100°C
Sodium silicate	Sol.	S	S	-
Sodium sulphate	Sat. sol.	S	S	-
Sodium sulphide	Sat. sol.	S	S	S
Sodium thiosulphate	40%	S	-	-
Sodium suphite	Sat. sol.	S	-	-
Gaseous dry hydrogen sulphide	100%	S	S	-
Sulphurous acid	Sol.	S	-	-
Sulphuric acid	Up to 10%	S	S	S
Sulphuric acid	10 a 30%	S	S	-
Sulphuric acid	50%	S	L	L
Sulphuric acid	96%	S	L	NS
Sulphuric acid	98%	L	NS	NS
Stannic (II) chloride	Sat. sol.	S	S	-
Stannic (IV) chloride	Sat. sol.	S	S	-
Succinic acid	Sat. sol.	S	S	-
Fruit juice		S	S	S
Apple juice		S	-	-
Tartaric acid	10%	S	S	-
Carbon tetrachloride	100%	NS	NS	NS
Tetrahydrofuran	100%	L	NS	NS
Tetrahydronaphthalene	100%	NS	NS	NS
Tiophene	100%	S	L	-
Toluene	100%	L	NS	NS
Turpentine		NS	NS	NS
Trichloroacetic acid	Up to 50%	S	S	-
Trichloroethylene	100%	NS	NS	NS
Triethanolamine	Sol.	S	-	-
Urea	Sat. sol.	S	-	-
Xylene	100%	L	NS	NS

Note: *The data contained in the table here above refer to the chemical resistance of polypropylene not submitted to mechanical and thermal stress (pressure etc.). To learn about the behaviour of threaded fittings, made from special brass alloys, please contact our Technical Service department.*

12 FREQUENTLY ASKED QUESTIONS

PIPE LAYING	The pipes may not be installed inside electric booths, above electric switchboards, in garbage dumps or pollutant stores. They may be installed in direct contact with the ground, Plaster, Lime and Cement. Buried pipes must be laid at a distance of at least 1 m from - and higher than - drain pipes.
LEGIONNAIRE'S DISEASE	Legionnaire's disease is a bacterial infection. The causative agents are naturally present in ponds and lakes. It is easier to find them at temperatures comprised between 25 and 45°C. Any (natural or artificial) environment ensuring these conditions is a potential growing environment. Some of the ideal growing environments are: - Cooling towers, condensers and evaporative coolers - Hot sanitary water reservoirs, supply networks and recirculation systems at temperatures below 50°C - Shower heads, aerators, whirlpool baths and pipe branches without any water flow. The Legionellosis bacterium spreads when contained in droplets less than 5 thousandths of a millimetre in size, known as aerosol. Legionnaire's disease therefore occurs more frequently in the following places: - Hospitals, clinics, nursing homes and other health care facilities - Hotels, barracks, other public accommodations - Sports facilities with showers - Central hot sanitary water supply systems
HOW TO PREVENT LEGIONNAIRE'S DISEASE	Preventive treatments against the Legionellosis bacterium in water supply networks include: - Avoid pipelines with closed end sections - Move the recirculation circuit (if any) as close as possible to the user - Periodically increase the water delivery temperature to > 55°C - Expose the supply water to UV irradiation using special lamps. Preventive treatments against the Legionellosis bacterium in air conditioning systems include: - Use efficient drop separator devices in cooling towers - Arrange cooling towers so that no outlet air can be sucked into external air intakes - Use dry filters for the treatment unit outside air - Regularly clean the systems to eliminate all bacterium's natural nutrients - Perform continuous chlorination for a few hours Regular hot water temperature increasing to 60°C is carried out by implementing a special programming cycle to increase the reservoir water temperature and at the same time, allow water circulation in the system. When decontamination is necessary, chlorine-based chemical disinfecting is carried out in air-conditioning units. As for water supply networks, the recommended treatment is thermal shock at 60°C with hot water tapping at all the various users.
NIRON AND LEGIONNAIRE'S DISEASE	The Legionellosis bacterium lives in the biofilm that will grow inside any type of pipe over time. The NIRON PPR system is the least suitable material for biofilm growing and therefore, the least likely material to 'promote' this bacterium proliferation (see the BELGAGUA certificate).
FREE CHLORINE RESISTANCE	The PPR used in NIRON System manufacturing may be damaged by a free chlorine concentration in water in excess of 0.5 mg/l (0.5 p.p.m.). Please be reminded that, in Italy, the maximum permitted concentration of free chlorine in water is 0.2 mg/l (0.2 p.p.m.). In water disinfecting systems, the use of PPR is not recommended near chlorine dosing units.
INSULATION	All the pipelines, including cold water pipes, must be insulated to limit heat loss and prevent the formation of condensate during summer months.

CONNECTION TO BOILERS AND INSTANT WATER HEATERS	Water boilers and heaters may only be directly connected to NIRON pipelines if the safety system will not allow short term maximum water temperatures to be reached that are higher than the malfunctioning temperature (95°C for sanitary hot water and 100°C for heating) and an internal pressure to be reached that is higher than 1.2 times the design pressure.
WATER FLOW RATE	We recommend not to exceed the following water flow rates: Pipe diameters 16 to 63 2.0 m/s Pipe diameters 75 to 250 2.5 m/s (according to the EN806 standards, rates up to 4 m/s are possible in pipe branches to users).
RISERS	Risers should be correctly sized (see page 28) and equipped with on-off devices with non-metal seals at their bases and with water hammer dampers at their tops.
RECIRCULATION SYSTEMS	The recirculation columns must be correctly sized (the water flow rate should never exceed 2 m/s) and connected to the riser top. When there are several risers, these should be equipped with suitable equaliser valves at the bottom. The maximum permissible amount of water flowing out of taps before it is hot is 1.5 litres. A recirculation system may be avoided when: - water consumption is continuous or with only a few minutes' interruptions - hot water dispensers are only used to fill tanks or basins - the hot water supply network development does not exceed 50 metres globally
PAINTING	Niron PPR can be painted with standard (water based) acrylic paint upon request.

THE RANGE

The main NIRON range products are shown here below.
The whole range is pictured in the current price list.

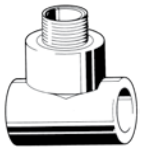
	MODEL	DIAMETER
1	**NIRON PIPE IN 4 M BARS**	16 20 25 32 40 50 63 75 90 110 125 160 200
1/4	**COMPOSITE FG/NIRON CLIMA PIPE***	20 25 32 40 50 63 75 90 110 125 160 200* 250*
85	**CROSSOVER PIPE**	20 25 32
85F	**COMPACT FEMALE FEMALE CROSSOVER PIPE**	20 25
85M	**COMPACT MALE FEMALE CROSSOVER PIPE**	20 25
90	**MALE/MALE 90° ELBOW**	16 20 25 32 40 50 63 75 90 110 125 160 200 250
90F	**FEMALE THREADED 90° ELBOW**	16 x 1/2" 20 x 1/2" 25 x 1/2" 25 x 3/4" 32 x 1/2" 32 x 3/4" 32 x 1" 40 x 1" 50 x 1"1/4 50 x 1"1/2 63 x 1"1/2 63 x 2"

	MODEL	DIAMETER
90M	**MALE THREADED 90° ELBOW**	16 x 1/2" 20 x 1/2" 25 x 1/2" 25 x 3/4" 32 x 1/2" 32 x 3/4" 32 x 1"
90TF	**FEMALE THREADED 90° ELBOW WITH HANGER**	16 x 1/2" 20 x 1/2"
90GTF	**FEMALE THREADED 90° TECHNICAL ELBOW WITH HANGERS**	20 x 3/8" 20 x 1/2"
90GTM	**MALE THREADED 90° TECHNICAL ELBOW WITH HANGERS**	20 x 3/8" 20 x 1/2"
90GR	**ADJUSTABLE UNIT (Disposable template)**	20 x 1/2"
92	**MALE/FEMALE 90° ELBOW**	20 25
92F	**MALE/FEMALE THREADED 90° ELBOW**	20 x 1/2"

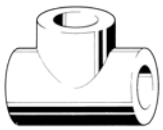
	MODEL	DIAMETER
120	**45° BEND**	16 20 25 32 40 50 63 75 90 110 125 160 200

	MODEL	DIAMETER
130F	**FEMALE THREADED TEE UNION**	16 x 1/2" x 16 20 x 1/2" x 20 25 x 1/2" x 25 25 x 3/4" x 25 32 x 1/2" x 32 32 x 3/4" x 32 32 x 1" x 32

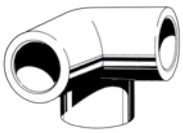
	MODEL	DIAMETER
130M	**MALE THREADED TEE UNION**	16 x 1/2" x 16 20 x 1/2" x 20 25 x 1/2" x 25 25 x 3/4" x 25 32 x 1/2" x 32 32 x 3/4" x 32 32 x 1" x 32



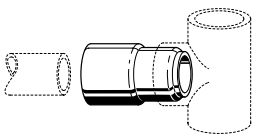
	MODEL	DIAMETER
130R	**REDUCED TEE UNION**	16 x 20 x 16 20 x 16 x 16 20 x 16 x 20 20 x 20 x 16 25 x 16 x 25 25 x 20 x 25 25 x 20 x 20 25 x 25 x 20 32 x 20 x 25 32 x 20 x 32 32 x 25 x 32 32 x 32 x 25 40 x 20 x 40 40 x 25 x 40 40 x 32 x 40 50 x 20 x 50 50 x 25 x 50 50 x 32 x 50 50 X 40 X 50 63 x 25 x 63 63 x 32 x 63 63 x 40 x 63 63 x 50 x 63 75 x 32 x 75 75 x 40 x 75 75 x 50 x 75 75 x 63 x 75 90 x 63 x 90 90 x 75 x 90 110x 63 x110 110x 75 x110 110x 90 x110 125x 75 x125 125x 90 x125 125x110x125



	MODEL	DIAMETER
221	**THREE-WAY OUTLET ELBOW**	20

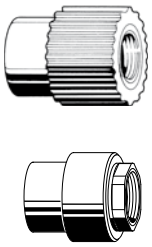


	MODEL	DIAMETER
241	**ADAPTER**	20/16 25/16 25/20 32/20 32/25 40/20 40/25 40/32 50/20 50/25 50/32 50/40 63/25 63/32 63/40 63/50 75/20 75/25 75/32 75/40 75/50 75/63 90/63 90/75 110/63 110/75 110/90 125/110 160/125 200/160

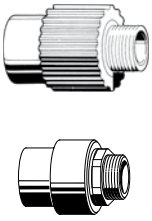


	MODEL	DIAMETER
270	**SOCKET**	16 20 25 32 40 50 63 75 90 110 125

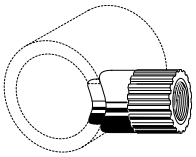
	MODEL	DIAMETER
270RF	**FEMALE THREADED PIPE UNION**	16 x 1/2" 20 x 1/2" 20 x 3/4" 25 x 1/2" 25 x 3/4" 32 x 3/4" 32 x 1" 32 x 1" 40 x 1" 40 x 1"1/4 50 x 1"1/4 50 x 1"1/2 63 x 1"1/2 63 x 2" 75 x 2"1/2 90 x 3" 110 x 4" 125 x 4"



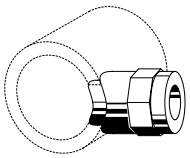
	MODEL	DIAMETER
270RM	**MALE THREADED PIPE UNION**	16 x 1/2" 20 x 1/2" 20 x 3/4" 25 x 1/2" 25 x 3/4" 32 x 3/4" 32 x 1" 40 x 1" 40 x 1"1/4 50 x 1"1/4 50 x 1"1/2 63 x 1"1/2 63 x 2" 75 x 2"1/2 90 x 3" 110 x 4" 125 x 4"



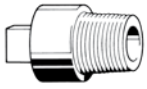
	MODEL	DIAMETER
275	**THREADED SADDLE UNION**	63/25 x 1/2" 63/25 x 3/4" 75/25 x 1/2" 75/25 x 3/4" 90/25 x 1/2" 90/25 x 3/4" 110/25 x 1/2" 110/25 x 3/4" 110/32 x 1"



	MODEL	DIAMETER
276	**SADDLE UNION FOR WELDING**	50/25 x 20 50/25 x 25 63/25 x 20 63/25 x 25 75/25 x 20 75/25 x 25 90/25 x 20 90/25 x 25 110/25 x 20 110/25 x 25 110/32 x 32



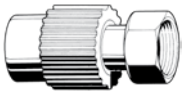
	MODEL	DIAMETER
290	**SYSTEM TESTING PLUG**	1/2" gas 3/4" gas



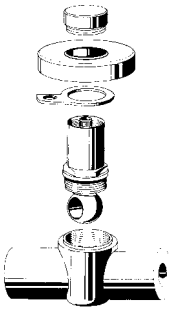
	MODEL	DIAMETER
301	**MALE THREADED TEST PLUG**	16 20 25 32 40 50 63 75 90 110 125 160 200 250

330	**THREE PIECE UNION**	20 25 32 40

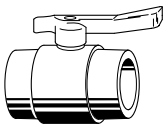
400	**STRAIGHT UNION FOR WELDING**	20 x 3/4" 25 x 3/4" 25 x 1" 32 x 1" 32 x 1"1/4 40 x 1"1/2 50 x 2" 63 x 2"1/2



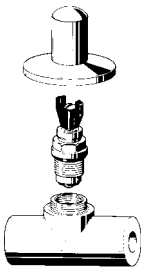
500	**DISASSEMBLING BALL COCK**	20 25 32



500/B	**PPR BALL COCK FOR EXTERIORS**	20 25 32 40 50 63 75 90 110 125

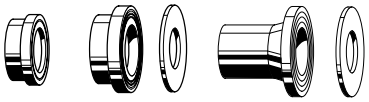


510	**SCREW TAP**	20 25



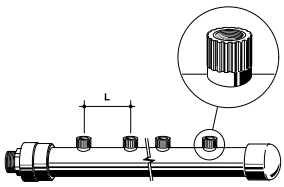
515	**SLANTED STOP TAP**	20 25 32

	MODEL	DIAMETER
520	**WELDING COLLAR**	32 40 50 63 75 90 110 125 160 200 250

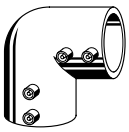


521	**ALUMINIUM FREE FLANGE**	32 40 50 63 75 90 110 125 160 200 250

530	**WATER METER MANIFOLD**	63 x 1/2 FF 63 x 3/4 FF 75 x 1/2 FF 75 x 3/4 FF 90 x 1/2 FF 90 x 3/4 FF

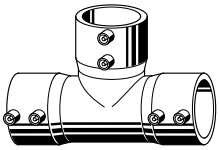


90E	**90° ELECTRIC ELBOW**	40 50 63 75 90 110

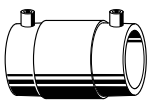


120E	**45° ELECTRIC BEND**	40 50 63 75 90 110

130E	**ELECTRIC TEE**	40 50 63 75 90 110



270E	**ELECTRIC SOCKET**	20 25 32 40 50 63 75 90 110 125 160 200 250



14

SPECIFICATION ITEM: PPR PIPES

PPR 80 pipes for hot and cold sanitary water supply

PRODUCT IDENTIFICATION: NIRON/NUPIGECO

Materials:

- The Pipes and Fittings used for plumbing installations will be made from Random Polypropylene Copolymer 80 (shortened to PPR 80).
- The PPR used for these pipes is compliant the following standards and/or characteristics:
  - Compliant with the European standard EN TC 155 system standard 25 and standard DIN 8077/78 and certified by the marks of compliance IIP (I), DVGW (D), CSTB (F)
  - Non-toxic as certified by a certificate issued by an Italian laboratory and the NSF board (USA)
  - Pressure resistant as certified by a certificate issued by the SKZ (D) laboratory
- The installation must fulfil the following conditions of use:

Class	Working Temperature °C	Pressure Bar	Time at wkg Years	Temperature max °C	Time at max T years	Malfunct Temperature. °C	Malfunct Time. Hours
1	60	10	49	80	1	95	100
2	70	8	49	80	1	95	100

- Pressure class PN20
- Minimum PPR80 density 0.898 g/cm3 according to ISO/R 1183
- Minimum modulus of elasticity = 700N/mm2 according to ISO527
- Ultimate elongation ≥ 500% according to ISO 527
- Heat conductivity 0.24 W/mK according to DIN 52612
- Linear thermal expansion coefficient 0.15mm/m°K according to VDE 0304
- Minimum dielectric strength 75 KV/mm according to DIN 53481
- The threaded unions for sanitary fixtures will be made from PPR80 with a CW602N (ADZ) Brass insert according to the standard EN12164:98

Pipe Dimensions and Identifying Marks

Outside Diameter (mm)	SDR	Minimum thickness (mm)	Inside Diameter mm	Water content litres/metre
16	6	2,7	10,6	0,08
20	6	3,4	13,2	0,13
25	6	4,2	16,6	0,22
32	6	5,4	21,2	0,35
40	6	6,7	26,6	0,56
50	6	8,4	33,2	0,86
63	6	10,5	42,0	1,39
75	6	12,5	50,0	1,96
90	6	15,0	60,0	2,83
110	6	18,4	73,2	4,21
125	6	20,8	83,4	5,46

Marking

The manufacturer shall mark the pipe with identifying details such as:

- Manufacturer's name
- Pipe diameter and thickness
- DIN 8077/78
- SKZ A 214
- ATG 98/2061
- Pressure class PN10 – 60°C/PN20 – 20°C
- NSF 61

Pipe installation

According to the European standards EN806 – 1/ 2/ 3/ 4/ 5/ 6/ and the Italian Standard UNI 9182, the priority recommendations are:

Pipe jointing:

- SOCKET FUSION by using a special welder with die temperature of 260°C manufactured in compliance with the DVS2207 standard. The pipes shall be cut perpendicularly to their axes and cleaned before the hot melting process. Heating and assembly times shall be complied with according to pipe diameters, as indicated in the supplier's technical catalogue. Minor alignment corrections may only be introduced immediately after inserting the pipe in its fitting.
- ELECTROFUSION by using a special welder. The pipes shall be cut perpendicularly to their axes and thoroughly SCRAPED before starting the electric melting process. The installation instructions contained in the supplier's technical catalogue shall be complied with.

Warnings

- Never heat pipes with naked flames
- At low temperatures, protect the pipe from hard impacts or bumps and knocks during transport. The pipes shall be stored at a dry, sheltered location on site. Do not install damaged pipes.
- Do not expose the pipes to direct UV radiation. When outdoor installation is necessary, use NIRON ALU pipes.
- Follow the manufacturer's instructions regarding linear thermal expansion and fixing/supporting systems.

System testing

All the installations must be tested under a pressure of 15 bars according to the European standards EN806-4 contained in the manufacturer's Technical Catalogue.

References:

EUROPEAN STANDARDS EN806 – UNI ENV 12108 – EN ISO 15874 – DIN8077/78 – DIN 16962 – DVS2207 part 11 – DVS2208 part 1 – UNI9281 – DIN1988 – prEN806

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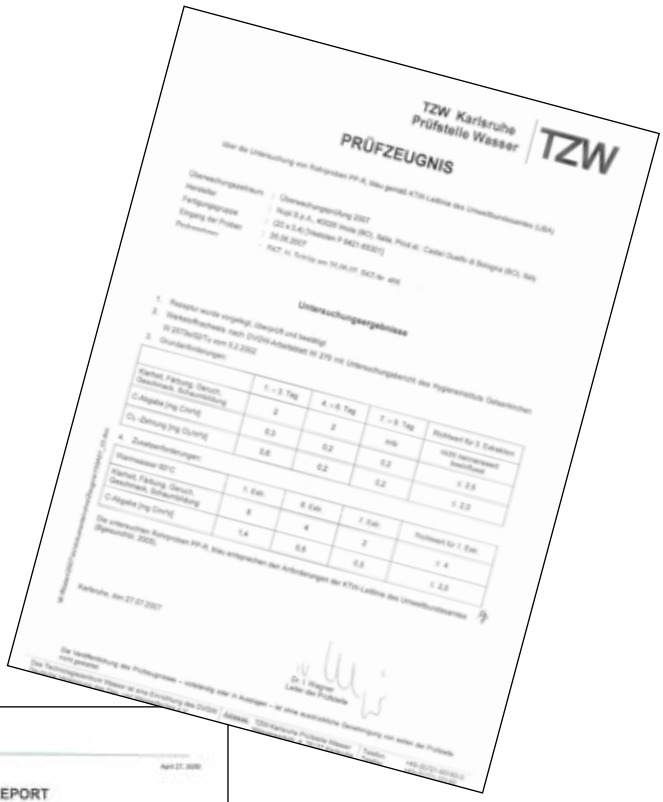
INTERNATIONAL NON-TOXICITY CERTIFICATES



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