VIALLI®

PP-RCT PIPES & FITTINGS

ABOUT US

VIALLI Pipes & fittings one of the European product produced by **FV PLAST**, we are Specialized in supplying piping products and fittings for plastic piping system of pressure and hot water (heating) distribution. Our main products are PPRc, PP-RCT, PEX Fittings & Pipes, PPRc & PP-RCT Stabi pipes with aluminum layer & PPR Fiberglass Composite Pipes.

Our production and inspection is effected strictly according to Germany and European Standards. For our PPR system production, we only use the heights-quality materials HOSTALEN, VESTOLEN and RA130E from BOREALIS- granulates with high molecular weight and highly heat stabilized: color gray/ green. The material is compliance with the recommendations of KTW, the German Federal Public Health Department (BGA).

VIALLI pipes and fittings are produced accordance to DIN German Standards.

Problematic spots like plastic-metal transitions are handles without compromise- we use metal components manufacture from the highest- quality Natural Brass, Brass Nickel Plated, Stainless Steel and Bronze all made in Germany, Our production process is fully automated. And our technologies are improved constantly.

All our product **Vialli PPR** pipes fitting & **Vialli Stabi** pipes produced and approved as per European Water Regulations Advisory Scheme **(WRAS)**

All our product achieved Hygienic and Quality Test Requirements as **DVGW** Recommended

VIALLIPOLYPROPYLENE
PP-RCT Pipes & Fittings

Based on the Success of **VIALLI** PPRc, the new Generation of Polypropylene Material is **VIALLIPP-RCT**.

The polypropylene Random Copolymer (PP.RC) was developed with a special crystalline structure that exhibits and improved pressure rating at elevated pressure rating. It is called Polypropylene Random Crystalline Temperature (**PP-RCT**)

The crystalline structure is created through a special Nucleation process that enables the pipes and fittings to operate at higher pressure at elevated temperatures thanks to this structure the new Generation of polypropylene (**VIALLIPP-RCT**) can be produced with higher compressive strength than PPRc

- **VIALLIPP-RCT** pipe are produced with Thinner walls for the same application case, so they have higher flow capacity with a consistent diameter
- **VIALLIPP-RCT** (polypropylene –Random- Copolymer Temperature resistant) with a modified Crystal structure (Beta Nucleated) increased temperature resistance RAL 6024 Traffic Green
- **VIALLI PP-RCT** produced according to German DIN Standard (DIN 8077/ DIN 8078) and (DIN EN ISO 15874) and complies with the requirements of the KTW guideline of German Federal Enviromental agency (U B A)
- **VIALLI PP-RCT** produced by single Layer, Homogeneous pipe for high pressure and Temperatures with simultaneous high flow PN16 and PN20
- **VIALLI PPR-CT** produced with Multi Layer Composite Fiber Glass (PN25), Multi Layer Composite Fiber Basalt (PN25) Multi Layer Composite Aluminum Middle Layer (PN25)

MATERIAL

SPECIFICATION OF RAW MATERIAL USED IN PRODUCTION:

- **PP-RCT**Standard pipe & fittings are manufactured from Polypropylene Random copolymer with enhanced Crystalline structure and improved Temperature resistance
- Brass inserts used in transition fittings is classified as CW617 (CuZn40Pb2) and suitable for drinking water installations.

PP-RCT (Polypropylene Random Crystalline Temperature).
Polypropylene random copolymer with special crytallinity by special " β nucleation" process providing an improved pressure resistance, especially at elevated temperatures.

- Special crystallinity structure – High degree of the Hexagonal for (β form).
- Improvement in long term strength 50% than regular PP-R.
- Improved resistance to crack propagation.
- Lower wall thickness and higher hydraulic capacity.

Pipes of PP-RCT materials shows pressure resistance, according to ISO/TR 9080 with proven minimum required strength (MRS) of 11.5 Pa and Categorized Required Strenght (CRS) of 5 MPa.

POLYPROPYLENE MATERIAL

Polypropylene is a thermoplastic material and belongs to the polyolefin groups.
PP is a semi- crystalline material. PP's mechanical properties, chemical resistance and specially relatively high heat deflection temperature have made PP, one of the most important material used in piping industry.

THE MAIN FOUR TYPES OF POLYPROPYLENE ARE:

- Polypropylene Homo Polymer **(PP-H) (Type 1)**– high internal pressure Resistance
- Polypropylene Block Co- Polymer **(PP-B) (Type 2)** – High impact strength especially at low temperature& low thermal endurance – Sewage Pipe System.
- Polypropylene Random Co-Polymer **(PP-R) (Type 3)** High internal Pressure Resistance at high Temperature& low e-modulus- Plumbing and sanitary application
- Polypropylene Random Crystalline **(PP-RCT)** High internal Pressure Resistance at elevated temperature – Hot water & Heating system

PP-RCT ADVANTAGES

- Improved long- term strength of **PP-RCT**material leads to a more economic set of dimensions of the pipe system.
- It enables designers to select thinner wall pipes and in some situations also smaller diameter pipe can be used.
- This results in higher hydraulic pipe capacity or the possibility to apply higher pressure than with standard PP-R.
- A higher range of working temperature for a given application HOT or COOL
- A life span of more than 50 years.
- **PP-RCT**is both safer and more economical (less man power required) to install.
- Create a homogeneous joint – welds are as strong or stronger than the pipe itself
- Welding time is significantly reduce compared to metal options.
- No noxious fumes are created by the welding process, making it ideal for enclosed spaces or building that will be applying for LEED certification.
- **PP-RCT**has an extremely high corrosion resistance – systems have a design life of more than 50 years, with no corrosion during this entire period.
- Compared to PP-R piping systems, **PP-RCT**may allow for a thinner walled pipe in the same application, increasing flow capacity.
- **PP-RCT**is a natural insulating material, while metallic pipes are naturally conductive.
- In certain application, the insulation value provided by the pipe wall alone may prove sufficient to avoid condensation or retain the desired water temperature.
- Low noise, the absorption properties and elasticity of this material soften noise and vibration caused by the water flow and water hammer effect.

QUALITY ASSURANCE

INCOMING MATERIAL INSPECTION

Approved quality raw material is used for the manufacturing the **PP-RCT**pipe system. The incoming raw material quality is ensured by the inspection and testing.

PRODUCT MONITORING

The process control set up will ensure the dimensional correctness of the items produced. Consistent product quality in maintaining by standard data of the injection molding machines, extrusion and compared with the specification.
Regular online checking of production runs are carried out.

QUALITY CONTROL & FINAL INSPECTION

Continuous in process inspection are carried out to monitor the process in regular intervals. The following test and procedure are being conducted before released from the warehouse after inspection.

- Visual appearance and surface finish.
- Dimensional accuracy.
- Internal pressure test.
- Impact test.
- Heat reservation test.

PRODUCTION STANDARDS OF VIALLI PP-RCT PIPES AND FITTINGS

Standard	Concern Production
DIN 8076	Standard for Testing metal threaded joints
DIN 8077	Polypropylene Pipes. Dimensions
DIN 8078	Polypropylene Pipes, General Quality Requirements & Testing
DIN 16962	Pipe joints and elements for Polypropylene Pressure Pipes
DIN 1988	Drinking Water Supply Systems, Materials, Components, Appliances Design and installation
DIN 16928	Pipe joints & Elements for Pipes, Laying-General Directions
DIN 2999	Standard for fittings with threaded metallic inserts
EN ISO-15874	Plastics piping system for hot and cold water installations – Polypropylene (PP)
BS 6700	Design, Installation, Testing and Maintenance of Services Supplying Water for Domestic use with in buildings and their Cartilages
DVS 2207	Welding of Thermoplastics
DVS 2208	Welding Machines and Devices for Thermoplastics

PP-RCT PROPERTIES

MECHANICAL PROPERTIES

	PROPERTY	Standard	Unit	PP-RCT
Mechanical Properties	MRF 190/5	ISO 1183	G/10min	0.5
	MRF 230/2.16	-	-	0.24 – 0.36
	MFI range	ISO1872/1873	-	T003
	Elongation at break	ISO 527	%	>300
	Flexural strength (3.5% flexural stress)	ISO 178	MPa	23
	Modulus of elasticity	ISO 527	MPa	900
Thermal Properties	Thermal conductivity at 20°C	DIN 52612	W/(m x K)	0.24
	Specific heat at 20°C	-	kJ / Kg K	2.0
Electrical Properties	Specific volume resistance	VDE 0303	OHM cm	-
	Specific surface resistance	VDE 0303	OHM	>1013
	Relative dielectric constant at 1 MHz	DIN 53483	-	23
Other Properties	Physiologically non - toxic	EEC 90/128	-	Yes
	FDA	-	-	Yes

PHYSICAL PROPERTIES

PROPERTY		Test Method	Unit	Value
Density		ISO 1183	g/cm^3	0.905
Melt flow rate	230°C, 2.16 kg 190 °C, 5.0 Kg	ISO 1183	G/10min	0.25 0.45
Tensile stress at yield	Yeild point	ISO 527	MPa	25
Elongation at yeild		ISO 527	%	10
Flexural Modulus		ISO 527	MPa	900
Charpy Impact Strength	23°C 0°C	ISO 179	KJ/m^2	40 4
Coefficient of thermal expansion (0°C /70°C)		DIN 53752	K^{-1}	1.5×10^4

CLASSIFICATIONS

Pipe system typically used for domestic hot & cold water supply system such as:

- Drinking water – fresh water up to 25°C temp. for Drinking and cooking.
- Hot tap water – Heated Drinking water up to a temperature 60°C.
- Sanitary application – Drinking water quality is not needed, like Flush system, washing & irrigation.

Wrong choice of piping material may cause failure of installation and have a quantitative influence on the quality of water which we consume. Vialli PP-RCT follow the standard of EN ISO 15874 classifies the service condition for hot and cold water application.

CLASS OF APPLICATION ACCORDING TO EN ISO 15874-1

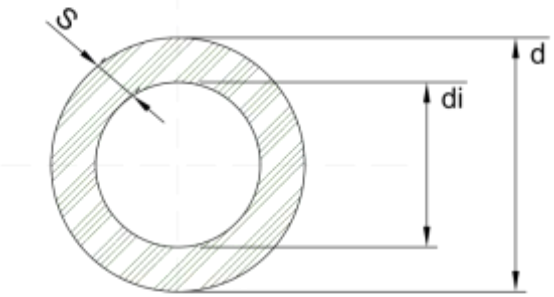
- **Class 1** (Supply of hot water of 60°C, service life 50 years).
- **Class 2** (Supply of 70°C, service life 50 years).
- **Class 4** (Floor Heating, low temperature heaters service life 50 years, assuming (in total for the entire life time) 2.5 years at the operating temperature of 20°C, 20 years at operating temperature of 40°C, 25 years at the operation rating temperature of 60°C, 2.5 years at the operating temperature of 70°C.
- **Class 5** (High temperature heaters, service life 50 years, out of which (in total for the entire length of service life) 14 years at the operating temperature of 20°C, 25 years at the operating temperature of 60°C, 10 years at the operating temperature of 80°C, 1 year at operating temperature 90°C). Maximum operating pressure (4,6,8,10bar) corresponding to the application class is calculated and assigned for each material and pipe series S.

PIPES ARE MARKED ACCORDING TO EN ISO 1574 BY CODE “S”

Relationship between older PN pressure class marking, Series S & SDR
Pipe Series – S dimensionless number related to the nominal outside diameter of a pipe and its wall thickness on the basis of this number, wall thickness (S) is to be calculated as follows:

$$s = \frac{d}{2s + 1}$$

PN = Nominal Pressure
S = Pipe Series
SDR = Standard Dimension Ratio
D = External diameter of pipe
s = Wall thickness of pipe



Pipe Series (S)							
20	26	12.5	8.3	5	3.2	2.5	2

PN	S	SDR
10	5	11
12.5	4	9
16	3.2	7.4
20	2.5	6
25	2	5

The VIALLI **PP-RCT**is a new type of material and the PN designation has not been implemented.

We designate the PPR tubes as PN for historical reasons (it used to be the former designation for the pressurized product range) although the values no longer correspond to definition above.

The lowest design coefficient according to “PN”, the standards EN ISO 1574 and DIN 8077 no longer specify the pipe classification.

OPERATING CONDITIONS

Recommended pipe SDR for PP-R and PP-RCT for application Class 1 (hot water supply 60°C) & Class 2 (hot water supply 70°C)

Operating Pressure	Class 1 (60°C)		Class 2 (70°C)	
	PP-R	PP-RCT	PP-R	PP-RCT
4 bar	SDR 11	SDR 13.6	SDR 11	SDR 13.6
6 bar	SDR 11	SDR 11	SDR 7.4	SDR 11
8 bar	SDR 7.4	SDR 9	SDR 6	SDR 9
10 bar	SDR 6	SDR 7.4	SDR 5	SDR 7.4

Recommended pipe SDR for PP-R and PP-RCT for application Class 4 (under floor heating & low temperature radiators) & Class 5 (High temperature radiators)

Operating Pressure	Class 4 (60°C)		Class 5 (70°C)	
	PP-R	PP-RCT	PP-R	PP-RCT
4 bar	SDR 11	SDR 13.6	SDR 11	SDR 13.6
6 bar	SDR 11	SDR 11	SDR 7.4	SDR 9
8 bar	SDR 7.4	SDR 9	SDR 5	SDR 7.4
10 bar	SDR 6	SDR 7.4	-	SDR 6

Classification of service conditions (EN ISO 15874-1)

AC	T_D	OT	T_{max}	Time at T_{max}	T_{mal}	Time at T_{mal}	Typical field of application
	°C	Years	°C	Years	°C	h	
1	60	49	80	1	95	100	Hot water supply 60°C
2	70	49	80	1	95	100	Hot water supply 70°C
4	20 40 60	2.5 20 25	70	2.5	100	100	Under Floor heating and low temp. radiators
6	20 60 80	14 25 10	90	1	100	100	High temp rediators
	20	50	-	-	-	-	Cold water supply

LEGEND			
AC	Application class	OT	Operation Time
T_D	Design Temperature	T_{max}	Maximum Temperature
		T_{mal}	Failure Temperature

MATERIAL STRENGTH & RESISTANCE (LIFE CYCLE)

One of the most important properties of a polymer material used for hot and cold water pressure pipes is its resistance to internal pressureat different temperatures.
Also creep behavior is an important factor to take consideration for plastic pipe system.

Stress details for PP-R and PP-RCT

Application class	Design stress for PP-R		Design stress for PP-RCT	
	Mpa	Bar	Mpa	Bar
1	3.90	30.9	3.63	36.3
2	2.13	21.3	3.40	34.0
4	3.30	33.0	3.67	36.7
5	1.90	19.0	2.92	29.2
20°C / 50 years	6.93	69.3	8.24	82.3

Safety Factor & Design Stress

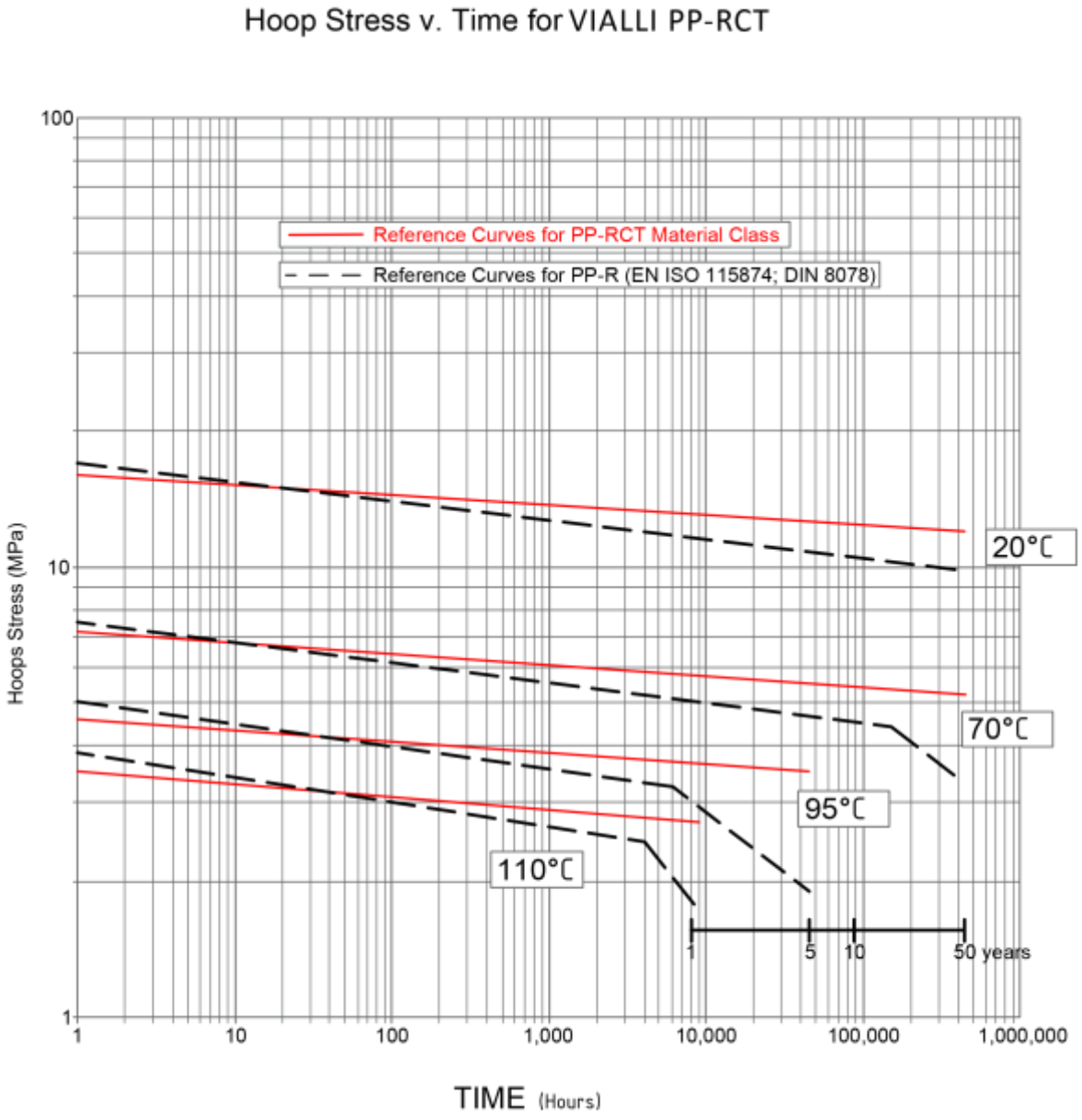
Temperature	Safety Factor (SF)	
°C	PP-R	PP-RCT
T_D	1.5	1.5
T_{max}	1.3	1.3
T_{mal}	1.0	1.0
T_{cold}	1.4	1.4

T_D = Design Temperature
T_{max} = Max Temperature
T_{mal} = FailureTemperature
T_{cold} = Cold water

Safety Factor & Design Stress

Temperature		Time Years	Required long term strength PP-R		Required long term strength PP-RCT	
			Mpa	Bar	Mpa	Bar
20°C	68°F	50	9.7	97	11.5	115
60°C	140°F	50	4.9	49	6.1	61
70°C	158°F	50	3.2	32	5.1	51
95°C	203°F	5	1.9	19	3.3	33
110°C	230°F	1	1.9	19	2.6	26

ISOTHERMAL MECHANICAL STRENGTH GRAPHIC FOR PP-RCT



RECOMENDED AREAS OF APPLICATION

AREA OF APPLICATION

- Potable water
- HVAC –Hot Water and Chilled Water
- Hydronics
- Buried and Above Ground Water pipes
- Commercial Buildings
- Residential Buildings
- Institutional Buildings
- Schools and universities
- Government Buildings
- Hospitals, Hotels and Apartments

SCHOOL

STADIUMS

COMMERCIAL AND RESIDENTIAL BUILDING

GOVERNMENT BUILDINGS

TYPES OF VIALLI PP-RCT PIPES

PP-RCT

- Lesser Thermal Expansion
- Oxigen Barrier
- Heating

PP-RCT With Aluminium

- 3x Lesser Thermal Expansion
- No need to shave before Welding
- Hot Water, Heating

PP-RCT With Fiber Glass

- 3x Lesser Thermal Expansion
- No need to shave before Welding
- Hot Water, Heating

PP-RCT With Basalt

- 3x Lesser Thermal Expansion
- No need to shave before Welding
- Hot Water, Heating
- Cold Water

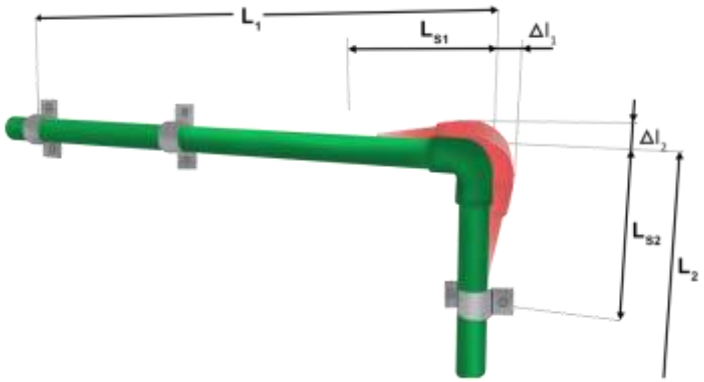
THERMAL LINEAR EXPANSION

Longitudinal expansivity and contractivity

The difference of temperature during installation and under service conditions, i.e a medium flows through the system at a different temperature to that prevailing during the installation period, results in liner changes – expansion or contraction (Δ)

ΔL = α x L x ΔT

ΔL = length change(mm)
α = Coefficient of thermal longitudinal expansion [mm/m°C] for PP-RCT design purposes α= 0.15 for Multilayer Fiber α= 0.15
L = Design distance of fixed points in the line (m)
ΔT=installation and service temperature

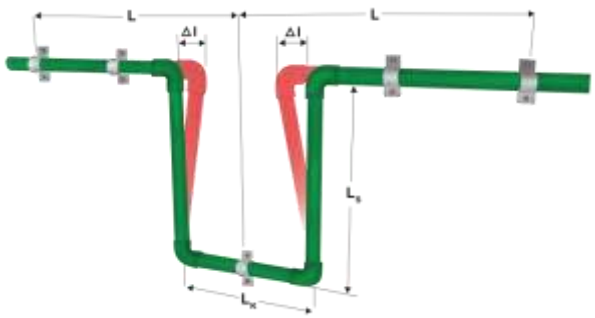


$$Ls = k.\sqrt{d.\Delta L[mm]}$$

Ls = Compensatory length
K= Material Constant for PPR (K =20)
d = Outer Diameter of piping (mm)
Δl = longitudinal change (mm) calculated for the previous formula (ΔL = α . L . ΔT)

U – COMPENSATOR

A suitable way of compensation piping id deflective in the direction perpendicular to the original route and at this perpendicular, a free compensatory length (marked L) is left, which ensures that no significant additional pressure and traction tension arise in the wall of the piping. Compensatory length LK depends on the calculated lengthening (shortening) of the route, material and the diameter of the piping. In the case of polypropylene for compensation of longitudinal changes flexibility of the material; is used. Apart from the compensation at the bending "U" compensators and loop compensators are used.



PB =Fixed point
Ku=Sliding point
L =Calculating length of the piping
Ls = Compensatory length
Δl = longitudinal change (mm) calculated for the previous formula (ΔL = α . L . ΔT)
Lk = Width of the compensator

L_k = 2. ΔL + 150 [mm] and also $L_k \geq 10.D$

Lk =With of the compensator
d = Outer Diameter of piping (mm)
Δl = longitudinal change (mm)

THERMAL LINEAR EXPANSION

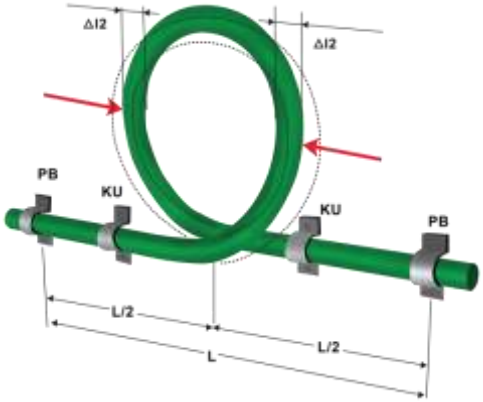
The value of the longitudinal change and the value of the compensatory length can also be read from the graphs.

Table for installation of a loop compensator

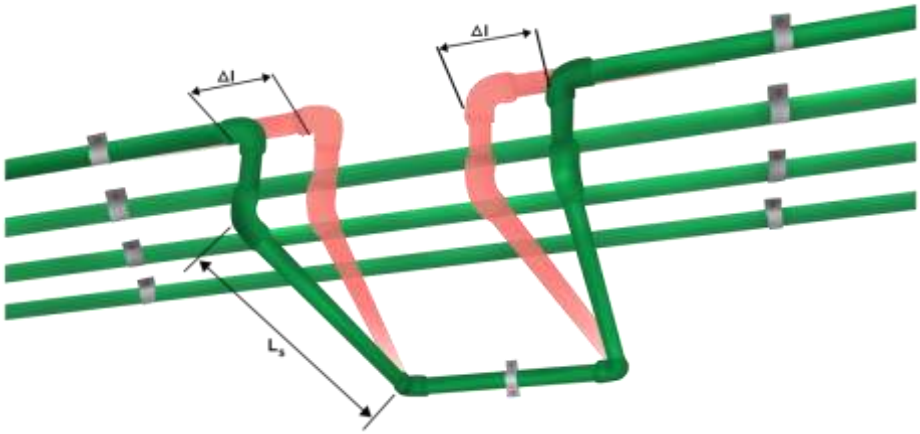
Piping diameter (mm)	Fixed points distance L (m)	
	Faser, Stabi	PPR and PP-RCT
16	24	8
20	27	9
25	30	10
32	36	12
40	42	14

Loop compensator LC

PB = Fixed point
Ku= Sliding point
L = Calculating length of the piping
Ls = Compensatory length
Lk = Width of the compensator



An example of compensation by changing the route adapted to the building structure



"U" Compensator

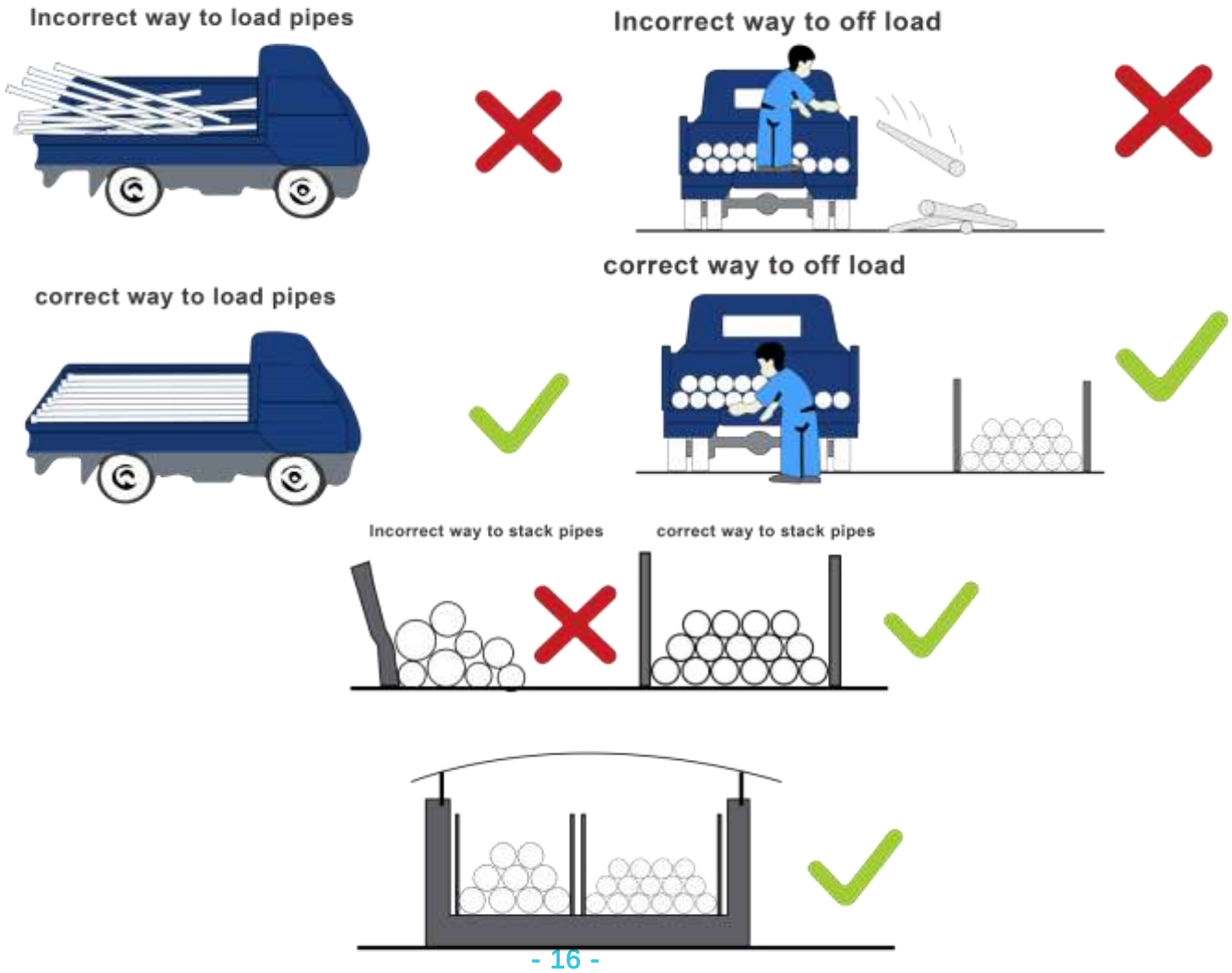
Calculated free length L means the length without any fixed support or suspension which could impede the dilatation. Free length L should not exceed the maximum distance of supports according to the piping diameter and the temperature of the medium.

HANDLING GUIDE

Thanks to the material properties of polypropylene, the pipes and fittings can be stored for a long under temperatures. The storage of pipes and fittings must be in accordance with the following conditions:

- The pipes should be supported along their full length.
- Bending of the pipes to be avoided.
- The material becomes sensitive to impact at low temperatures and in particular at temperature below °C, for this reason knocks and similar impacts are to be avoided under these conditions.
- High – polymer materials are sensitive to U.V radiation, for this reason the M.P.I material should also be protected against the effects of UV radiation.

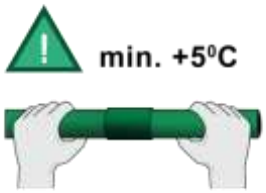
ON SITE STORAGE AND HANDLING



ASSEMBLY AND INSTALLATION

GENERAL

Only components not damage or contaminated either during storage of transport, may be used for installation works.



A minimum temperature level for plastic piping installation is with regard to welding, +5°C. at lower temperatures it is difficult to provide working conditions for high quality pipe joints.

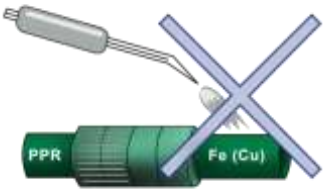
Components of plastic piping system must be protected against damage during transport and installation.

Pipe bending should be done at +15°C for pipes of diameter range 16-32mm minimum bending radius equals to eight diameters (D).

Components must not be exposed to naked flames.

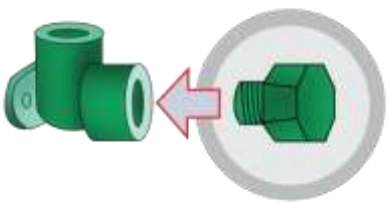
Pipeline cross over's should be made with used of components specially designed for this purpose.

Threaded fittings must be used for screw type joints. Threads should never be cut directly into plastic components. Threads are sealed with a special PTFE tape or sealing compound.



Brazing of soldering of metal fittings should not take place close to joint between metal plastic systems because of potential hazard of heat transfer to the fitting.

It is recommended to use plastic plugs for blanking elbows or wall mounting groups (plastic plugs are designated only for temporary use). For long term blanking has to be plug with metal thread.



WELDING & FUSION

VIALLI offers widest range of joining options of any PP-RCT product line with two primary joining methods and a complete range of fittings sizes. VIALLI can be joined by socket fusion and butt fusion.

SOCKET FUSION

VIALLI offers socket fusion for full pressure joining with a full range of fittings in ½ inch through 5 inch sizes, joints can be made using hand held tools, and in large sizes with bench-style tools for maximum effectiveness.

BUTT FUSION

VIALLI offers butt fusion with long spigot fittings staring at 2 inch through 24 inch. Butt fusion is often a more fabrication friendly technique compared to socket fusion in sizes of 2 inch through 5 inch, and customer can take advantage of this feature of the VIALLI system.

WELDING & FUSION

VIALLI welding is performed according to the below guidelines. In this process pipes and fittings are welded overlapping. The end of the pipes and fittings are heated using a welding device and subsequently connected.

VIALLI Welding devices and tools

- Make sure that the welding tools lie flat against the heating element.
- Do not use pliers or other unsuitable tools so as not to damage the coating of the welding tools.
- The required welding temperature for processing the VIALLI PP-RCT system is 206°C.
- Warning: the first welding should not be done until five minutes after welding temperature has been reach.
- VIALLI welding devices and tools are to be protected from impurities.
- Burned on particles can lead to incorrect welding connections.
- Tools may be cleaned with non-fibrous, coarse paper towels.
- The welding tools must always be kept dry. If necessary, dry them with a clean non fibrous cloth.
- Damage and soiled welding tools must be replaced, since only clean, properly functioning tools can produce clean and proper connections.

GUIDELINES

Minimum times for socket welding of PP pipeline segments at an outdoor temperature of 20°C and moderate air movement in case of outdoor tempreature of under 5°C, heat up tmies must be doubled.

1	2	3	4	5
External pipe Dia. mm	**Insert depth mm**	**Heating period Sec.**	**Processing period sec.**	**Cooling period Mins.**
20	14	5	3	
25	15	7	3	
32	16.5	8	4	2
40	18	12	6	4
50	20	18	7	
			9	
63	24	24	8	6
75	26	30	10	8
90	32	40	10	8
110	38.5	50	15	10
125	40	55	17	12
160	43	65	20	14
200	46	72	25	17
250	50	78	27	20

CHEMICAL RESISTANCE

Definitions, symbols and abbrevations

The criteria of classification, definitions, symbols and abbrevatins adopted in this document are as follows:

S= Satisfactory

The chemical resistance of polypropylene exposed to the action of a fluid is classified as satisfactory when the results of the test are acknowledge to be satisfactory by the majority of the countries participating in the evaluation.

L= Limited

The chemical resistance of polypropylene exposed to the action of a fluid is classified as limited when the results of test are acknowledged to be limited by the majority of the countries participating in the evaluation.

Also classified as limited is the resistance to the action of chemical fluids for which judgments “S” and “NS” or “L” are pronounced to an equal extent.

NS= Not satisfactory

The chemical resistance of a polypropylene exposed to the action of a fluid as classifie as “not satisfactory” when the results of test are acknowledges to be not satisfactory by the majority of the countries participating in the evaluation.

Also classified as “Not satisfactory” are materials for which judgments “L” and “NS” are pronounced to an equal extent

Sat. sol Satured= aqueous solution, prepared at 20°C Sol Aqueous solution at a concentration higher than 10% but not saturated
Dil.sol = Dilute aqueous solution at a concentration equal to lower 10%.
Work.sol = Aqueous solution having the usual concentration for industrial use.

Solution concentration reported in the text are expressed as a percentage by mass. The aqueous solutions id sparingly soluble chemicals are considered, as far as chemical action towards polypropylene is concerned, as saturated solutions. In general, common chemical names are used in this document.

The evaluation of chemical resistance of polypropylene is base on PP not subjected to mechanical stress. Polypropylene subjected to mechanical stress may behave different and show different results.

CHEMICAL RESISTANCE

VIALLI piping system are useful for wide variety of process piping applications. Before determining the suitability of a VIALLI piping system for conveying chemicals of any type under pressure, it is important to verify that the material is suitable for use and the piping system will be capable of withstanding the chemicals under the concurrent pressure and temperature and other loads under which it will operate. The chemical resistance table provided in this section provide a general guideline for determine the suitability of VIALLI PP-RCT piping systems. However, chemical resistance is dependent on a great number of Specific factors, which include more than the concentration of the chemicals and temperatures to which they are to be handled. Other factors include, but are not limited to the concurrent temperature, pressure, and other internal and external loads imposed on the system, the duration of application (i.e. continuous vs. intermittent) steady vs. cyclic loading, consideration of other chemicals which may be mixed together with the chemical under question, and the design codes to which the system is being implemented. These charts may serve as a general guideline for determination of resistance, it is recommended to contact the factory for further guidance for any chemical application of VIALLI. The final determination will be the engineer in responsible charge of the project or other representative of the owner.

Prior to considering VIALLI for any chemical application, consult the factory for the full recommendation base on the complete conditions of the application. Do not rely solely on the recommendation shown in the chart a suitability is based on additional factors including but not limited to pressure, temperature, duration and whether there are any mixtures of chemicals involved.

When considering the installation of VIALLI PP-RCT materials that are connected to an existing copper piping system, do not install the PP-RCT material in application involving elevated temperatures with aggressive water applications if the velocity of the water in the copper piping exceeds 10ft / second, this can result in the release of copper ions which can result in potential stress cracking in PP piping.

HEAT LOSS / GAIN

VIALLI pipe material is considered to have excellent insulation characteristics with its low thermal conductivity value. Competing metal pipe such as copper, steel, and stainless steel are all considered poor insulators. Actually the metal pipe material is considered a conductor of heat. Comparing the heat loss / gain charts of bare VIALLI pipe to the heat loss/gain chart of metal pipe it is easy to see the thermal advantages which VIALLI pipe provides. With a 50°F delta temperature difference across the pipe, the heat loss / gain of the metal pipe is huge compared to that which is lost of gain by VIALLI pipe.

There are two terms used to describe the heat loss within a pipe, these are K-Factor and R-value. The K factor is also known as thermal conductivity. The thermal conductivity of a material is based on the number of BTUs per Hour which passes through a one inch thick by one square foot section of material, with a 1°F temperature difference between the two surfaces. The lower the K-factor the more suitable the material is for insulation, typical pipe insulation is in the range of 0.021 BTU/Hr-ft-°F @ 75°F. the K –factor of steel is 31 BTU/hr-ft-°75F. the K-factor of copper is 227 BTU/hr-ft-°F @ 75°F. these are all quite high when compared to VIALLI pipe, which has K Factor of .22w/m.K @ 68°F.

The National Commercial & industrial Insulation Standards Manual defines R value as "A measure of the ability to retard heat flow rather than transmit heat". With R value, the better insulator is the material which has the highest R-value.

For the flat insulation geometry the relation between R-value and K-factor is shown in the first equation below. For cylindrical pipe geometry equivalent thickness, use the equation shown in the middle box below to determine the R- Value since the outer surface area if insulation is proportionately greater than the inner surface area. The equivalent thickness is the insulation thickness of a flat surface which would equal the heat flux at the outer surface of a cylindrical geometry. The relationship between R-value and K-factor for pipe insulation is in the equation shown on the bottom.

R- Value Equations

$$R - Value = \frac{Thickness\ (inches)}{k - factor(BTU\ inch/(hrft^2f)}$$

$$R - Value = \frac{Equivalent\ Thickness\ (inches)}{k - factor(BTU\ inch/(hrft^2f)}$$

r_2 = Outer Radius, r_1 = Inner Radius

$$Equivalent\ Thickness = r_2 x\ in\left(\frac{r_2}{r_1}\right)$$

INSULATION

For thermal/ technical and physical/ mechanical reasons, usage of plastic threaded coupling is not permissible in sanitary engineering. Plastic threaded couplings may be used, for instance, in provisional distribution systems

INSULATION

While hot water piping system and heating systems are insulated against heat loss, the cold water pipes are conversely insulated against het gain and pipe condensation. Cold water system insulation is necessary, as drinking water health requirements demand that the temperature level be kept under 20°C. Similarly, the hot water temperature must be below the upper limit given by the standard of protection against scalding, through the temperature limits are also aimed at keeping the bacteria the population under control. Specialized technical solutions aside (such as thermal sterilization) properly functioning circulation and keeping hot water at the required temperature level are both crucial for protection against bacteria such as Legionella pneumophila.

The thickness and type of insulation layers are determined on the basis of thermal resistance of the insulation system to be used, air humidity in the area of the piping system and the difference between the room temperature (air) and that of the flowing water.

The piping system must be insulated along its whole length, including fittings and valves. It is necessary to maintain a minimum insulation layer thickness along both the pipe diameter and the pipeline length, this means the insulation types that are cut lengthwise to be wrapped over the pipes must be thoroughly sealed after the installation (e.g using and adhesive, clamps or a sealing tape).

MINIMUM THERMAL INSULATION LAYER

Example:

Placement / routing of pipes	Insulation layer thickness • = 0.040 W/mK
Freely laid pipes in unheated areas (basement areas for example)	4mm
Freely laid pipes in heated areas	9mm
Pipes in crawlways without concurrently running hot water lines	4mm
Pipes in crawlways with concurrently running hot water lines	13mm
Independently running under plaster pipes (in channels)	4mm
Under plaster pipes (in chanels) running in parallel w/ hot water lines	13mm
Pipes cast over with concrete	4mm

Note:

•The thickness values must be re-calculated for other thermal characteristic.

•High demanding system (such as in bathroom, bathtub, washing machines, etc.) heat loss in plastic pipes with flowing water can be up to 20% smaller than in metal ones. Another 15% can be save by thorough insulation. In systems with small and /or short-time demand, where pipes are not regularly heated to operating temperatures, the savings will be smaller (only 10%) although up to 20% can be expected at peak demand.

•The insulation layer thickness for hot water systems usually ranges between 9 and 15mm at the value of thermal resistance •=0.040 W/mK

FLOW RATE vs. VELOCITY

Pipe diameter is a critical factor in properly designing the **VIALLI** pipe system are recommended to maintain an average flow velocity of 8 fps to provide energy efficient pumping, control of noise generation, and to dampen the affects of water hammer on the piping system. Once pipe sizes have been determined for the following equations can be used to determine the system pressure drop, and to select pump motor horsepower. When determining frictional pressure loss across a system it is recommended that 20% safety factor be used to account for aging of pipe, non-smooth welds, and manufacturing tolerances.

LEGEND

L	Length of pipe and / or equivalent of pipe fitting (ft)	**μ**	Absolute viscosity of liquid in pipe, (lb_{Mass} / ft-s)
D	Inside diameter of pipe, (ft)	**v**	Kinematic viscosity of fluid of liquid in pipe, (ft^2/s)
V	Average flow velocity with in pipe, (ft/s)	**Re**	Reynolds number
g	32.174, Gravitational constant, (ft/s^2)	**p**	Density of liquid in pipe, (lb_{Mass} / ft-s)
f	Friction factor	**Q**	Volumetric flow, (gpm)
ε	2.2966E-05, Absolute roughness of polypropylene pipe, (feet)	**C**	Valve manufacturer's flow coefficient

The **Reynolds number** allows the friction factor to be determined. Depending on how large or small the Reynolds number will determine which equation should be used to calculate the friction factor.

$$\mathrm{Re}\frac{p.D.V}{\mu} = \frac{V.D}{v}$$

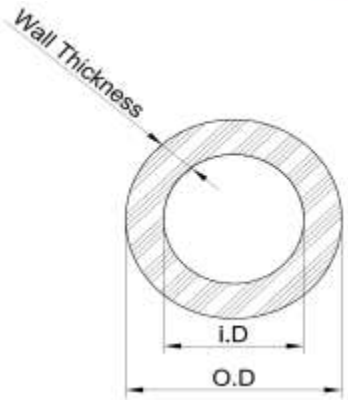
For Reynolds Number >4000, the flow condition is considered to be turbulent flow condition. For turbulent flow conditions use the **Colebrook equation** to calculate the friction factor.

$$\frac{1}{\sqrt{f}} = -2.\log_{10}\left(\frac{e}{3.7D} + \frac{2.51}{Re\sqrt{f}}\right)$$

A moody diagram can be used to determine the friction factor as well. It can be used to determine the friction factor in laminar flow conditions, or turbulent flow conditions. Transitional flow conditions, or turbulent flow conditions. To use moody diagram first calculate the Reynolds number and a relative roughness number. Use these numbers with moody diagram to determine the friction factor. An equation for relative roughness is shown below.

$$\text{Relative Roughness} = \frac{e}{D}$$

VIALLI PP-RCT PRODUCTS



1.) VIALLI PP-RCT Pipes Single Layer SDR 9 SDR 11 (PN16)

Description:

PP-RCT Pressure pipe, Homogeneous pipe for high pressures and high temperature with simultaneous high flow.

Material:

PP-RCT (Polypropylene Random-Copolymer Temperature Resistant) with modified crystalline structure (beta nucleated) and increased temperature resistance

Geometric Properties:

Outside Diameter and wall thickness according to DIN 8077 and DIN EN ISO 15874

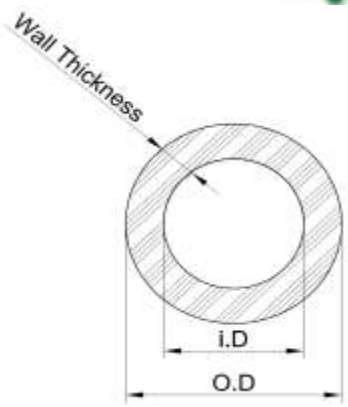
Type:

Suitable for socket welding, butt-welding according DVS 2207, Welding Equipment according to DVS 2208

Properties:

Good resistance to chemicals
Corrosion resistance
Excellent processing capability

Size (O.D)	i.D	SDR	Wall Thickness	Art. No.
20mm	15.4mm	9	2.3mm	1CT01020
25mm	19.4mm	9	2.8mm	1CT01025
32mm	26.2mm	11	2.9mm	1CT01032
40mm	32.6mm	11	3.7mm	1CT01040
50mm	40.8mm	11	4.6mm	1CT01050
63mm	51.4mm	11	5.8mm	1CT01063
75mm	61.4mm	11	6.8mm	1CT01075
90mm	73.6mm	11	8.2mm	1CT01090
110mm	90.0mm	11	10.0mm	1CT01110
125mm	102.2mm	11	11.4mm	1CT01125
160mm	130.8mm	11	14.6mm	1CT01160
200mm	163.3mm	11	18.2mm	1CT01200
250mm	204.6mm	11	22.7mm	1CT01200



2.) VIALLI PP-RCT Pipes Single Layer SDR 7.4 (PN20)

Description:

PP-RCT Pressure pipe, Homogeneous pipe for high pressures and high temperature with simultaneous high flow.

Material:

PP-RCT (Polypropylene Random-Copolymer Temperature Resistant) with modified crystalline structure (beta nucleated) and increased temperature resistance

Geometric Properties:

Outside Diameter and wall thickness according to DIN 8077 and DIN EN ISO 15874

Type:

Suitable for socket welding, butt-welding according DVS 2207, Welding Equipment according to DVS 2208

Properties:

Good resistance to chemicals
Corrosion resistance
Excellent processing capability

Size (O.D)	i.D	SDR	Wall Thickness	Art. No.
20mm	14.4mm	7.4	2.8mm	1CT01020
25mm	18.0mm	7.4	3.5mm	1CT01025
32mm	23.2mm	7.4	4.4mm	1CT01032
40mm	29.0mm	7.4	5.5mm	1CT01040
50mm	36.2mm	7.4	6.9mm	1CT01050
63mm	45.8mm	7.4	8.6mm	1CT01063
75mm	54.4mm	7.4	10.3mm	1CT01075
90mm	65.4mm	7.4	12.3mm	1CT01090
110mm	79.8mm	7.4	15.1mm	1CT01110

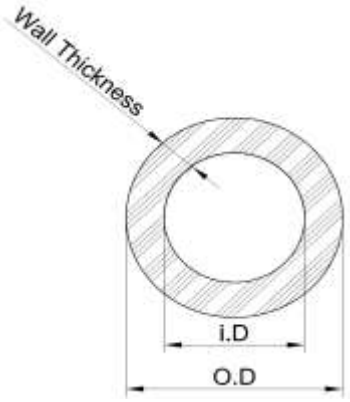
3.) VIALLI PP-RCT Pipes Multi Layer Aluminum CompositeSDR 7.4 , SDR 9(PN25)

Description:

PP-RCT Pressure pipe, multi-layer with Aluminum -middle-layer for reduce axial expansion

Material:

PP-RCT(Polypropylene Random-Copolymer Temperature Resistant) with modified crystalline structure (beta nucleated) and increased temperature resistance



Geometric Properties:

Outside Diameter and wall thickness according to DIN 8077 and DIN EN ISO 15874

Type:

Suitable for socket welding, butt-welding according DVS 2207, Welding Equipment according to DVS 2208

Properties:

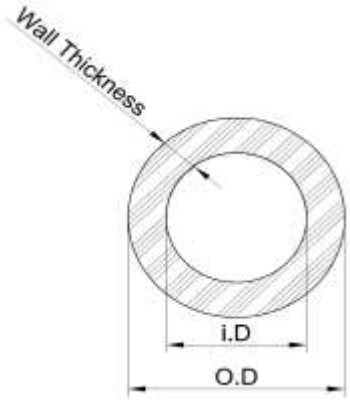
Good resistance to chemicals
Corrosion resistance
Excellent processing capability

Size (O.D)	i.D	SDR	Wall Thickness	Art. No.
20mm	14.4mm	7.4	2.8mm	2CTAU06020
25mm	19.4mm	9	2.8mm	2CTAU06025
32mm	24.8mm	9	3.6mm	2CTAU06032
40mm	31.0mm	9	4.5mm	2CTAU06040
50mm	38.8mm	9	5.6mm	2CTAU06050
63mm	48.8mm	9	7.1mm	2CTAU06063
75mm	58.2mm	9	8.4mm	2CTAU06075
90mm	65.4mm	7.4	12.3mm	2CTAU06090
110mm	79.8mm	7.4	15.1mm	2CTAU06110

4.) VIALLI PP-RCT Pipes Multi Layer Fiber Glass SDR 7.4 , SDR 11 (PN25)

Description:
PP-RCT Pressure pipe, multi-layer, with fiber Glass-middle-layer for reduce axial expansion.

Material:
PP-RCT (Polypropylene Random-Copolymer Temperature Resistant) with modified crystalline structure (beta nucleated) and increased temperature resistance



Geometric Properties:
Outside Diameter and wall thickness according to DIN 8077 and DIN EN ISO 15874

Type:
Suitable for socket welding, butt-welding according DVS 2207, Welding Equipment according to DVS 2208

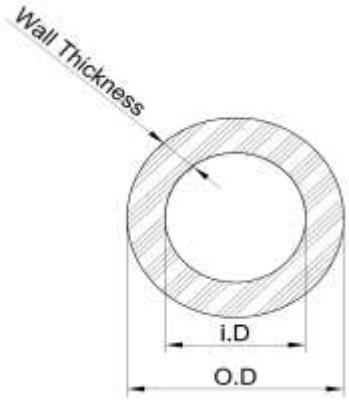
Properties:
Good resistance to chemicals
Corrosion resistance
Excellent processing capability

Size (O.D)	i.D	SDR	Wall Thickness	Art. No.
20mm	14.4mm	7.4	2.8mm	3CTFG06020
25mm	18.0mm	7.4	3.5mm	3CTFG06025
32mm	23.2mm	7.4	4.4mm	3CTFG06032
40mm	29.0mm	7.4	5.5mm	3CTFG06040
50mm	36.2mm	7.4	6.9mm	3CTFG06050
63mm	45.8mm	7.4	8.6mm	3CTFG06063
75mm	54.4mm	7.4	10.3mm	3CTFG06075
90mm	65.4mm	7.4	12.3mm	3CTFG06090
110mm	79.8mm	7.4	15.1mm	3CTFG06110
125mm	102.2mm	11	11.4mm	3CTFG06125
160mm	130.8mm	11	14.6mm	3CTFG06160
200mm	163.6mm	11	18.2mm	3CTFG06200
250mm	204.6mm	11	22.7mm	3CTFG06250

5.) VIALLI PP-RCT Pipes Multi Layer Fiber Basalt SDR 7.4 , SDR 11 (PN25)

Description:
PP-RCT Pressure pipe, multi-layer, with fiber Basalt-middle-layer for reduce axial expansion

Material:
PP-RCT (Polypropylene Random-Copolymer Temperature Resistant) with modified crystalline structure (beta nucleated) and increased temperature resistance

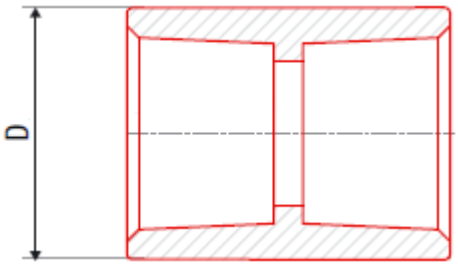


Geometric Properties:
Outside Diameter and wall thickness according to DIN 8077 and DIN EN ISO 15874

Type:
Suitable for socket welding, butt-welding according DVS 2207, Welding Equipment according to DVS 2208

Properties:
Good resistance to chemicals
Corrosion resistance
Excellent processing capability

Size (O.D)	i.D	SDR	Wall Thickness	Art. No.
20mm	14.4mm	7.4	2.8mm	5CTFB06020
25mm	18.0mm	7.4	3.5mm	5CTFB06025
32mm	23.2mm	7.4	4.4mm	5CTFB06032
40mm	29.0mm	7.4	5.5mm	5CTFB06040
50mm	36.2mm	7.4	6.9mm	5CTFB06050
63mm	45.8mm	7.4	8.6mm	5CTFB06063
75mm	54.4mm	7.4	10.3mm	5CTFB06075
90mm	65.4mm	7.4	12.3mm	5CTFB06090
110mm	79.8mm	7.4	15.1mm	5CTFB06110
125mm	102.2mm	11	11.4mm	5CTFB06125
160mm	130.8mm	11	14.6mm	5CTFB06160
200mm	163.6mm	11	18.2mm	5CTFB06200
250mm	204.6mm	11	22.7 mm	5CTFB06250



6.) Coupling (Equal Socket)

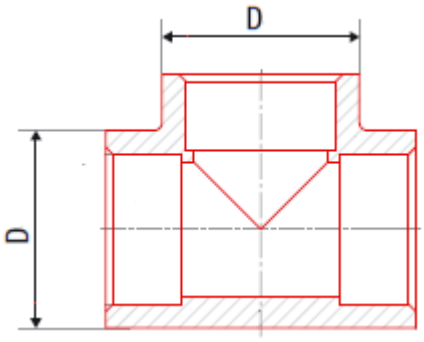
Easy interconnection of individual pipes of a water or heating Distribution system, having reduced pressure loss.

Size (D)	Description	Art. No.
20mm	Equal Socket	CT202020
25mm	Equal Socket	CT202025
32mm	Equal Socket	CT202032
40mm	Equal Socket	CT202040
50mm	Equal Socket	CT202050
63mm	Equal Socket	C202063
75mm	Equal Socket	CT202075
90mm	Equal Socket	CT202090
110mm	Equal Socket	CT202110
125mm	Equal Socket	CT202125
160mm	Equal Socket	CT202160
200mm	Equal Socket	CT202200
250mm	Equal Socket	CT202250

7.) Equal Tee

A fittings allowing for the branching of a distribution system. The Inside Diameter of the fittings is not reduce compared to the Inside diameter of the piping, and therefore, the fitting dose not Significantly increase the pressure loss in the distribution system

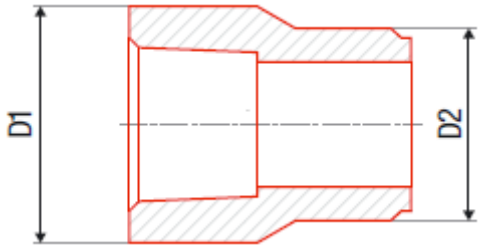
Size (D)	Description	Art. No.
20x20x20mm	Equal Tee	CT207020
25x25x25mm	Equal Tee	CT207025
32x32x32mm	Equal Tee	CT207032
40x40x40mm	Equal Tee	CT207040
50x50x50mm	Equal Tee	CT207050
63x63x63mm	Equal Tee	CT207063
75x75x75mm	Equal Tee	CT207075
90x90x90mm	Equal Tee	CT207090
110x110x110mm	Equal Tee	CT207110
125x125x125mm	Equal Tee	CT207125
160x160x160mm	Equal Tee	CT207160
200x200x200mm	Equal Tee	CT207200
250x250x250mm	Equal Tee	CT207250

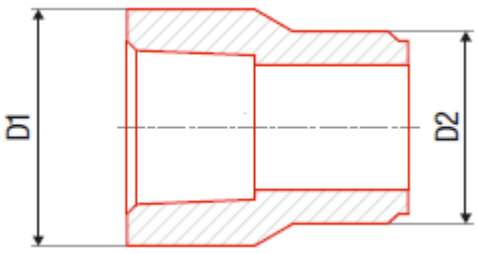


8.) Reducer Socket

Reduced interconnection of individual pipes of a water of Heating Distribution system, having reduce pressure loss.

Size (D1, D2)	Description	Art. No.
25/20mm	Reducer Socket	CT201025020
32/20mm	Reducer Socket	CT201032020
32/25mm	Reducer Socket	CT201032025
40/20mm	Reducer Socket	CT201040020
40/25mm	Reducer Socket	CT201040025
40/32mm	Reducer Socket	CT201040032
50/25mm	Reducer Socket	CT201050025
50/32mm	Reducer Socket	CT201050032
50/40mm	Reducer Socket	CT201050040
63/25mm	Reducer Socket	CT201063025
63/32mm	Reducer Socket	CT201063032
63/40mm	Reducer Socket	CT201063040
63/50mm	Reducer Socket	CT201063050
75/50mm	Reducer Socket	CT201075050
75/63mm	Reducer Socket	CT201075063





Reducer Socket

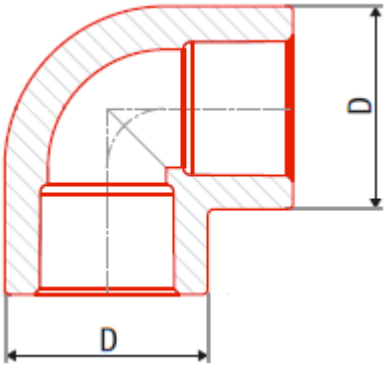
Reduced interconnection of individual pipes of a water of Heating Distribution system, having reduce pressure loss

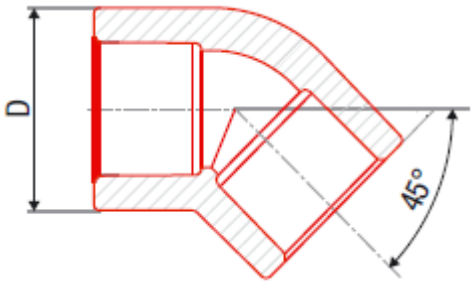
Size (D1, D2)	Description	Art. No.
75/63mm	Reducer Socket	CT201075063
90/63mm	Reducer Socket	CT201090063
90/75mm	Reducer Socket	CT201090075
110/90mm	Reducer Socket	CT2010110090
125/110mm	Reducer Socket	CT20101250110
160/110mm	Reducer Socket	CT20101600110
160/125mm	Reducer Socket	CT20101600125
160/50mm	Reducer Socket	CT2010160050
160/75mm	Reducer Socket	CT2010160075
160/90mm	Reducer Socket	CT2010160090
200/90mm	Reducer Socket	CT2010200090
200/110mm	Reducer Socket	CT20102000110
200/160mm	Reducer Socket	CT20102000160
250/160mm	Reducer Socket	CT20102500160
250/200mm	Reducer Socket	CT2010250200

9.) Elbow 90°

A simple, reliable fitting used to change the direction of a Distribution system. When installed properly it increases the Pressure loss in the distribution system noticeably less than Elbows in other distribution systems. Thanks to the full-size Inside Diameter corresponding to that of the piping.

Size (D)	Description	Art. No.
20mm	Elbow 90°	CT205020
25mm	Elbow 90°	CT205025
32mm	Elbow 90°	CT205032
40mm	Elbow 90°	CT205040
50mm	Elbow 90°	CT205050
63mm	Elbow 90°	CT205063
75mm	Elbow 90°	CT205075
90mm	Elbow 90°	CT205090
110mm	Elbow 90°	CT205110
125mm	Elbow 90°	CT205125
160mm	Elbow 90°	CT205160
200mm	Elbow 90°	CT205200
250mm	Elbow 90°	CT205250





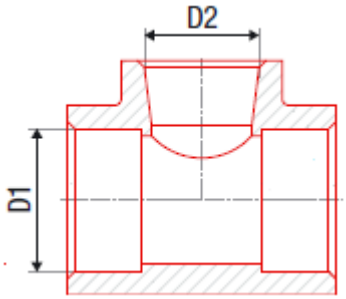
10.) Elbow 45°

A simple, reliable fitting to change the direction of a Distribution System. When installed properly, it increases the pressure loss in the distribution system noticeably less than elbows in other distribution systems, thanks to the full-size inside diameter corresponding to that of the piping.

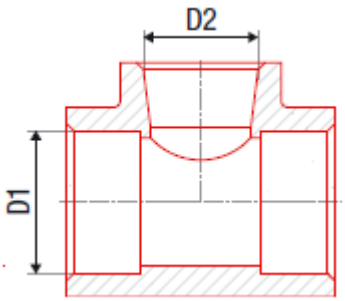
Size (D)	Description	Art. No.
20mm	Elbow 45°	CT206020
25mm	Elbow 45°	CT206025
32mm	Elbow 45°	CT206032
40mm	Elbow 45°	CT206040
50mm	Elbow 45°	CT206050
63mm	Elbow 45°	CT206063
75mm	Elbow 45°	CT206075
90mm	Elbow 45°	CT206090
110mm	Elbow 45°	CT206110
125mm	Elbow 45°	CT206125
160mm	Elbow 45°	CT206160
200mm	Elbow 45°	CT206200
250mm	Elbow 45°	CT206020

11.) Reducer Tee

A fitting allowing for the branching of a distribution system. The Inside diameter of the fitting is not reduced compared to the Inside diameter of the piping, and therefore, the fitting dose not Significantly increase the pressure loss in the distribution system.



Size (D1, D2)	Description	Art. No.
25x20x25mm	Reducer Tee	CT312025020
32x25x32mm	Reducer Tee	CT312032025
32x20x32mm	Reducer Tee	CT312032020
40x20x40mm	Reducer Tee	CT312040020
40x25x40mm	Reducer Tee	CT312040025
40x32x40mm	Reducer Tee	CT312040032
50x25x50mm	Reducer Tee	CT312050025
50x32x50mm	Reducer Tee	CT312050032
63x25x63mm	Reducer Tee	CT312063025
63x32x63mm	Reducer Tee	CT312063032
63x40x63mm	Reducer Tee	CT312063040
63x50x63mm	Reducer Tee	CT312063050
75x25x75mm	Reducer Tee	CT312075025
75x32x75mm	Reducer Tee	CT312075032
75x40x75mm	Reducer Tee	CT312075040
75x50x75mm	Reducer Tee	CT312075050
75x63x75mm	Reducer Tee	CT312075063

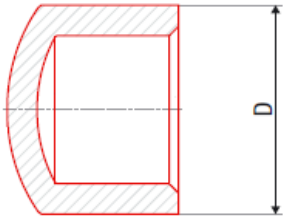


Reducer Tee

Size (D1, D2)	Description	Art. No.
90x40x90mm	Reducer Tee	CT312090040
90x50x90mm	Reducer Tee	CT312090050
90x63x90mm	Reducer Tee	CT312090063
90x75x90mm	Reducer Tee	CT312090075
110x40x110mm	Reducer Tee	CT312110040
110x50x110mm	Reducer Tee	CT312110050
110x63x110mm	Reducer Tee	CT312110063
110x75x110mm	Reducer Tee	CT312110075
110x90x110mm	Reducer Tee	CT312110090
125x110x125mm	Reducer Tee	CT3121250110
160x110x160mm	Reducer Tee	CT3121600110
160x25x160mm	Reducer Tee	CT312160025
160x40x160mm	Reducer Tee	CT312160040
160x50x160mm	Reducer Tee	CT312160050
160x63x160mm	Reducer Tee	CT312160063
160x75x160mm	Reducer Tee	CT312160075
160x90x160mm	Reducer Tee	CT312160090

12.) End cap

A permanent or temporary end of a branch of a water or heating Distribution system. Fully corresponding to the pressure range.



Size (D)	Description	Art. No.
20mm	End Cap	CT228020
25mm	End Cap	CT228025
32mm	End Cap	CT228032
40mm	End Cap	CT228040
50mm	End Cap	CT228050
63mm	End Cap	CT228063
75mm	End Cap	CT228075
90mm	End Cap	CT228090
110mm	End Cap	CT228110
125mm	End Cap	CT228125
160mm	End Cap	CT228160

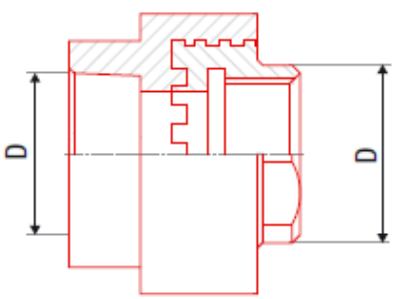
13.) Pipe Bridge

It allows for crossing of individual tracks of a water and Heating Distribution system. It is most often for distribution systems in Floor or when avoiding vertical pipes.

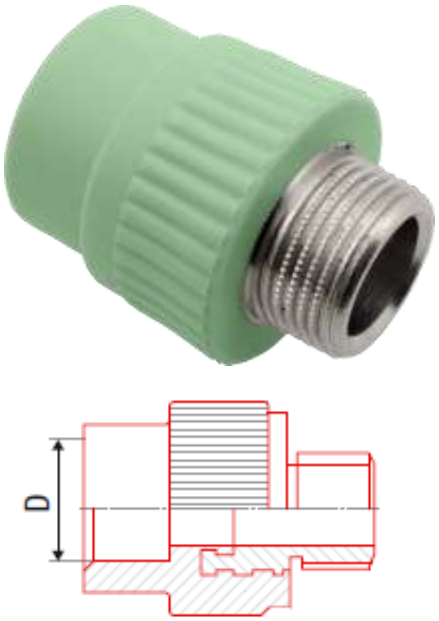
Size (D, D1)	Description	Art. No.
20mm	Pipe Bridge	CT243020
25mm	Pipe Bridge	CT243025
32mm	Pipe Bridge	CT243032

14.) Female Adaptor

A fitting used for the transition from a welded part a water or Heating distribution system to brass screw joints and threaded Fittings.



Size (D)	Description	Art. No.
20x ½”	Female Adaptor	CT247020
25x ½”	Female Adaptor	CT247025
25x ¾”	Female Adaptor	CT247025
32x 1”	Female Adaptor	CT247032
40x 1¼”	Female Adaptor	CT247040
50x 1½”	Female Adaptor	CT247050
63x 2”	Female Adaptor	CT247063
75x 2½”	Female Adaptor	CT247075
90x 3”	Female Adaptor	CT247090
110x 4”	Female Adaptor	CT247110



15.) Male Adaptor

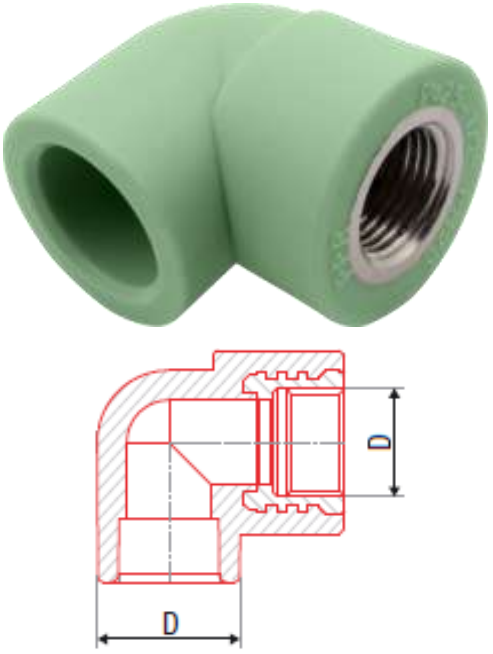
A fitting used for the transition from a welded part of a water or heating distribution system to brass screw joints and Threaded Fittings.

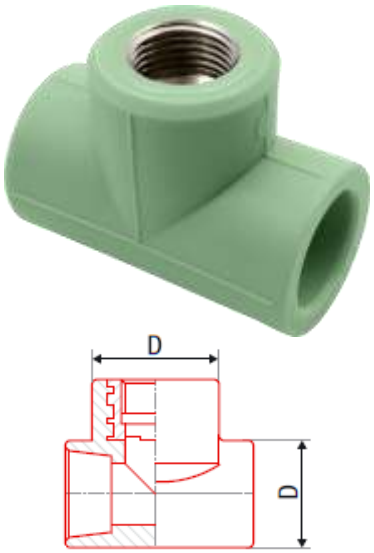
20x ½"	Male Adaptor	CT216020
25x ½"	Male Adaptor	CT216025
25x ¾"	Male Adaptor	CT216025
32x 1"	Male Adaptor	CT216032
40x 1¼"	Male Adaptor	CT216040
50x 1½"	Male Adaptor	CT216050
63x 2"	Male Adaptor	CT216063
75x 2½"	Male Adaptor	CT216075
90x 3"	Male Adaptor	CT216090
110x 4"	Male Adaptor	CT216110

16.) Female Elbow 90°

A fitting used for the transition from a welded part of a water or heating distribution system to brass screw joints and Threaded fittings.

Size (D)	Description	Art. No.
20x ½"	Female Elbow	CT216020
25x ½"	Female Elbow	CT216026
25x ¾"	Female Elbow	CT216025
32x ½"	Female Elbow	CT206036
32x ¾"	Female Elbow	CT206035
32x 1"	Female Elbow	CT216020





17.) Female Tee

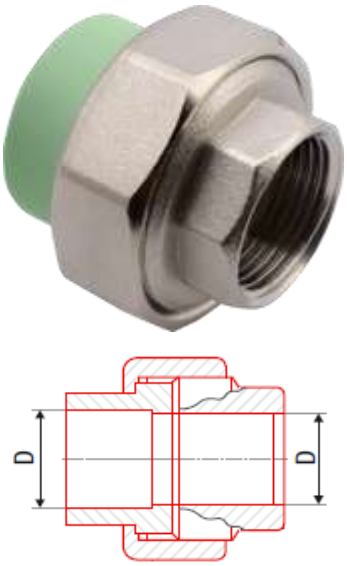
A fitting used for the transition from a welded part of a water or Heating distribution system to brass screw joints and threaded Fittings.

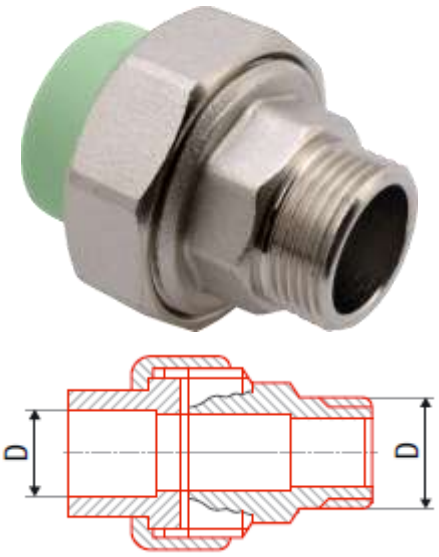
Size (D)	Description	Art. No.
20x ½"x20	Female Tee	CT233020
25x ½"x25	Female Tee	CT233026
25x ¾"x25	Female Tee	CT233025
32x ½"x32	Female Tee	CT233036
32x ¾"x32	Female Tee	CT233035
32x1"x32	Female Tee	CT233032
40x ½"x40	Female Tee	CT233040

18.) Female Union

A fittings used for transition from welded part of a water or Heating distribution system to brass screw joints and threaded
fittings.

SizeSize (D)	Description	Art. No.
20x ½"	Female Union	CT536020
25x ¾"	Female Union	CT536025
32x1"	Female Union	CT536032
40x1¼"	Female Union	CT536040
50x 1½"	Female Union	CT536050
63x2"	Female Union	CT536063





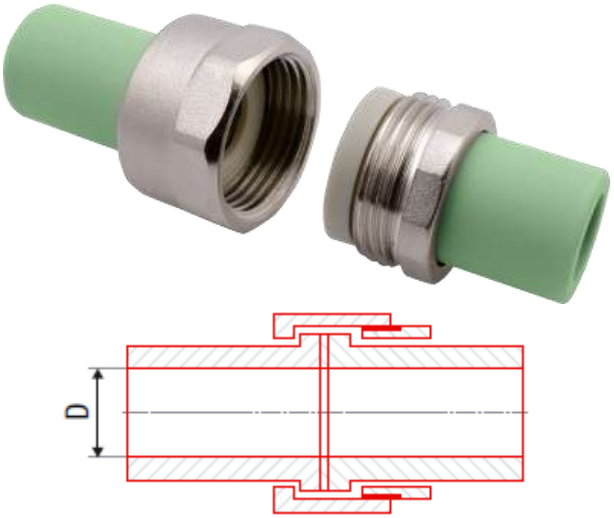
19.) Male Union

A fittings used for transition from welded part of a water or Heating distribution system to brass screw joints and threaded
fittings.

Size (D)	Description	Art. No.
20x ½"	Male Union	CT677020
25x ¾"	Male Union	CT677025
32x1"	Male Union	CT677032
40x1¼"	Male Union	CT677040
50x 1½"	Male Union	CT677050
63x2"	Male Union	CT677063

20.) Union Socket – Metal

A fittings used for transition from welded part of a water or Heating distribution system to brass screw joints and threaded fittings.



Size (D)	Description	Art. No.
20mm	Union Socket	CT298020
25mm	Union Socket	CT298025
32mm	Union Socket	CT298032
40mm	Union Socket	CT298040
50mm	Union Socket	CT298050
63mm	Union Socket	CT298063

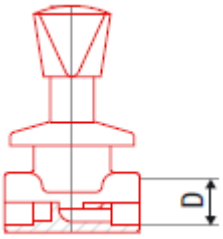
21.) Stainless Steel Non-Rising Stem Valve

The Straight-way plastic valve makes it not only possible to close But also to partially regulate the flow in a part of a distribution System. When operated and maintained properly, the replacement parts provide almost endless service life.

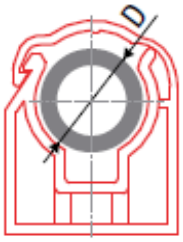
Size (D)	Description	Art. No.
20mm	S.S Non-Rising Stem Valve	CT396020
25mm	S.S Non-Rising Stem Valve	CT396025
32mm	S.S Non-Rising Stem Valve	CT396032
40mm	S.S Non-Rising Stem Valve	CT396040
50mm	S.S Non-Rising Stem Valve	CT396050
63mm	S.S Non-Rising Stem Valve	CT396063

22.) Chrome Plated Valve

An elegant concealed valve for closing branches of a Distribution System, intended for premises with higher aesthetic requirements Such as bathrooms, toilet rooms and wash rooms.



Size (D)	Description	Art. No.
20mm	Chrome Plated Valve	CT344020
25mm	Chrome Plated Valve	CT344025
32mm	Chrome Plated Valve	CT344032



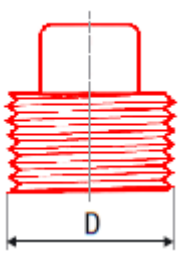
23.) Pipe Clamp

PPR system accessory for fastening pipes.

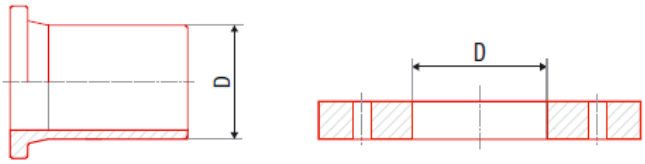
Size (D)	Description	Art. No.
20mm	Pipe Clamp	CT901020
25mm	Pipe Clamp	CT901025
32mm	Pipe Clamp	CT901032
40mm	Pipe Clamp	CT901040

24.) Test Plug

Temporary closure of threaded fittings in water or heating Distribution systems. It is used especially to blank wall-Mounted Tee fittings.



Size (D)	Description	Art. No.
½"	Test Plug	C32403



25.) Flange set

A fitting and steel flange used for the transition from a welded part of a water or Heating distribution system to flange dismountable joints.

Size (D)	Description	Art. No.
32mm	Flange Set	CT831032
40mm	Flange Set	CT831040
50mm	Flange Set	CT831050
63mm	Flange Set	CT831063
75mm	Flange Set	CT831075
90mm	Flange Set	CT831090
110mm	Flange Set	CT831110
125mm	Flange Set	CT831125
160mm	Flange Set	CT831160
200mm	Flange Set	CT831200
250mm	Flange Set	CT831250

26.) Welding Socket

To join pipe to valves and fittings or to other sections of pipe, fillet-type seal welds be used. socket welded joints construction is a good choice wherever the benefits of high leakage integrity and great structural strength are important designconsiderations.

Size	Description	Art. No.
20mm	Welding Socket	20
25mm	Welding Socket	25
32mm	Welding Socket	32
40mm	Welding Socket	40
50mm	Welding Socket	50
63mm	Welding Socket	63
75mm	Welding Socket	75
90mm	Welding Socket	90
110mm	Welding Socket	110
125mm	Welding Socket	125
160mm	Welding Socket	160
200mm	Welding Socket	200
250mm	Welding Socket	250

27.) Pipe Cuter

A pipe cutter is a type of tool used by plumber to cut pipe. besides producing a clean cut, the tool is often a faster, cleaner, and more convenient way of cutting pipe

Size	Description	Art. No.
16-40 mm	Pipe Cuter	91411
50-250mm	Special Pipe Cuter	91412

28.) Welding Machine Set

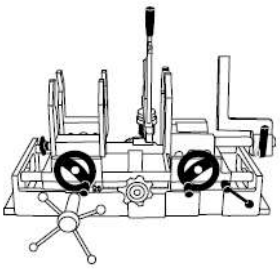
PPR Pipe Welding Machine for Welding of PPR pipes & fittings coated with high-quality PTFE non-stick coating

Size	Description	Art. No.
20-32 mm	Welding Machine	91421
40-110mm	Welding Machine	91422

29.) Adjustable Welding Machine Set

PPR Pipe Welding Machine for Welding of PPR pipes & fittings coated with high-quality PTFE non-stick coating

Size	Description	Art. No.
125-250mm	Welding Machine	91423



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