

**RAKtherm**<sup>®</sup>  
Ultimate Piping Solutions

**GREENER THAN EVER**

ULTIMATE PIPING  
**SOLUTIONS..**



INNOVATION  
**TECHNOLOGY**

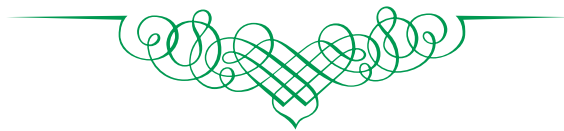


**RAK THERM**  
TO WORLDWIDE





" COMMIT TO DELIVER  
THE ULTIMATE  
PIPING  
**SOLUTIONS**  
WITH THE LATEST  
INNOVATION  
**TECHNOLOGY**  
TO BE PRIDE  
OF THE INDUSTRY  
FROM  
**RAK THERM**  
TO WORDLWIDE. "



*Welcome to*  
**RAKtherm®**



Gulf Plastic and Converting Industries (Tahweel™), is a multifaceted manufacturing Company based in the United Arab Emirates, supplying various engineering systems for the construction sector.

With over 40 year experience in plastic pipe and fitting manufacturing in Saudi Arabia, Egypt and Jordan, Tahweel™ has launched its first integrated PP-R and PE-X pipes & fittings system for servicing a booming construction sector worldwide and in the Middle East in particular under the trade name of RAKtherm®. With 40,000 m<sup>2</sup> Manufacturing complex based in Ras Al Khaimah and sales branch office based in Sharjah, Tahweel™ is well on its way to become the regional leader in water supply and drainage systems.

RAKtherm is a versatile, and comprehensive system for delivery of water and other fluids, used in applications of pressurized hot and cold water delivery as well as under floor heating in all modern residential, commercial, and industrial buildings. RAKtherm® offers the widest range of PP-R and its complimentary PE-X piping systems in the Middle East and North Africa, including Multilayer oxygen barrier pipes and Aluminium composite pipes in addition to the conventional piping systems.

We believe the quality of products and the support services provided at RAKtherm® are our main advantages. This is translated in a very wide range of products that are produced with state-of-the-art machinery from the most reputed sources, and a very high-tech quality control system which ensures that this quality is always maintained in addition to well trained and highly motivated staff on all levels of the company that are always committed to premium service at any time.

A handwritten signature in black ink, reading "Ali Hashim". The signature is fluid and cursive.

Tahweel Industrial Group President



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# system... an Overview



## INTRODUCTION

**RAKtherm**..a versatile, and comprehensive system for water and other fluid delivery, is used in applications of pressurized warm or cold water in all modern residential, commercial, and industrial applications. The creative solutions provided by **RAKtherm** in its product base renders it a leader in the construction industry.

## RAK THERM PIPING SYSTEMS ARE USED IN:

- Potable installations inside houses, high rise buildings, hotels, hospitals and virtually all types of commercial and residential buildings.
- Factories with high-pressure water and compressed air circuits.
- Rain drainage and collection systems.
- Indoor and outdoor swimming pools, gyms and their water filtration circuits and water installations.
- Piping networks for all types of irrigation and agriculture applications and pressurized networks.
- Piping networks for all types for industrial applications for the delivery of aggressive chemicals including many acidic, alkaline and other reactive and corrosive chemicals.
- Piping networks for all types of chilled water application and cooling systems networks.
- Piping networks for heating installations from the boiler outlets or water heating unit up to the individual radiators or heat exchangers.

## RAK THERM PIPING SYSTEMS ARE ALSO USED IN:

- Connections from municipality mains to the tanks and reservoirs.
- Boilers and radiator connections and networks.



## ULTIMATE PIPING SOLUTIONS

**RAKtherm**<sup>®</sup>  
Ultimate Piping Solutions

- Risers for water delivery, ventilation, and pressure relief.
- Water transport from pumps to upper tanks and distribution points.
- Connections through meters, and distributor manifolds.
- Distributions inside flats, apartments, houses etc...
- Underfloor network distribution and underfloor heating networks.



## RAK THERM MATERIALS

**RAKtherm** pipes and fittings are made with a material called polypropylene which is used extensively in food and medical industries because of its safe properties.

A random copolymer grade of polypropylene called PP-R 80 was especially developed for engineering applications with certain stringent requirements. PP-R 80 is characterized by excellent physical and chemical properties even at elevated temperatures. Compression strength, elasticity, corrosion, chemical and heat resistance are just some of these properties. **RAKtherm** PP-R 80 system has proven its high resilience even at the most extreme conditions. These factors and more, make **RAKtherm** PP-R 80 the ideal material for the delivery of potable hot and cold water in your home, office, or factory.

## RAK THERM PP-R 80...AN IDEAL SOLUTION

**RAKtherm** pipes and fittings are designed to withstand constant temperatures up to 70 °C. The service life expectancy depends on the installed system pressure and pressure changes. Even though the service life expectancy of the pipes is more than 50 years, a permanent temperature rise from 70 to 90 °C will accordingly reduce the operational life of the pipe. However, a temperature rise up to 100 °C in short time frames is usually unproblematic. (See table 1.1,1.2).

# system... An Overview

TABLE 1.1 SERVICE LIFE AGAINST HOT WATER APPLICATION  
UNDER CONSTANT PERIOD ( SERVICE CONDITION)

|                  |             | Permissible Working Pressures (Bars)/1.25 Safety Factor |  |  |  |
|------------------|-------------|---|--|--|--|
|                  |             | RAKtherm<br>Standard Pipe<br>SDR 11<br>ISO S5           | RAKtherm<br>Standard Pipe<br>SDR 7.4<br>ISO S3.2 | RAKtherm Stabi Pipe<br>RAKtherm standard<br>pipe SDR 6<br>(ISO S2.5) | RAKtherm Stabi Pipe<br>RAKtherm standard<br>pipe SDR 5<br>(ISO S2) |
|                  |             | Nominal Pressure Class                                  |  |  |  |
| Years of Service | Temperature | PN10  | PN16   | PN20   | PN25   |
| 1 Years          | 10°C        | 21.1  | 33.4   | 42.0   | 52.9   |
|                  | 20°C        | 18.1  | 28.6   | 36.0   | 45.3   |
|                  | 30 °C       | 15.3  | 24.3   | 30.6   | 38.5   |
|                  | 40 °C       | 12.9  | 20.5   | 25.8   | 32.5   |
|                  | 50 °C       | 11.0  | 17.5   | 22.0   | 27.7   |
|                  | 60 °C       | 9.3   | 14.7   | 18.5   | 23.3   |
|                  | 70 °C       | 7.8   | 12.4   | 15.6   | 19.6   |
|                  | 80°C        | 6.5   | 10.4   | 13.1   | 16.4   |
|                  | 95 °C       | 4.6   | 7.3  | 9.2  | 11.6   |
| 5 Years          | 10°C        | 20.0  | 31.6   | 39.8   | 50A  |
|                  | 20 °C       | 16.9  | 26.8   | 33.8   | 42.2   |
|                  | 30 °C       | 14.4  | 22.8   | 28.7   | 36.1   |
|                  | 40 °C       | 12.1  | 19.2   | 24.2   | 30.5   |
|                  | 50 °C       | 10.2  | 16.2   | 20.4   | 25.7   |
|                  | 60 °C       | 8.6   | 13.7   | 17.2   | 21.7   |
|                  | 70°C        | 7.2   | 11.4   | 14.3   | 18.0   |
|                  | 80 °C       | 5.7   | 9.1  | 11.5   | 14.4   |
|                  | 95°C        | 3.0   | 4.8  | 6.1  | 7.6  |
| 10 Years         | 10°C        | 19.3  | 30.6   | 38.5   | 48.5   |
|                  | 20°C        | 16.4  | 26.1   | 32.8   | 41.3   |
|                  | 30 °C       | 13.9  | 22.0   | 27.7   | 34.9   |
|                  | 40 °C       | 11.8  | 18.7   | 23.6   | 29.7   |
|                  | 50 °C       | 9.9   | 15.7   | 19.7   | 24.9   |
|                  | 60 °C       | 8.3   | 13.2   | 16.6   | 20.8   |
|                  | 70 °C       | 7.0   | 11.1   | 14.0   | 17.6   |
|                  | 80°C        | 4.8   | 7.6  | 9.6  | 12.0   |
|                  | 95 °C       | 2.6   | 4.0  | 5.1  | 6.4  |

TABLE 1.1 SERVICE LIFE AGAINST HOT WATER APPLICATION  
UNDER CONSTANT PERIOD ( SERVICE CONDITION)

|                  |             | Permissible Working Pressures (Bars)/1.25 Safety Factor |   |   |   |
|------------------|-------------|---|---|---|---|
|                  |             | RAKtherm Standard Pipe SDR 11 ISO S5                    | RAKtherm Standard Pipe SDR 7.4 ISO S3.2 | RAKtherm Stabi Pipe RAKtherm standard pipe SDR 6 (ISO S2.5) | RAKtherm Stabi Pipe RAKtherm standard pipe SDR 5 (ISO S2) |
|                  |             | Nominal Pressure Class                                  |   |   |   |
| Years of Service | Temperature | PN10  | PN16                                    | PN20  | PN25  |
| 25 Years         | 10°C        | 18.7  | 29.6                                    | 37.3  | 46.9  |
|                  | 20 °C       | 16.0  | 25.3                                    | 31.8  | 40.1  |
|                  | 30 °C       | 13.4  | 21.3                                    | 26.8  | 33.7  |
|                  | 40 °C       | 11.3  | 18.0                                    | 22.6  | 28.5  |
|                  | 50 °C       | 9.6   | 15.2                                    | 19.1  | 24.1  |
|                  | 60 °C       | 8.0   | 12.6                                    | 15.9  | 20.0  |
|                  | 70°C        | 6.1   | 9.6                                     | 12.1  | 15.2  |
|                  | 80 °C       | 3.8   | 6.1                                     | 7.6   | 9.6   |
| 50 Years         | 10°C        | 18.2  | 28.8                                    | 36.3  | 45.7  |
|                  | 20 °C       | 15.5  | 24.5                                    | 30.9  | 38.9  |
|                  | 30 °C       | 13.1  | 20.7                                    | 26.1  | 32.9  |
|                  | 40 °C       | 11.0  | 17.5                                    | 22.0  | 27.7  |
|                  | 50 °C       | 9.3   | 14.7                                    | 18.5  | 23.3  |
|                  | 60 °C       | 7.7   | 12.1                                    | 15.3  | 19.2  |
|                  | 70°C        | 5.1   | 8.1                                     | 10.2  | 12.8  |
|                  | 80 °C       | NIA   | NIA                                     | NIA   | NIA   |
| 75 Years         | 10°C        | 17.7  | 28.1                                    | 35.4  | 44.5  |
|                  | 20 °C       | 15.0  | 23.8                                    | 29.3  | 37.7  |
|                  | 30 °C       | 12.8  | 20.2                                    | 25.5  | 32.1  |
|                  | 40 °C       | 21.3  | 16.9                                    | 21.3  | 26.9  |
|                  | 50 °C       | 8.9   | 14.2                                    | 17.8  | 22.5  |
|                  | 60 °C       | NIA   | NIA                                     | NIA   | NIA   |
|                  | 70°C        | NIA   | NIA                                     | NIA   | NIA   |
|                  | 80 °C       | NIA   | NIA                                     | NIA   | NIA   |

# system... An Overview

TABLE 1.2 SERVICE LIFE AGAINST HOT WATER APPLICATION UNDER CONSTANT PERIOD ( SERVICE CONDITION )

|  |             | Permissible Working Pressures (Bars)/1.25 Safety Factor |   |  |  |
|--|-------------|---|---|--|--|
|  |             |   | RAKtherm Standard Pipe<br>SDR 7.4<br>ISO S3.2 | RAKtherm Stabi Pipe<br>RAKtherm standard<br>pipe SDR 6<br>(ISO S2.5) | RAKtherm Stabi Pipe<br>RAKtherm standard pipe<br>SDR 5<br>(ISO S2) |
|  |             | Nominal Pressure Class                                  |   |  |  |
| Service Condition  | Temperature | Years of Service  | PN16  | PN20   | PN25   |
| Constant service<br>Temperature 70 °C<br>incl. 30 days per<br>year at... | 75°C        | 5   | 11.33   | 14.27  | 17.07  |
|  |             | 10  | 10.95   | 13.79  | 15.20  |
|  |             | 25  | 9.32  | 11.74  | 15.00  |
|  |             | 45  | 8.08  | 10.18  | 14.40  |
|  |             | 5   | 10.72   | 13.50  | 13.86  |
|  | 80°C        | 10  | 10.16   | 12.80  | 13.06  |
|  |             | 25  | 8.84  | 11.14  | 13.72  |
|  |             | 42.5  | 7.77  | 9.79   | 10.17  |
|  |             | 5   | 9.85  | 12.45  | 13.32  |
|  |             | 10  | 9.42  | 11.87  | 12.22  |
|  | 85°C        | 25  | 8.05  | 10.14  | 11.06  |
|  |             | 37.5  | 7.29  | 9.18   | 9.88   |
|  |             | 5   | 9.04  | 11.39  | 11.74  |
|  |             | 10  | 8.69  | 10.94  | 12.12  |
|  |             | 25  | 7.03  | 8.86v  | 9.91   |
| 90°C   | 35          | 6.48  | 8.16  | 8.86   |  |
|  | 5           | 11.20   | 14.11   | 15.90  |  |
|  | 10          | 10.77   | 13.57   | 14.50  |  |
|  | 25          | 9.19  | 10.05   | 13.70  |  |
|  | 45          | 7.97  | 11.58   | 12.80  |  |
| Constant service<br>Temperature 70 °C incl.<br>60 days per year at...    | 80°C        | 5   | 10.14   | 10.05  | 15.80  |
|  |             | 10  | 9.96  | 13.12  | 15.40  |
|  |             | 25  | 8.38  | 10.56  | 13.20  |
|  |             | 40  | 7.47  | 9.41   | 11.60  |
|  |             | 5   | 9.55  | 12.03  | 15.78  |
|  | 85°C        | 10  | 9.14  | 11.52  | 15.30  |
|  |             | 25  | 7.31  | 9.22   | 13.30  |
|  |             | 35  | 6.73  | 8.48   | 11.20  |
|  |             | 5   | 8.76  | 11.04  | 14.90  |
|  |             | 10  | 7.75  | 9.76   | 12.90  |
| 90°C   | 25          | 6.20  | 7.81  | 10.48  |  |
|  | 30          | 5.92  | 7.46  | 8.45   |  |

TABLE 1.2 SERVICE LIFE AGAINST HOT WATER APPLICATION  
UNDER CONSTANT PERIOD ( SERVICE CONDITION )

|  |             | Permissible Working Pressures (Bars)/1.25 Safety Factor |   |  |  |
|--|-------------|---|---|--|--|
|  |             |   | RAKtherm Standard Pipe<br>SDR 7.4<br>ISO S3.2 | RAKtherm Stabi Pipe<br>RAKtherm standard<br>pipe SDR 6<br>(ISO S2.5) | RAKtherm Stabi Pipe<br>RAKtherm standard<br>pipe SDR 5<br>(ISO S2) |
|  |             | Nominal Pressure Class                                  |   |  |  |
| Service Condition  | Temperature | Years of Service  | PN16  | PN20   | PN25   |
| Constant service<br>Temperature 70 °C<br>incl. 90 days per<br>year at... | 75 °C       | 5   | 11.12   | 14.02  | 14.73  |
|  |             | 10  | 10.62   | 13.38  | 13.80  |
|  |             | 25  | 8.99  | 11.33  | 12.40  |
|  | 80 °C       | 45  | 7.80  | 9.82   | 11.20  |
|  |             | 5   | 10.23   | 12.90  | 16.10  |
|  |             | 10  | 9.80  | 12.35  | 15.50  |
|  |             | 25  | 7.97  | 10.05  | 12.71  |
|  |             | 37.5  | 7.21  | 9.09   | 11.52  |
|  | 85 °C       | 5   | 9.37  | 11.81  | 15.15  |
|  |             | 10  | 8.51  | 10.72  | 14.20  |
|  |             | 25  | 6.81  | 8.58   | 12.16  |
|  | 90 °C       | 32.5  | 6.37  | 8.03   | 11.40  |
|  |             | 5   | 8.41  | 10.59  | 11.30  |
|  |             | 10  | 7.11  | 8.96   | 10.45  |
|  |             |   | 25  | 5.69   | 7.17   |

# system... an Overview



## AN INVESTMENT FOR YOUR FAMILY'S HEALTH

At the highest level of **RAKtherm**'s priorities is maintaining the quality of water that reaches your family, PP-R 80, as a material, is inert by nature and does not, in any way, react or affect potable water, as compared with other materials used in conventional piping systems that can corrode, react chemically, or seep certain contaminants into the water system, affecting the health and safety of the potable water. This ensures continuous hygienic potable water for you and your family.

## RAK THERM, YOUR ENVIRONMENT FRIENDLY CHOICE

Heavy metals such as nickel and chrome negatively impact the environment, plated metal inserts, previously used in fittings, no longer find their way into the **RAKtherm** product line (consistent with BS 6920). In addition, **RAKtherm** pipe and fitting materials can be 100% recycled, and used again in other products (consistent with DVGW working sheet W270). These are just a few of the many ways that **RAKtherm** contributes to the welfare of our environment.

## CORROSION & CHEMICAL RESISTANCE

PP-R 80, used in all **RAKtherm** piping systems, has high corrosion resistance properties in addition to impressive resistance to the common chemicals used in virtually all household detergents and disinfectants. This advantage surpasses traditional piping systems, thus ensuring a longer working life, less prone to premature failures and expensive maintenance.

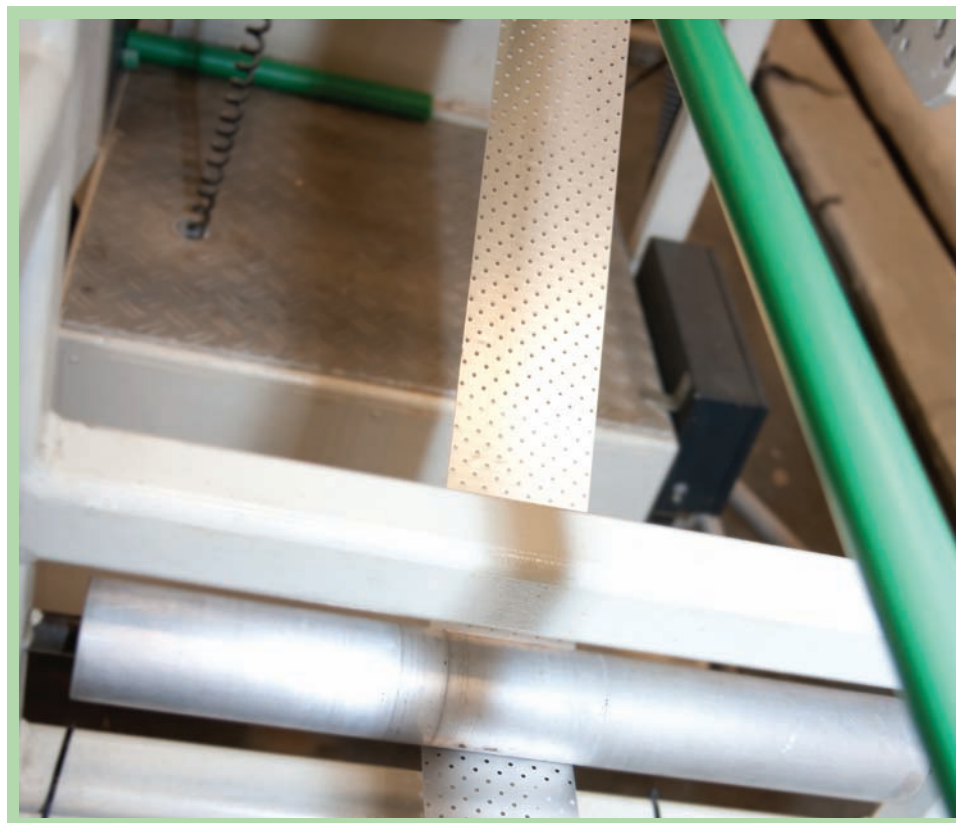
Refer to CHEMICAL RESISTANCE TABLE  
in RAKtherm Technical Manual

## RAKATHERM MECHANICAL AND THERMAL PROPERTIES

In accordance with its areas of application, **RAKtherm** piping systems is designed for continuous temperatures of 0°C to 90° C, and short-term peak temperatures of up to 100° C and a service life of a minimum of 50 years. Therefore **RAKtherm** piping system is suitable for all types of chilled and heating water networks. More precise details are summarized in table (1.1 & 1.2)

## RAKATHERM ALUMINIUM COMPOSITE PIPE TECHNOLOGY

RAKtherm Stabi pipes integrated with aluminium layer are developed for exposed hot & cold water installations. **RAKtherm** Stabi composite pipes are convenient and reliable due to its superior characteristics in low linear expansion rate (nearly identical to metallic pipes) and higher flow rates with same external diameter and lower wall thickness.



For exposed and open air installations under direct sunlight or UV radiation, **RAKtherm** remains physically stable through a specially developed external black layer (UV resistant), in adherence with the aluminium layer.

**RAKtherm** Stabi composite pipe installations are applied from building connection points or distribution station to the very last endpoints of the installation.

# system... An Overview

For heating installations **RAKtherm** Stabi composite pipes are installed starting from the boiler outlets or water-heating unit, up to the individual radiators or heat exchangers. In hot water application the use of **RAKtherm** Stabi-Pipe is always advisable due to reduced longitudinal expansion during heat load.

## RAK THERM STABI COMPOSITE PIPES AREAS OF APPLICATION:

- Potable water pipe networks for cold and hot water installations, in residential buildings, hotels, hospitals, and shipbuilding and other buildings.
- Pipe networks for compressed air plants
- Pipe networks for swimming pool facilities
- Pipe networks for solar plants
- Pipe networks in agriculture
- Pipe networks for industry and applications where transport of aggressive fluids is required

## ADVANTAGES:

- Length extension reduced by at least 75% compared with standard pipes.
- Higher flow rate increased by 20% with the same external diameter and wider flow area inside the pipe.
- Impact rate higher than the standard pipe.
- Excellent internal pressure resistance even at high temperatures.
- Supports intervals can be increased with less of mounting clips are used compared with plastic pipes.
- Superior UV-resistance, long service life.
- No oxygen infiltration with superior hygiene properties.

## EASY, RELIABLE INSTALLATION

RAKtherm system components are joined by simple-to-use fusion-welding techniques. Pure and consistent resins of the highest quality, used in the manufacture of our components, ensure reliable and repeatable welding over and over again. No matter where or when, each junction can be joined in merely a few seconds.

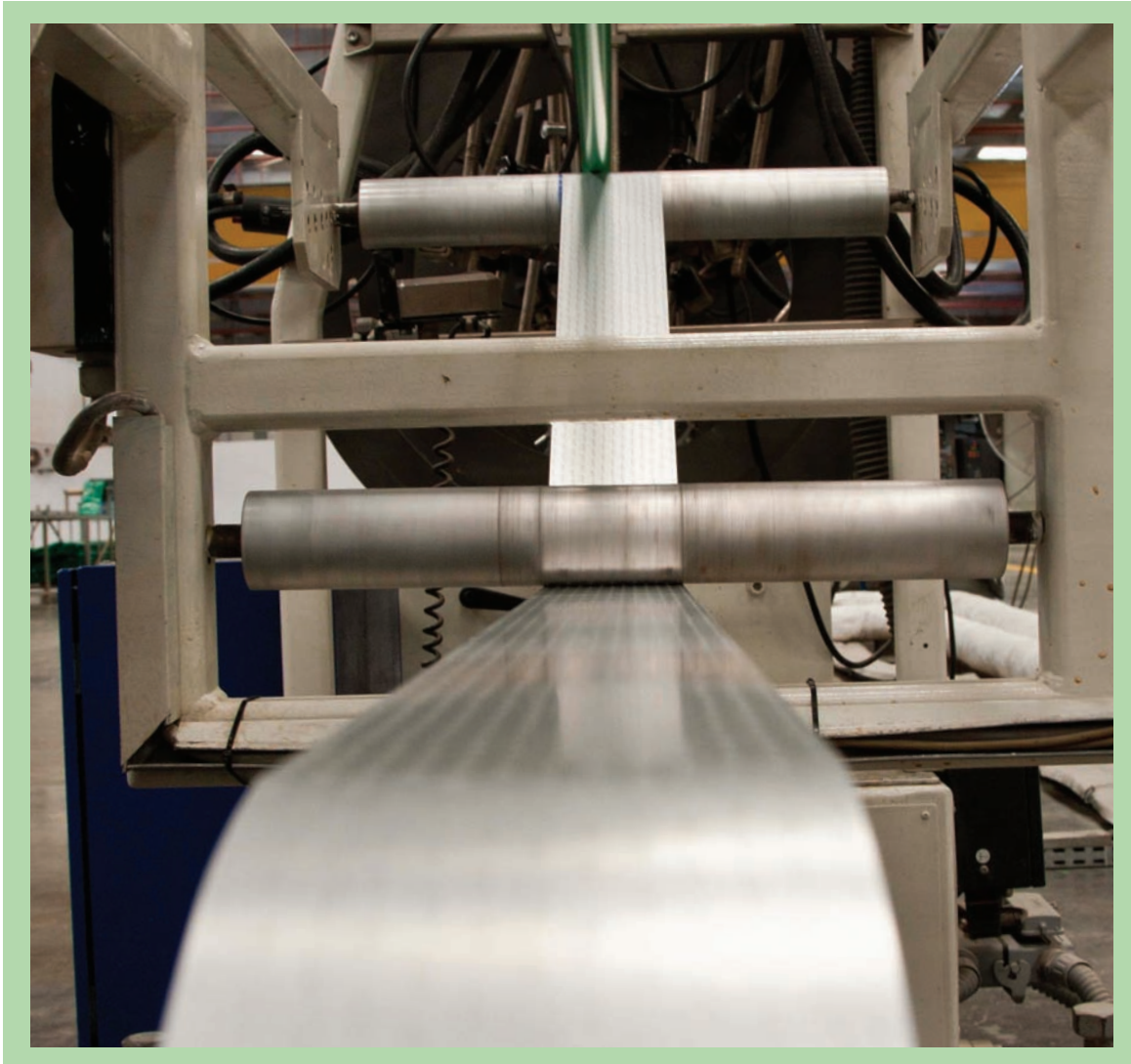


## THROUGH, SIMPLE TO USE INSTRUCTIONS

Our manuals provide the highest degree step-by-step instructions guiding you to easily build up an impressive and complex network of efficient piping systems, no matter what your application is.

## SERVICE & SUPPORT

Our support team is available around the clock for your technical queries, providing you with the expertise to ensure your continuous success in the design and installation of your network.



# Quality Assurance



It is our mission at **RAKtherm** to maintain the highest levels of quality through clear operating procedures, work instructions, forms and records throughout the company. Statistical quality control and sound documentation ensures traceability is maintained anytime in the future. This means that all corporate and plant functions within **RAKtherm**, whether commercial, or operational, are required to be clearly stated and documented, ensuring that the quality of your product is never compromised or been left to chance.

## STANDARDS & REGULATIONS

**RAKtherm** Pipes and fittings are produced with the following standards and regulations:

|               |   |
|---------------|---|
| DIN 1988 DVGW | Code of Practice (Drinking water supply systems; materials, components, appliances, design and installation).                                       |
| DIN 8076      | Standard for testing metal threaded joints.   |
| DIN 8077      | Polypropylene (PP) pipe dimensions.   |
| DIN 8078      | Polypropylene (PP) pipes; general quality requirements testing & chemical resistance of pipes and fittings.   |
| DIN 2999      | Standards for fittings with threaded metallic inserts.  |
| DIN 169621PtI | Pipe joint assemblies and fittings for type 1 & 2 polypropylene (PP) pressure pipes; bends produced by segment inserts for buff welding dimensions. |
| DIN 16928     | Installation, pipe and fitting connections.   |
| DIN 4109      | Noise control in buildings.   |
| DIN 4140      | Insulation of service installations.  |
| DVS 2207      | Welding of thermoplastic pipes and fittings.  |

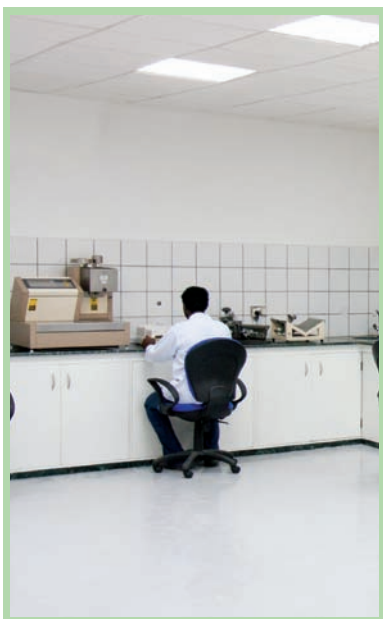
|                |  |
|----------------|--|
| DVS 2208       | Welding machines & devices for thermoplastic pipes and fittings.   |
| BS 6920        | Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water. |
| DIN 16836      | Multilayer Pipes-General Requirement and Testing   |
| DVGW W544      | General Requirements and Testing of plastic pipes  |
| ISO 9001 -2008 | Quality Management system.   |
| OHSAS 1 8001   | British standard for Health and safety management system.  |

## QUALITY GUARANTEE

**RAKtherm** always maintains the highest standards of quality for its users. To support this, **RAKtherm** warrants a 10-year guarantee for all its piping network components from the date of purchase. (Please ask your local representative for details)

## MAINTAINING A HIGH LEVEL OF QUALITY

**RAKtherm** maintains a comprehensive quality control system beginning from designing the required specifications, to control of incoming raw materials processing of the product, packing, storage, shipping to the customer, and finally continuous servicing and support to guarantee that complete total quality is achieved. This is accomplished parallel to the Quality Assurance Program with the objective to ensure that total quality, and not only localized quality is maintained as required. The overall quality system operated and documented by RAKtherm is implemented throughout the plant. The overall system has been designed to exceed requirements stated by national and international authorities and institutions. Regular checks are done by neutral bodies, to further eliminate any chance of quality deviation. This is yet another quality assurance for our customer.





# Quality Assurance

A well-designed manufacturing process includes establishing the required specifications, and strictly adhering to them throughout the manufacturing process. This is assured by precise machinery, well trained staff, and continuously updated and modernized equipment. Ultrasonic measurement and in-process data recording on the production lines identify real-time changes in the process and assure that any deviations on the quality of the product to the set standard is avoided.

**RAKtherm** is fully equipped with quality control labs that include state-of-the-art measurement and performance evaluation instrumentation to aid in controlling and achieving specification compliance. Our engineers utilize these ultra-modern high-tech equipment to run dimensional, physical and chemical property tests. For example, accelerated hydrostatic testing on samples taken from production runs, using technically advanced equipment, is just one of many tests that is conducted on a continuous basis to simulate the aging of piping systems under working conditions.

We also strongly believe and always nourish the environment of continuous quality improvement in every aspect of our business and the enhancement of our employee knowledge and skills to achieve their best in individual performance and teamwork. This is just a glimpse of the meaning of quality at **RAKtherm**, which is committed to your

complete satisfaction through consistently exceeding your expectations through the understanding of your needs and requirements.

# CERTIFICATES



# Product Range



PIPES



## RAKtherm Pipe SDR 11 PP-R PN 10 Pipe Series 4 According To DIN 8077/78

| Art.-No. | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Internal Diameter (ID)mm | Water content l/mt | Kg / mt |
|----------|-----------|--------------|-----------------------|--------------------|--------------------------|--------------------|---------|
| P10-20   | 20 mm     | 100 mts      | 20                    | 1.9                | 16.2                     | 0.206              | 0.107   |
| P10-25   | 25 mm     | 100 mts      | 25                    | 2.3                | 20.4                     | 0.327              | 0.164   |
| P10-32   | 32 mm     | 40 mts       | 32                    | 2.9                | 26.2                     | 0.531              | 0.261   |
| P10-40   | 40 mm     | 40 mts       | 40                    | 3.7                | 32.6                     | 0.834              | 0.412   |
| P10-50   | 50 mm     | 20 mts       | 50                    | 4.6                | 40.8                     | 1.307              | 0.638   |
| P10-63   | 63 mm     | 20 mts       | 63                    | 5.8                | 51.4                     | 2.075              | 1.010   |
| P10-75   | 75 mm     | 20 mts       | 75                    | 6.8                | 61.4                     | 2.941              | 1.410   |
| P10-90   | 90 mm     | 12 mts       | 90                    | 8.2                | 73.6                     | 4.254              | 2.030   |
| P10-110  | 110 mm    | 8 mts        | 110                   | 10                 | 90                       | 6.362              | 3.010   |

## RAKtherm Pipe SDR 7.4 PP-R PN 16 Pipe Series 5 According To DIN 8077/78

| Art.-No. | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Internal Diameter (ID)mm | Water content l/mt | Kg / mt |
|----------|-----------|--------------|-----------------------|--------------------|--------------------------|--------------------|---------|
| P16-20   | 20 mm     | 100 mts      | 20                    | 2.8                | 14.4                     | 0.163              | 0.148   |
| P16-25   | 25 mm     | 100 mts      | 25                    | 3.5                | 18                       | 0.254              | 0.230   |
| P16-32   | 32 mm     | 40 mts       | 32                    | 4.4                | 23.2                     | 0.415              | 0.370   |
| P16-40   | 40 mm     | 40 mts       | 40                    | 5.5                | 29                       | 0.651              | 0.575   |
| P16-50   | 50 mm     | 20 mts       | 50                    | 6.9                | 36.2                     | 1.029              | 0.896   |
| P16-63   | 63 mm     | 20 mts       | 63                    | 8.6                | 45.8                     | 1.633              | 1.410   |
| P16-75   | 75 mm     | 20 mts       | 75                    | 10.3               | 54.4                     | 2.307              | 2.010   |
| P16-90   | 90 mm     | 12 mts       | 90                    | 12.3               | 65.4                     | 3.318              | 2.870   |
| P16-110  | 110 mm    | 8 mts        | 110                   | 15.1               | 79.8                     | 5.674              | 4.300   |

## RAKtherm Pipe SDR 6 PP-R PN 20 Pipe Series 6 According To DIN 8077/78

| Art.-No. | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Internal Diameter (ID)mm | Water content l/mt | Kg / mt |
|----------|-----------|--------------|-----------------------|--------------------|--------------------------|--------------------|---------|
| P20-20   | 20 mm     | 100 mts      | 20                    | 3.4                | 13.2                     | 0.137              | 0.172   |
| P20-25   | 25 mm     | 100 mts      | 25                    | 4.2                | 16.6                     | 0.216              | 0.266   |
| P20-32   | 32 mm     | 40 mts       | 32                    | 5.4                | 21.2                     | 0.353              | 0.434   |
| P20-40   | 40 mm     | 40 mts       | 40                    | 6.7                | 26.6                     | 0.556              | 0.671   |
| P20-50   | 50 mm     | 20 mts       | 50                    | 8.3                | 33.4                     | 0.866              | 1.040   |
| P20-63   | 63 mm     | 20 mts       | 63                    | 10.5               | 42                       | 1.385              | 1.650   |
| P20-75   | 75 mm     | 20 mts       | 75                    | 12.5               | 50                       | 1.963              | 2.340   |
| P20-90   | 90 mm     | 12 mts       | 90                    | 15                 | 60                       | 2.827              | 3.360   |
| P20-110  | 110 mm    | 8 mts        | 110                   | 18.3               | 73.4                     | 4.208              | 5.010   |

## RAKtherm Pipe SDR 5 PP-R PN 25 Pipe Series 2 According To DIN 8077/78

| Art.-No. | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Internal Diameter (ID)mm | Water content l/mt | Kg / mt |
|----------|-----------|--------------|-----------------------|--------------------|--------------------------|--------------------|---------|
| P25-20   | 20 mm     | 100 mts      | 20                    | 4.1                | 11.8                     | 0.111              | 0.198   |
| P25-25   | 25 mm     | 100 mts      | 25                    | 5.1                | 14.8                     | 0.178              | 0.307   |
| P25-32   | 32 mm     | 40 mts       | 32                    | 6.5                | 19                       | 0.291              | 0.498   |
| P25-40   | 40 mm     | 40 mts       | 40                    | 8.1                | 23.8                     | 0.461              | 0.775   |
| P25-50   | 50 mm     | 20 mts       | 50                    | 10.1               | 29.8                     | 0.703              | 1.210   |
| P25-63   | 63 mm     | 20 mts       | 63                    | 12.7               | 37.6                     | 1.137              | 1.910   |
| P25-75   | 75 mm     | 20 mts       | 75                    | 15.1               | 44.8                     | 1.619              | 2.700   |
| P25-90   | 90 mm     | 12 mts       | 90                    | 18.1               | 53.8                     | 2.336              | 3.880   |
| P25-110  | 110 mm    | 8 mts        | 110                   | 22.1               | 65.8                     | 2.742              | 5.780   |



RAKtherm STABI PIPE 25 x 4.2mm PP-R DIN 8077/8078

## RAKtherm Stabi Composite Pipe RR-R PN 20 With Aluminium Thicknes 0.2 mm According To DIN 8077/78

| Art.-No. | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Internal Diameter (ID)mm | Water content l/mt | Kg / mt |
|----------|-----------|--------------|-----------------------|--------------------|--------------------------|--------------------|---------|
| PS20-20  | 20 mm     | 100 mts      | 20                    | 2.8                | 14.4                     | 0.163              | 0.220   |
| PS20-25  | 25 mm     | 100 mts      | 25                    | 3.5                | 18                       | 0.254              | 0.320   |
| PS20-32  | 32 mm     | 40 mts       | 32                    | 4.4                | 23.2                     | 0.415              | 0.470   |
| PS20-40  | 40 mm     | 40 mts       | 40                    | 5.5                | 29                       | 0.651              | 0.720   |
| PS20-50  | 50 mm     | 20 mts       | 50                    | 6.9                | 36.2                     | 1.029              | 1.060   |
| PS20-63  | 63 mm     | 20 mts       | 63                    | 8.6                | 45.8                     | 1.633              | 1.650   |
| PS20-75  | 75 mm     | 20 mts       | 75                    | 10.3               | 54.4                     | 2.307              | 2.280   |
| PS20-90  | 90 mm     | 12 mts       | 90                    | 12.3               | 65.4                     | 3.318              | 3.200   |
| PS20-110 | 110 mm    | 8 mts        | 110                   | 15.1               | 79.8                     | 5.674              | 4.600   |

# Product Range

## RAKtherm Stabi Composite Pipe RR-R PN 25 With Aluminium Thicknes 0.2 mm According To DIN 8077/78

| Art.-No. | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Intrernal Diameter (ID)mm | Water content l/mt | Kg / mt |
|----------|-----------|--------------|-----------------------|--------------------|---------------------------|--------------------|---------|
| PS25-20  | 20 mm     | 100 mts      | 20                    | 3.4                | 13.2                      | 0.137              | 0.241   |
| PS25-25  | 25 mm     | 100 mts      | 25                    | 4.2                | 16.6                      | 0.216              | 0.350   |
| PS25-32  | 32 mm     | 40 mts       | 32                    | 5.4                | 21.2                      | 0.353              | 0.542   |
| PS25-40  | 40 mm     | 40 mts       | 40                    | 6.7                | 26.6                      | 0.556              | 0.805   |
| PS25-50  | 50 mm     | 20 mts       | 50                    | 8.3                | 33.4                      | 0.866              | 1.217   |
| PS25-63  | 63 mm     | 20 mts       | 63                    | 10.5               | 42                        | 1.385              | 1.860   |
| PS25-75  | 75 mm     | 20 mts       | 75                    | 12.5               | 50                        | 1.963              | 2.586   |
| PS25-90  | 90 mm     | 12 mts       | 90                    | 15                 | 60                        | 2.827              | 3.656   |
| PS25-110 | 110 mm    | 8 mts        | 110                   | 18.3               | 73.4                      | 4.208              | 5.372   |



## RAKtherm Stabi Composite Pipe RR-R PN 20 With Aluminium Thicknes 0.2 mm According To DIN 8077/78 Special technology with black layer (UV resistant ) for out door and external installations under sunlight

| Art.-No.   | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Intrernal Diameter (ID)mm | Water content l/mt | Kg / mt |
|------------|-----------|--------------|-----------------------|--------------------|---------------------------|--------------------|---------|
| PSUV20-20  | 20 mm     | 100 mts      | 20                    | 2.8                | 14.4                      | 0.163              | 0.220   |
| PSUV20-25  | 25 mm     | 100 mts      | 25                    | 3.5                | 18                        | 0.254              | 0.320   |
| PSUV20-32  | 32 mm     | 40 mts       | 32                    | 4.4                | 23.2                      | 0.415              | 0.470   |
| PSUV20-40  | 40 mm     | 40 mts       | 40                    | 5.5                | 29                        | 0.651              | 0.720   |
| PSUV20-50  | 50 mm     | 20 mts       | 50                    | 6.9                | 36.2                      | 1.029              | 1.060   |
| PSUV20-63  | 63 mm     | 20 mts       | 63                    | 8.6                | 45.8                      | 1.633              | 1.650   |
| PSUV20-75  | 75 mm     | 20 mts       | 75                    | 10.3               | 54.4                      | 2.307              | 2.280   |
| PSUV20-90  | 90 mm     | 12 mts       | 90                    | 12.3               | 65.4                      | 3.318              | 3.200   |
| PSUV20-110 | 110 mm    | 8 mts        | 110                   | 15.1               | 79.8                      | 5.674              | 4.600   |

## RAKtherm Stabi Composite Pipe RR-R PN 25 With Aluminium Thicknes 0.2 mm According To DIN 8077/78 Special technology with black layer (UV resistant ) for out door and external installations under sunlight

| Art.-No.   | Dimension | Packing Unit | Outer Diameter (OD)mm | Wall Thickness (S) | Intrernal Diameter (ID)mm | Water content l/mt | Kg / mt |
|------------|-----------|--------------|-----------------------|--------------------|---------------------------|--------------------|---------|
| PSUV25-20  | 20 mm     | 100 mts      | 20                    | 3.4                | 13.2                      | 0.137              | 0.241   |
| PSUV25-25  | 25 mm     | 100 mts      | 25                    | 4.2                | 16.6                      | 0.216              | 0.350   |
| PSUV25-32  | 32 mm     | 40 mts       | 32                    | 5.4                | 21.2                      | 0.353              | 0.542   |
| PSUV25-40  | 40 mm     | 40 mts       | 40                    | 6.7                | 26.6                      | 0.556              | 0.805   |
| PSUV25-50  | 50 mm     | 20 mts       | 50                    | 8.3                | 33.4                      | 0.866              | 1.217   |
| PSUV25-63  | 63 mm     | 20 mts       | 63                    | 10.5               | 42                        | 1.385              | 1.860   |
| PSUV25-75  | 75 mm     | 20 mts       | 75                    | 12.5               | 50                        | 1.963              | 2.586   |
| PSUV25-90  | 90 mm     | 12 mts       | 90                    | 15                 | 60                        | 2.827              | 3.656   |
| PSUV25-110 | 110 mm    | 8 mts        | 110                   | 18.3               | 73.4                      | 4.208              | 5.372   |



# Product Range



## FITTINGS & ACCESSORIES



### Socket

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| S1-20    | 20 mm     | 10 pcs       | 0.010      |
| S1-25    | 25 mm     | 10 pcs       | 0.015      |
| S1-32    | 32 mm     | 5 pcs        | 0.025      |
| S1-40    | 40 mm     | 5 pcs        | 0.042      |
| S1-50    | 50 mm     | 5 pcs        | 0.081      |
| S1-63    | 63 mm     | 1 pc         | 0.141      |
| S1-75    | 75 mm     | 1 pc         | 0.200      |
| S1-90    | 90 mm     | 1 pc         | 0.318      |
| S1-110   | 110 mm    | 1 pc         | 0.563      |



### Reducer Socket

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| R1-2520  | 25/20 mm  | 10 pcs       | 0.012      |
| R1-3220  | 32/20 mm  | 5 pcs        | 0.015      |
| R1-3225  | 32/25 mm  | 5 pcs        | 0.020      |
| R1-4020  | 40/20 mm  | 5 pcs        | 0.025      |
| R1-4025  | 40/25 mm  | 5 pcs        | 0.029      |
| R1-4032  | 40/32 mm  | 5 pcs        | 0.034      |
| R1-5020  | 50/20 mm  | 5 pcs        | 0.044      |
| R1-5025  | 50/25 mm  | 5 pcs        | 0.045      |
| R1-5032  | 50/32 mm  | 5 pcs        | 0.050      |
| R1-5040  | 50/40 mm  | 5 pcs        | 0.056      |
| R1-6320  | 63/20 mm  | 1 pc         | 0.071      |
| R1-6325  | 63/25 mm  | 1 pc         | 0.073      |

# Product Range



## Reducer Socket

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| R1-6332  | 63/32 mm  | 1 pc         | 0.091      |
| R1-6340  | 63/40 mm  | 1 pc         | 0.092      |
| R1-6350  | 63/50 mm  | 1 pc         | 0.105      |
| R1-7540  | 75/40 mm  | 1 pc         | 0.130      |
| R1-7550  | 75/50 mm  | 1 pc         | 0.135      |
| R1-7563  | 75/63 mm  | 1 pc         | 0.158      |
| R1-9050  | 90/50 mm  | 1 pc         | 0.196      |
| R1-9063  | 90/63 mm  | 1 pc         | 0.220      |
| R1-9075  | 90/75 mm  | 1 pc         | 0.265      |
| R1-11063 | 110/63 mm | 1 pc         | 0.350      |
| R1-11075 | 110/75 mm | 1 pc         | 0.390      |
| R1-11090 | 110/90 mm | 1 pc         | 0.468      |

## Elbow 90°

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| E1-20    | 20 mm     | 10 pcs       | 0.016      |
| E1-25    | 25 mm     | 10 pcs       | 0.024      |
| E1-32    | 32 mm     | 5 pcs        | 0.039      |
| E1-40    | 40 mm     | 5 pcs        | 0.072      |
| E1-50    | 50 mm     | 5 pcs        | 0.162      |
| E1-63    | 63 mm     | 1 pc         | 0.262      |
| E1-75    | 75 mm     | 1 pc         | 0.454      |
| E1-90    | 90 mm     | 1 pc         | 0.727      |
| E1-110   | 110 mm    | 1 pc         | 1.200      |

## Elbow 45°

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| E3-20    | 20 mm     | 10 pcs       | 0.014      |
| E3-25    | 25 mm     | 10 pcs       | 0.019      |
| E3-32    | 32 mm     | 5 pcs        | 0.032      |
| E3-40    | 40 mm     | 5 pcs        | 0.053      |
| E3-50    | 50 mm     | 5 pcs        | 0.120      |
| E3-63    | 63 mm     | 1 pc         | 0.208      |
| E3-75    | 75 mm     | 1 pc         | 0.316      |
| E3-90    | 90 mm     | 1 pc         | 0.516      |
| E3-110   | 110 mm    | 1 pc         | 0.990      |

## Equal Tee

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| T1-20    | 20 mm     | 10 pcs       | 0.021      |
| T1-25    | 25 mm     | 10 pcs       | 0.031      |
| T1-32    | 32 mm     | 5 pcs        | 0.051      |
| T1-40    | 40 mm     | 5 pcs        | 0.090      |
| T1-50    | 50 mm     | 5 pcs        | 0.200      |
| T1-63    | 63 mm     | 1 pc         | 0.348      |
| T1-75    | 75 mm     | 1 pc         | 0.523      |
| T1-90    | 90 mm     | 1 pc         | 0.850      |
| T1-110   | 110 mm    | 1 pc         | 1.425      |



## Reducing Tee

| Art.-No.    | Dimension         | Packing Unit | Kg / Piece |
|-------------|-------------------|--------------|------------|
| T2-202520   | 20 x 25 x 20 mm   | 10 pcs       | 0.039      |
| T2-252020   | 25 x 20 x 20 mm   | 10 pcs       | 0.036      |
| T2-252025   | 25 x 20 x 25 mm   | 10 pcs       | 0.034      |
| T2-253225   | 25 x 32 x 25 mm   | 5 pcs        | 0.066      |
| T2-322032   | 32 x 20 x 32 mm   | 5 pcs        | 0.048      |
| T2-322525   | 32 x 25 x 25 mm   | 5 pcs        | 0.063      |
| T2-323225   | 32 x 32 x 25 mm   | 5 pcs        | 0.056      |
| T2-322532   | 32 x 25 x 32 mm   | 5 pcs        | 0.058      |
| T2-402040   | 40 x 20 x 40 mm   | 5 pcs        | 0.088      |
| T2-402540   | 40 x 25 x 40 mm   | 5 pcs        | 0.083      |
| T2-403240   | 40 x 32 x 40 mm   | 5 pcs        | 0.099      |
| T2-502050   | 50 x 20 x 50 mm   | 5 pcs        | 0.184      |
| T2-502550   | 50 x 25 x 50 mm   | 5 pcs        | 0.190      |
| T2-503250   | 50 x 32 x 50 mm   | 5 pcs        | 0.185      |
| T2-504050   | 50 x 40 x 50 mm   | 5 pcs        | 0.222      |
| T2-632063   | 63 x 20 x 63 mm   | 1 pc         | 0.324      |
| T2-632563   | 63 x 25 x 63 mm   | 1 pc         | 0.322      |
| T2-633263   | 63 x 32 x 63 mm   | 1 pc         | 0.331      |
| T2-634063   | 63 x 40 x 63 mm   | 1 pc         | 0.322      |
| T2-635063   | 63 x 50 x 63 mm   | 1 pc         | 0.379      |
| T2-753275   | 75 x 32 x 75 mm   | 1 pc         | 0.498      |
| T2-754075   | 75 x 40 x 75 mm   | 1 pc         | 0.502      |
| T2-755075   | 75 x 50 x 75 mm   | 1 pc         | 0.531      |
| T2-756375   | 75 x 63 x 75 mm   | 1 pc         | 0.497      |
| T2-904090   | 90 x 40 x 90 mm   | 1 pc         | 0.812      |
| T2-905090   | 90 x 50 x 90 mm   | 1 pc         | 0.809      |
| T2-906390   | 90 x 63 x 90 mm   | 1 pc         | 0.812      |
| T2-907590   | 90 x 75 x 90 mm   | 1 pc         | 0.920      |
| T2-11050110 | 110 x 50 x 110 mm | 1 pc         | 1.360      |
| T2-11063110 | 110 x 63 x 110 mm | 1 pc         | 1.360      |
| T2-11075110 | 110 x 75 x 110 mm | 1 pc         | 1.380      |
| T2-11090110 | 110 x 90 x 110 mm | 1 pc         | 1.420      |

## End Cap

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| C-20     | 20 mm     | 10 pcs       | 0.009      |
| C-25     | 25 mm     | 10 pcs       | 0.011      |
| C-32     | 32 mm     | 5 pcs        | 0.019      |
| C-40     | 40 mm     | 5 pcs        | 0.037      |
| C-50     | 50 mm     | 5 pcs        | 0.066      |
| C-63     | 63 mm     | 1 pc         | 0.131      |
| C-75     | 75 mm     | 1 pc         | 0.180      |
| C-90     | 90 mm     | 1 pc         | 0.281      |
| C-110    | 110 mm    | 1 pc         | 0.576      |

# Product Range



## Cross Tee

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| X-20     | 20 mm     | 10 pcs       | 0.024      |
| X-25     | 25 mm     | 10 pcs       | 0.035      |
| X-32     | 32 mm     | 5 pcs        | 0.059      |



## Female Union both ends welding

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| UF2-20   | 20 mm     | 10 pcs       | 0.052      |
| UF2-25   | 25 mm     | 10 pcs       | 0.061      |
| UF2-32   | 32 mm     | 5 pcs        | 0.126      |



## Saddle Socket

| Art.-No.   | Dimension   | Packing Unit | Kg / Piece |
|------------|-------------|--------------|------------|
| SDS1-6320  | 63 x 20 mm  | 5 pcs        | 0.031      |
| SDS1-6325  | 63 x 25 mm  | 5 pcs        | 0.032      |
| SDS1-6332  | 63 x 32 mm  | 5 pcs        | 0.038      |
| SDS1-7520  | 75 x 20 mm  | 5 pcs        | 0.034      |
| SDS1-7525  | 75 x 25 mm  | 5 pcs        | 0.041      |
| SDS1-7532  | 75 x 32 mm  | 5 pcs        | 0.038      |
| SDS1-9020  | 90 x 20 mm  | 5 pcs        | 0.035      |
| SDS1-9025  | 90 x 25 mm  | 5 pcs        | 0.036      |
| SDS1-9032  | 90 x 32 mm  | 5 pcs        | 0.042      |
| SDS1-11020 | 110 x 20 mm | 5 pcs        | 0.035      |
| SDS1-11025 | 110 x 25 mm | 5 pcs        | 0.036      |
| SDS1-11032 | 110 x 32 mm | 5 pcs        | 0.042      |



## Flanges Adaptor

| Art.-No. | Dimension            | Packing Unit | Kg / Piece |
|----------|----------------------|--------------|------------|
| F-75     | 75 mm (ppr socket)   | 1 pc         | 0.084      |
| P-FS-75  | 75 mm (steel flang)  | 1 pc         | 1.855      |
| P-FG-75  | 75 mm (gasket)       | 1 pc         | 0.048      |
| F-90     | 90 mm (ppr socket)   | 1 pc         | 0.135      |
| P-FS-90  | 90 mm (steel flang)  | 1 pc         | 1.565      |
| P-FG-90  | 90 mm (gasket)       | 1 pc         | 0.074      |
| F-110    | 110 mm (ppr socket)  | 1 pc         | 0.201      |
| P-FS-110 | 110 mm (steel flang) | 1 pc         | 1.920      |
| P-FG-110 | 110 mm (gasket)      | 1 pc         | 0.106      |



## End Plug

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| C2-1/2   | 1/2"      | 10 pcs       | 0.026      |
| C2-3/4   | 3/4"      | 10 pcs       | 0.029      |
| C1-1     | 1"        | 50 pcs       | 0.017      |



## Over Bridge Bow

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| B-20     | 20 mm     | 10 pcs       | 0.063      |
| B-25     | 25 mm     | 10 pcs       | 0.098      |
| B-32     | 32 mm     | 5 pcs        | 0.165      |



## Bracket For Pipe

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| BT-20    | 20 mm     | 200 pcs      | 0.006      |
| BT-25    | 25 mm     | 200 pcs      | 0.008      |
| BT-32    | 32 mm     | 100 pcs      | 0.010      |
| BT-40    | 40 mm     | 100 pcs      | 0.013      |



## Clamp For Pipe

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| P-CL-20  | 20 mm     | 50 pcs       | 0.042      |
| P-CL-25  | 25 mm     | 50 pcs       | 0.053      |
| P-CL-32  | 32 mm     | 50 pcs       | 0.060      |
| P-CL-40  | 40 mm     | 50 pcs       | 0.067      |
| P-CL-50  | 50 mm     | 50 pcs       | 0.077      |
| P-CL-63  | 63 mm     | 25 pcs       | 0.082      |

# Product Range

## FITTINGS & ACCESSORIES



### Transition Piece Round-Female

| Art-No.  | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| AF-201/2 | 20 mm x 1/2" | 10 pcs       | 0.058      |
| AF-203/4 | 20 mm x 3/4" | 10 pcs       | 0.072      |
| AF-251/2 | 25 mm x 1/2" | 10 pcs       | 0.059      |
| AF-253/4 | 25 mm x 3/4" | 10 pcs       | 0.073      |
| AF-323/4 | 32 mm x 3/4" | 5 pcs        | 0.078      |



### Transition Piece Round-Female With Hexagon Socket

| Art-No.    | Dimension      | Packing Unit | Kg / Piece |
|------------|----------------|--------------|------------|
| AF1-321    | 32 mm x 1"     | 5 pcs        | 0.236      |
| AF1-401    | 40 mm x 1"     | 5 pcs        | 0.240      |
| AF1-4011/4 | 40 mm x 1.1/4" | 5 pcs        | 0.367      |
| AF1-5011/2 | 50 mm x 1.1/2" | 1 pc         | 0.435      |
| AF1-632    | 63 mm x 2"     | 1 pc         | 0.586      |
| AF1-7521/2 | 75 mm x 2.1/2" | 1 pc         | 1.061      |
| AF1-903    | 90 mm x 3"     | 1 pc         | 1.635      |
| AF1-1104   | 110 mm x 4"    | 1 pc         | 3.310      |



### Transition Piece Round-Male

| Art-No.  | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| AM-201/2 | 20 mm x 1/2" | 10 pcs       | 0.068      |
| AM-203/4 | 20 mm x 3/4" | 10 pcs       | 0.081      |
| AM-251/2 | 25 mm x 1/2" | 10 pcs       | 0.069      |
| AM-253/4 | 25 mm x 3/4" | 10 pcs       | 0.081      |
| AM-323/4 | 32 mm x 3/4" | 5 pcs        | 0.086      |

## Transition Piece Round-Male With Hexagon Socket



| Art.-No.   | Dimension      | Packing Unit | Kg / Piece |
|------------|----------------|--------------|------------|
| AM1-321    | 32 mm x 1"     | 5 pcs        | 0.227      |
| AM1-401    | 40 mm x 1"     | 5 pcs        | 0.231      |
| AM1-4011/4 | 40 mm x 1.1/4" | 5 pcs        | 0.381      |
| AM1-5011/2 | 50 mm x 1.1/2" | 1 pc         | 0.430      |
| AM1-632    | 63 mm x 2"     | 1 pc         | 0.688      |
| AM1-7521/2 | 75 mm x 2.1/2" | 1 pc         | 1.000      |
| AM1-903    | 90 mm x 3"     | 1 pc         | 1.500      |
| AM1-1104   | 110 mm x 4"    | 1 pc         | 4.890      |

## Transition PP-R Male Union



| Art.-No.    | Dimension      | Packing Unit | Kg / Piece |
|-------------|----------------|--------------|------------|
| TUM2-201/2  | 20 mm x 1/2"   | 10 pcs       | 0.121      |
| TUM2-253/4  | 25 mm x 3/4"   | 10 pcs       | 0.186      |
| TUM2-321    | 32 mm x 1"     | 5 pcs        | 0.264      |
| TUM2-4011/4 | 40 mm x 1.1/4" | 5 pcs        | 0.400      |
| TUM2-5011/2 | 50 mm x 1.1/2" | 1 pc         | 0.626      |
| TUM2-632    | 63 mm x 2"     | 1 pc         | 1.030      |

## Transition PP-R Female Union



| Art.-No.    | Dimension      | Packing Unit | Kg / Piece |
|-------------|----------------|--------------|------------|
| TUF2-201/2  | 20 mm x 1/2"   | 10 pcs       | 0.108      |
| TUF2-253/4  | 25 mm x 3/4"   | 10 pcs       | 0.176      |
| TUF2-321    | 32 mm x 1"     | 5 pcs        | 0.212      |
| TUF2-4011/4 | 40 mm x 1.1/4" | 5 pcs        | 0.322      |
| TUF2-5011/2 | 50 mm x 1.1/2" | 1 pc         | 0.530      |
| TUF2-632    | 63 mm x 2"     | 1 pc         | 0.930      |

## Transition Elbow Female



| Art.-No. | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| E6-201/2 | 20 mm x 1/2" | 10 pcs       | 0.068      |
| E6-203/4 | 20 mm x 3/4" | 10 pcs       | 0.080      |
| E6-251/2 | 25 mm x 1/2" | 10 pcs       | 0.073      |
| E6-253/4 | 25 mm x 3/4" | 10 pcs       | 0.092      |
| E6-321/2 | 32 mm x 1/2" | 5 pcs        | 0.081      |
| E6-323/4 | 32 mm x 3/4" | 5 pcs        | 0.093      |
| E6-321   | 32 mm x 1"   | 5 pcs        | 0.260      |

# Product Range



## Wall Mount Elbow

| Art.-No. | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| E5-201/2 | 20 mm x 1/2" | 10 pcs       | 0.072      |
| E5-251/2 | 25 mm x 1/2" | 10 pcs       | 0.079      |



## Transition Elbow Male

| Art.-No. | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| E7-201/2 | 20 mm x 1/2" | 10 pcs       | 0.078      |
| E7-203/4 | 20 mm x 3/4" | 10 pcs       | 0.091      |
| E7-251/2 | 25 mm x 1/2" | 10 pcs       | 0.087      |
| E7-253/4 | 25 mm x 3/4" | 10 pcs       | 0.099      |
| E7-323/4 | 32 mm x 3/4" | 5 pcs        | 0.111      |
| E7-321   | 32 mm x 1"   | 5 pcs        | 0.333      |



## Transition Female Tee

| Art.-No. | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| T3-201/2 | 20 mm x 1/2" | 10 pcs       | 0.074      |
| T3-203/4 | 20 mm x 3/4" | 10 pcs       | 0.088      |
| T3-251/2 | 25 mm x 1/2" | 10 pcs       | 0.081      |
| T3-253/4 | 25 mm x 3/4" | 10 pcs       | 0.098      |
| T3-321/2 | 32 mm x 1/2" | 5 pcs        | 0.089      |
| T3-323/4 | 32 mm x 3/4" | 5 pcs        | 0.102      |
| T3-321   | 32 mm x 1"   | 5 pcs        | 0.268      |



## Ball Valve

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| BV-20    | 20 mm     | 1 pc         | 0.350      |
| BV-25    | 25 mm     | 1 pc         | 0.500      |
| BV-32    | 32 mm     | 1 pc         | 0.655      |
| BV-40    | 40 mm     | 1 pc         | 0.900      |
| BV-50    | 50 mm     | 1 pc         | 1.313      |
| BV-63    | 63 mm     | 1 pc         | 2.530      |



## Valve Body

| Art.-No.  | Dimension      | Packing Unit | Kg / Piece |
|-----------|----------------|--------------|------------|
| V4-203/4  | 20 mm x 3/4"   | 1 pc         | 0.087      |
| V4-253/4  | 25 mm x 3/4"   | 1 pc         | 0.096      |
| V4-321    | 32 mm x 1"     | 1 pc         | 0.141      |
| V4-4011/4 | 40 mm x 1.1/4" | 1 pc         | 0.254      |





## Stop Valve

| Art.-No. | Dimension      | Packing Unit | Kg / Piece |
|----------|----------------|--------------|------------|
| V1-20    | 20 mm x 3/4"   | 1 pc         | 0.198      |
| V1-25    | 25 mm x 3/4"   | 1 pc         | 0.207      |
| V1-32    | 32 mm x 1"     | 1 pc         | 0.295      |
| V1-40    | 40 mm x 1.1/4" | 1 pc         | 0.549      |



## Concealed Valve

| Art.-No. | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| V2-20    | 20 mm x 3/4" | 1 pc         | 0.410      |
| V2-25    | 25 mm x 3/4" | 1 pc         | 0.419      |
| V2-32    | 32 mm x 1"   | 1 pc         | 0.433      |



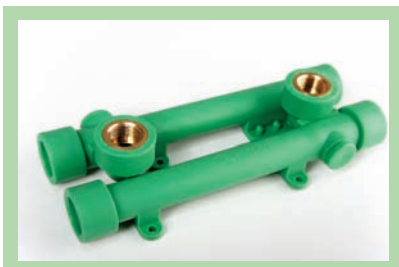
## Angel Valve

| Art.-No. | Dimension   | Packing Unit | Kg / Piece |
|----------|-------------|--------------|------------|
| P-V5-1/2 | 1/2" x 1/2" | 1 pc         | 0.170      |



## Bend

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| BE-25    | 25 mm     | 10 pcs       | 0.044      |
| BE-32    | 32 mm     | 5 pcs        | 0.075      |
| BE-40    | 40 mm     | 5 pcs        | 0.125      |

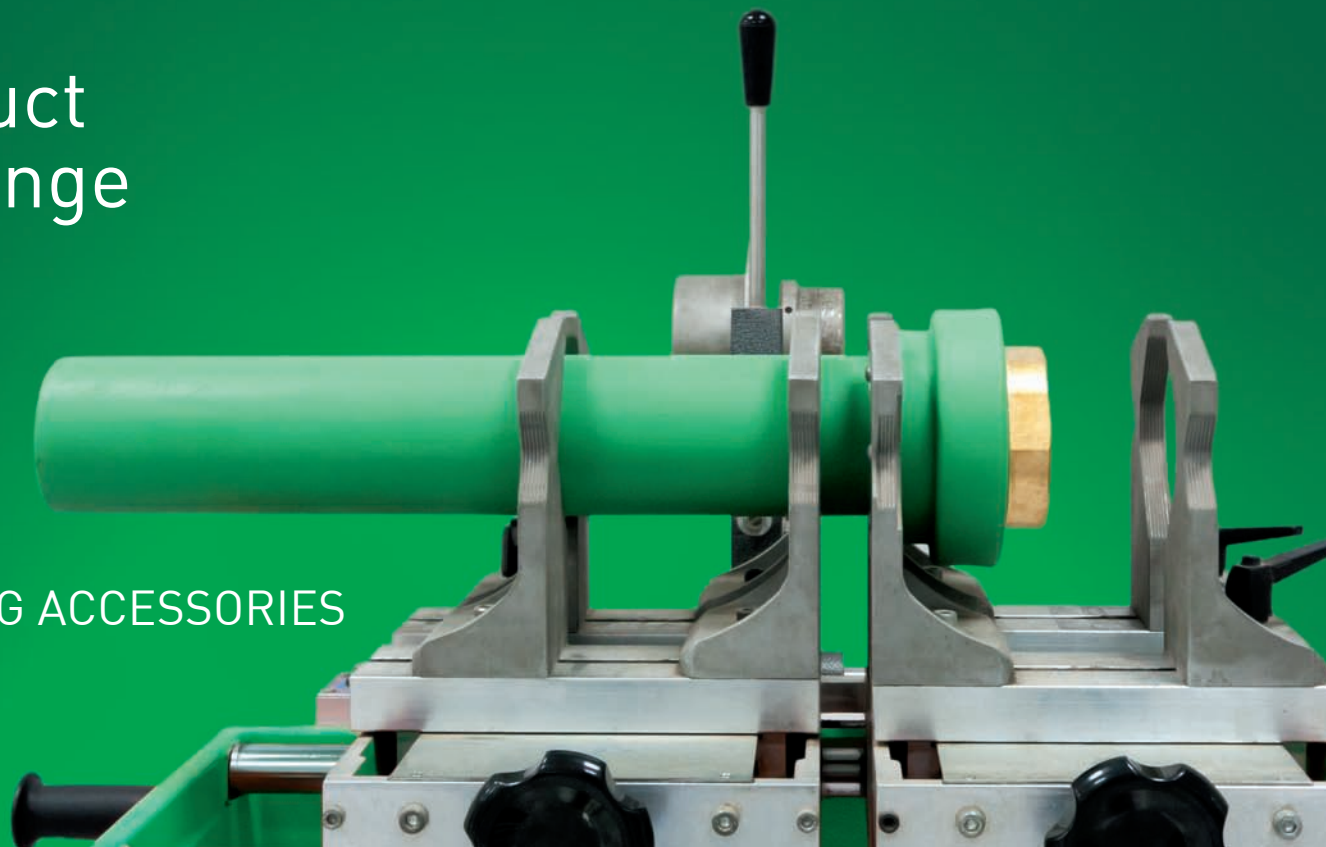


## Wall Mount Group

| Art.-No. | Dimension    | Packing Unit | Kg / Piece |
|----------|--------------|--------------|------------|
| WM-20    | 20 mm x 1/2" | 1 set        | 0.220      |
| WM-25    | 25 mm x 1/2" | 1 set        | 0.283      |

# Product Range

## WELDING ACCESSORIES



### Marking Tool

| Art-No.    | Dimension   | Packing Unit | Kg / Piece |
|------------|-------------|--------------|------------|
| WDT-20:110 | 20 - 110 mm | 100 pcs      | 0.005      |

### Welding Device

| Art-No.    | Dimension   | Packing Unit | Kg / Piece |
|------------|-------------|--------------|------------|
| P-WD2-2063 | 20 - 63 mm  | 1 pc         | 6.090      |
| P-WD2-110  | 75 - 110 mm | 1 pc         | 7.000      |

### Welding Tools

| Art-No.   | Dimension | Packing Unit | Kg / Piece |
|-----------|-----------|--------------|------------|
| P-WT1-20  | 20 mm     | 1 pc         | 0.112      |
| P-WT1-25  | 25 mm     | 1 pc         | 0.142      |
| P-WT1-32  | 32 mm     | 1 pc         | 0.185      |
| P-WT1-40  | 40 mm     | 1 pc         | 0.260      |
| P-WT1-50  | 50 mm     | 1 pc         | 0.395      |
| P-WT1-63  | 63 mm     | 1 pc         | 0.618      |
| P-WT1-75  | 75 mm     | 1 pc         | 0.790      |
| P-WT1-90  | 90 mm     | 1 pc         | 1.170      |
| P-WT1-110 | 110 mm    | 1 pc         | 1.750      |

### Peeling Tools

| Art-No.    | Dimension  | Packing Unit | Kg / Piece |
|------------|------------|--------------|------------|
| P-WT2-2025 | 20 - 25 mm | 1 pc         | 0.340      |
| P-WT2-3240 | 32 - 40 mm | 1 pc         | 0.470      |
| P-WT2-5063 | 50 - 63 mm | 1 pc         | 1.060      |
| P-WT2-7590 | 75 - 90 mm | 1 pc         | 1.160      |
| P-WT2-110  | 110 mm     | 1 pc         | 1.660      |



## Welding Tools For Saddle

| Art.-No.    | Dimension | Packing Unit | Kg / Piece |
|-------------|-----------|--------------|------------|
| P-WT1-6320  | 63/20 mm  | 1 pc         | 0.380      |
| P-WT1-6325  | 63/25 mm  | 1 pc         | 0.365      |
| P-WT1-6332  | 63/32 mm  | 1 pc         | 0.335      |
| P-WT1-7520  | 75/20 mm  | 1 pc         | 0.377      |
| P-WT1-7525  | 75/25 mm  | 1 pc         | 0.357      |
| P-WT1-7532  | 75/32 mm  | 1 pc         | 0.337      |
| P-WT1-9020  | 90/20 mm  | 1 pc         | 0.382      |
| P-WT1-9025  | 90/25 mm  | 1 pc         | 0.362      |
| P-WT1-9032  | 90/32 mm  | 1 pc         | 0.342      |
| P-WT1-11020 | 110/20 mm | 1 pc         | 0.386      |
| P-WT1-11025 | 110/25 mm | 1 pc         | 0.366      |
| P-WT1-11032 | 110/32 mm | 1 pc         | 0.346      |

## Repair Pin

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| RP-7:11  | 7 - 11 mm | 1 pc         | 0.250      |

## Professional Pipe Cutter

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| P-PC-042 | 0 - 42 mm | 1 pc         | 0.447      |

## Pipe Cutter

| Art.-No.  | Dimension | Packing Unit | Kg / Piece |
|-----------|-----------|--------------|------------|
| P-PC1-042 | 0 - 42 mm | 1 pc         | 0.420      |

## Pipe Cutter

| Art.-No. | Dimension | Packing Unit | Kg / Piece |
|----------|-----------|--------------|------------|
| P-PC-075 | 0 - 75 mm | 1 pc         | 1.670      |

## Pipe Cutter

| Art.-No.    | Dimension   | Packing Unit | Kg / Piece |
|-------------|-------------|--------------|------------|
| P-PC2-50125 | 50 - 125 mm | 1 pc         | 1.600      |

# Welding



Assembly of the **RAKtherm** system is easily done by electric heating tools (threaded inserts), mounted on the **RAKtherm** welding device...a process called fusion welding.

Fusion Welding requires the heating of the pipe and its respective fitting socket simultaneously to the right fusion temperature. A homogeneous melt between two parts occurs and a uniform layer is formed. These parts are thereafter joined easily by inserting the male part into the female part. This combination is held in place till the parts cool down to ambient temperature and become one. This process is repeated throughout the network of pipes and fittings at the construction site and combined with other units until a closed efficient water delivery system is formed.

This technique permits joining to be carried out with simple equipment supplied by your local **RAKtherm** agent or representative. Needless to say, parts to be welded must have the same properties, and therefore, to avoid failures in the network and guarantee a long and trouble-free service life, never mix **RAKtherm** pipes or fittings with other brands.

It is widely acknowledged that, in order to establish a consistent and structurally sound joint, it is necessary to follow **RAKtherm** fusion welding preparation procedure. If the appropriate procedures are followed, contamination and disturbance effects that might weaken the fusion mechanism will be avoided.

## USING RAKTHERM WELDING DEVICE & TOOLS



- Only use original **RAKtherm** welding devices and welding tools to ensure proper fusion of pipes and fittings.
- Take out the device and other required equipment from the portable storage box.
- Before heating up the device, mount and finger tighten the threaded inserts so as to hold the tools firmly.
- Never install a tool in a location on the device which makes it extend outside the edge of the tongue of the device! Always place the larger size diameter tools on the inner positions of the welding device. This is especially true for diameters over 40 mm



- Plug in and switch on welding device. At this point, both thermostat and control lamps will light up. Adjust the thermostat to the correct fusion temperature at 26cFC. The thermostat lamp goes off when the temperature reaches the set temperature. Depending on the ambient temperature, the heating-up process should take between 5 to 25 minutes. Allow a few more minutes in extreme cold cases.

Note that DVS-Welding Guidelines state that the temperature of the welding device has to be checked at its application area before starting the welding process or whenever a new tool is to be changed. It is recommended that this is done through the use of **RAKtherm** temp-pen or another qualified surface thermometer.

- Use an Allen Key to tighten up the tools. Do not use pliers or any other tools for this job. This can scratch or damage the stick-free coating on the device and insert.
- After finishing the welding process and the device has been switched off, wait until it has cooled down before reusing or storing it away.

# Welding



- Always keep the device in a dry and clean place. The device need to be used when completely dry.
- To avoid shock hazards, never use a device that has been exposed to water or other fluids or in rain. Moreover, never clean the device with water or handle the device with wet hands.
- Never use water to cool down the device temperature, even after it has been unplugged. This could damage the thermostat.
- It is necessary to maintain the device clean at all times, especially in the locations where the threaded inserts (tools) are mounted. Failure to do so may result in improper contact between the inserts and device, and a resulting inefficient heating of the inserts and inadequate welding thereof. Cleaning should be done with a paper or non fibrous cloth and alcohol.
- Durable and proper joining with the device can only be guaranteed when the tools and the tongue are assured of perfectly good condition. It is recommended to replace any defective device or tool.
- Never attempt to open a defective device. Let the expert hands of RAKtherm's engineers help in assessment of the device's qualification and if possible make the necessary repairs.

Procedure for the application of temp-pen see in RAKtherm Technical Manual

## HEATING OF RAKTHERM PIPES & FITTINGS

The following table depicts the general guidelines for heating of pipes and fittings for the purpose of welding according to DVS 2207 part 11.

TABLE 4.1: WELDING OF PP-R PIPES

| Pipe External Ø mm | Welding Depth mm | Heating Time sec.DVS | Welding Time Sec. | Cooling Time min. |
|--------------------|------------------|----------------------|-------------------|-------------------|
| 20                 | 14               | 5                    | 4                 | 2                 |
| 25                 | 15               | 7                    | 4                 | 2                 |
| 32                 | 16.5             | 8                    | 6                 | 4                 |
| 40                 | 18               | 12                   | 6                 | 4                 |
| 50                 | 20               | 18                   | 6                 | 4                 |
| 63                 | 24               | 24                   | 8                 | 6                 |
| 75                 | 26               | 30                   | 8                 | 8                 |
| 90                 | 29               | 40                   | 8                 | 8                 |
| 110                | 32               | 50                   | 10                | 8                 |
| 125                | 40               | 60                   | 10                | 8                 |

When the outdoor temperature is below 5°C, the heating time according to DVS 2207 part 11 should be increased by 50%.

## INSTRUCTIONS FOR WELDING OF RAKTHERM PIPES & FITTINGS

The welding machine is heated up to 260 °C (described in “Using RAKtherm Welding Device & Tools”).

1. Use RAKtherm pipe cutter to cut the pipe. Make sure that a straight and clean pipe end results and not at a skewed angle. This is to ensure that the welding adheres to the right conditions.

The joining process during RAKtherm fusion welding can be divided into three stages:

Stage I: Initial heating and fitting expansion.

Stage II: Heat soaking to create the joint.

Stage III: Joint cooling.

Note: Stages I and II are commonly termed ‘fusion time’.

For successful joining of pipes, at least three preparation stages must be followed:

- Firstly, pipe ends must have properly finished squared ends as opposed to having a chamfered or broken edge. This ensures that the central cold zones come in full contact with the welding tools and proper heat conduction will accordingly be achieved. Before welding Stabi composite pipes peel-off the aluminum polypropylene layer completely.
- Secondly, the pipe surfaces to be joined must be properly cleaned to remove contaminants and foreign material. Otherwise, any contamination on the pipe surface is retained at the joint interface, which can significantly reduce the strength of the joint.
- Finally, the pipe and fitting should be clamped during welding to eliminate relative movement. This ensures that the molten polymer is allowed to fuse fully at the fusion interface, developing a strong joint.

# Welding

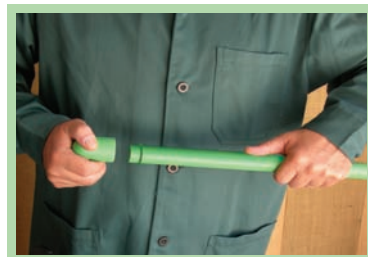
2. Mark the welding depth with a pencil and measurement plate which are provided with the **RAKtherm** welding kit.
3. Enter the end of the pipe into the tool upto the marked depth without twisting it and simultaneously and also without twisting, push the fitting onto the heating tool, observing the general guidelines for heating up times outlined in table 4.1.

Timing for heating should not start until the pipe and fitting reaches to the marked welding depth. Both fitting and pipe should be heated for a set time, known as the heating time. When heating time is complete, the pipe and fitting should be removed from the heating tool, and pressed together to the marked welding depth for a few seconds without twisting. A homogeneous structure of the same material is thereupon formed.

The major alignment should be done before insertion of the pipe and fitting. Use fusion time for minor alignment before fusion is complete and the assembled parts have cooled. Never mechanically stress the welding joint before cooling time.

A cross-section of a properly welded **RAKtherm** joint will normally show a smooth transition between the two initial parts. This is because the components have uniformly melted and fused into each other to form one single piece.

RAKtherm Electro Fusion coupling welding procedure please see in Technical Manual



## INSTALLATION & INSTRUCTION FOR THE WELDING SADDLES

### Use of RAKtherm welding saddles:

- Subsequent extension of existing pipe systems.
- Alternative use to tees, especially in maintenance and alteration jobs.
- Direct branching of a service line to a supply line

### Preparation for welding

Mount the RAKtherm saddle welding tool to the welding machine. Once the tool is positioned, check that the surface temperature is in the range of 260 degree C (described in "Using RAKtherm welding Device & Tools"). Make sure that the surface to be welded is clean and dry.



Drill out the pipe at the welding point with a spiral drill bit. If necessary, clean the hole from any burrs. Caution is to be taken in drilling the correct depth and diameter see table 4.2. When drilling, make sure that the opposite pipe wall is not reached, otherwise, the pipe will be damaged.

TABLE 4.2:

| Saddle Art No. | Heating Time Pipe (sec.) | Heating Time Saddle (sec.) | Saddle Holding Holding Time (sec.) | Cooling Time (sec.) | Hole Diameter |
|----------------|--------------------------|----------------------------|------------------------------------|---------------------|---------------|
| SDS1-6325      | 30                       | 20                         | 20                                 | 30                  | 20            |
| SDS1-6332      | 30                       | 20                         | 20                                 | 30                  | 25            |
| SDS1-7525      | 30                       | 20                         | 20                                 | 30                  | 20            |
| SDS1-7532      | 30                       | 20                         | 20                                 | 30                  | 25            |
| SDS1-9025      | 30                       | 20                         | 20                                 | 30                  | 20            |
| SDS1-9032      | 30                       | 20                         | 20                                 | 30                  | 25            |

After drilling, remove the remaining aluminum at the entrance of the hole with a chamfering device.

Heat up the pipe with the tool for 30 seconds. Subsequently, heat the saddle along with the external surface of the pipe for another 20 seconds, total of 50 sec for the pipe. Make a light pressure with the saddle on the tools. Make sure that the entire surface is in contact with the heating tool.

After finishing the heating phase, remove the welding unit and insert the welding saddle nozzle into the heated drilled pipe hole. Fix under light pressure, avoiding rotation for an additional 30 sec.



For **RAKtherm** Stabi pipe

The system may be exposed to full load after 15 minutes of welding.



# Installation

## INTRODUCTION

Water service lines are connections that lead from the water mains to the building plumbing network. The service line consists of all pipes, valves, and fittings between the main water cabinet through the meter, and ending at the individual outlets or endpoints.

DIN 1988 Parts 1 & 3 apply to drinking water supply systems inside buildings and their networks. It specifies requirements for design, installation, operation and maintenance of such systems in addition to alterations to these systems. It also gives particular attention to materials, components and appliances installed to supply a building with potable water. Designers and installers should make sure that only such required equipment and appliances are installed ensuring proper economic and technically qualified functioning of the system is maintained.

When installation is executed, **RAKtherm** instructions should be strictly followed. Additionally, the following must be readily available:

- A building site plan; engineering drawing of each floor including cellars (plan view), with simplified pipe work diagram and sectional drawings;
- Pipe sizing calculation in accordance with DIN 1988 part 3;
- A detailed pipe network diagram showing length of pipe runs, pipe nominal sizes, bore diameters, material, draw-off points (type, number and sizes or bore diameter), minimum flow pressure required, and the fitting group as defined in the of DIN 4109 series of standards, where necessary.

## RAK THERM PIPE JOINT ASSEMBLIES

Pipes and pipe joint assemblies are designed for a minimum service life of 50 years, taking into account operating conditions (temperature, pressure and frequency of use) given in table 5.1. The system is

operated at working temperatures and pressures higher than that given in the table; appropriate provisions should be made..

**TABLE 5.1**  
**OPERATING CONDITIONS FOR PIPES & PIPE JOINT ASSEMBLIES**

|                  | Range of Working Pressure (fluctuating) in bar | Temperature in °C | Frequency of use (hours per year) |
|------------------|--|-------------------|-----------------------------------|
| Cold water pipes | 0 to 10  | Up to 25*         | 8760                              |
| Hot water pipes  | 0 to 10  | Up to 60*         | 8710                              |

\*Reference temperature for creep rupture strength: 20°C.

## PIPE JOINTS WITH THREADED FITTINGS

**RAKtherm** Pipe joint assemblies are designed to resist axial tension when properly supported. If such joints occur in buried pipe work, properly sized supports should be located at bends and branches to counter the hydraulic forces acting on these joints. Care should be taken to ensure that the designed system has unobstructed flow at joints and where changes of direction occurs. The streamlined design of RAKtherm threaded fittings, in compliance with DIN 2999 part 1, ensures that this is met.

## GENERAL GUIDELINES FOR THE INSTALLATION OF PIPE WORK INSIDE BUILDINGS

- No pipe should be secured to another pipe or used as a support for other pipes.
- The arrangement of pipes should facilitate their identification. Mounting plates should be used where required.
- Pipes should be laid so as to prevent the formation of air locks. Where pipes are likely to suffer from frost damage, drainage fittings should be provided at the lowest points of the system.
- Where pipes are laid above one another, exposed cold water pipes should be on the lowest level in order to minimize the risk of condensation.
- Where a system provides water to two or more buildings, a riser should be installed in each building.
- Where draw-off points on a storey require backflow prevention but are not individually isolated (DIN 1988 part 4), the main branch pipe should branch off from the riser not less than 300 mm above the maximum possible water level on the storey.

# Installation



## LINEAR EXPANSION

Linear expansion of pipes is directly proportional to the heat subjected to the pipe material. Hence, cold water pipes have practically no linear expansion and could be neglected in the installation design. On the other hand, expansion of pipes is significant in warm water and heating installations and in extreme temperature varying environments, and therefore needs to be considered.

## FORMULA FOR CALCULATION OF LINEAR EXPANSION

The linear expansion  $\Delta L$  is calculated according to following formula:

$$\Delta L = \alpha \cdot L \cdot \Delta T$$

Where:

$\Delta L$  Expanded length (mm)

$\alpha$  Coefficient of linear expansion (mm/mK)

L Length of segment in (mm)

$\Delta T$  Temperature difference between working and installation

## LINEAR EXPANSION CALCULATION EXAMPLE:

Assuming you need to calculate the expansion ( $\Delta L$ ) of a standard RAKtherm pipe segment (L) of 1.6 meters at a maximum working temperature of 70°C. You know that the RAKtherm standard pipe has a coefficient of linear expansion of ( $\alpha = 0.15$ ). You know that the installation was executed at the typical ambient temperature of 25°C.

$$\Delta L = \alpha \cdot L \cdot \Delta T \text{ or } \Delta L = 0.15 \cdot 1.6 \cdot (70^\circ\text{C} - 25^\circ\text{C}) = 10.8 \text{ mm}$$

That means you can expect a linear expansion of 10.8 mm for this segment of pipe if the temperature difference is respected.

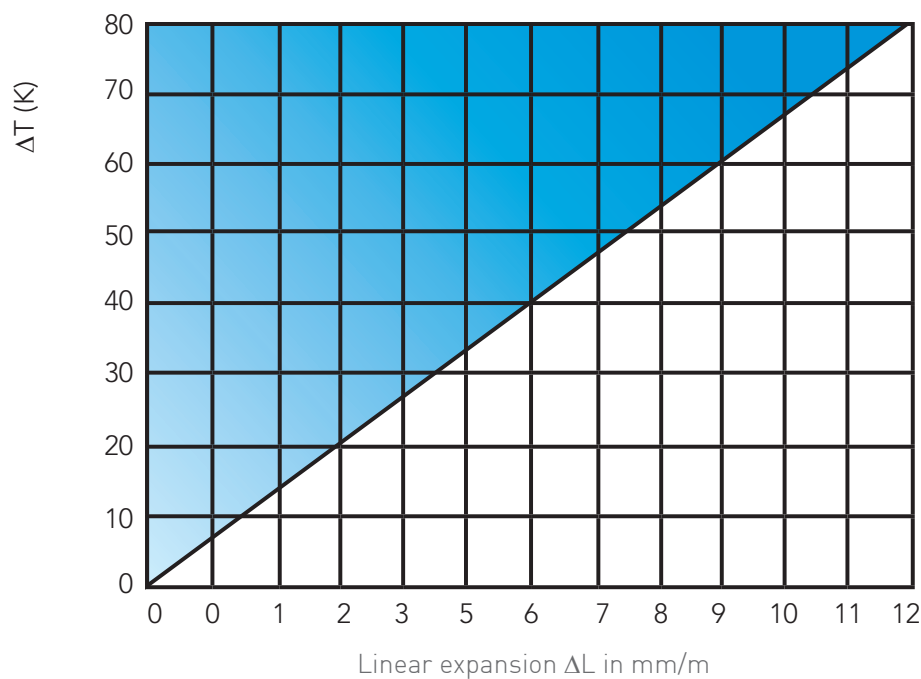
Alternatively, you can quickly obtain the result from the following table for different types of pipe:

TABLE 5.2: STANDARD PIPE LINEAR EXPANSION CHART (METERS)

|      | $\Delta T(^{\circ}X)^{**}$ |       |       |       |       |       |       |       |       |       |       |       |        |        |        |
|------|----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
|      | 10                         | 15    | 20    | 25    | 30    | 35    | 40    | 45    | 50    | 55    | 60    | 65    | 70     | 75     | 80     |
| 0.1  | 0.15                       | 0.23  | 0.30  | 0.38  | 0.45  | 0.53  | 0.60  | 0.68  | 0.75  | 0.83  | 0.90  | 0.98  | 1.05   | 1.13   | 1.20   |
| 0.2  | 0.30                       | 0.45  | 0.60  | 0.75  | 0.90  | 1.05  | 1.20  | 1.35  | 1.50  | 1.65  | 1.80  | 1.95  | 2.10   | 2.25   | 2.40   |
| 0.3  | 0.45                       | 0.68  | 0.90  | 1.13  | 1.35  | 1.58  | 1.80  | 2.03  | 2.25  | 2.48  | 2.70  | 2.93  | 3.15   | 3.38   | 3.50   |
| 0.4  | 0.60                       | 0.90  | 1.20  | 1.50  | 1.80  | 2.10  | 2.40  | 2.70  | 3.00  | 3.30  | 3.60  | 3.90  | 4.20   | 4.50   | 4.80   |
| 0.5  | 0.75                       | 1.13  | 1.50  | 1.88  | 2.25  | 2.63  | 3.00  | 3.38  | 3.75  | 4.13  | 4.50  | 4.88  | 5.25   | 5.63   | 6.00   |
| 0.6  | 0.90                       | 1.35  | 1.80  | 2.25  | 2.70  | 3.15  | 3.60  | 4.05  | 4.50  | 4.95  | 5.40  | 5.85  | 6.30   | 6.75   | 7.20   |
| 0.7  | 1.05                       | 1.58  | 2.10  | 2.63  | 3.15  | 3.68  | 4.20  | 4.73  | 5.25  | 5.78  | 6.30  | 6.83  | 7.35   | 7.88   | 8.40   |
| 0.8  | 1.20                       | 1.80  | 2.40  | 3.00  | 3.60  | 4.20  | 4.80  | 5.40  | 6.00  | 6.60  | 7.20  | 7.80  | 8.40   | 9.00   | 9.60   |
| 0.9  | 1.35                       | 2.03  | 2.70  | 3.38  | 4.05  | 4.73  | 5.40  | 6.08  | 6.75  | 7.43  | 8.10  | 8.78  | 9.45   | 10.13  | 10.80  |
| 1.0  | 1.50                       | 2.25  | 3.00  | 3.75  | 4.50  | 5.25  | 6.00  | 6.75  | 7.50  | 8.25  | 9.00  | 9.75  | 10.50  | 11.25  | 12.00  |
| 2.0  | 3.00                       | 4.50  | 6.00  | 7.50  | 9.00  | 10.50 | 12.00 | 13.50 | 15.00 | 16.50 | 18.00 | 19.50 | 21.00  | 22.50  | 24.00  |
| 3.0  | 4.50                       | 6.75  | 9.00  | 11.25 | 13.50 | 15.75 | 18.00 | 20.25 | 22.50 | 24.75 | 27.00 | 29.25 | 31.50  | 33.75  | 36.00  |
| 4.0  | 6.00                       | 9.00  | 12.00 | 15.00 | 18.00 | 21.00 | 24.00 | 27.00 | 30.00 | 33.00 | 36.00 | 39.00 | 42.00  | 45.00  | 48.00  |
| 5.0  | 7.50                       | 11.25 | 15.00 | 18.75 | 22.50 | 26.25 | 30.00 | 33.75 | 37.50 | 41.25 | 45.00 | 48.75 | 52.50  | 56.25  | 60.00  |
| 6.0  | 9.00                       | 13.50 | 18.00 | 22.50 | 27.00 | 31.50 | 36.00 | 40.50 | 45.00 | 49.50 | 54.00 | 58.50 | 63.00  | 67.50  | 72.00  |
| 7.0  | 10.50                      | 15.75 | 21.00 | 26.25 | 31.50 | 36.75 | 42.00 | 47.25 | 52.50 | 57.75 | 63.00 | 68.25 | 73.50  | 78.75  | 84.00  |
| 8.0  | 12.00                      | 18.00 | 24.00 | 30.00 | 36.00 | 42.00 | 48.00 | 54.00 | 60.00 | 66.00 | 72.00 | 78.00 | 84.00  | 90.00  | 96.00  |
| 9.0  | 13.50                      | 20.25 | 27.00 | 33.75 | 40.50 | 47.25 | 54.00 | 60.75 | 67.50 | 74.25 | 81.00 | 87.75 | 94.50  | 101.30 | 108.00 |
| 10.0 | 15.00                      | 22.50 | 30.00 | 37.50 | 45.00 | 52.50 | 60.00 | 67.50 | 75.00 | 82.50 | 90.00 | 97.50 | 105.00 | 112.50 | 120.00 |

\*\*Difference between installation and working temperature [°C]

GRAPH 5.1 LINEAR EXPANSION CAUSED BY TEMPERATURE FOR RAKTHERM STANDARD PIPES



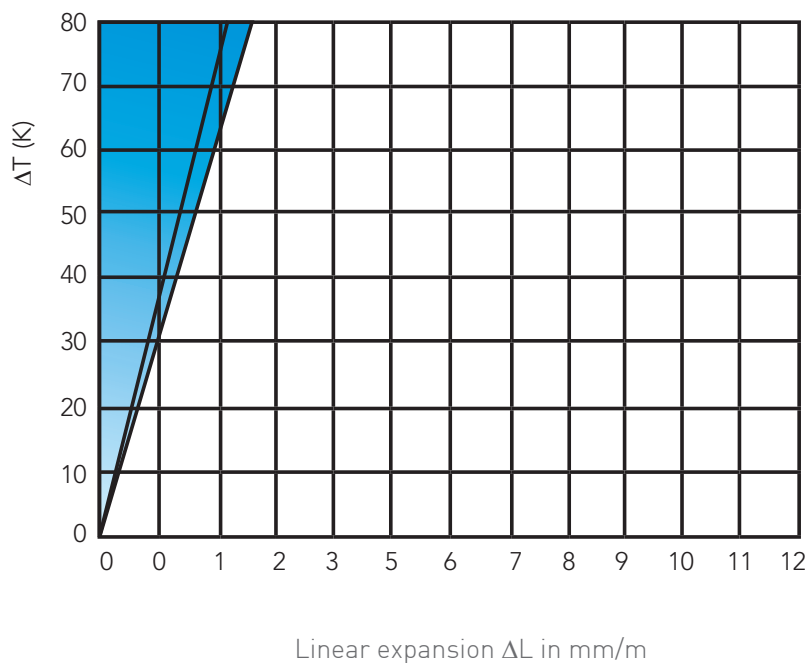
# Installation

TABLE 5.3: STANDARD PIPE LINEAR EXPANSION CHART (METERS)

| Length of segment (meters) | $\Delta T(^{\circ}X)^{**}$ |      |      |      |      |       |       |       |       |       |       |       |       |       |       |
|----------------------------|----------------------------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                            | 10                         | 15   | 20   | 25   | 30   | 35    | 40    | 45    | 50    | 55    | 60    | 65    | 70    | 75    | 80    |
| 0.1                        | 0.03                       | 0.05 | 0.06 | 0.08 | 0.09 | 0.11  | 0.12  | 0.14  | 0.15  | 0.17  | 0.18  | 0.20  | 0.21  | 0.23  | 0.24  |
| 0.2                        | 0.06                       | 0.09 | 0.12 | 0.15 | 0.18 | 0.21  | 0.24  | 0.27  | 0.30  | 0.33  | 0.36  | 0.39  | 0.42  | 0.45  | 0.48  |
| 0.3                        | 0.09                       | 0.14 | 0.18 | 0.23 | 0.27 | 0.32  | 0.36  | 0.41  | 0.45  | 0.50  | 0.54  | 0.59  | 0.63  | 0.68  | 0.72  |
| 0.4                        | 0.12                       | 0.18 | 0.24 | 0.30 | 0.36 | 0.42  | 0.48  | 0.54  | 0.60  | 0.66  | 0.72  | 0.78  | 0.84  | 0.90  | 0.96  |
| 0.5                        | 0.15                       | 0.23 | 0.30 | 0.38 | 0.45 | 0.53  | 0.60  | 0.68  | 0.75  | 0.83  | 0.90  | 0.98  | 1.05  | 1.13  | 1.20  |
| 0.6                        | 0.18                       | 0.27 | 0.36 | 0.45 | 0.54 | 0.63  | 0.72  | 0.81  | 0.90  | 0.99  | 1.08  | 1.17  | 1.26  | 1.35  | 1.44  |
| 0.7                        | 0.21                       | 0.32 | 0.42 | 0.53 | 0.63 | 0.74  | 0.84  | 0.95  | 1.05  | 1.16  | 1.26  | 1.37  | 1.47  | 1.58  | 1.68  |
| 0.8                        | 0.24                       | 0.36 | 0.48 | 0.60 | 0.72 | 0.84  | 0.96  | 1.08  | 1.20  | 1.32  | 1.44  | 1.56  | 1.68  | 1.80  | 1.92  |
| 0.9                        | 0.27                       | 0.41 | 0.54 | 0.68 | 0.81 | 0.95  | 1.08  | 1.22  | 1.35  | 1.49  | 1.62  | 1.76  | 1.89  | 2.03  | 2.16  |
| 1.0                        | 0.30                       | 0.45 | 0.60 | 0.75 | 0.90 | 1.05  | 1.20  | 1.35  | 1.50  | 1.65  | 1.80  | 1.95  | 2.10  | 2.25  | 2.40  |
| 2.0                        | 0.60                       | 0.90 | 1.20 | 1.50 | 1.80 | 2.10  | 2.40  | 2.70  | 3.00  | 3.30  | 3.60  | 3.90  | 4.20  | 4.50  | 4.80  |
| 3.0                        | 0.90                       | 1.35 | 1.80 | 2.25 | 2.70 | 3.15  | 3.60  | 4.05  | 4.50  | 4.95  | 5.40  | 5.85  | 6.30  | 6.75  | 7.20  |
| 4.0                        | 1.20                       | 1.80 | 2.40 | 3.00 | 3.60 | 4.20  | 4.80  | 5.40  | 6.00  | 6.60  | 7.20  | 7.80  | 8.40  | 9.00  | 9.60  |
| 5.0                        | 1.50                       | 2.25 | 3.00 | 3.75 | 4.50 | 5.25  | 6.00  | 6.75  | 7.50  | 8.25  | 9.00  | 9.75  | 10.50 | 11.25 | 12.00 |
| 6.0                        | 1.80                       | 2.70 | 3.60 | 4.50 | 5.40 | 6.30  | 7.20  | 8.10  | 9.00  | 9.90  | 10.80 | 11.70 | 12.60 | 13.50 | 14.40 |
| 7.0                        | 2.10                       | 3.15 | 4.20 | 5.25 | 6.30 | 7.35  | 8.40  | 9.45  | 10.50 | 11.55 | 12.60 | 13.65 | 14.70 | 15.75 | 16.80 |
| 8.0                        | 2.40                       | 3.60 | 4.80 | 6.00 | 7.20 | 8.40  | 9.60  | 10.80 | 12.00 | 13.20 | 14.40 | 15.60 | 16.80 | 18.00 | 19.20 |
| 9.0                        | 2.70                       | 4.05 | 5.40 | 6.75 | 8.10 | 9.45  | 10.80 | 12.15 | 13.50 | 14.85 | 16.20 | 17.55 | 18.90 | 20.25 | 21.30 |
| 10.0                       | 3.00                       | 4.50 | 6.00 | 7.50 | 9.00 | 10.50 | 12.00 | 13.50 | 15.00 | 16.50 | 18.00 | 19.50 | 21.00 | 22.50 | 24.00 |

\*\*Difference between installation and working temperature [°C]

GRAPH 5.1 LINEAR EXPANSION CAUSED BY TEMPERATURE FOR RAKTHERM STANDARD PIPES



Please see the details of Linear Expansion and Installation Types in RAKtherm technical Manual

## INSULATION OF RAKTHERM PIPES

A major advantage of the use of polypropylene pipes is its low coefficient of conductivity. In other words, PP-R systems, in comparison to steel piping systems, offer superior insulating properties, and require much less insulation, if further heat loss is to be prevented.

insulating material should ensure that the water is maintained at the designed operating temperature. Legal and other obligations (in building regulations) should also be complied to.

The insulating effect is mainly a function of the thickness of insulation and its thermal conductivity. It increases in direct proportion to the temperature. Moisture can impair the performance of insulating material. Hence open cell and fibrous insulating materials should be supplemented with a vapor barrier attached to the outer surface of the insulation.

Condensation can form on any insulating material if the pipe carrying cold water is inadequately lagged. Furthermore, it can lead towards moisture penetrating to the pipe in case of using unsuitable materials. Obviously, closed cell material with a high moisture resistance should be used to insulate cold water pipes. All butt joints, cuts, and ends should be properly sealed.

Considering the areas where frost damage is common, even insulation would prove insufficient in preventing the freezing if the system is out of service. Pipes should hence be drained or protected.

## INSULATION OF RAKTHERM PIPES FOR COLD WATER APPLICATIONS

For cold water, and according to the requirements of DIN 1988 part 2, insulation of pipes should be designed to adequately protect against condensation and moisture (See table 5.4).

**TABLE 5.4: RAKTHERM RECOMMENDES MINIMUM INSULATION THICKNESS FOR COLD WATER PIPES.**

| Pipes Location                               | Insulation Thickness in mm, for $\lambda = 0,040 \text{ W/(mk)}$ * |
|--|--|
| Exposed pipes, in unheated room (eg. Cellar) | 4  |
| Exposed pipes, in heated room                | 9  |
| Ducted pipes (cold water only)               | 4  |
| Ducted pipes (cold & hot water)              | 13   |
| Pipes in wall recess, next to hot pipes      | 13   |
| Pipes on concrete floor                      | 4  |

\*For other values of the thickness is to be obtained by conversion, on the basis of pipe diameter of 20mm

Under required circumstances, cold water pipework should be adequately protected against condensation and sources of heat. The installation of cold water pipes should be done avoiding heat sources (hot pipes, chimneys, boilers), unless the pipes are equipped with proper insulation so as to retain the water temperature.

# Installation

For residential applications, assuming normal service conditions, the insulation thickness specified in table 5.4 should be used. However, insulation will not provide permanent protection of the water against warmth.

The specifications of Technical Manual table 5.10 are also applicable where the protection against condensation on the outer surface of the insulation is concerned, assuming that the water temperature is 10 °C.



## PROTECTION OF RAKTHERM HOT WATER PIPES AGAINST HEAT LOSS

The minimum requirements specified (Heating System Regulation) should be complied with for restricting the heat loss of hot water pipes.

**RAKtherm** pipes and fittings have to be protected by insulation to prevent heat loss. Pipes and fittings made of PP-R 80 have heat conductivity constant of 0.15 W/mK. This indicates a significantly higher degree of self-insulation compared to metal pipes, meaning that in terms of heat transfer **RAKtherm** pipes and fittings offer superior natural insulating properties.

## RAKTHERM PRESSURE TEST

**RA erm** pipes due to their material properties expand when subject to pressure, which influences the test result, this may also be affected by differences in temperature of pipe and test medium resulting from a high thermal expansion coefficient of the pipe material, a change of 0.5 to 1 bar. Thus, the test medium should be kept at constant temperature throughout the test acc to DIN 1988 TRWI the pressure test must be performed 1.5 times of the operating pressure. Using cold water, the pipe system should be filled slowly and bled completely using calibrated measuring instruments that indicate pressure changes of 0.1 bar wherever possible. Measurements should be taken at the lowest point of the pipe system.



Where pipes and fittings have been welded, the pressure test should not be performed before two hours have elapsed after the last welding operation.

The pressure test consists of two stages:

For the first stage, a test pressure equal to the permissible working pressure plus 5 bar should be applied twice within 30 minutes at 10 minute intervals. Then the pressure should be checked. In case more than a 0.6 bar drop occurs over a period of 30 minutes at a rate of 0.1 bar/min, then a leakage is reported.

The second stage should follow the first stage without interval and should last minimum of 2 hours. Then the Pressure drop should be checked. If the pressure drop is more than 0.2 bar and the pipe work shows signs of leakage, then the network should be corrected and the test must be repeated.

## TRANSPORT & STORAGE

During transportation and storage, RAKtherm piping system components could be exposed to open air at any temperature for short period of time provided that it is kept in the shade protected from direct sunlight. However, at temperature below 0°C, the material becomes more susceptible to damage if hard blows are delivered. Hence, at low temperature, the material has to be treated with more caution. It is not recommended that RAKtherm pipes and fitting be stored in open air for long period of time.



Additionally, a solid base is recommended to avoid any deformation of pipes during transportation and storage. Even though RAKtherm pipes are extremely robust it is recommended to treat the material with care.





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الخليج للصناعات البلاستيكية والتحويلية (تحويل)

Factory (Al - Jazerah Al - Hammrah)

P.O. Box: 30739

Ras Al - Khaima, United Arab Emirates

Toll Free No: 800 Raktherm

800 72584376

Tel: +971 7 2447128

Fax: +971 7 2447129

E-mail: info@raktherm.com

E-mail: sales@raktherm.com

[www.raktherm.com](http://www.raktherm.com)

