



PİMTAS®

PLASTİK İNŞ. MALZ.SAN. VE TİC. A.Ş.

TECHNICAL CATALOGUE

U-PVC - UH-PVC - HDPE - PP - ABS
BORU, EK PARÇA, VANA | PIPES, FITTINGS, VALVES



2018





DEAR CUSTOMER

Pimtaş Plastic was established in 1977 and it is one of the international leading organizations in plastic industry that performs manufacture and specific design of plastic construction materials (i.e., Pipe, Fittings, Ball Valve, Butterfly Valve, Check Valve, Pool and Fittings technical equipment) since it started production.

Holding ISO 9001 quality management system and TSE / KIWA - WRAS documents and ISO 18001+ISO 14001 certificates, Pimtaş Plastic, which gained the trust and appreciation of consumers, is a company that exports to 80 different countries, European Countries in particular, thanks to most recent technological infrastructure, machine and molding systems.

With more than 300 experienced employees, the Company renders service with an annual production capacity of 25000 tons in its factory with 20,000 m² indoor area and 6,000 m² open stock site in Gebze Plastic Dealers Organized Industrial Zone and two different production facilities with 3000 m² indoor area and 4000 m² open stock site in Gebze E5 Eskihisar turnout.

As Pimtaş Plastic, we have produced in order to be able to offer more quality products and services for our customers since 1977 and we renew ourselves every passing year.

pimtaş family

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MISSION QUALITY APPROACH

PLASTIC RAW MATERIAL TECHNICAL SPECIFICATIONS

PLASTIC PIPING SYSTEMS CALCULATION TECHNIQUES

COUPLING TECHNIQUES

BALL VALVES

BUTTERFLY VALVES

UNILATERAL VALVE

UNIONS

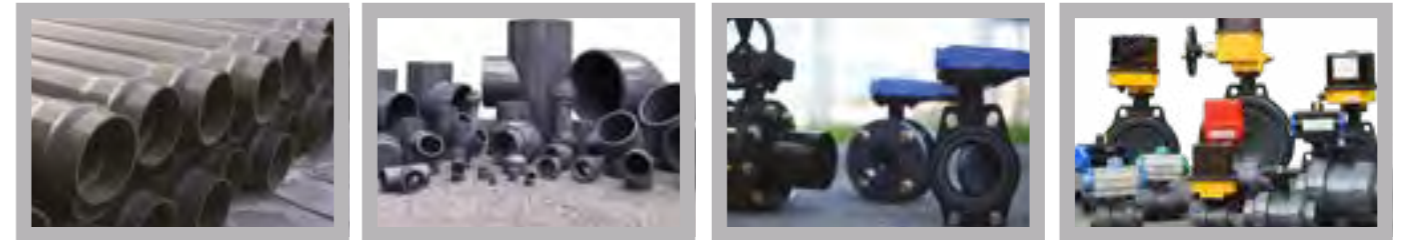
CHECK VALVES

HANDLING, STORAGE

STANDARD / DIMENSIONS / TABLE

POOL CHEMICALS





1) MISSION

This technical catalog was prepared in order to give you significant information about planning, product selection, installation operation, and commissioning the lines in pressured pipe lines. These data were prepared in accordance with ISO and EN Standards and the knowledge of manufacturers.

Our objective is to provide correct information for the planners, engineers and pipe line laying staff.

This technical catalog includes the following information;

- Plastic material information,
- Plastic terms, abbreviations, descriptions,
- Standards and certificates of conformity,
- Piping material selection-chemical resistance,
- Planning industrial piping systems,
- Hydraulic calculation techniques and head losses,
- Operation and installation,
- Coupling techniques,
- Valves and actuator valve basic information,
- General information,

2) QUALITY APPROACH

2A) QUALITY ASSURANCE TEST METHODS

General

Test laboratory is fully equipped in order to perform wide range of tests on the products such as pipe, pipes, fittings, manual and automatic valves, flow meters and pipe line components in compliance with applicable standards as well as its own and external test specifications.

In accordance with the agreements regarding test laboratory programs, PIMTAŞ research-development departments, manufacturing facilities are audited all the time.

Development and product release tests are performed for Re-De departments. Type test (TT), initial type test (ITT), batch release tests (BRT) and process validation tests (PVT) are carried out for our own production units. Other test programs are performed by external companies.

As well as well documented records of laboratory procedures, experience and competence of the personnel, continuing training at high standards, technical of test facility and equipment is high level.

Quality control process, performed in PIMTAŞ Laboratories, consists of three stages.

- 1-) Input Quality Control
- 2-) Proses Quality Control
- 3-) Output-Final Quality Control

Input Quality Control

Input Quality Control Tests are applied for any raw material and auxiliary materials from the material suppliers in compliance with (quality-production) standards, specified by PIMTAŞ.

In technical parts-raw materials and auxiliary materials in batches from the suppliers-

“**Acceptance Sampling**” is taken in every delivery and their tests are conducted in accordance with applicable standards and it is essential that

Process Quality Control

In the manufacture, performed with "PIMTAŞ Approval" certificate, samples, which are taken

a- during production and at time intervals in compliance with the standards

b- immediately after the production, are tested in PIMTAŞ Laboratories in accordance with applicable standards and those that received approval certificate are dispatched to storehouses for stocking purposes.

Output-Final Quality Control

Products with quality approval undergo label and package compliance controls following the automatic packing-packaging operations. The products, lacking approval regarding delivery compliance are not made available for the customers.

Test programs also include the following tests:

- Long term internal pressure test (EN ISO 1167 (1-2), ISO 9393)
- Burst tests on fittings and pipes
- Impact resistance tests (ISO 8085, ISO 13957)
- Separation test
- Stripping test (ISO 13954)
- Tensile strength and fracture mod test on butted test samples (ISO 13953)
- Pressure decrease test (EN 12117)
- Identifying density (EN ISO 1183)
- Fusion flow rate (EN ISO 1133)
- Oxidation induction test (OIT) (EN 728) ISO 11357-6

Whole list of accredited tests can be seen in the table. Following tests are included in this constantly updated table;

Breaking elongation test EN ISO 6259(1-3)

Carbon black dispersion test TS ISO 18553

Carbon black quantity test ISO 6964

Tensile elongation test TS ISO 13953

Density test TS EN ISO 1183-1

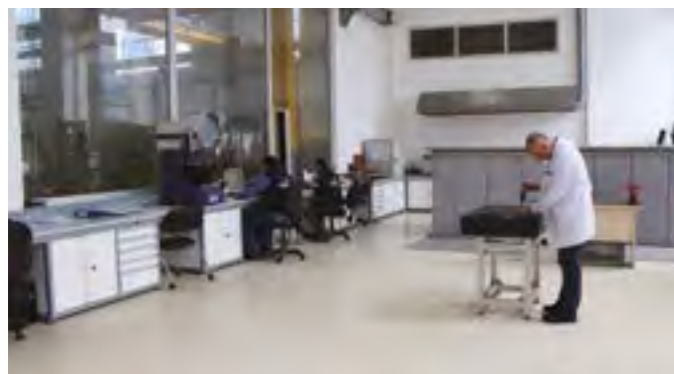
Volatile matter test EN 12099

Leakage test under vacuum (ISO 3459-Procedure B)

Dimensional stability test EN ISO 2505

Ring flexibility determination test EN ISO 13968

Ring hardness determination test ISO 9969



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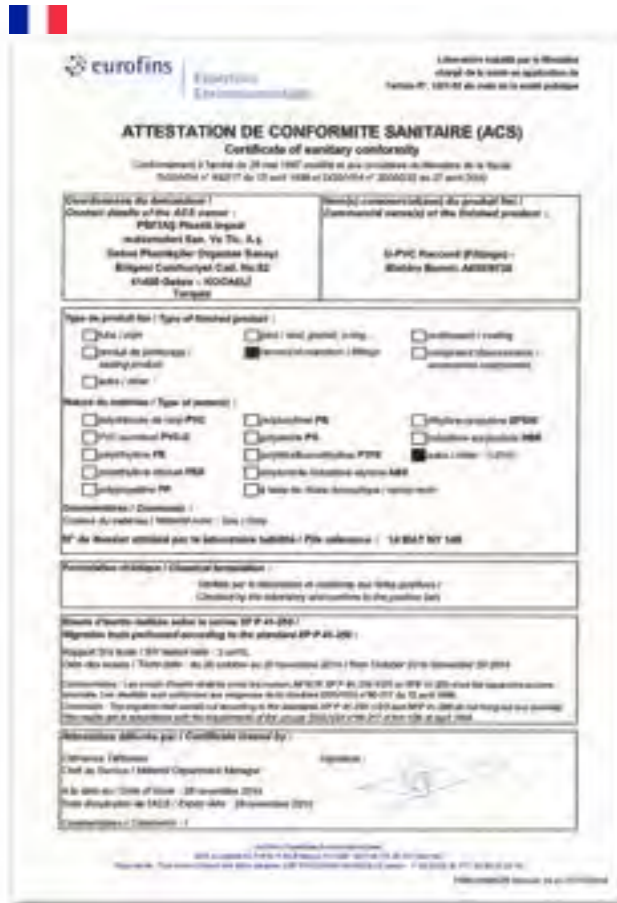
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LIST OF ABBREVIATIONS

WARNING !!

Information included in the technical catalog were prepared so as to help you while planning your works. Identifications and technical information included herein shouldn't be considered as guaranteed features. The data are only advisory.

ANSI	American National Standard
ASTM	American Society for Testing and Materials
BS	British Standard
DIN	Deutsche Industrie-Normen
ISO	International Standardization Organization
ABS	Acrylnitril Butadien Styrene
PVC-U	Polyvinyl Chloride
PVC-UH	High Strength Pvc
PVC- C	Polyvinyl Chloride chlorinated
PP	Polypropylene heat stabilized
PE	Polyethylene
PVDF	Polyvinylidene fluoride
EPDM	Ethylene Propylene Rubber
FPM	Fluorine Rubber, e.g. Viton
NBR	Nitrile Rubber
IIR	Butyl Rubber
CSM	Chlore Sulphonyl Polythene, e.g. Hypalon
CR	Chloroprene Rubber, e.g. Neoprene
PTFE	Polytetrafluorethylene, e.g. Teflon
PB TP	Polybutylene terephthalate
UP-GF	Unsaturated polyester resin glasfibre reinforced
St	Steel
Ms	Brass
Tg	Malleable iron
d	Pipe outside diameter
DN	Nominal bore
PN	Nominal pressure at 20°C, water
kg	Weight in kilograms
SP	Standard pack. The figure given indicates the quantity of fittings contained in a gross
G	Pipe thread, not pressure tight in the thread to Iso 228-1
NPT	Taper male thread pressure tight in the thread to ANSI B 1.20.1
R	Taper male thread, pressure tight in the thread to ISO7-1/DIN 2999-1
Rc	Taper female thread, pressure tight in the thread to ISO 7-1/DIN 2999-1
Rp	Parallel female thread, pressure tight in the thread to ISO7-1/DIN 2999-1
Tr	Trapezoid thread
SC	Size of hexagon bolts
s	A/F
e	Wall thickness
AL	Number of screw holes
®	Registered trade-mark



STANDARDS PVC PIPE-FITTING STANDARDS

ASTM D 1784 (2011 - 00)	Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
ASTM D 1785 (2006 - 00)	Standard specification for polyvinyl chloride (PVC) plastic pipe, schedules 40, 80, and 120
ASTM D 2464 (2006 - 00)	Standard specification for threaded polyvinyl chloride (PVC) plastic pipe fittings, schedule 80
ASTM D 2466 (2006 - 00)	Standard specification for polyvinyl chloride (PVC) plastic pipe fittings, schedule 40
ASTM D 2467	Standard specification for polyvinyl chloride(PVC)plastic pipe fittings,Schedule 80
BS 3506:1969 (1969-09)	Specification for unplasticized PVC pipe for industrial uses.
BS 4346-1 (1969-02)	Joints and fittings for use with unplasticized PVC pressure pipes. Injection moulded unplasticized PVC fittings for solvent welding for use with use with pressure pipes including potable water supply
EN ISO 1452-1 (2009-12)	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly (vinyl chloride) (PVC-U) - Part 1: General
EN ISO 1452-2 (2009-12)	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly (vinyl chloride) (PVC-U) - Part 2: Pipes
EN ISO 1452-3 (2009-12)	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly (vinyl chloride) (PVC-U) - Part 3: Fittings
EN ISO 1452-4 (2009-12)	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly (vinyl chloride) (PVC-U) - Part 2: Valves
EN ISO 1452-5 (2009-12)	Plastics piping systems for water supply and for buried and above-ground drainage and sewerage under pressure - Unplasticized poly (vinyl chloride) (PVC-U) - Part 2: Fitness for purpose of the system
EN ISO 15493 (2003-04)	Plastics piping systems for industrial applications - acrylonitrile-butadiene (ABS), unplasticized polyvinyl chloride (PVC-U) and chlorinated polyvinyl chloride (PVC-C) specifications for components and the system: metric series (ISO 15493-2003)
ISO 265-1 (1988-12)	Pipes and fittings of plastics materials; fittings for domestic and industrial waste pipes; basic dimensions: Metric series; part 1: Unplasticized polyvinyl chloride (PVC-U)
ISO 727-1 (2002-05)	Fittings of unplasticized polyvinyl chloride (PVC-U), chlorinated polyvinyl chloride (PVC-C) or acrylonitrile butadiene styrene (ABS) with plain sockets for pipes under pressure part 1: Metric series (revision of ISO 727: 1985)
ISO 727-2 (2005-06)	Fittings of unplasticized polyvinyl chloride (PVC-U), chlorinated polyvinyl chloride (PVC-C) or acrylonitrile butadiene styrene (ABS) with plain sockets for pipes under pressure part 2: Inch-based series

PE PIPE-FITTING STANDARDS

STANDART NO	
TS pr EN 728	Plastic piping and channel systems-Determination of oxidation induction period for thermoplastic pipe and fittings
TS EN ISO 1167-1	Thermoplastic pipes, fittings and sets- Determination of internal pressure resistance- Used in liquid transportation-Part 1: General method
TS EN 12099	Plastic piping systems- Determination of volatile matter content for polyethylene pipe materials and fittings.
TS EN 12107	Plastic piping systems- Injection-molded thermoplastics fittings, valves and auxiliary equipment- Determination of long term hydrostatic resistance of thermoplastic materials for injection molded pipe fittings.
TS EN 12118	Plastic piping systems - Determination of moisture content in thermoplastics by means of coulometric method
TS EN ISO 1133	Plastics- Thermoplastics-Determination of melt mass flow rate (MFR) and melt-volume flow rate (MVR).
TS EN ISO 1872-1	Plastics-Polyethylene (PE) molding and extrusion substances-Part 1: System of notation of features and principles.
TS EN ISO 12162	Thermoplastic materials- Total service (design) coefficient of classification and notation regarding pipes and fittings used in pressured applications.
TS EN ISO 13478	Thermoplastic pipes-Test performed in full size for resistance to rapid crack propagation (RCP) - Used in transfer of fluids
TS EN ISO 13479	Polyolefin pipes-Determination of resistance crack propagation- Used in liquid transfer of liquids- test for slow crack growth on notched pipes (Notch test)
TS EN ISO 1183-1	Plastics-Non-cellular plastics-Density determination methods-Part 1: Immersion method, liquid pycnometer method and titration method.
TS 7792	Polyolefin pipes and fittings-Carbon black determination test method with calcination and pyrolysis and key features.
TS ISO 111414	Plastic pipes and fittings-Preparing test systems of polythene (PE) pipe/pipe or pipe/fittings with butt welding
TS ISO 11420	Method for evaluating carbon black dispersion of polyolefin pipe, fittings and their paste.
TS ISO 13480	Polyethylene pipes-Resistance to slow crack growth-Cone test method.
TS EN 682	Elastomeric seals-Material specifications of seals of pipes and fittings used in gas and hydrocarbon liquid transfer.
TS EN 1716	Protection of metals against corrosion-Electro deposited cadmium coating on iron and steel.
TS EN 12117	Plastic piping systems - Determination of relation for gaseous flow rate pressure decrease regarding fittings, valves and auxiliary equipment.
TS ISO 10838-1	Pipe systems-Mechanical fittings for - the supply of polyethylene gaseous fuels Part 1: Metal fittings for the pipes, nominal outside diameter of which is 63 mm or lower.
TS ISO 10838-2	Pipe systems-Mechanical fittings for - the supply of polyethylene gaseous fuels Part 2: Metal fittings for the pipes with a nominal outside diameter higher than 63 mm.
TS ISO 13953	Pipes and fittings-Determination of tensile strength and damage type of test pieces, taken from a polyethylene (PE)-butt welded connection.
TS ISO 13954	Plastic pipes and fittings-striping decohesion test for polyethylene (PE) electrofusion assemblies, nominal outside diameter of which is 90 mm or higher.
TS ISO 13955	Plastic pipes and fittings-crushing decohesion test for polyethylene (PE) electrofusion assemblies
TS ISO/DIS 13956	Plastic pipes and fittings- Determination of splice strength-Tear test for polyethylene (PE) fittings.
TS EN 1555-1	Plastic pipe systems-From Polyethylene-Used in transfer of gaseous fuels (PE)- Part 1 General
TS EN 1555-2	Plastic pipe systems-From Polyethylene-Used in transfer of gaseous fuels (PE)- Part 2: Pipes.
TS EN 1555-3	Plastic pipe systems-From Polyethylene-Used in transfer of gaseous fuels (PE)- Part 3: Fittings
TS EN 1555-4	Plastic pipe systems-From Polyethylene-Used in transfer of gaseous fuels (PE)- Part 4: Valves
TS EN 1555-5	Plastic pipe systems-From Polyethylene-Used in transfer of gaseous fuels (PE)- Part 5: System utility
TS ISO 11413	Plastic pipe and fittings-Preparing test piece from a polyethylene pipe with electro fusion welded fitting.
TS 8084 ISO 4065	Thermoplastic pipes-Universal wall thickness table.
TS ISO 4433-1	Thermoplastic pipes-Resistance to chemical liquids-Classification- Part 1: Immersion test method.
TS ISO 4433-2	Thermoplastic pipes-Resistance to chemical liquids-Classification- Part 2: Polyolefin pipes.
TS EN 681-1	Elastomeric seals- Specifications of materials-Used in water and drainage applications-Part 1: Rubber
TS EN 681-2	Elastomeric seals-Specifications of materials-Used in pipe couplings in contaminated water and drainage applications- Part 2: Thermoplastic elastomers.
TS 6694	Polyethylene (PE) pipes-Pressure decrease test method and its characteristics in mechanical pipe coupling systems.

STANDARD NO	PE PIPE- FITTING STANDARDS
TS EN 713	Plastic piping systems- Mechanical connections between pressured, polyolefin pipe and fittings-Leakage determination for twisted pipe system under internal pressure.
TS EN 715	Thermoplastic piping systems-Connections, made with small-diameter, pressured pipes and fittings, which are resistant to axial loads - Leakage determination under water pressure, including axial loads, created by hydrostatic pressure.
TS 418-1 EN 12201-1	Plastic piping systems-For drinking and domestic water-Polyethylene (PE)- Part 1: General
TS 418-1 EN 12201-2	Plastic piping systems-For drinking and domestic water-Polyethylene (PE)- Part 2: Pipes
TS 418-1 EN 12201-3	Plastic piping systems-For drinking and domestic water-Polyethylene (PE)- Part 3: Fittings
TS 418-1 EN 12201-4	Plastic piping systems-For drinking and domestic water-Polyethylene (PE)- Part 4: Valves

VALVE STANDARD

EN ISO 16135 (2006-03)	Industrial valves-Ball valves of thermoplastic materials.
EN ISO 16136 (2006-03)	Industrial valves-Butterfly valves of thermoplastic materials.
EN ISO 16137 (2006-03)	Industrial valves-Check valves of thermoplastic materials.
EN ISO 16138 (2006-03)	Industrial valves-Diaphragm valves of thermoplastic materials.
EN ISO 9393-1 (2004-07)	Thermoplastics valves - Pressure test methods and requirements - Part 1: General
EN ISO 9393-2 (2005-10)	Thermoplastics valves - Pressure test methods and requirements - Part 2: Test conditions and basic requirements

FLANGE STANDARDS in inch SIZES

Connection measurements of the flanges with the following standards are in compliance with each other.

EN 1092 - Pn 10 - Pn16 Steel flange standard.

ANSI B 16,5 ,Class 150.Steel flange standard.

ASTM D 4024 - thermoset-fiberglass flange standard.

BS-EN 1759-1-Steel flange standard.

FLANGE STANDARDS in metric SIZES

Connection measurements of the flanges with the following standards are in compliance with each other.

EN 1452-3-PVC-U Plastic flange standard

BS 4504-Pn 10-Pn16 - Steel flange standard

DIN 2501-Pn 10-Pn16 - Steel flange standard

ISO 7005-1-Pn 10-Pn16 - Steel flange standard

THREAD STANDARDS

ISO 7/1	- Leakage is ensured through pipe threads.(Conic male thread and parallel female thread).
	- Pipe threads where pressure-tight joints are made on the threads. (Taper external threads and parallel internal threads.)
TS EN 10226-1-1	- Leakage is ensured through pipe threads.(Conic male thread and parallel female thread).
	- Pipe threads where pressure-tight joints are made on the threads. (Taper external threads and parallel internal threads.)
ISO 228-1	- Leakage is not ensured through pipe threads. (Parallel external and internal threads.)
	- Pipe threads where pressure-tight joints are not made on the threads. (Parallel external and internal threads.)
	ASTM D 2464(Sch 80). ASTM F 1498. -Taper pipe threads.

2B) CORPORATE TRAINING

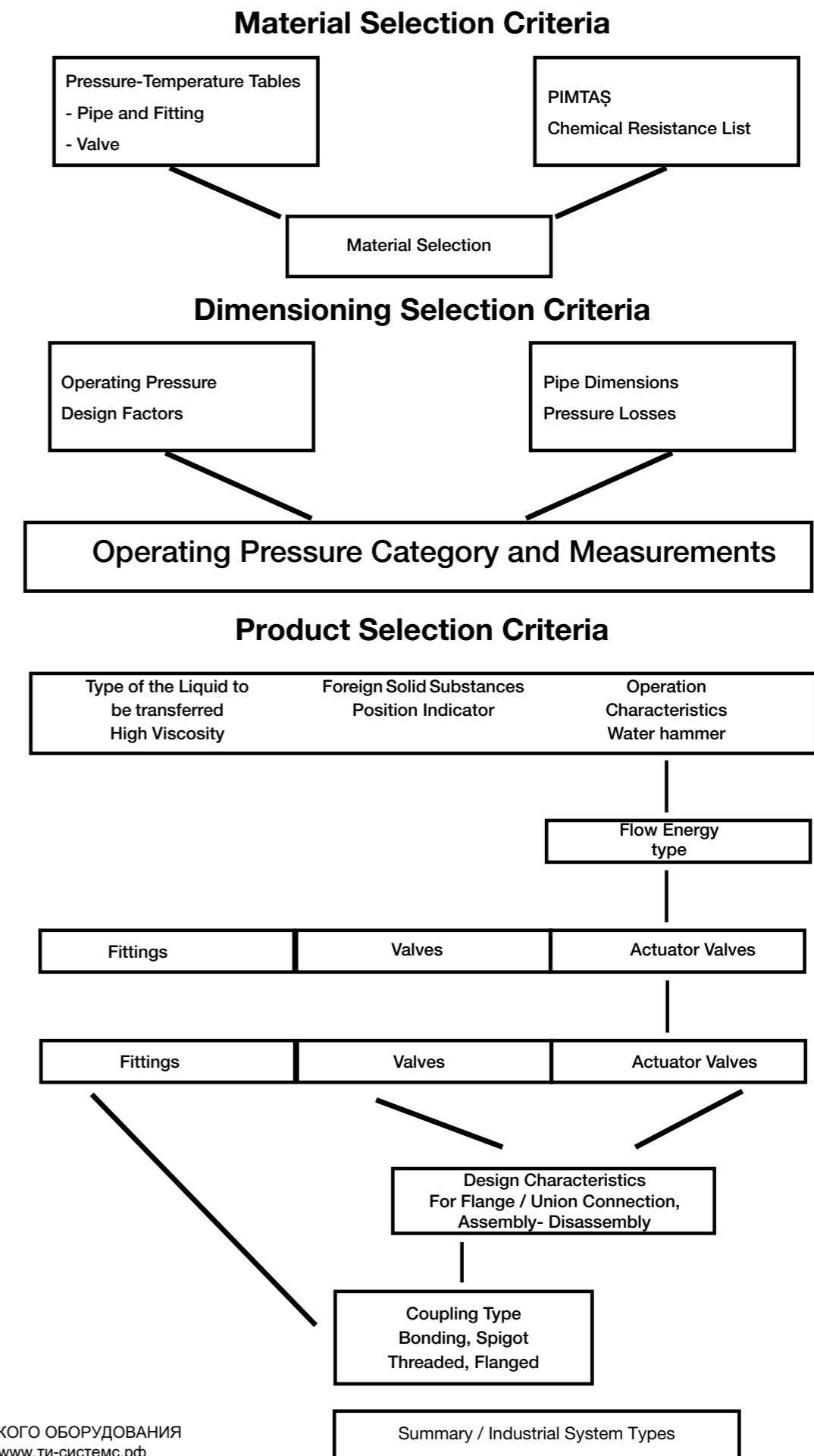
Believing in the following approach; "Most valuable factor is human", PIMTAŞ invests in human. Several trainings are provided for PIMTAŞ employees in order to increase either their business performance or corporate knowledge within the organization at regular intervals, furthermore it is enabled to take part in necessary foreign and domestic trainings, seminars and congresses.

Conveying the targeted results clearly and transparently, ensuring that employees love their jobs, perform the work efficiently and be contributor, making any and all business, training and organization opportunities available for the employees, acting together and as a whole, PIMTAŞ is also a leader in the sector as a "team" about training.

Considering the fact of proceeding primarily making use of knowledge in the trainings, PIMTAŞ adopts it as principle to use knowledge and technology in production and after-sale services with inquisitory, problem-solving and solution-oriented employees, to ensure constant customer satisfaction with personnel and dealer trainings provided regularly.



3) HOW TO SELECT PLASTIC PIPE-FITTINGS



4) PLASTIC RAW MATERIAL TECHNICAL SPECIFICATIONS

4-1) PVC

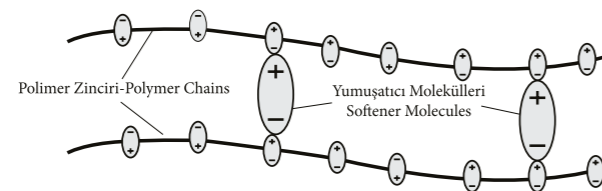
4-1A) PVC TECHNICAL SPECIFICATIONS

GENERAL

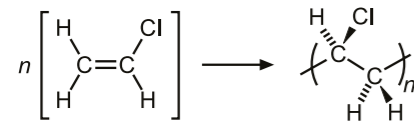
PVC raw material is colorful and has many favorable qualities. It was primarily developed in 1875; however, it was only possible in 1930 that it was used as a raw material in industrial production and came into life of the people.

PVC raw material is obtained from 57 % chlorine (obtained through decomposition of chlorine, caustic soda and hydrogen) and at the rate of 43% ethylene. Thanks to this feature, 97% ethylene is used in polypropylene raw materials of petrol sources due to low production cost of PVC raw material. That is to say, PVC enables us to use world's petrol reserves less and therefore its price shows less dependency than other raw materials.

Chemical materials are added into PVC raw material, which is produced in this way, in order to bring in several characteristics, expected from itself such as elasticity, softness, hardness, and flexibility. For instance, chemical substances, which provides flexibility and softness, are added if a plastic pipe is to be made from PVC raw material so that that it wouldn't be broken. Creating bonds between polymer chains, stabilizers decrease friction force and ensure that raw material has a more flexible structure thus preventing fission of these chains. Here, the (non-plasticized) raw material not containing any stabilizer is called as U-PVC.



Calcite substance is used as a filler in order to decrease the production cost of pipes made of PVC. Calcite substance, which is abundant in nature and chemical formula of which is $CaCO_3$, is calcium carbonate (i.e.i, Lime stone). Calcite is the fine powder form of well-known marble. The use of calcite substance more than 9% in PVC pipes results in pipe's being brittle and unstable. Furthermore, the utilized calcite material should have a health certificate.



PVC Hammaddesi



Calcium Filling Material

Hard polyvinyl chloride (PVC-U) material



Properties of hard polyvinyl chloride (reference values)

Properties	Value (*)	Units	Test Standard
Density	1.38	gr/cm ³	EN ISO 1183-1
Yield stress at 23°C	≥52	N/mm ²	EN ISO 527-1
Tensile elasticity coefficient at 23°C	≥2500	N/mm ²	EN ISO 527-1
Charpy notched impact strength at 23°C	≥6	kJ/m ²	EN ISO 179-1/1eA
Charpy notched impact strength at 0°C	≥3	kJ/m ²	EN ISO 179-1/1eA
Vicat heat flexural temperature, B/50N	≥76	°C	EN ISO 306
Thermal conductivity at 23°C	0.15	W/mK	EN ISO 12664
Water absorption at 23°C	≤0,1	%	EN ISO 62
Color	7011	-	RAL
Limiting oxygen index (LOI)	42	%	ISO 4589-1

*Typical values measured on the material. These values are used for design purposes.

GENERAL

Commonly used as PVC abbreviation, polyvinyl chloride is one of the most important and oldest polymers, produced serially. Only (PE) and polypropylene exceed the PVC consumption all over the world. PVC was produced in nineteenth century for the first time. However, it was for the first time in 1913 that an industrial production process was granted a patent. It is not possible to carry out some industrial applications without PVC today. In addition, PVC has also become irreplaceable regarding the use of daily materials.

PVC is a polymer that contains approximately 56% chloride in weight. PVC resin becomes a material that can only be used and treated by using additives. Selection of additives ensures a wide range of alteration in properties and change in the planned application.

PVC materials has two categories. Soft PVC (PVC-P), produced by adding plasticizers (e.g., phtalate) is not used by PIMTAŞ. Hard PVC, which is also called as non-plasticized PCV (PVC-U) is used for the engineering of pipe lines.

PVC-U is an amorphous thermoplastic. PVC-U molded parts is rather dependent on the composition of the formula, however it is also dependent upon the treatment. Thanks to our 50 years of experience in manufacture of PVC and development our own formulation constantly, PIMTAŞ company has become a milestone regarding PVC-U pipes. Internal pressure resistance is tested in accordance with ISO standard 1167 and calculated in compliance with ISO 9080. Industrial stages are classified as MRS 25 for our industrial categories under the terms and conditions of ISO 12162.

Internal pressure resistance is tested in accordance with ISO standard 1167 and calculated in compliance with ISO 9080.r. Industrial stages are classified as MRS 25 for our industrial categories under the terms and conditions of ISO 12162.

PVC-U material of PIMTAŞ company has the following characteristics:

- It has versatile utilization feature.
- It has a very good resistance to chemicals and corrosion.
- It is proved to be harmless physiologically and proper for contact with foodstuff.
- It has no impact on drinking water.
- it is biologically inert and it doesn't support microbial growth.
- It has a high level of mechanical tensile strength and impact resistance.
- It is self-extinguishing.
- It performs safe solvent cementing using Tangit cement.
- It is the adhesive formation designed for PIMTAŞ PVC-U.
- Tin stabilizers are easily used for fittings and valves, it is a lead-free system.
- Frictional loss is low thanks to smooth surfaces.



Resistance to infrared radiation and weather conditions.

PVC-U is very resistant to weather conditions. As well as the impact of wind and rain, long term effect of direct sun lights may also damage the material only superficially. Although resistance of PVC-U material against weather conditions is very well regarding infrared radiation, it loses some part of its resistance to impact. In unusual applications, it may be advantageous to protect the material from exposure to direct sun light. Please contact your PIMTAŞ dealer for proper protection conditions.



Application limits

Application limits of the material is based on embrittlement and softening temperatures, the quality of the implementation and expected service life.

For detailed information about application temperatures and pressures, please look at respective p-T diagrams.



Burning behavior

High chlorine content of PVC-U material results in an advantageous burning behavior. Self-ignition due to temperature influences occurs at a temperature of 450°C only. PVC-U material catches fire when it is exposed to a fire; however, it extinguishes immediately after the fire is removed.

Oxygen index is at the rate of 42% (substances that burn with an oxygen amount of 21% are considered as inflammable material).

Therefore, PVC-U material corresponds to VO class, which is the best flammability class pursuant to UL94 standard and it corresponds to B1 construction material class (high flash-point) in wall thicknesses less than 3,2 mm according to DIN 4102-1 standard and B2 construction material class (normally flammable) in wall thicknesses more than 3,2 mm. With respect to NF P 92-501 French test method, PIMTAŞ PVC-U material is tested as M2.

As PVC releases hydrogen chloride that creates a corrosive acid due to water when it is burned, it is essential to clean the areas which are sensitive to corrosion immediately after a fire. As the strong odor of HCl gas enables to escape early from toxic burning gases and mainly from odorless carbon monoxide, HCl danger for the personnel is at minimum level.

There aren't any restrictions with regard to selection of the fire extinguishing agents.



Electrical properties

PVC-U is not conductive just as all other unaltered thermoplastics. And this means lack of occurrence of electrochemical corrosion in PVC-U systems. On the other hand, it is essential to take these non-conductivity properties into consideration as there may be electrostatic load in the pipes. It is specifically important to consider this condition in the areas where it is likely to have explosive gases. In order to prevent emergence of electrostatic loads in polymer piping systems, there are several methods available. Please contact your PIMTAŞ representative for detailed information about these methods.

Specific volume resistivity is higher than 105Ωcm.



Physiological properties

PVC-U formulas were developed to be used in drinking water and foods by PIMTAŞ Inc. That PVC-U material is neutral, and that it is harmless physiologically in terms of foods containing acid and alcohol and that it is inactive in terms of odor, taste or microbiological impacts on drinking water is regularly controlled and audited by independent organizations in several countries.

PIMTAŞ company offers PVC-U systems, free of lead and cadmium for your application regarding the fields of drinking water and food.

Waste monomer content of vinyl chloride is below limit of detection of modern analytic methods.

For detailed information about current approvals regarding the applications with drinking water and foodstuff, please contact your sales representative.

PLASTIC RAW MATERIAL OXYGEN PERMEABILITY;

Permeability is the degree to which a material allows a certain liquid or gas pass through it.

Oxygen permeability is important in that it influences the quantity of corrosion in pipe lines.

OXYGEN PERMEABILITY OF SOME PLASTIC RAW MATERIALS;

Material	Oxygen	Nitrogen	Hydrogen	Carbon Dioxide	Water Vapor
PE	8-19	2-6	25-55	32-75	0.5-1.5
PP	5	2	65	25	1.1
PVC	0.4	0.04	10	0.9	6.5
PVDF	0.7	0.2	3	<1.0	5.2

What is UH-PVC ? What are the differences between U-PVC and UH-PVC ?

PVC is a strong, semi-rigid substance in its natural form. Pvc-UH may be described as non-plasticized polyvinyl chloride with high impact resistance.

This feature must be marked as PVC-U if the MRS value of fitting material is not higher than 25MPa in TS 274-3 EN 1452-3 and as PVC-UH if such value is higher than 25MPa

(TS 274-3 EN 1452-3 Article 4.3) This phrase is only applicable to fittings.

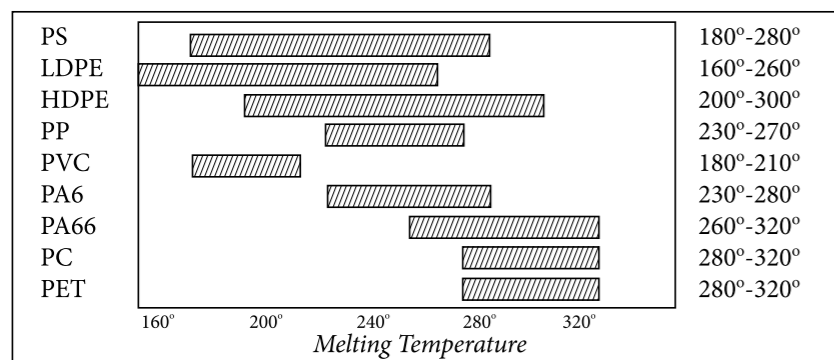
-According to TS EN ISO 1452-1- Standard, PVC finished goods and formulations must be indicated based on the minimum required strength level (MRS). (MRS) Value is calculated on the basis of (LPL) value pursuant to ISO 12162. LPL value is determined through the analysis in compliance with ISO 9080. Here, water test is applied for water based on ISO 1167-1 and ISO 1167-2, and hydrostatic pressure tests are performed. In these tests, if the calculated MRS value of MRS - Minimum surface strength force for PVC material at the end of 20 °C - 50 years of time period is not higher than (25 Mpa), raw material is called as PVC-U, and as PVC-UH if it is higher than (25Mpa).

As is understood, Surface Strength Value (MRS) is increased with the addition of special additives to PVC finished products and formulations. These formulations are trade secret and approved by internationally accredited laboratories. Pursuant to standards such as TSE and KIWA, companies do not accept PVC-UH marking on the fittings without this approval.

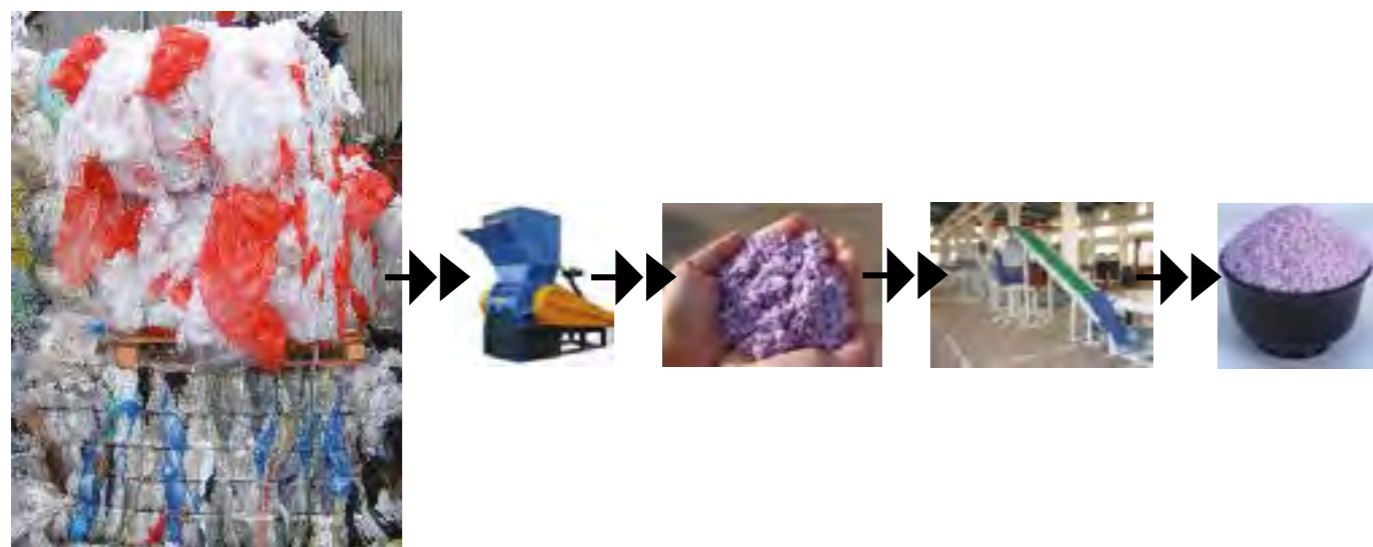
As can be understood from the foregoing explanation, (MRS) value of PVC-UH is higher than PVC-U. This indicates that it has a finished product-formulation with stronger resistance.

This is a technology, which requires know-how and it is performed by very few raw material producers in the world today Formulation used within PIMTAŞ is produced by SOLWAY company.

TEMPERATURES IN MANUFACTURING PROCESS OF PLASTICS (FROM MOLLER / JESKE)



Furthermore, both the economic life of U-PVC raw material continues and environmental cleaning is ensured since it is possible to melt U-PVC raw however much it is desired and use it by processing again. Therefore, it is not required to burn or dispose PVC material to eliminate it. No matter how much old or worn out PVC wastes are, they can be melted again and used as a product with lower quality and environmental cleaning is ensured. That is to say, if a PVC product, which was produced initially as a food package, is melted and processed again, resulting PVC product, which was manufactured again through recycling, may now be used in different works other than food, not requiring hygiene, but not food packages.



TECHNICAL SPECIFICATIONS OF PVC RAW MATERIAL

It is rather a hygienic raw material to be used in the sensitive areas such as drinking water transportation.

- Service life is between 15 - 100 years (60 years in average).
- It is easy to handle and apply thanks to low specific weight.
- It may be used in production again after it is broken.
- Environmentally friendly. Bacteria, insects and other rodentia are not able to do harm.
- It has fire extinguishing capacity. It never disperses fire.
- Resistant to many chemical substances and acids.
- It has very-well heat, sound and electric isolation.
- It has a good impact resistance.
- Processing (making pipe etc.) is conducted with lesser electric consumption in comparison to other plastic raw materials.
- Availability and price is less petrol-dependent in comparison to other plastic raw materials.



Technical specifications of SOLVAY/ITALY U-PVC raw material, used in production:

PRESSURE CATEGORY; PN (NOMINAL PRESSURE)

This is completely a theoretical and unreal value. It is used to classify the pipes. A PVC pipe in this diameter and wall thickness states that it can withstand this pressure at 20 °C for 50 years.

WHAT IS STANDART DIMENSION RATIO (SDR)?

This term is used for classifying plastic pipes. This refers to the ratio of pipe outside diameter to wall thickness.

WHAT IS SAFETY FACTOR?

While wall thicknesses of plastic pipes are determined according to desired pressure resistance, calculated wall thickness is multiplied by a certain safety coefficient when required wall thickness is calculated in consideration of some factors inside and outside the pipe which adversely affect pressure resistance and decrease compression strength. For instance, PVC pipes are multiplied by 2.0 safety factor whereas the wall thickness required for PE pipes is multiplied by 1.2 safety factor.

The reasons why calculated pipe wall thicknesses are multiplied by such a safety factor are as follows;

- Deficiencies of raw material arising out of quality and production status,
- Hammer impact within the pipe line or sudden pressure changes,
- Irregularities to emerge while using the pipe line due to external loads imposed on the pipe,
- Pressure changes within the pipe owing to temperature changes.

SAFETY COEFFICIENTS FOR SOME RAW MATERIALS

PE	1.25
PP	1.60
PVC	2.0

Long term attitude of thermoplastic materials

MRS rates;

MRS rates of thermoplastic materials, used in industrial applications are indicated in the following table (further see the definition in essentials section). These rates are taken from below specified standards:

- EN ISO 15493 (ABS, PVC-U, PVC-C)
- EN ISO 15494 (PB, PE, PP)
- EN ISO 10931 (PVDF)

Material	MRS value
ABS	14 MPa
PE 80	8 MPa
PE 100	10 MPa
PP-H	10 MPa
PP-B	8 MPa
PP-R	8 MPa
PVC-U	25 MPa
PVC-C (Pipe Material)	25 MPa
PVC-C (Fitting Material)	20 MPa
PVDF	25 MPa

4-1-B) PVC-U MALZEMENİN UZUN SÜRELİ DAVRANIŞI

Calculation (pursuant to EN ISO 15493:2003)

Long term attitude of PVC-U material is indicated in the following table. Rupture lines are indicated for temperature values between 20°C–60°C. These are shown as LPL curves (Low-Predictable Limit). Based on the definition, this refers to the fact that 97,5% of all break points are within or on the curves.

Typically no pipe bend is shown in hydrostatic resistance diagram for amorphous thermoplastics such as PVC-U.

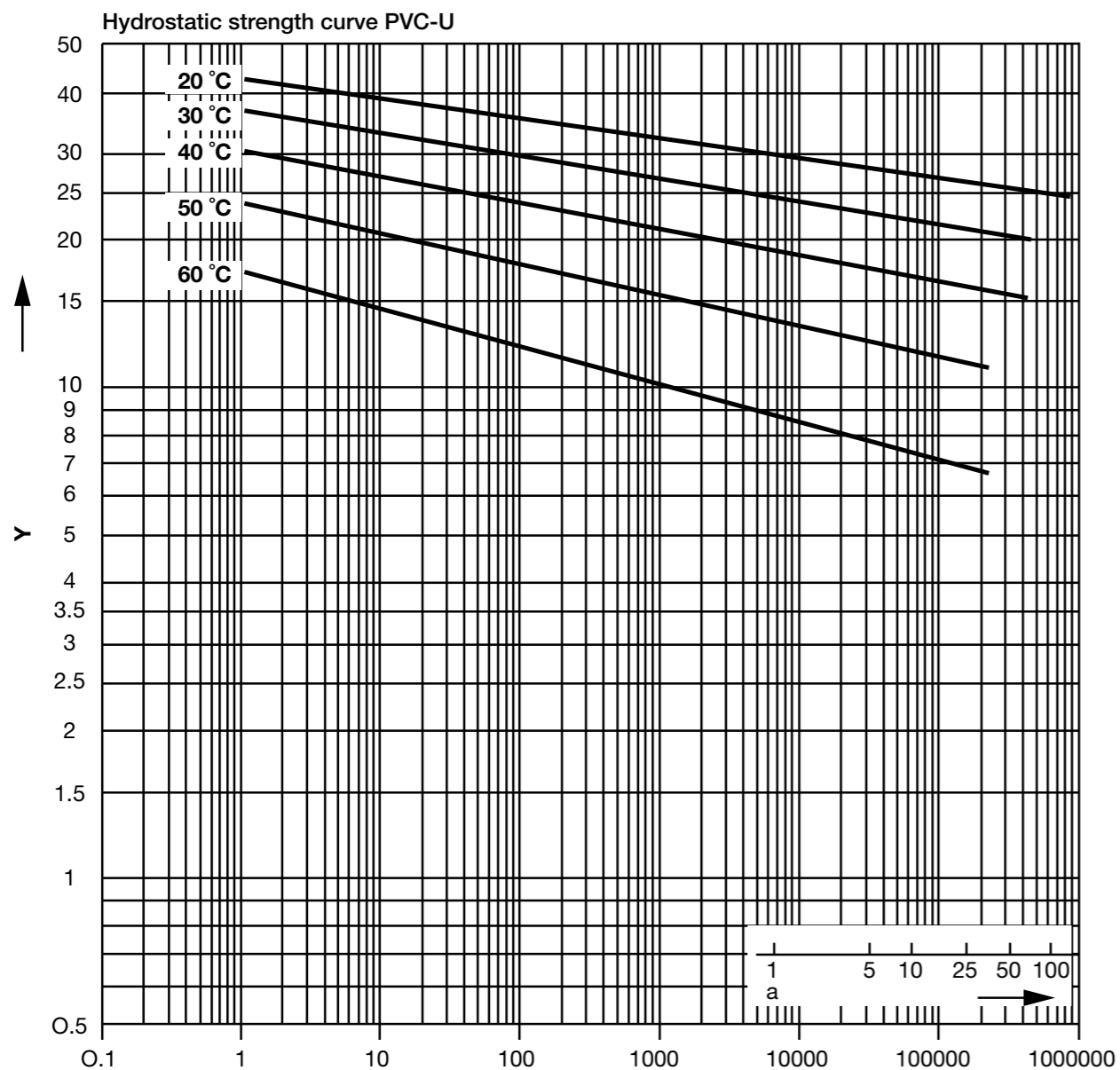
Curves are drawn at a pair of logarithmic scale (not linear). When you read tension or time values, please take this condition into account. Pressure/temperature diagram indicated for the pipes and fittings made of PVC-U material is obtained from included design factor and the hydrostatic strength diagram with a service life for 25 years.

Hydrostatic strength diagram is determined through extrapolation method pursuant to EN ISO 9080 standard. With the following formula, (4 parameter model) tension, temperature or heat may be calculated at temperature rates between 10°C–60°C.

$$\text{Log}t = -164.461 - 29349.493 \frac{\log \sigma}{T} + 60126.534 \frac{1}{T} + 75.079 \log \sigma$$

Wherein;

- t: Failure time, hour (h)
- T: Substance temperature in Kelvin
- σ : Environmental stress, MPa (1 MPa = 1 N/mm²)



PVC-U PRESSURE / TEMPERATURE DIAGRAM

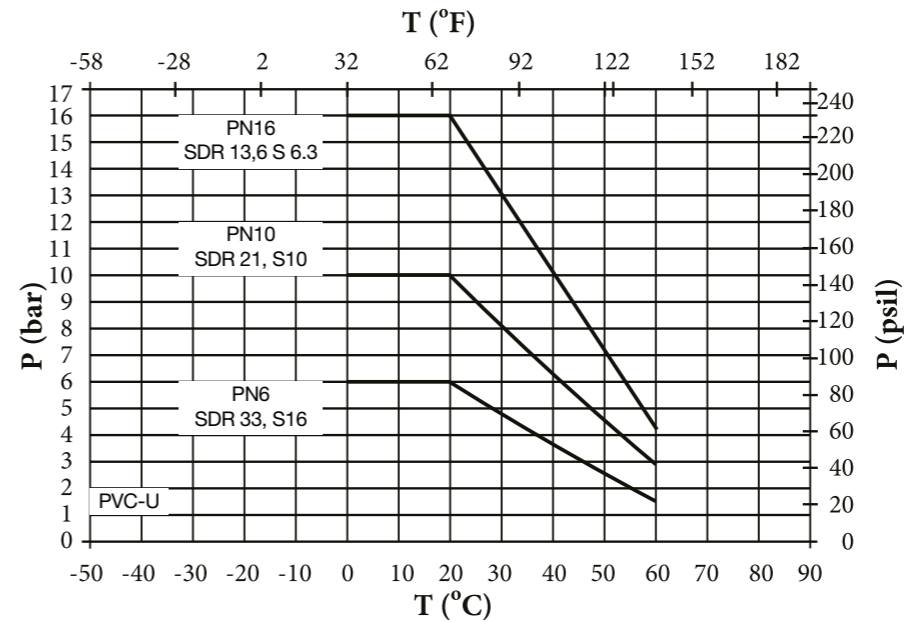
Following pressure/temperature diagram regarding PVC-U pipes and fittings is valid for a service life for 25 years.

Design factor at a value of 2,5, suggested by PIMTAŞ company, is used.

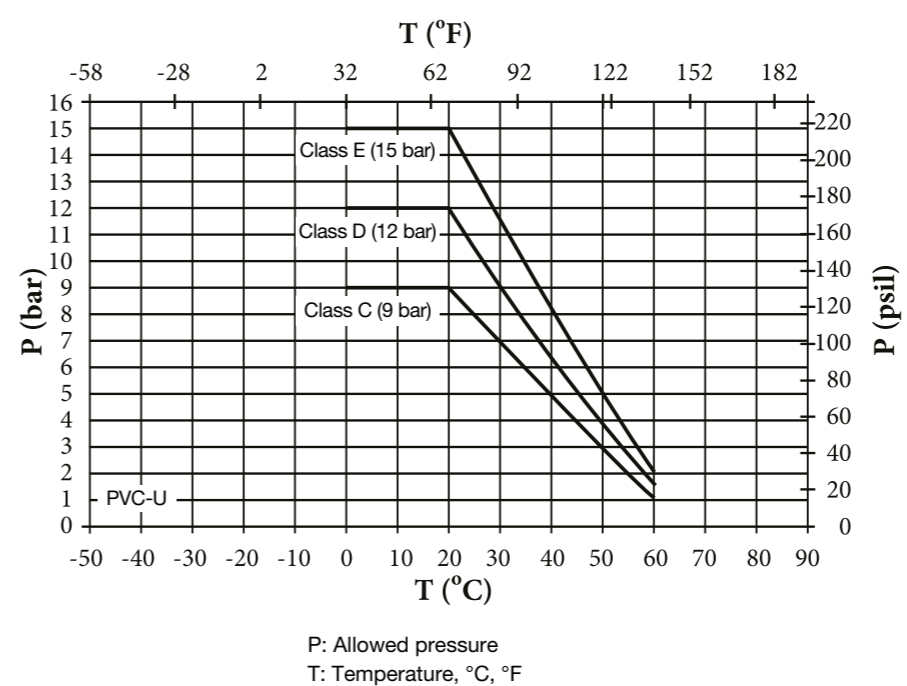
Water or substances similar to water, in other words, the ratio regarding the chemical resistance may be used for the substances without decrease factor.

Remarks: Please consider pressure/temperature diagrams for the valves and fittings. Due to the utilized construction and/or insulation material, there may be differences when compared to the pipes and fittings. These data are respectively available in related valve types and planning principles of special fittings.

Metric based systems



Inch based systems



Attention: PVC-U sealing weld fittings with sizes between 200–280 are designed and tested according to PN10 pressure.

Sizes between d315–d400 are designed and tested according to PN6 pressure. Experiences obtained in this respect and the tests indicate that pipes equal to, or bigger than d315 in size may be slightly oval. And this may result in a high sealing gap.

This is why, PIMTAŞ company suggests that pipes equal to, or bigger than d315 in size should be operated under 6 bar operating pressure. At the same time, please also see the specific information for these sizes in solution sealing instructions regarding PVC-U material.

ARE THE PRODUCTS, MADE OF PVC BAD FOR HEALTH ?

There isn't even a single report in which it is indicated that PVC products, which entered into our daily lives since 1950, results in cancer. Because, the only point to cause cancer in PVC raw material may be the survival of inert vinyl chloride monomers, in the quantities to thread human health, in the raw material as a result of failure of full polymerization process. However, today it is possible to constantly monitor the amount of inert vinyl chloride monomer within the raw material during the polymerization process thanks to the polymerization technology, carried out within closed reactors completely under control and polymerization process is continued until the rate of vinyl chloride monomer within the raw material decreases to the amount of 1 PPM (one in a million).

Products made of PVC are the leading among the plastic materials, approved by the laboratories, accredited with World Health Organization for the storage and transportation of foodstuff. Any and all containers and type materials in which the products such as surgery materials, used in medical field, are kept, are made of PVC. The reason why PVC raw material has a clean register regarding transmission of disease is that PVC material is neutral against drinking water and other liquids, that is to say it fails to react. Therefore, PVC raw material never releases any particulate in the water. Besides, it is known that chlorine is used as a microbicide in water disinfection.

Among the stabilizers, added in order to increase durability of the raw material after PVC raw material is produced, the use of Cadmium (Cd) and Lead (Pb) as stabilizers, which are kind of heavy metal materials that are considered unhealthy, is prohibited and such are no longer used today. Instead of these heavy metals, now Barium (Ba), Zinc (Zn), Calcium (Ca) and Tin (Sn) are used as stabilizer all over the world today. Tin (Sn) is used as stabilizer in the production of raw material, used by our company. Although PVC raw material is given in excessive dosages to mice for many years in order to determine whether or not PVC raw material leads to cancer, it was reported that no carcinogenic action is observed for lifelong.

DO THE PRODUCTS, MADE OF PVC POLLUTE ENVIRONMENT ?

U-PVC Raw material is the most environmentally-friendly material among all synthetic plastic materials due to the fact that either far less petrol is used for its production in comparison to other plastic raw materials or it requires far less energy for its production in comparison to others.

For instance, U-PVC raw material is the material that requires the least energy to be processed in all plastic raw materials as it can be seen in the following table. Because, the melting point of U-PVC is the lowest among other raw materials. Both far less energy and less process time is required in order to process U-PVC in comparison to other plastic materials. And this result in much lower cost of final product in PVC.

FACTORS TO AFFECT SERVICE LIFE OF U-PVC PIPE LINES

- 1.) It is essential that U-PVC pipes be manufactured with wall thicknesses, anticipated in applicable standards and no calcite be used more than 9% definitely during the production so that the pipes could ensure the service life and pressure resistance, anticipated in pipe line projects. Otherwise, the service life of pipes will decrease later on even if they pass the pressure test during delivery.
- 2.) The most important factor to affect the quality of the pipe line is its joining quality. Because, a pipe line leaks 70% through joint areas. In order to prevent this, it is essential that diameter difference of two pieces to be coupled shouldn't be more than 0.4 mm. Otherwise, the two pieces will engage each other lavishly and binding agent or O-Ring seal will not cover this space well and there will leakage in time at this point ultimately. As each company has its own production tolerance, it is possible that there occurs a space, which couldn't be covered by adhesive agent in the event that two products, manufactured by different companies are coupled. Therefore, it will be proper to supply the pipes and fittings from the same manufacturing company as far as possible.
- 3.) Any kind of plastic pipes have specific pros and cons. The most suitable pipe type is determined in consideration of several factors such as the structure of the land, traffic load, climate conditions, desired pressure resistance and ambient temperature degree. Because, the result will be definitely unfavorable if the type of the pipe is not proper for that project or land no matter how quality a pipe is produced.

ARE U-PVC PIPES FLAMMABLE AND DO THEY TRANSMIT FIRE ?

There is a fallacy that PVC raw material transfers fire upstairs and that it releases hydrochloric acid and dioxin during fire and thus it is dangerous. Namely; gases emerging with the fire in any fire type performs toxin emission based on the type of the burning material. During a fire, people are poisoned due to Carbon Monoxide (CO) revealed by incompletely burned products. As Carbon monoxide is an odorless and very poisonous substance, people become poisoned before they have realized the existence of carbon monoxide yet. However, PVC raw material immediately burns completely as its melting point is very low and HCL (Hydrochloric Acid) is released owing to burning of PVC. That is to say, Carbon Monoxide gas that leads to intoxication of people during the fire, does not arise out of burning of PVC raw material. Hydrochloric acid, emerging during the burning of PVC, is in fact a poisonous substance. However, people can perceive even if it is present in the environment in very little amounts such as 5 PPM as it has very strong odor and they get rid of getting poisoned immediately escaping from the environment. Thanks to this feature, this hydrochloric acid to emerge during the burning of PVC raw material, in fact, warns people as a forerunner of a fire.

As is known, there is 21% free oxygen in the air we breathe. Substances, which are flammable in an environment with oxygen amount less than 21% are classified as "FLAMMABLE" material. Whereas the self-ignition temperature for the wood is 280°C, PVC raw material is self-ignited at least 450 °C so that PVC raw material is self-ignited.

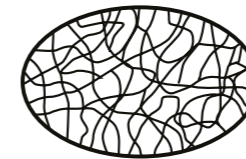
PVC raw material was determined as the plastic raw material with the lowest ignition capacity as CLASS V0 according to UL 94 flammable materials classification. Likewise, construction materials are separated into 2 groups as A (Non-flammable) and B (Flammable) based on their flammability characteristics according to DIN 4102 Standard.

While this standard indicates Polypropylene and Polyethylene materials in class B2 (normal flammable), it indicates PVC in class B1 (Flame Extinguisher Flame Retardant). Likewise, THE INSTITUTE CSI OF BOLLATE identifies the materials manufactured from U-PVC Raw material as self-extinguishing, i.e., bearing no-flame. When the wood is burned, it releases three-times more heat than U-PVC material; THAT IS TO SAY, PVC RAW MATERIAL IS NOT A FLAMMABLE AND FIRE INCREASING MATERIAL ON NO ACCOUNT.

As all materials manufactured from plastic, if PVC material is exposed to open flame, PVC material also takes fire. However, burning will immediately stop if you remove the flame. The reason of this is the release of Hydrochloride gas (MARINE ACID) when PVC is burned and it immediately stops burning thereby decreasing the amount of oxygen in fire area. Chlorine, which is the most available substance in PVC raw material is a non-flammable material. PVC raw material is definitely non-flammable if it isn't exposed to open flame directly. This is why, PVC pipes have no contribution to the transfer of fire upstairs, which take place at homes.

SERVICE LIVES OF U-PVC PIPES UNDER HEAVY CONDITIONS

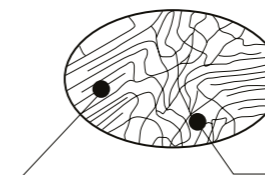
Pipes and fittings, manufactured from U-PVC resist to chemicals and heavy use and storage conditions very well. In the same way, they are not affected by standing under bad weather conditions, direct sunlight, rain and wind for a long time. Because, chemical structure of U-PVC raw material is amorphous. That is, U-PVC raw material consists of amorphous bonds. U-PVC doesn't have a crystal structure. That is to say, it is not brittle such as Polyethylene and Polypropylene. But, it has a crystalline structure at the rate of 80%. The more the crystal structure, the more brittle the product is, as it will lose its strength against the sun. Because, the molecules in the raw materials such as Polyethylene and Polypropylene are connected to each other with parallel ties when they remain under sunlight. As for U-PVC raw material, molecules are interconnected irregularly and amorphously and they do not have a crystalline structure. Therefore, it is more difficult to break U-PVC bonds than that of Polyethylene. Thus, pipes and fittings made of U-PVC raw material have much more strength life under the same conditions than Polyethylene and Polypropylene pipes. If the pipes manufactured from Polyethylene and Polypropylene are kept for a long time under the sunlight, crystallization continues and there occurs fissions on the pipe from end to end. This takes place due to crystal structure



The structure of U-PVC



Therefore, it is essential to add a substance at the rate of 2,5%, called as carbon black into the Polyethylene raw material in order to prevent crystallization under sunlight. In the event that pipes are made of polyethylene raw material into which carbon black is not added, these pipes will be cracked from end to end under sunlight. Nothing happens to U-PVC pipes under the same conditions.



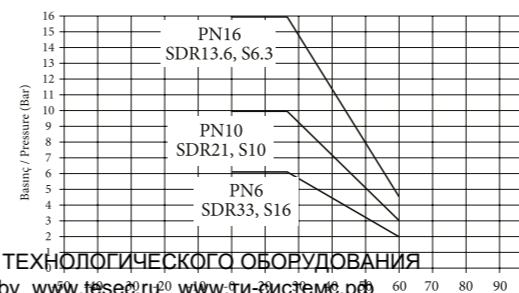
Crystalline structure of Polyethylene



Amorphous structure of PVC

As the temperature increases, pressure resistance of U-PVC pipes decreases. Following table indicates at which temperature will U-PVC pipes resist to which pressure for 25 years. For example, PVC pipe is able to resist to a pressure of 10 bars when the temperature increases up to 40°C, whereas it can withstand a pressure of 16 bars at 20°C for 25 years.

MRS value indicates how much bar of pressure a pipe can withstand at 20°C for 50 years. While the Polyethylene pipes have a MRS value of 10MPa and Polypropylene pipes have a MRS value of 8MPa, U-PVC pipes have a MRS value of 25MPa. Namely, U-PVC pipes resist to much higher pressure under the same diameter and wall thickness as well as the same utilization temperature than Polyethylene and Polypropylene pipes. As can be seen from the table, U-PVC pipes can withstand even very high acid concentrations. Adjacent concentrations are those that can be resisted at 20 °C. As the temperature of acid increases, strength/resistance of U-PVC pipes may vary.



4-1С) УСТОЙЧИВОСТЬ К ВОЗДЕЙСТВИЮ ХИМИЧЕСКИХ ВЕЩЕСТВ

ТАБЛИЦА СТОЙКОСТИ ТРУБ ИЗ ПВХ К ВОЗДЕЙСТВИЮ ХИМИЧЕСКИХ ВЕЩЕСТВ

Как видно из следующей таблицы, трубы из ПВХ обладают очень хорошей прочностью по отношению ко многим химическим веществам и почти ко всем кислотам. Информация о прочности, приведенная в следующей таблице, применима к температуре 20°C. Трубы из U-образного ПВХ могут вести себя по-разному при более высоких температурах. Информацию о состоянии прочности труб из ПВХ по отношению к другим химическим веществам и при более высоких температурах можно получить у компании.

Название химического вещества	Использование при температуре 20 ° C		Использование при температуре 40 ° C	
	Dayanıklı (Resistant)	Dayanısız (Irresistant)	Dayanıklı (Resistant)	Dayanısız (Irresistant)
Aniline	Dayanısız (Irresistant)	☹️	Dayanısız (Irresistant)	☹️
Arsenic Asit (Up To %80 Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Aseton	Dayanısız (Irresistant)	☹️	Dayanısız (Irresistant)	☹️
Barium Salts (Saturated)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Beer (Commercial form)	Dayanıklı (Resistant)	😊		
Benzoic Acid	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Gasoline (Fuel)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Borax (Ageous)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Boric Acid (Ageous)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Butanol	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Calcium Hydroxide (Sturated)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Calcium Salts	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Carbonic Acid	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Caustic Soda (NaOH) (50% Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Citric Acid	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Chloric Acid (Up To %20 Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Chlorine Gas	Dayanısız (Irresistant)	☹️		
Chloroform	Dayanısız (Irresistant)	☹️		
Compressed Air With Oil	Dayanısız (Irresistant)	☹️	Dayanısız (Irresistant)	☹️
Copper Salts	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Diesel Feul (Commercial Form)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Ethyl Alcohol (%96 Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Formic Acid (Up To %50 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Freon 12 Gas	Dayanıklı (Resistant)	😊		
Fruit Juice	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Fuel Oil	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Glucose	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Hexane	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Hydrochloric Acid (Up To %38 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊

КИСЛОТОСТОЙКОСТЬ ТРУБ ИЗ ПВХ	
Средний	Концентрация до 5
Серная кислота	≤ 70 % H2SO4
Смесь хромовой и серной кислот	≤ 70 % H2SO4 + K2Cr207 / Na2Cr201
Хромовая кислота	≤ 10 % CrO3
Соляная кислота	≤ 25% HCl
Азотная кислота	≤ 20 % HNO3
Гипохлорит натрия (гипохлорит калия)	≤ 6 % NaOCl
Перекись водорода	≤ 5 % H2O2
Hydrofluoric Acid	≤ 0 % HF

Название химического вещества	Использование при температуре 20 ° C		Использование при температуре 40 ° C	
	Dayanıklı (Resistant)	Dayanısız (Irresistant)	Dayanıklı (Resistant)	Dayanısız (Irresistant)
Hydrogen Peroxide (Up To 90 % Conc.)	Dayanıklı (Resistant)	😊		
Lactic Acid (% 10 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Sınırlı Dayanıklı (Medium Resistant)	☹️
Methane - Doğal Gaz (Natural Gas)	Dayanıklı (Resistant)	😊		
Methanol	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Milk (Süt)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Mineral Water (Maden Suyu)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Naphtaline	Dayanısız (Irresistant)	☹️		
Nitric Acid (HNO3) (% 6,3 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Nitric Acid (HNO3) (% 25 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Nitric Acid (HNO3) (% 65 Aqueous Conc.)	Sınırlı Dayanıklı (Medium Resistant)	☹️	Sınırlı Dayanıklı (Medium Resistant)	☹️
Nitric Acid (HNO3) (More Than % 85 Aqueous Conc.)	Dayanısız (Irresistant)	☹️		
Olive Oil	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Phosphoric Acid (Up To % 95 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Phthalic Acid (Saturated)	Dayanıklı (Resistant)	😊	Sınırlı Dayanıklı (Medium Resistant)	☹️
Potassium Hydroxide (% 50 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Propane (Gaseous And Liquid)	Dayanıklı (Resistant)	😊		
Salisilic Acid (Saturated)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Sea Water	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Starch (Nişasta) (Aqueous Solution)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Sulphuric Acid (Up To % 98 Aqueous Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Toluene	Dayanısız (Irresistant)	☹️		
Urea (Up To % 30 Conc.)	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Urine	Dayanıklı (Resistant)	😊	Dayanıklı (Resistant)	😊
Xylene	Dayanısız (Irresistant)	☹️		

2-4) PP

2-4 A) TECHNICAL SPECIFICATIONS

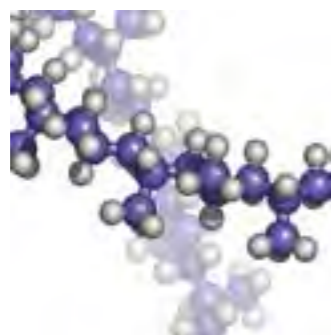
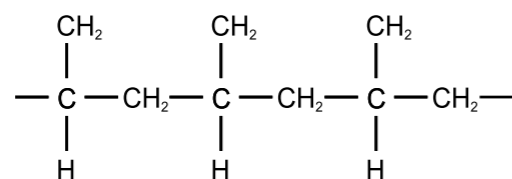
POLYPROPYLENE RAW MATERIAL GENERAL

Polypropylene is a natural white color material, obtained through polymerization (i.e., obtaining larger molecules through butt splice of molecules) of propylene molecules, acquired from 'Naphtha' substance, which is one of the derivatives of crude oil. As derivatives, obtained from crude oil, is used at the rate of 97% on average in its production, availability and price status is directly based on world's raw crude oil reserves and prices. In other words, polypropylene will also finish when petrol is over in the world. It is possible to make improvements on physical characteristics of polypropylene raw material such as hardness, heat resistance and brittleness thereby placing ethylene molecules inside polypropylene molecules as a result of a range of mixed chemical operations so that it is fit for different usage area and purposes. For instance, it is ensured that ethylene molecules at the rate of 1/7 is placed into propylene molecules through reaction of propylene gas with ethylene gas in a reactor under very special conditions. Percentage of this included ethylene and their position of placement between propylene molecules determine the physical properties of obtained material. In this way, a raw material, which is resistant to very high pressure and very high temperatures, is obtained. Today, it is possible to use containers manufactured from propylene in cooking ovens at 120°C.

The biggest advantage of polypropylene raw material, which is more expensive than other plastic materials is that it can be safely used in high temperatures and pressures for very long years (i.e., 50 years).

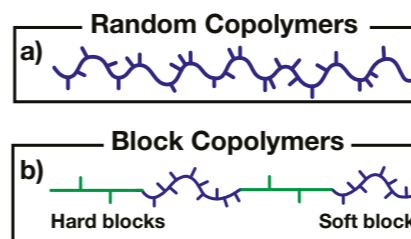
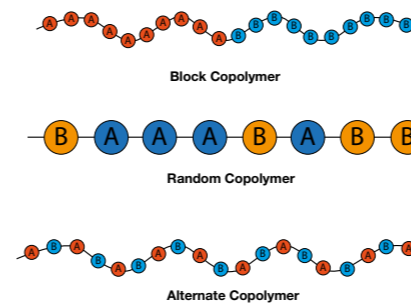
Now, there are 3 kinds of Polypropylene raw materials, used in our daily lives.

1. Polypropylene Homopolymer (is produced from propylene molecules only). As there is no ethylene additive, it is very soft. It is used for the production of materials such as carrier bag, nylon and bags.
2. Polypropylene Bloc Copolymer (is the raw material, ethylene percentage of which is up to 3% It is not very resistant to heat. It can be used in the production of plastic materials that can be utilized in cold water transmission lines only.)
3. Polypropylene Random Copolymer (is a raw material, ethylene percentage of which is between 3-7%. They are safely used in the areas where very high temperature and pressure resistance is required, they can be used in water transmission at high temperatures such as 90 °C.



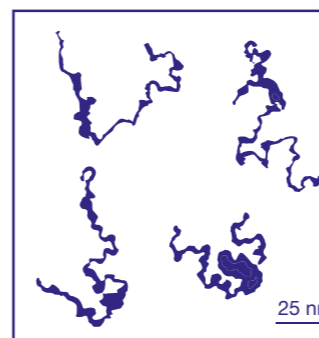
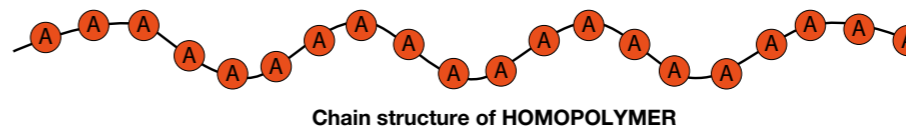
WHAT IS COPOLYMER ?

We had learned that plastic raw materials are produced through POLYMERIZATION process of single sort of MONOMERS with the same type and characteristics. As for COPOLYMERS, these are the POLYMERS, obtained through combination of 2 or more different MONOMERS. For instance, ABS raw material is obtained through the combination of 3 MONOMERS (i.e., acrylonitrile + butadiene + styrene).



1) HOMOPOLYMER PP-H TYPE 1

Polymer materials, which are produced from SINGLE SORT OF MONOMER ONLY, are called HOMOPOLYMER. They are obtained only through the reaction of propylene. As homopolymer PP becomes brittle in low temperatures, they are not preferred in low temperature applications. This kind of PP is a material, inflation molding. HPP has a wide range of usage area in the manufacture of parts such as packaging tape, parts of vacuum cleaner, toys, marking pen, TV case, bumper, wheel parts, petrol tank, cassette, bottle cover, switch and electrical sockets. Due to the fact that it can preserve desired characteristics only up to 0 °C, standard PP film (PP homopolymer) is rarely utilized in packaging applications.

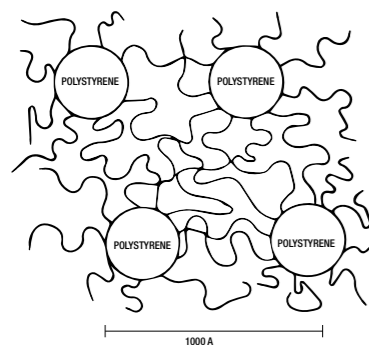


View of HOMOPOLYMER in electron microscope

2) BLOC COPOLYMER PP-B TIP 2

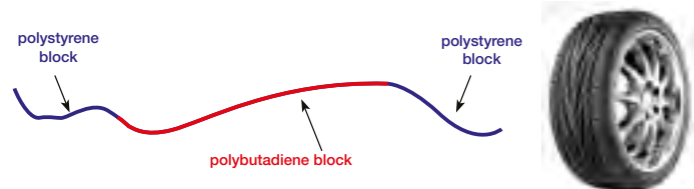
The kind of COPOLYMER, obtained through assembly of another or a few MONOMER in BLOCKS to a current POLYMER. If 2 kinds of monomer are blocked into the main chain, it is called as DIBLOCK COPOLYMER, and it is called as TRIBLOCK copolymer if 3 different kinds of monomer blocks are added to the main chain. Ethylene-propylene copolymer is preferably used due to features such as resistance to lower temperatures, better thermal stability and thermal resistance as well as good welding properties. Production with injection molding for frozen products, Usage as "heat sealing" layer in containers and sterilizable packaging materials;

Manufacture of tray and cups which can be sterilized with vapor and heated in microwave, can be listed among the typical applications of ethylene-propylene copolymer Multi-layered bottles and boxes, including multi-layered barrier layer that contains a barrier layer fit for sterilization in autoclave and availability of hot filling are the recent developments. Amount of ETHYLENE monomer within bloc copolymer is much more than %6. (PP Random Copolymer contains %6 ETHYLENE MONOMER). Therefore, PP Bloc copolymer is much harder than normal PP homopolymer and it has far better impact resistance even in low temperatures. The only disadvantage is that they are not CLEAR and TRANSPARENT.



SYMBOLIC MOLECULE STRUCTURE OF BLOC COPOLYMER

Car tire is one of the most commonly used BLOC COPOLYMER products in daily life. Poly (styrene-butadiene-styrene), or SBS namely is used in the manufacture of materials such as car tires or soles where durability and frictional resistance is important.



For Polypropylene, it is named as bloc copolymer PP-B. Produced through the assembly of %3 ETHYL MONOMER in blocks into Main PROPYL chain.

3) RANDOM COPOLYMER;

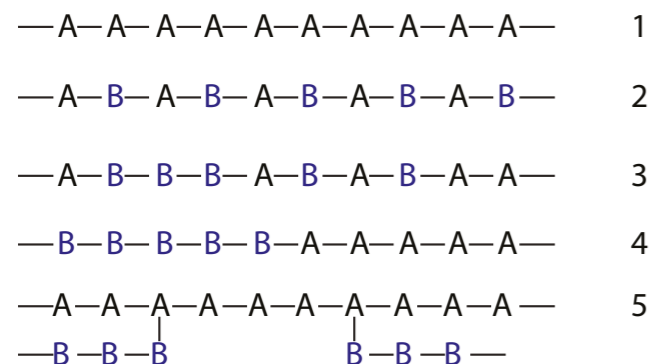
Obtained through random bonding of another MONOMER to the molecule chain of a MONOMER.

For example; PP-RC

Here, it is obtained through assembly of ETHYLENE monomer at the rate of approximately %6 onto molecule chain of PROPYLENE monomer randomly. Addition of ETHYLENE monomers into polymer chain prevents crystallization tendency and thus it is ensured that the material has a better impact resistance, a softer appearance, a better heat resistance, a better fracture resistance and better clarity. For example, at 23 °C, while it is 103 KJ/m² for PP homopolymer the same value is 180 KJ/m² for PP-Random copolymer.

Material Type	Description	Range of Density g/cm ³	Molecule Structure
PP-H	PP-Type 1 (Homopolymer)	0,905-0,915	P-P-P-P-P-P-P-P-P-P-P-P-P-P-P-P
PP-B	PP-Type 2 (Block Copolymer)	0,900-0,910	P-P-E-E-P-P-P-P-E-E-P-P-P-P-E
PP-R	PP-Type 3 (RandomCopolymer)	0,900-0,910	P-P-E-P-P-P-E-E-P-P-P-E-P-P-E-P

MOLECULE CHAIN STRUCTURES OF SEVERAL TYPES OF POLYMERS



MOST COMMON RANDOM COPOLYMER: ARE THE PIPE AND FITTINGS MADE OF POLYPROPYLENE RANDOM COPOLYMER (PP-RC).

4-2 B) LONG TERM BEHAVIOUR CHARACTERISTICS OF POLYPROPYLENE

Calculation (pursuant to EN ISO 15494:2003)

In the following chart, long term behavior of PP-H, PP-B and PP-R materials are indicated. Rupture lines for temperature rates between 10°C - 110°C are indicated. These are shown as LPL curves (Low-Predictable Limit). Based on the definition, this refers to the fact that %97,5 of all break points are within or on the curves.

Typically there are no pipe bends indicated in hydrostatic strength diagram for amorphous thermoplastics such as polypropylene.

Curves are drawn at a pair of logarithmic scale (not linear). When you read tension or time rates, please take this condition into account.

Pressure/temperature diagram indicated for the pipes and fittings made of PP-H and PP-R material is obtained from included design factor and the hydrostatic strength diagram with a service life for 25 years.

Hydrostatic strength diagram is determined through extrapolation method pursuant to EN ISO 9080 standard. With the following formula (-4parameter model) stress, temperature or time may be calculated at temperature rates between 10°C - 95°C.

In the event that tests with longer testing periods are performed at 95°,90° and 110°C , dotted lines of the curves shall apply.

Attention: 110°C curve was determined separately using the water inside and air outside and obtained through the values of following equations.

The first section (the part on the left of the curves, indicated in the following figures):

PP-H:
 $\log t = -46.364 - 9601.1 \frac{\log \sigma}{T} + 20381.5 \frac{1}{T} + 15.24 \log \sigma$

PP-B:
 $\log t = -56.086 - 10157.8 \frac{\log \sigma}{T} + 23971.7 \frac{1}{T} + 13.32 \log \sigma$

PP-R:
 $\log t = 55.725 - 9484.1 \frac{\log \sigma}{T} + 25502.2 \frac{1}{T} + 6.39 \log \sigma$

The second section (the part on the right of the curves, indicated in the following figures):

PP-H:
 $\log t = 18.387 + 8918.5 \frac{1}{T} + 4.1 \log \sigma$

PP-B:
 $\log t = -13.699 - 6970.3 \frac{1}{T} + 3.82 \log \sigma$

PP-R:
 $\log t = 19.98 + 9507 \frac{1}{T} + 4.11 \log \sigma$

PRESSURE/HEAT DIAGRAM REGARDING POLYPROPYLENE

Beta PP-H 100 - Beta Polypropylene Homopolymer Color RAL 7032 Gray

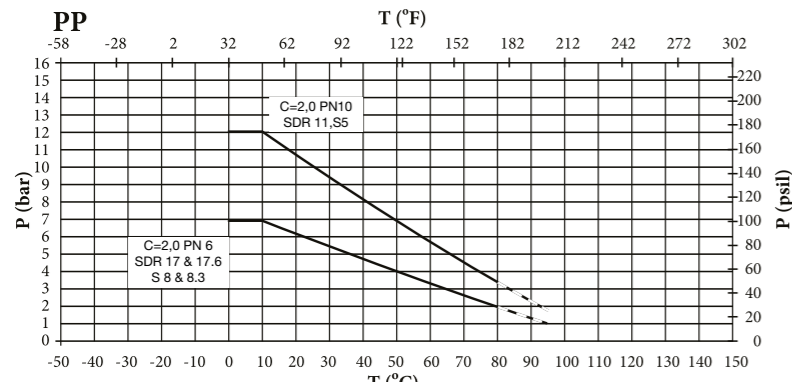
Following pressure/temperature diagram regarding Polypropylene pipes and fittings is valid for a service life of 25 years.

PIMTAŞ suggests the design factor as 2.0.

Water or substances similar to water, in other words, the ratio regarding the chemical resistance may be used for the substances without decrease factor.

Remarks: Please consider pressure/temperature diagrams for the valves and fittings. Due to the utilized construction and/or insulation material, there may be differences when compared to the pipes and fittings. These data are respectively available in related valve types and planning principles of special fittings.

Pressure/temperature diagram regarding Polypropylene pipes and fittings with injection molding

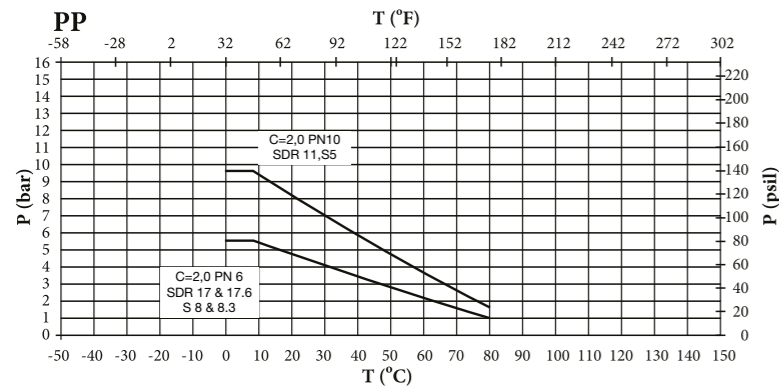


P: Allowed pressure
T: Temperature, °C, °F

For the applications, temperatures of which are within the range indicated with dashed lines, please contact your PIMTAŞ representative.

Pressure/Temperature diagram for fittings welded with polypropylene piece

Part welded fittings has a 0,8 decrease factor in allowed operating pressure.



P: Allowed pressure
T: Temperature, °C, °F

POLYPROPYLENE RANDOM COPOLYMER NATURAL

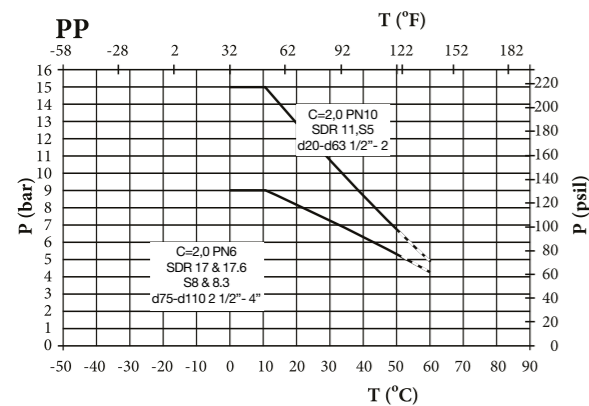
Following pressure/Temperature diagram for natural pipes and fittings is valid for a service life of 25 years.

A design factor at the rate of 2, suggested by PIMTAŞ factory is used.

Water or substances similar to water, in other words, the ratio regarding the chemical resistance may be used for the substances without decrease factor.

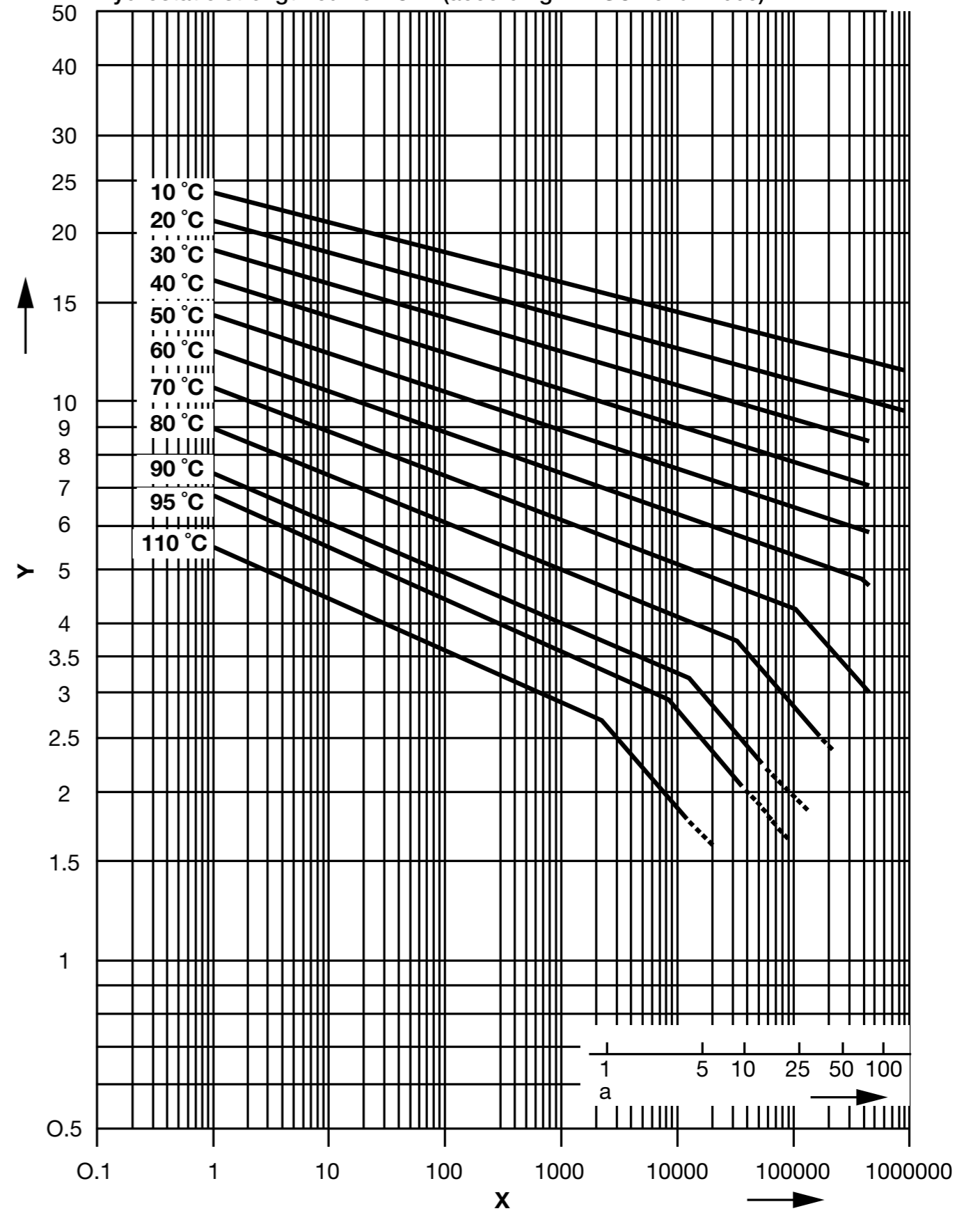
Remarks: Please consider pressure/temperature diagrams for the valves and fittings. Due to the utilized construction and/or insulation material, there may be differences when compared to the pipes and fittings. These data are respectively available in related valve types and planning principles of special fittings.

Remarks: The use of Polypropylene Random Copolymer Natural material at higher temperatures may result in color fading in the material.

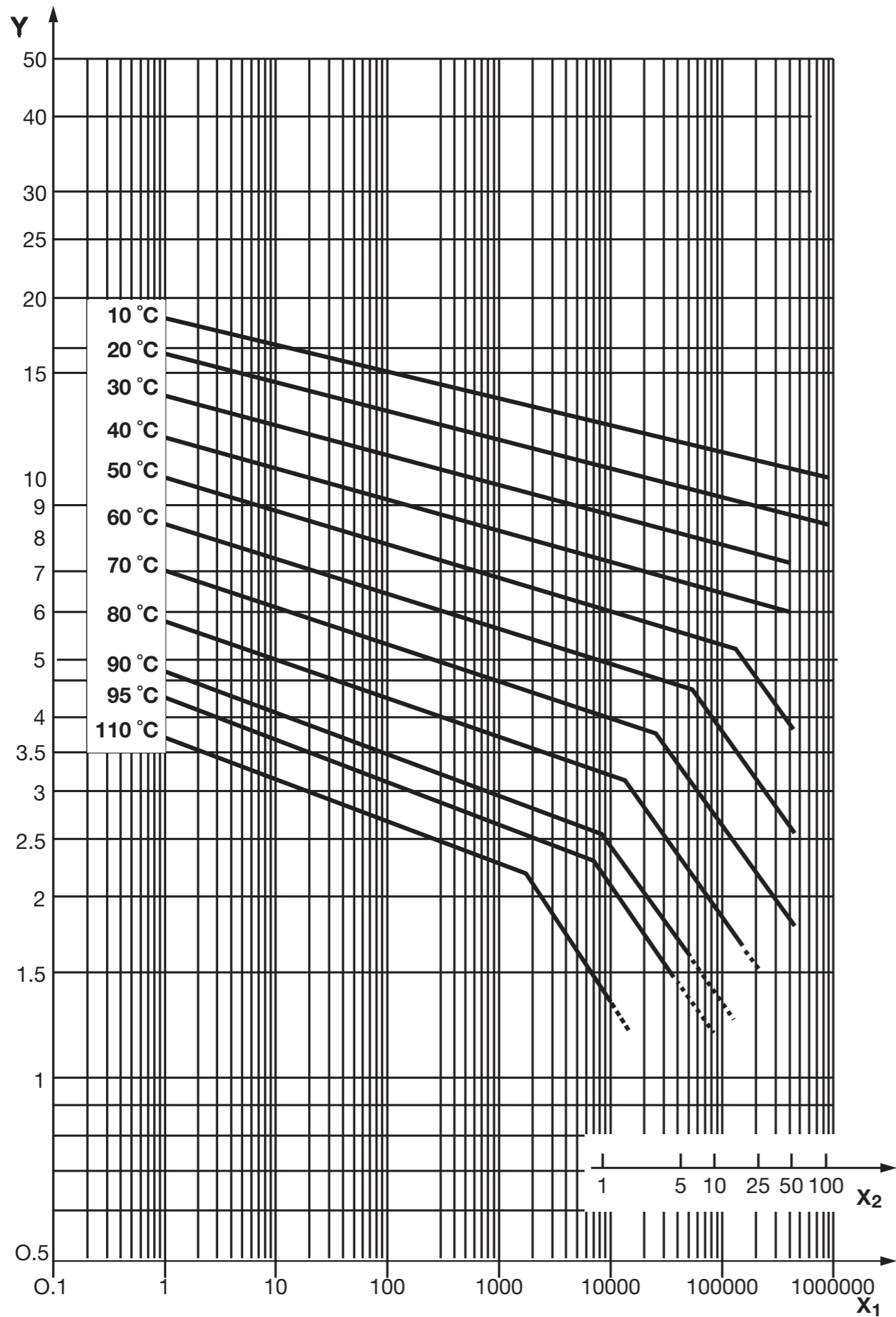


P: Allowed pressure
T: Temperature, °C, °

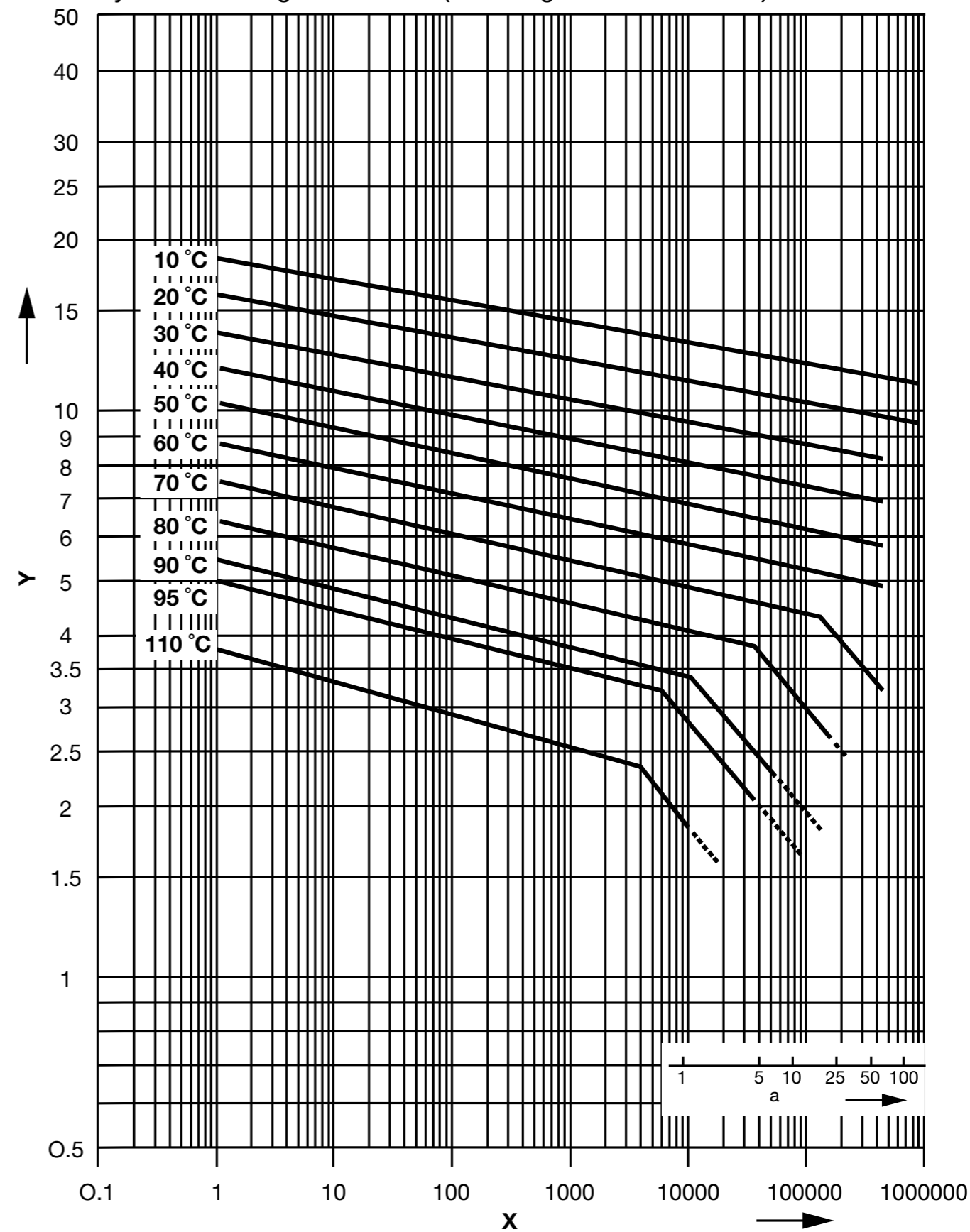
Hydrostatic strength curve PO-H (according EN ISO 15494:2003)



Hydrostatic strength curve PP-B (According EN ISO 15494:2003)



Hydrostatic strength curve PP-R (according EN ISO 15494:2003)



4-2C) RESISTANCE TO PP CHEMICALS

Resistance degree of polypropylene raw material to some acids and chemicals

Application Temperature

Kimyasalın Adı Name of Chemical	20°C	40°C	IMPORTANT WARNING
Benzin Yakıtı (Gasoline -Fuel)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	Products, manufactured from polypropylene can withstand high temperatures. However, it may shorten the service life of these pipes to expose them to high pressures at high temperatures constantly. Furthermore, it is not suggested to use the products, made of polypropylene at temperatures more than 400 C in drinking water pipelines in terms of health aspects although they have a hygiene certificate. It is more proper to use polypropylene pipes in waste water and heating water conduction.
Benzoic Acid	Sınırlı Dayanıklı (Medium Resistant)	Dayaniksız (Irresistant)	
Bira / Beer	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Ethanol	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Formic Acid	Dayaniksız (Irresistant)	Dayaniksız (Irresistant)	
Hydrochloric Acid (HCL) % 20	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Üre (Urea)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Calcium Hydroxide	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Calcium Chloride	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Lactic Acid	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Dizel Yakıtı (Diesel Fuel)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Meyva Suyu (Fruit Juice)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Nitric Acid	Sınırlı Dayanıklı (Medium Resistant)	Dayaniksız (Irresistant)	
Oleic Acid	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Pamuk Yağı (Cotton Oil)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Sirke (Vinegar)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Citric Acid	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Sodium Hydroxide	Sınırlı Dayanıklı (Medium Resistant)	Dayaniksız (Irresistant)	
Tuzlu Çözelti (Sodium Chloride)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Sulphuric Acid	Sınırlı Dayanıklı (Medium Resistant)	Dayaniksız (Irresistant)	
Süt (Milk)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	
Zeytin Yağı (Olive Oil)	Dayanıklı (Resistant)	Dayanıklı (Resistant)	

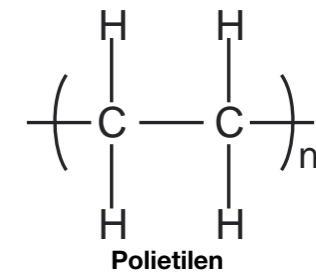
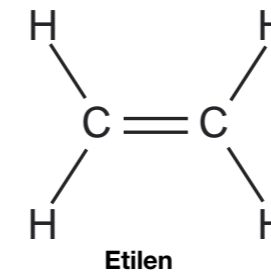
4-3) HDPE

4-3A) TECHNICAL SPECIFICATIONS POLYETHYLENE (PE)

Polyethylene was first synthesized in 1930s. Afterwards, polyethylene types for different applications were developed using several process methods and crystal systems. The first applications of PE were that of military purposes. Its military usage in many areas such as coating underground pipes and radar insulation provided a significant advantage in World War II.

Polyethylene is a thermoplastic that is used in a wide range of products. It is named after ethylene in the form of monomer, polyethylene is produced by using ethylene. In plastic industry it is generally referred to as PE briefly. In fact, Ethylene molecule C_2H_4 consists of two CH₂ bonded with double bonds (CH=CH). Production type of polyethylene becomes $-(CH_2-CH_2)_n-$ with polymerization of ethylene. Polymerization method may take place through radical polymerization, anionic polymerization, ion coordination polymerization and cationic polymerization methods. Each of these methods provides different types of polyethylene production.

While polyethylene was produced only with low densities beforehand, it was advanced and three recent polyethylene types, e.g., high density, linear, medium density were included in the family. Each of the four polyethylene types contains monomer ethylene and different structures of polymer molecule result in emergence of these three recent types. Different branching conditions of chain-formed macro molecules to create polymer molecule ensure polyethylene diversity. For example, branching is little if any in linear low density polyethylene, a little more in high density and much more in middle density polyethylene. That low branching is long or short has also an impact on the characteristics of polymer. All of these four types of polyethylene are the basic polymeric materials of industry and they have very different fields of use.



CLASSIFICATION OF POLYETHYLENE

Based on density and chemical characteristics, Polyethylene is classified in several categories. Mechanical properties are based on molecular weight, crystal structure and the type of branching.

- UHMWPE (Ultra Yüksek Moleküler Ağırlıklı PE) (Ultra High Molecular Weight PE)
- HDPE (Yüksek Yoğunluklu PE) (High Density PE)
- HDXLPE (Yüksek Yoğunluklu Çapraz Bağlı PE) (High Density Cross-Linked PE)
- PEX (Çapraz Bağlı PE) (Cross-Linked PE)
- MDPE (Orta Yoğunluklu PE) (Medium Density PE)
- LDPE (Düşük Yoğunluklu PE) (Low Density PE)
- LLDPE (Lineer Bağlı Düşük Yoğunluklu PE) (Linear Low Density PE)
- ULDPE (Çok Düşük Yoğunluklu PE) (Very Low Density PE)

SPECIFICATIONS

General characteristic features of Polyethylenes are as follows:

- Durable
- Resistant to acid, base and solvents
- Superior dielectric features
- Resistant environmental conditions
- Easy to process

Branching in polymer chain determines the degree of crystallization. In linear and high density polyethylene, branching is very little and molecule structure is linear. In molecule structures with less branching, crystallinity is generally much more. As the crystallinity within the polymer increases, hardness also increases, mechanical and chemical properties improves and strength against gases and liquids increase. The best characteristic to identify Polymers is the average molecular weight of that polymer. Average molecular weight is identified approximately with melting index. Melting index is inversely proportional to the weight of molecule. Hardness and durability of PEs with high molecular weight is more, melting flow indexes (MFI) are lower. As part of the rule, applicable to all polymers in general, high molecular weight corresponds to low melting flow index. Molecular weight of polymers is measured by means of Gel Permeation Chromatography (GPC) device. This device is one of the latest products of technology and it is very special to operate. Following chemical substances are added into polyethylenes by melting through mixture method under pressure in order to improve the properties of polyethylene and increase its strength and stability against some influences.

Antioxidants: This kind of chemical substances are generally phenolic and divided into two groups as primary and secondary antioxidants. Primary antioxidants, in other words; radical extinguishers neutralize the radicals released upon disintegration of macromolecules during the heating of polymer, and prevent their growth. And secondary antioxidants break up the hydroxy peroxides to emerge following the disintegration of polymer in aerobic environment and prevents continuation of degradation. Mixtures of these two oxidants in different rates ensure that polymer be resistant to degradation for a long time, which is called synergistic effect. In the event that phenolic antioxidant is above 500 ppm in the polymer, yellowing problem takes place especially in the areas without lighting during storage.

UV stability providers: Ultraviolet section of sunlight has an impact on any kind of carbon-carbon bonds and result in break up of such bond making such bond weak within time. In order to prevent this, chemical substances, which cools this influence of sun before the polymer, are placed inside the polymer. These chemical substances are divided into two main groups as UV absorber and UV quencher. Furthermore, the mixtures of these two groups to show synergistic influence are used in order to increase UV stability. UV additives are generally three types, e.g., benzophenone, nickel quencher and HALS. Foregoing substances or the mixtures of these in different combinations are the kinds of additives, currently used in industry. The substances, known as HALS, are recent products and they are chemically called as Hindered Amine Light Stabilizers. HALSs are today very common and produced by many companies. On the other hand, colored pigments do also have a significant impact on prevention of UV. Carbon black, in particular, is widely used to increase strength of polymer against the sun.

Lubricant and anti-blockers: Amines of fatty acids (i.e., stearic acid, oleic acid, erucic acid) are used as lubricant and inorganic compounds including more than 90% silicon dioxide are used as anti-blocker. In anti-blocking additives, the distribution of particle size and oil absorption of the substance is very important. Oil absorption is important in anti-blockers used together with lubricants. Although their features differ according to types; good-strength against outer environmental conditions and vapor, flexibility, poor mechanical force and top chemical strength are among the general characteristics. They have a wide range of usage areas such as containers, plastic boxes, kitchen utensils, coatings, pipe and tubes, toys, dielectric layers in the cables, packaging packaging film and they are low-cost.

Raw materials used in manufacture of polyethylene pipes and fittings are classified with MRS (Minimum Required Strength). MRS refers to the strength value of a material against internal pressure for 50 years at 20 C°.

Materials are classified as follows according to MRS:

- PE 63 MRS Value: 6,3MPa
- PE80 MRS Value: 8,0MPa
- PE100 MRS Value: 10,0MPa

In PE Piping systems, safety coefficient is determined based on the category of the raw material and condition of the pipe line and all calculations are made according to this coefficient.

Safety coefficient for natural gas lines is taken as C=2.0.

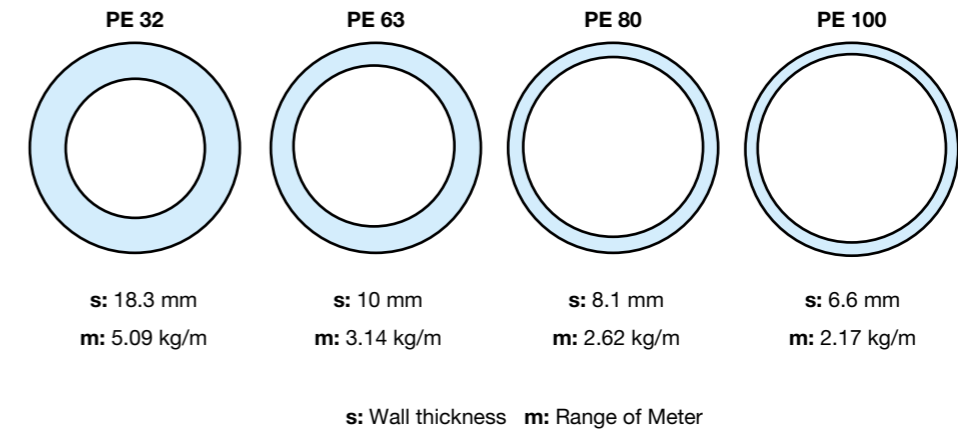
Safety coefficient for drinking water supply pipeline is taken as C=1.25.

Classification of Coefficient C

- PE Cmin=1.25
- PP Cmin=1.6
- PVC Cmin=2.0

As the density of PE material increases, mechanical strength rates also increase. Since a pipe with the same operating pressure is manufactured from different raw materials, decrease in wall thickness is as follows.

In the event that a pipe with an outer diameter of 110 mm and an operating pressure of 10 bars is manufactured from PE 32, PE 63, PE 80 and PE 100 raw materials, wall thicknesses and weights of such will be based on the following data.



Standard Diameter Ratio SDR	Pipe Series 5	PN (Bar) Material Category		
		PE 40	PE 80	PE 100
41	20		3.2	4
33	16		4	5
27.6	13.3			6
26	12.5	2.5	5	6.4
22	10.5		6	
21	10	3.2	6.3	8
17.6	8.3			
17	8	4	8	10
13.6	6.3	5	10	12.5
11	5		12.5	16
9	4	8	16	20
7.4	3.2	10	20	25
6	2.5		25	32

s: Pipe Series = (SDR-1)/2 SDR: Outer Diameter / Wall Thickness PN: Nominal Pressure

POLYETHYLENE (PE 100)

Advances in technology ensured that significant developments be experienced in plastic raw material production as well. Developed in 1950s, low density polyethylene (PE -32LDPE) was first used in drinking water pipes. Afterwards, usage in systems not requiring high pressure was applied successfully following the development of PE 63 raw material. PE producers made PE 80 raw material available as the 2nd generation following PE 63. Thus, PE 80 raw material was also started to be used in drinking water and natural gas networks with high performance. And the 3rd-generation PE 100 raw material, developed in early 1999, delivered both a high performance and an economic solution regarding the utilization area in drinking, domestic water and natural gas networks. The biggest advantage of PE 100 is that it has a strong tensile strength and safety coefficient. For instance, allowed operating pressure of the pipe, manufactured from PE 80 based on SDR11 is 0 bars, operating pressure of the pipe, manufactured from PE 100 raw material is 16 bars. That is to say, pipes produced with PE 100 enables operation under higher pressures with lower wall thicknesses. While the product quality increases in the pipes produced with PE 100, at the same time, material saving up to 30% and economical saving is ensured.

Polyethylene is divided as unimodal and bimodal based on molecular weight distribution. PE 100 is a bimodal polyethylene. It is essential that a quality polyethylene with improved mechanical properties should have high molecular weight. If the polyethylene raw material fails to have required amount of high molecular weight, it will not be possible to process this material well. And this will result in the fact that produced PE pipe lacks desired mechanical properties and strength. High strength and mechanical properties required to be held by a Polyethylene pipe may only be ensured through bimodal polyethylene raw material (i.e., PE 100). Bimodal polyethylene is obtained through the mixture of two different molecular weights to ensure these two features. In bimodal molecular structure, long polymer chains to ensure durability of the pipe as well as short polymer chains to ensure easy processing characteristic for the product are properly and optimally available in a polymer particle. Moreover, combination of long and short chains ensures high tensile force and high strength against slow crack growth for PE 100.

CHARACTERISTICS OF PE PIPE AND FITTINGS

- Polyethylene 100 pipes are not affected from earthquake because of their elastic structure. Absorbs elongation in land-slide areas
- Maintains elasticity characteristics up to 40°C degrees
- Polyethylene 100 pipes may be used on the work site as tube coils.
- High strength against chemicals. Non-corrosive.
- High abrasive strength. Impenetrable. Furthermore, it has no carcinogenic impact since molecule penetration to fluid is beside the point.
- No corrosion occurs due to the fluid inside and structure of the soil outside.
- 8 times lighter than steel as its density is low.
- It is possible to carry out coupling operation outside the channel and then place into the channel.
- Resistance to water-hammer
- PE pipes may operate without any problem under operating pressure at least for 50 years.
- PE pipes ensures %100 sealing thanks to coupling methods. No assembly wastage
- PE pipes do not change the odor and taste of the water, therefore they are sanitary.
- High impact resistance in low temperatures.
- Easy to handle
- Resistance to abrasion due to weather conditions
- Resistance to UV lights.
- Resistance to cracks and impacts.
- No need for cathodic protection.
- Availability of more than one welding methods, are among the advantages of PE pipes and fittings.

Table 1: Specifications of PE 100

SPECIFICATION	PE 100	UNIT	STANDARD
PHYSICAL PROPERTIES			
Density	0.955	g/cm ³	ISO 1183
Viscosity Number	360	cm ³ /g	ISO 1628 -3
Melt Glow Rate (190 0C/5 kg)	0,20 -0,60	g/10 min	ISO 1133
MECHANICAL PROPERTIES			
Yield Strength	>22	MPa	ISO 527
Yield Strain	9	%	ISO 527
Elongation At Break Point	>600	%	ISO 527
Tensile Modulus	900	MPa	ISO 527
Charpy Impact Resistance (Notched) +23 C	26	kJ/m ²	ISO 179/1eA
Charpy Impact Resistance (Notched) -20 0C	13	kJ/m ²	ISO 179/1eA
OTHER PROPERTIES			
Oxygen Induction Time (OIT) (210 0C)	≥ 20	min	ISO TR10837
Carbon Black Ratio	2 -2,3	%	ISO 6964
Carbon Black Dispersion	≤ 3		ISO 18553
MRS (Minimum Required Strength)	>10	MPa	ISO TR 9080
Resistance To Slow Crack Growth 4,6 MPa 80 0C Notched	>3000	Hour	EN ISO 13479
Linear Expansion Coefficient	1,8x10 ⁻⁴	C ⁻¹	ASTM D 696 (20-60 ⁰ C)
Specific Heat	1.9	J/gC	BPLC
Thermal Conductivity	0.38	W/mC0	DIN 52612
Inflammability Class	B2	-	DIN 4102
ELECTRICAL PROPERTIES			
Electrical Resistance	>20	kV/mm	BS 2782:201 B
Volume Resistivity	>10 ¹³	m	BS 2782:230 A
Surface Resistance	>10 ¹⁵	-	BS 2782:231 A
Relative Permeability	2.6	-	BS 2067

Table 1: Specifications of PE 100

ABRASION RESISTANCE

Due to rather low friction coefficient, Polyethylene provides greater advantages than other types of pipes in which abrasive slurries are carried. Usage areas and laboratory tests indicate that PE' performance exceeded the performance of metallic pipes. Their flexibility, lightness and easy installation make PE pipes an ideal selection for abrasive slurry applications. External impact of abrasive filling materials on PE is rather insignificant. If the pipe is damaged with a sharp object or the cut or hollow pipe exceeds 10 of wall thickness, the damaged part must be cut and removed and replaced.

THERMAL CHARACTERISTICS

PE pipes may be used between 50- °C and 60+ °C. Higher temperatures decrease the hardness and tensile force of the material. As all other thermoplastics, PE proves a larger thermal expansion than that of metals. PE has a linear thermal expansion coefficient of 0,2-0,15 mm/mK and this rate is 1.5 times higher than that of PVC. Thermal conductivity of PE is 0,38 w/ mK and PE piping systems are more economic due to this resistivity feature in comparison to metal systems such as copper metal systems.

BURNING BEHAVIOR

Due to non-polar nature just as hydrocarbons with high molecular weight, PE has a high strength against chemical wastes. It is not possible to decay, corrode PE through chemical or electrical reactions, or decrease the mechanical property therewith. PE shows high chemical resistance to acids, alkaline solutions, solvents, alcohol and water and low chemical resistance to oxidized acids, ketones, aromatic hydrocarbons and cloned hydrocarbons. Although the degree of chemical resistance is based on the concentration, temperature and operating pressure of the chemical, these three specifications determine the service life of the pipe.

In the following table (Table 2), resistance of polyethylene at 23°C and 60°C to several chemicals are indicated. +, /, and - symbol in the Table respectively indicates that polyethylene is resistant, limited resistant and not resistant to chemical.

Usage areas of PE Pipes					
	PE 40 HDPE	PE 63 HDPE	PE 80 HDPE	PE 80 HDPE	PE 100 HDPE
Drinking Water Pipe Lines		•	•	•	•
Pressurized Irrigation Pipe Lines		•	•	•	•
Main Supply Subscriber Connection Applications	•	•	•	•	•
Hydroelectric Power Plants			•	•	•
Gas Lines			•	•	•
Treatment Plants Pipe Line			•	•	•
Drinking Water Treatment Plant			•	-	-
Swimming Pool Pipe Line			•	-	-
Cooling Water Pipe Line			•	-	-
Pressurized Air Lines	•	-	-	-	-
Pipe Line for Solid Substances		•	-	-	-
Sheathed Geothermal Heating Pipes			•	-	-
Cable Regulator Pipe			•	-	-
Sewage Pipe Lines			•	-	-
Cable Regulator Pipe			•	-	-
Sewage Pipe Lines			•	-	-
Solid Waste Coal Gas Discharge Line			•	-	-
Solid Waste Drainage Line			•	-	-
Sea Discharge Line			•	-	-
Sea Discharge Application			•	-	-
Fish Farm application		•	-	-	-

4B) LONG TERM BEHAVIOR OF POLYETHYLENE

Pressure/Temperature diagram for Polyethylene

PE 100

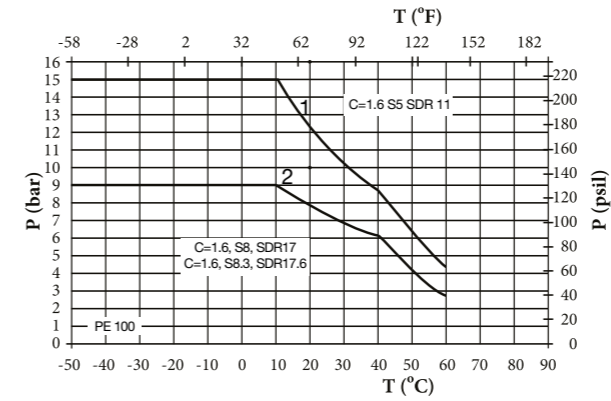
Following pressure/temperature diagram for PE 100 pipes and fittings is valid for a service life for 25 years.

Suggested by PIMTAŞ company, 1,6 design factor (1,25) is used.

Water or substances similar to water, in other words, the ratio regarding the chemical resistance may be used for the substances without decrease factor.

Remarks: Please consider pressure/temperature diagrams for the valves and fittings. Due to the utilized construction and/or insulation material, there may be differences when compared to the pipes and fittings. These data are respectively available in related valve types and planning principles of special fittings.

For long term applications at temperatures over 40°C and under constant pressure, please contact your PIMTAŞ representative.



1: Design Factor C = 1,25, S5, 20°C for water SDR11, 50 years

2: Design Factor C = 1,25C=1.25, S8.3, SDR17.6 and S8,20°C for water SDR17, 50 years.

P:Allowed pressure, bar, psi

T:Temperature, °C, °F

PE 80

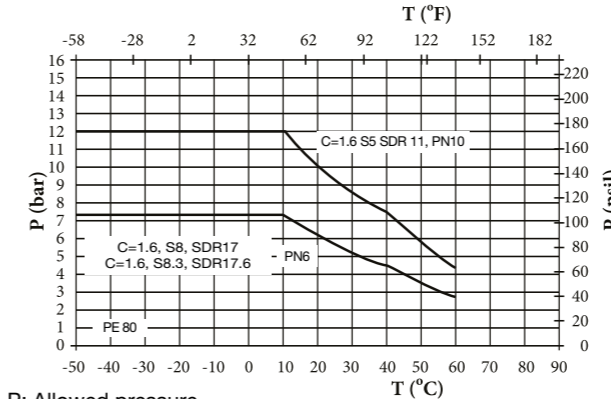
Following pressure/temperature diagram for PE 80 pipes and fittings is valid for a service life for 25 years.

Suggested by PIMTAŞ company, 1,6 design factor (1,25) is used.

Water or substances similar to water, in other words, the ratio regarding the chemical resistance may be used for the substances without decrease factor.

Remarks: Please consider pressure/temperature diagrams for the valves and fittings. Due to the utilized construction and/or insulation material, there may be differences when compared to the pipes and fittings. These data are respectively available in related valve types and planning principles of special fittings.

For long term applications at temperatures more than 40°C and under constant pressure, please contact your PIMTAŞ representative.



P: Allowed pressure

T: Temperature, °C,

Nominal Pressure comparison for SDR17 and SDR17.6

Determination of nominal pressure (PN)

According to the standard, nominal pressure refers to a nominal measurement of the piece size of a pipe line. And this refers to the mechanical properties of such pipe piece.

As well as geometrical sizes such as SDR, yield strength, sizing strength and minimum design factor are also taken into consideration.

In piping systems, designed for carrying water, nominal pressure rate indicates maximum allowed operating pressure in bar at °20C and in water for 50 years. And this refers to minimum value of total (calculation) coefficients. It is calculated through the following equation:

$$[PN] = 10 \cdot \sigma S/[S] = 20 \cdot \sigma S/- \text{ as } / (\text{SDR1-}) (\sigma \text{SMPa, PN}$$

PN bar)

Minimum Required Strength (MRS):

In water at 20°C and for 50 years, σ_{LCL} value was rounded to the next number in RIO standard numbers series. It is understood that σ_{LCL} value refers to a specified equivalent stress for a period and temperature from a time-independent flow chart. LCL refers to Low Confidence Limit. R10

standard number series is a Renard standard numbers series according to ISO 3 and ISO 497 standard.

Design stress (σ_S):

refers to allowed stress for a certain application or operating conditions, which are referred to as mega pascal. It is obtained by dividing required minimum strength with C coefficient and calculated through the following formula:

$$\sigma_S = MRS / C$$

The calculated value is rounded up to the next value in R10 standard numbers series.

Total operating (calculation) coefficient (C):

Refers to a total coefficient which is higher than one and that considers both the operating conditions and characteristics of pipe constituent that haven't been included in low confidence limit (σ_{LCL}) yet.

If the foregoing identification is used in order to calculate the nominal pressure for both of the SDR category, the result regarding a PE 100 pipe will be as follows:

SDR17

MRS = 10 MPa

C = 1,25 (minimum factor)

$\sigma_S = 8,0$ MPa

PN = 10 bar SDR17.6

MRS = 10 MPa

C = 1,25 (minimum factor)

$\sigma_S = 8,0$ MPa

PN = 9,6 bar

In this way, foregoing definitions create a 0,4 bar difference at nominal pressure (PN), however this will not create a problem in real practice as stated below:

1) Industrial pipe lines are normally designed for a service life of 25 years. If we determine - from time independent flow charts for ELTEX TUB 121 and CRP 100 at operating point of 25 years and at 20°C - an equivalent σ_{LCL} stress, it would be possible to obtain a stress at the rate of 10,6 MPa (minimum value for both of the PE 100 materials based on the data of manufacturer).

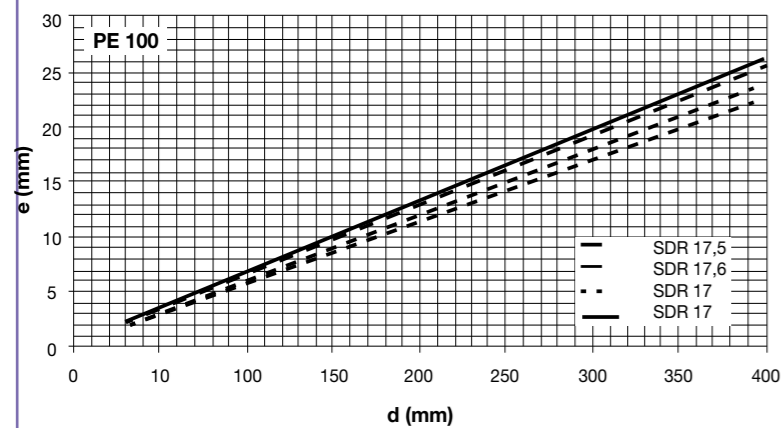
2) If this stress is used in order to calculate σ_S dimensioning stress and this value is not rounded up, 8,48 MPa value is obtained.

3) Therefore, real nominal pressure in the application would be as follows: For SDR 17 =>PN = 10,6 bar, for SDR 17.6 =>PN = 10,2 bar.

To sum up, both of the SDR categories comply with the conditions regarding the industrial applications to identify a PN10 system.

Comparison of geometrical dimensions

As can be seen in the following table, two SDR categories differ only a little in terms of wall thickness. And this indicates that wall thickness is an area, which complies with the conditions of both SDR categories.

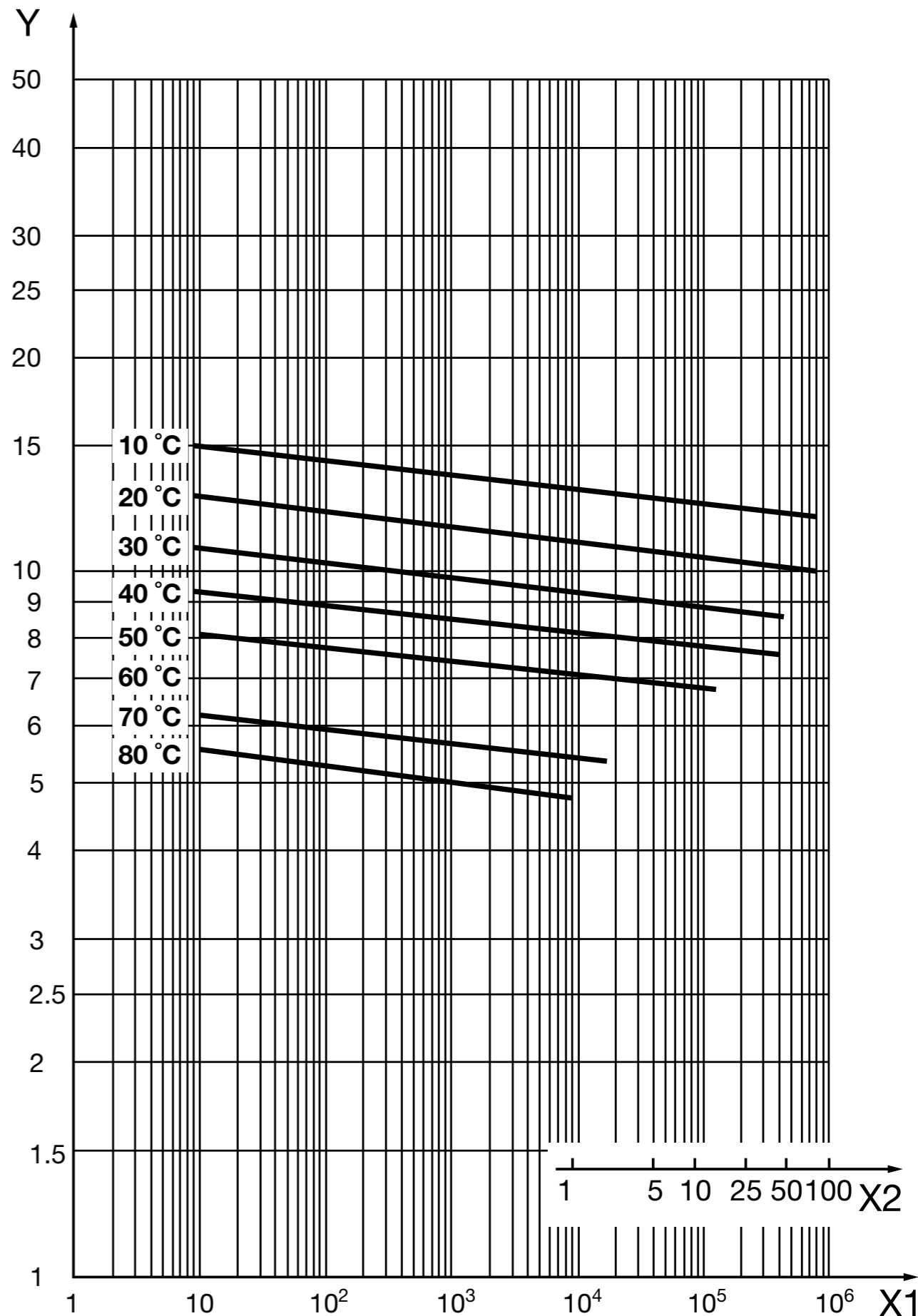


d: External pipe diameter

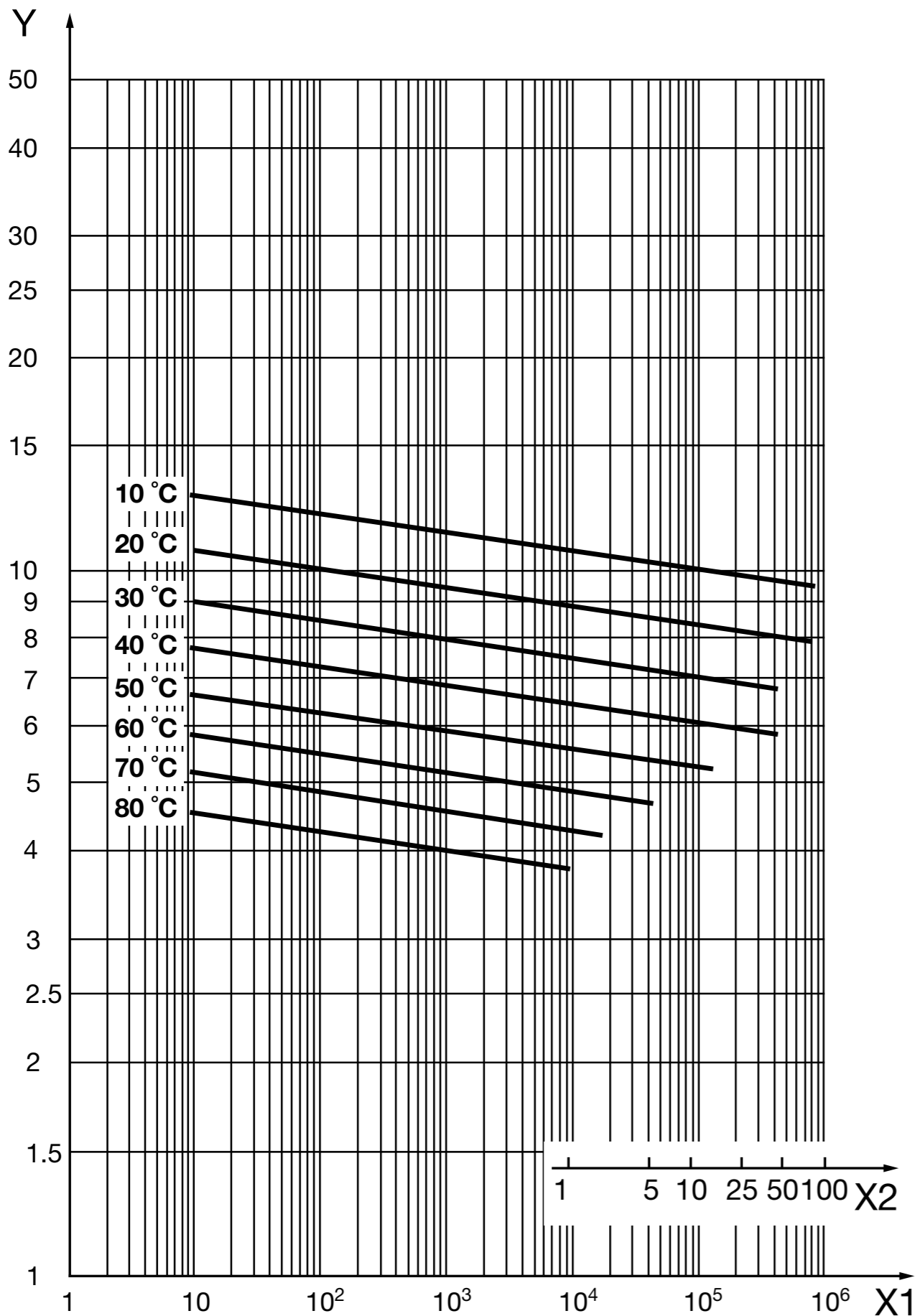
e: Wall thickness

The space for the wall thickness is not allowed to exceed %10 in butt fusion. When it comes to the differences of wall thicknesses in SDR17 and SDR17.6 categories, obtained space is much lower. And this means that butt fusion of both SDR categories is not a problem.

Hydrostatic strength curve PE100 (EN ISO 15494:2003)



Hydrostatic strength curve PE100 (EN ISO 15494:2003)



SERVICE LIFE STRENGTH

PE 100 PIPES

PRESSURE - TEMPERATURE - SERVICE LIFE TABLE FOR PE 100 PIPES

Temperature (°C)	Operation Time (YEAR)	SDR									
		41	33	21	17	13.6	11	9	7.4	6	
		PIPE SERIES S									
		20	16	10	8	6.3	5	4	3.2	2.5	
		PN									
4	5	8	10	12.5	16	20	25	32			
OPERATING PRESSURE (BAR)											
10	5	5.0	6.3	10.1	12.6	15.7	20.7	25.2	31.5	40.4	
	10	4.9	6.2	9.9	12.4	15.5	19.8	24.8	31.0	39.7	
	25	4.8	6.0	9.8	12.1	15.1	19.3	24.2	30.2	38.0	
	50	4.7	5.9	9.5	11.9	14.8	19.0	23.8	29.7	38.0	
	100	4.6	5.8	9.3	11.6	14.6	18.7	23.3	29.2	37.4	
20	5	4.2	5.3	8.4	10.6	13.2	18.9	21.2	28.5	33.9	
	10	4.1	5.2	8.3	10.4	13.0	16.6	20.8	28.0	33.3	
	25	4.0	5.0	8.1	10.1	12.7	16.2	20.3	25.0	32.5	
	50	4.0	5.0	8.0	10.0	12.5	16.0	20.0	24.5	32.0	
	100	3.9	4.9	7.8	9.6	12.2	15.7	18.6	22.5	31.4	
30	5	3.8	4.5	7.2	9.0	11.2	14.4	18.0	22.5	28.8	
	10	3.5	4.4	7.0	8.8	11.0	14.1	17.7	22.1	28.3	
	25	3.4	4.3	6.9	8.6	10.8	13.8	17.2	21.6	27.6	
	50	3.3	4.2	6.7	8.4	10.6	13.5	16.9	21.2	27.1	
	100	3.2	4.1	6.6	8.3	10.5	13.4	16.8	21.1	27.0	
40	5	3.0	3.0	6.1	7.7	9.6	12.3	15.4	19.3	24.7	
	10	3.0	3.8	6.0	7.6	9.5	12.1	15.2	19.0	24.3	
	25	2.9	3.7	5.9	7.4	9.2	11.8	14.8	18.5	23.7	
	50	2.9	3.6	5.8	7.2	9.1	11.6	14.5	18.2	23.3	
	100	2.8	3.5	5.7	7.1	9.0	11.5	14.4	18.1	23.2	
50	5	2.6	3.3	5.3	6.7	8.3	10.7	13.4	16.7	21.4	
	10	2.6	3.2	5.2	6.5	8.1	10.4	13.0	17.7	20.3	
	15	2.3	2.9	4.7	5.9	7.4	9.5	11.8	14.8	19.0	
60	5	1.9	2.4	3.8	4.6	6.0	7.7	9.7	21.1	15.5	
70	2	1.5	1.5	3.1	3.9	4.9	6.2	7.8	9.8	12.5	

PRESSURE REDUCTION COEFFICIENTS BASED ON TEMPERATURE

Design of PE piping system was carried out according to 20 °C. Max. operating temperature is 40 °C. However, pipe selection should be made using the adjacent coefficients if a constant operation over 20 °C is anticipated.

It is possible to make interpolation for interim temperatures. Allowed operating temperature (PFA) is calculated through the following equation.

$PFA = fT \times fA \times PN$

fT: Pressure Reduction Coefficient

fA: Application Dependant (In water conduction fA= 1), Decrease factor (or Increase factor)

PN: Nominal Pressure

PE 80 PIPES

PRESSURE - TEMPERATURE - SERVICE LIFE TABLE FOR PE 80 PIPES

Temperature (°C)	Operation Time (YEAR)	SDR								
		41	26	22	17	13.6	11	9	7.4	6
		PIPE SERIES S								
		20	12.5	10.5	8	6.3	5	4	3.2	2.5
		PN								
OPERATING PRESSURE (BAR)										
		3.2	5	6	8	10	12.5	16	20	25
10	5	4.0	6.3	7.5	10.1	12.6	15.8	20.2	25.3	31.6
	10	3.9	6.2	7.4	9.9	12.4	15.5	19.8	24.8	30.3
	25	3.8	6.0	7.2	9.7	12.1	15.1	19.4	24.2	30.3
	50	3.8	5.9	7.1	9.5	11.9	14.8	19.0	23.8	29.7
	100	3.7	5.8	7.0	9.3	11.6	14.6	18.7	23.3	29.2
20	5	3.4	5.3	6.3	8.5	10.6	13.2	17.0	21.2	26.5
	10	3.3	5.2	6.2	8.3	10.4	13.0	16.7	20.8	26.0
	25	3.2	5.0	6.1	8.1	10.1	12.7	16.2	20.3	25.4
	50	3.2	5.0	6.0	8.0	10.0	12.5	16.0	20.0	25.0
	100	3.1	4.9	5.8	7.8	9.8	12.2	15.7	19.6	24.5
30	5	2.8	4.5	5.4	7.2	9.0	11.2	14.4	18.0	22.5
	10	2.8	4.4	5.3	7.0	8.8	11.0	14.1	17.7	22.1
	25	2.7	4.3	5.1	6.9	8.6	10.8	13.8	17.3	21.6
	50	2.7	4.2	5.0	6.7	8.4	10.6	13.5	16.9	21.2
40	5	2.4	3.9	4.6	6.2	7.7	9.6	12.4	15.5	19.3
	10	2.4	3.8	4.5	6.0	7.6	9.5	12.1	15.2	19.0
	25	2.3	3.7	4.4	5.9	7.4	9.2	11.8	14.8	18.5
	50	2.3	3.6	4.3	5.8	7.2	9.1	11.6	14.5	18.2
50	5	2.1	3.3	4.0	5.3	6.7	8.4	10.7	13.4	16.8
	10	2.0	3.2	3.8	5.1	6.4	8.1	10.3	12.9	16.2
	15	1.8	2.8	3.4	4.5	5.7	7.1	9.1	11.4	14.3
60	5	1.4	2.2	2.7	3.6	4.5	5.6	7.2	9.0	11.3
70	2	1.1	1.7	2.0	2.7	3.4	4.3	5.5	6.9	8.7

Pressure Reduction Coefficients Based on Temperature

Design of PE piping system was performed according to 20 °C. Max. operating temperature is 40 °C. However, pipe selection should be made using the adjacent coefficients if a constant operation over 20 °C is anticipated.

It is possible to make interpolation for interim temperatures.

Allowed operating pressure (PFA) is calculated through the following equation.

$$PFA = fT \times fA \times PN$$

fT: Pressure Reduction Coefficient

fA: Application Dependant (In water conduction fA=1), Decrease factor (or Increase factor)

PN: Nominal Pressure

4-3-C) CHEMICAL RESISTANCE

Due to non-polar nature just as hydrocarbons with high molecular weight, PE has a high strength against chemical wastes. It is not possible to decay, corrode PE through chemical or electrical reactions, or decrease the mechanical property therewith. PE shows high chemical resistance to acids, alkaline solutions, solvents, alcohol and water and low chemical resistance to oxidized acids, ketones, aromatic hydrocarbons and chlorinated hydrocarbons. Although the degree of chemical resistance is based on the concentration, temperature and operating pressure of the chemical, these three specifications determine the service life of the pipe.

In the following table (Table 2) resistance of polyethylene at 23°C and 60°C to several chemicals is indicated. +, /, and - symbol in the Table respectively indicates that polyethylene is resistant, limited resistant and not resistant to chemical.

Name of Chemical	% Concentration	23°C	60°C
Acetic acid	100	+	+
Acetic anhydride	100	.	.
Acetone	100	.	+
Accumulator acid	38	+	+
Aluminum salt, aq.	Sat	+	+
Ammonia, aq	Sat	+	+
Ammonium salts, aq,	100	+	+
Amyl alcohol	100	+	+
Aniline	50	+	+
Antifreeze glycol	100	+	/
Asphalt	Sat	+	+
Barium salts, aq.	100	+	+
Benzaldehyde	100	/	-
Benzene	100	+	/
Benzine	100	+	/
Benzine, normal	100	/	-
Benzine, super	Sat	+	+
Benzoic acid, aq.	Sat	+	+
Bone oil	100	+	+
Borax, aq.	100	+	+
Boric acid, aq.	Sat	+	+
Break fluid	100	-	+
Bromine	100	-	-
Bromine water	Sat	+	-
Butane, liquid	Sat	+	-
Butyl acelate	100	+	/
Butyl alcohol, -n	100	+	+
Calcium salts, aq.	Sat	/	+
Carbon disulphide	100	/	-
Carbon tetrachloride	100	+	-
Carbonic acid, aq.	Sat	+	+
Caustic potash solution	50	/	+
Chlorobenzene	100	/	-
Chlorine water	Sat	-	-
Chlorine, liquid	100	/	-
Chloroform	100	-	-
Chlorosulfonic acid	100	+	-
Chromic Acid	20	+	+
Chromium salts, aq	Sat	+	+
Chromiumtrioxide, aq.	Sat	+	-
Copper (III) -salts, aq.	Sat	+	+
Cresol, aq.	Sat	+	/
Cumolhydroperoxide	70	+	-
Cyclohexane	100	+	+
Cyclohexanole	100	+	+

Table 2 : Resistance of polyethylene against chemicals

Name of Chemical	% Concentration	23 ⁰ C	60 ⁰ C
Cyclohexanone	100	+	/
Decahydronaphthalene	100	.	-
Detergents, aq.	10	.	+
Dibutylphthalate	100	+	/
Dibutylsebacate	100	+	/
Diesel oil	100	+	/
Diethylether	100	+	
Dihexylphthalate	100	+	+
Diisononylphthalate	100	+	+
Dimethylformamide	100	+	+
Dinonyladipate	100	+	
Diocyladipate	100	+	
Diocylphthalate	100	+	+
Dioxane, -1,4	100	+	+
Ethanol	96	+	+
Ethanol amine	100	+	+
Ethyl hexanol, -2	100	+	
Ethyl-2-hexane acid	100	+	
Ethyl-2-hexane acid chloride	100	+	
Ethyl-2-hexyl chloroformiat	100	+	
Ethylacetate	100	+	/
Ethylbenzene	100	/	-
Ethylchloride	100	/	
Ethylene chlorhydrin	100	+	+
Ethylene chloride	100	/	/
Ethylene daimine tetraacetic acid, aq.	Sat	+	+
Ethylglykolacetate	100	+	
Fatty acids > C6	100	+	/
Ferrous salt, aq.	Sat	+	+
Floor polish	100	+	/
Fluoride, aq.	Sat	+	+
Fluosilicic acid	100	+	+
Formaldehyde, aq.	Sat	+	+
Formalin	32	+	+
Formic acid	40	+	+
Frigen 11	Com	/	
Fuel Oil	98	+	/
Furfuryl alcohol	100	+	/
Glycerine	100	+	+
Glycerine, aq.	100	+	+
Glycol	100	+	+
Glycol acid	70	+	+
Glycol, aq.	50	+	+
Heptane	100	+	/
Heafluosilicic acid, aq.	Sat	+	+
Hexane	100	+	+
Humic acids, aq.	1	+	+
Hydrazine, aq.	Sat	+	+
Hydriodic acid, aq.	Sat	+	
Hydrochinone, aq.		+	
Hidrochloric acig	38	+	+

Table 2 : Resistance of polyethylene against chemicals

Name of Chemical	%-Concentration	23 ⁰ C	60 ⁰ C
Hydrochloric acid	10	+	+
Hydrofluoric acid	40	+	+
Hydrofluoric acid	70	+	/
Hydrogen peroxide	30	+	+
Hydrogen sulphide	Low	+	+
Hydrosylammonium sulphate	Sat	+	+
Hydroxyacetone	100	+	+
Isononan acid	100	+	/
Isononan acid chloride	100	+	
Isooctane	100	+	/
Isopropanol	100	+	+
Lactic acid, aq.	90	+	+
Lauric acid chloride	100	+	
Lithium salts	Sat	+	+
Lysol	Com	+	/
Magnesium salts, aq.	Sat	+	+
Menthol	100	+	
Mercuric salts, aq.	50	+	+
Mercury	100	+	+
Methane suphonic acid	50	+	
Methanol	100	+	+
Methoxyl butanol	100	+	/
Methoxy butyl acetate	100	+	/
Methyl cyclohexane	100	+	/
Methyl ethyl ketone	100	+	+
Methyl glycol	100	+	+
Methyl isobutyl ketone	100	+	/
Methyl sulphuric acid	50	+	
Methyl-4-pentanol-2	100	+	/
Methylacetate	100	/	+
Methylene chloride	100	+	+
Mineral oil	100	+	+
Monochloracetic acid ethyl ester	100	+	/
Monochloracetic acid methyl ester	100	+	+
Morpholine	100	+	/
Motor oil	100	+	
Na-dodecyl benz.sulphon	100	+	
Nail polish remover	100	+	+
Neodecana acid	100	+	/
Neodecana acid chloride	100	+	+/-
Nickel salts, aq.	Sat	+	-
Nitric acid	50	+	
Nitric acid	25	+	
Nitrobenzene	100	+	+
Nitrohydrochloric acid HCl:HNO3	3:1		
Nitromethane	100		
Oils, etherial			
Oils, vegetable	100		

Table 2 : Resistance of polyethylene to

Name of Chemical	% - Concentration	23 °C	60 °C
Oleic acid	100	+	/
Oleum	>100	-	-
Oxalic acid, aq.	Sat	+	+
Paraffin oil	100	+	/
Paraldehyde	100	+	
PCB	100	/	
Pectin	Sat	+	+
Perchloroethylene	100	/	-
Perchloric acid	20	+	+
Perchloric acid	50	+	/
Perchloric acid	70	+	-
Petroleum	100	+	/
Petroleum ether	100	+	/
Phenol, aq.	Sat	+	+
Phenylchloroform	100	/	
Phosphates, aq.	Sat	+	+
Phosphoric acid	85	+	/
Phosphoric acid	50	+	+
Potassium permanganate, aq.	Sat	+	+
Potassium persulphate, aq.	Sat	+	+
Potassium salt, aq.	Sat	+	+
Potassium soap	100	+	+
Propane, liquid	100	+	
Pyridine	100	+	/
Salad oil	100	+	+
Salted water	Sat	+	+
Sea water		+	+
Shoe polish	100	+	/
Silicone oil	100	+	+
Silver salts, aq.	Sat	+	+
Soap solution	Sat	+	+
Soap solution	10	+	+
Soda lye	60	+	+
Sodium chlorate, aq.	25	+	+
Sodium chlorite, aq.	5	+	+
Sodium hypochlorite, aq.	5	+	+
Sodium hypochlorite, aq.	30	/	/
Sodium hypochlorite, aq.	20	+	+
Sodium salts, aq.	Sat	+	+
Succinic acid, aq.	Sat	+	+
Sulphur dioxide, aq.	low	+	+
Sulphuric acid	96	-	-
Sulphuric acid	50	+	+
Tannic acid	10	+	+
Tar	100	+	/
Tartaric acid, aq.	Sat	+	+
Test fuel, aliphatic	100	+	/
Tetrachlorethane	100	/	-

Table 2 : Resistance of polyethylene against chemicals

Kimyasalın Adı	%-Konsantrasyon	23 °C	60 °C
Tetrachlorethylene	100	/	-
Tetrahydro naphthalene	100	+	-
Tetrahydrofuran	100	/	-
Thiophene	100	/	/
Tin-II-chloride, aq.	Sat	+	+
Toluene	100	/	-
Transformer oil	100	+	/
Trichlorethylene	100	/	-
Tricresyl phosphate	100	+	+
Two-stroke oil	100	+	/
Urea, aq.	Sat	+	/
Uric acid	Sat	+	+
Urine		+	+
Washing-up liquid, fluid	5	+	+
Water glass	100	+	+
Wetting agent	100	+	/
Xylene	100	/	-
Zinc salts, aq.	Sat	+	+

Tablo 2 : Polietilenin kimyasallara karşı direnci

- **sat** (saturate): doymun

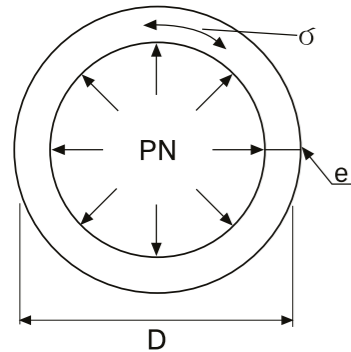
- **low**: düşük

5) (PVC-PP-PE) CALCULATION TECHNIQUES

5-A) WALL THICKNESS CALCULATION

CALCULATION OF ESSENTIAL PIPE WALL THICKNESSES

Stress arising out of the internal pressure created on the pipe jacket by the liquid passing through a pipe is called as ENVIRONMENTAL STRESS (σ).



MRS (Minimum required strength) is the EXTRAPOLE strength value, obtained in the tests, performed at 20 °C for 50 years or in the tests performed accordingly upon conditioning. Raw material of each plastic has different MRS rates.

MRS rates of different plastic raw materials are presented in the following table.

Material	MRS	C	Q (MPa)
PE80	8,0	1.25	6.3
PE 100	10.0	1.25	8.0
PVC-U (DIN 8062)	25.0	2.50	10.0
PVC-U (TS274-2 EN 1452-2)	25.0	2.00	12.5

Environmental Stress is calculated with the following, $\sigma = \frac{MRS}{C}$ and $\sigma = \frac{PN \cdot (D-e)}{2 \cdot e}$ formulas.

Wherein; σ = Design stress (MPa)

MRS = Minimum Required Strength (MPa)

C = Safety coefficient (without unit)

PN = pressure (Bar) desired to pass through the pipe

D = Pipe outside diameter (mm)

e = Wall thickness (mm)

Following formula is $e = \frac{PN \cdot D}{2 \cdot \sigma + PN}$ obtained from these two formulas,

As can be seen from the foregoing table, safety coefficient in polyethylene pipes is taken as 1.25; whereas the DIN so62 standard acknowledges the safety coefficient for U PVC pipes as 2.5 in PVC pipes, it is considered as 2 in EN 1152 2 Standard. However, the wall thicknesses of both of these two standards differ for pipes in 100 mm and over since both of the standards accept safety standards as 2 up to (including) 90 mm pipes.

Classification of plastic pipes are made based on the following definitions;

1) SDR : Standard Dimension Ratio.

$$SDR = \frac{D}{e} \text{ Refers to ratio of pipe outside diameter to wall thickness.}$$

2) S : Serial Number. Refers to the ratio of environmental stress to pressure category to which a pipe is desired to withstand

$$\text{Calculated with } S = \frac{\sigma}{PN} = \frac{SDR}{2} - 1 \text{ formula.}$$

3) PN : Pressure category. Refers to the highest operating pressure, a pipe can withstand when the lowest safety coefficient is considered.

$$\text{Calculated with } PN = \frac{\alpha \cdot 2e}{D-e} = \frac{\alpha}{S} = \frac{2\sigma}{SDR-1} \text{ formulas.}$$

5B) HEAD LOSSES-WATER HAMMER

FLUID VELOCITY AND HEAD LOSS TABLE FOR U-PVC PN 10 PIPES

D (mm)	32		40		50		63		75		90		110		125		140	
Q (lt / sn)	V	J	V	J	V	J	V	J	V	J	V	J	V	J	V	J	V	J
1.00	1.54	0.1004	0.97	0.0290	0.62	0.0098												
2.00	3.07	0.3625	1.94	0.1047	1.25	0.0355	0.78	0.0115	0.55	0.0049								
3.00			2.92	0.2219	1.87	0.0752	1.18	0.0243	0.83	0.0104	0.58	0.0043						
4.00					2.49	0.1282	1.57	0.0414	1.11	0.0178	0.77	0.0073						
5.00							1.96	0.0626	1.39	0.0269	0.96	0.0110	0.62	0.0037				
6.00							2.35	0.0878	1.66	0.0377	1.15	0.0155	0.74	0.0053	0.57	0.0028		
7.00							2.74	0.1168	1.94	0.0501	1.35	0.0206	0.86	0.0070	0.67	0.0038	0.53	0.0022
8.00									2.22	0.0642	1.54	0.0264	0.99	0.0090	0.77	0.0048	0.61	0.0028
10.00									2.77	0.0971	1.92	0.0398	1.23	0.0135	0.96	0.0073	0.76	0.0042
12.00											2.31	0.0559	1.48	0.0190	1.15	0.0102	0.92	0.0059
14.00											2.69	0.0743	1.73	0.0252	1.34	0.0136	1.07	0.0078
16.00													1.97	0.0323	1.53	0.0174	1.22	0.0100
18.00													2.22	0.0402	1.72	0.0216	1.37	0.0125
20.00													2.47	0.0489	1.91	0.0263	1.53	0.0152
22.00													2.71	0.0583	2.10	0.0313	1.68	0.0181
24.00															2.30	0.0368	1.83	0.0212
28.00															2.68	0.0490	2.14	0.0283
32.00																	2.44	0.0362
35.00																	2.67	0.0427

D (mm)	160		180		200		225		250		280		315		355		400	
Q (lt / sn)	V	J	V	J	V	J	V	J	V	J	V	J	V	J	V	J	V	J
40.00	2.34	0.0286	1.84	0.0160	1.50	0.0096	1.18	0.0054	0.96	0.0032	0.76	0.0019	0.60	0.0011		0.0008		
45.00	2.63	0.0356	2.08	0.0200	1.68	0.0120	1.33	0.0067	1.08	0.0040	0.86	0.0023	0.68	0.0013	0.53	0.0012		
55.00			2.54	0.0289	2.06	0.0174	1.62	0.0097	1.32	0.0058	1.05	0.0034	0.83	0.0019	0.65	0.0019	0.51	0.0006
70.00					2.62	0.0271	2.07	0.0152	1.67	0.0091	1.33	0.0053	1.05	0.0030	0.83	0.0027	0.65	0.0009
85.00							2.51	0.0218	2.03	0.0131	1.62	0.0075	1.28	0.0042	1.01	0.0033	0.79	0.0013
95.00							2.80	0.0268	2.27	0.0161	1.81	0.0092	1.43	0.0052	1.13	0.0040	0.89	0.0016
105.00									2.51	0.0194	2.00	0.0111	1.58	0.0063	1.24	0.0052	0.98	0.0020
120.00									2.87	0.0248	2.29	0.0142	1.81	0.0080	1.42	0.0064	1.12	0.0025
135.00											2.57	0.0177	2.03	0.0100	1.60	0.0078	1.26	0.0031
150.00											2.86	0.0215	2.26	0.0122	1.78	0.0104	1.40	0.0038
175.00													2.64	0.0162	2.07	0.0133	1.63	0.0050
200.00															2.37	0.0159	1.87	0.0065
220.00															2.61		2.05	0.0077
260.00																	2.43	0.0105
280.00																	2.61	0.0120

D (mm)	160		180		200		225		250		280		315		355		400	
Q (lt / sc)	V	J	V	J	V	J	V	J	V	J	V	J	V	J	V	J	V	J
10.00	0.58	0.0022																
12.00	0.70	0.0031	0.55	0.0017														
14.00	0.82	0.0041	0.65	0.0023	0.52	0.0014												
16.00	0.94	0.0052	0.74	0.0029	0.60	0.0018												
18.00	1.05	0.0065	0.83	0.0037	0.67	0.0022	0.53	0.0012										
20.00	1.17	0.0079	0.92	0.0044	0.75	0.0027	0.59	0.0015										
22.00	1.29	0.0095	1.01	0.0053	0.82	0.0032	0.65	0.0018										
24.00	1.40	0.0111	1.11	0.0062	0.90	0.0037	0.71	0.0021	0.57	0.0013								
28.00	1.64	0.0148	1.29	0.0083	1.05	0.0050	0.83	0.0028	0.67	0.0017	0.53	0.0010						
32.00	1.87	0.0189	1.48	0.0106	1.20	0.0064	0.94	0.0036	0.77	0.0021	0.61	0.0012						
35.00	2.05	0.0223	1.61	0.0125	1.31	0.0075	1.03	0.0042	0.84	0.0025	0.67	0.0015	0.53	0.0008				

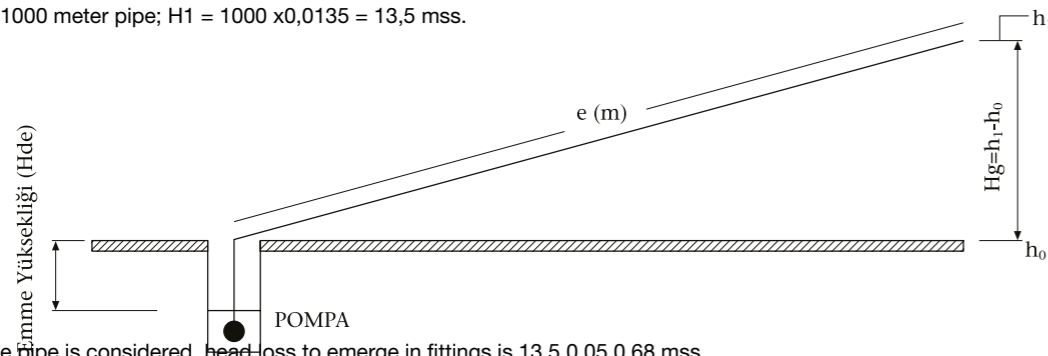
MODEL CALCULATION FOR THE IMPACT OF HEAD LOSSES AND WATER HAMMER ON PIPE PRESSURE

Suppose that we will transport water to a place 15 meters in height with 10 Lsc flow rate by means of PN 10 pipes 1000 meters in length and 110 mm in diameter.

We wonder if this selected pipe pressure is adequate to carry out this work?

Here, Q = 10 L/sc, L = 1000 m, Hg = 15 m.

1. From the table, J = 0,0135 is found
For 10 L/sc flow rate of 100 mm PVC pipe
Head loss in 1000 meter pipe; H1 = 1000 x 0,0135 = 13,5 mss.



2. If 5% of the pipe is considered, head loss to emerge in fittings is 13,5 0,05 0,68 mss
3. Further adding the water column load to emerge due to the height of 15 meters, into these head losses;
Operating pressure to emerge inside the pipe is calculated as:
13.5 0,68 15 29,18 mss 3 A.
4. Let's calculate the impact of water hammer to make the actual influence on the pipe;
From the table on the adjacent page, alg 3-1,55 and V 1.23 is found for PN 10 pipe, which is 110 mm in diameter.

Water hammer = a/g. V= 34,55 . 1,23 = 42,5 mss = 4 Atü is found.

Total pressure to have an impact on the pipe: is 3 + 4 = 7 ATÜ. That is to say, maximum 7 bars of suppression mode of a pressure will have an impact on the pipe in this installation. As the pipe was selected as 10 ATU in the beginning, it will not fracture in depression mode, that is to say the lowest pressure in this installation will be 3-1-1 ATU. The result is negative. Pressure difference likely to take place due to water hammer will beat the pressure the pipe can resist and stretch the pipe inwards. That is to say, the pipe will stretch in tis case. This shows that correct pipe pressure wasn't selected for this installation work. A proper pipe pressure should be selected where either the total pressure in suppression mode will not be more than the selected pressure or the minimum pressure in depression mode will be positive.

CALCULATION OF HEAD LOSSES IN U-PVC PIPES

'Head Loss' term refers to how much less distance a liquid would flow due to friction of the liquid with internal perimeter of the pipe than the amount of flow it would carry out inside a 1 meter pipe, if there had been a frictionless environment.

While a liquid flows through a pipe, there occurs decrease in flow rate either due to friction with internal surface of the pipe or increase or decrease of pressure in turns called as 'Water Hammer' as well as narrowing and expansions. This means that liquid fails to pass through a pipe in/at calculated amounts and rates. Therefore, the amount of HEAD LOSS ro emerge due to friction with pipe's internal wall and Water Hammer should be taken into consideration in the stage where pipe diameter and pressure is determined.

Hazen-Williams formula is used used while calculating Head Loss.

Head Loss; J = 6.815 .

Is calculated with this formula.

Wherein, J = Head Loss (m/m)

V = Fluid velocity (m/sn)

C = Roughness Coefficient (without unit)

D = Pipe internal diameter (mm)

$$J = \frac{V^{1,852}}{C^{1,852} \cdot D^{1,167}}$$

In the calculations C value for Polyethylene and PVC pipes is taken as;

- 130 for 16 - 20 mm diameters,
- 140 for 25 - 32 mm diameters,
- and 150 for diameter 40 and over.

In Q = V.A formula, Q = flow Rate (m3/sn)

V = Fluid velocity (m/sn) and A = internal cross-sectional area of the pipe (m²).

Although there are detailed schedules to calculate head losses to take place in the fittings, the amount of head loss to take place in these parts is considered as 5% of the Head Loss, calculated inside the pipe practically.

- Ø
- Ø
- Ø

WATER HAMMER:

Although there are detailed schedules to calculate head losses to take place in the fittings, the amount of head loss to take place in these parts is considered as 5% of the Head Loss, calculated inside the pipe practically.

$$a = \frac{9900}{48,3 + K \frac{d}{e}}$$

is calculated with this formula.

Wherein, d = Pipe internal diameter (mm)

e = Pipe wall thickness (mm)

K = The ratio of water flexibility to pipe flexibility (without unit)

K value is taken as 33,3 for PVC pipes,

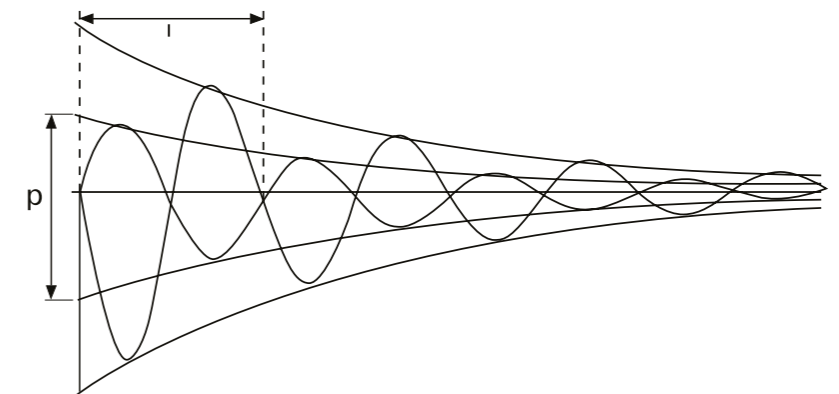
99,9 for PE 100 pipes,

111 for PE 63 pipes.

Water Hammer (m) is calculated with the following formula= V. a/g

Wherein, V = Fluid velocity inside the pipe (m/sn),

g = Gravitational acceleration, (m/sn2),



outside diameter (mm)	PE - 100 PIPE		U-PVC PIPE	
	a	a/g	a	a/g
63	255.21	26.02	379.37	38.68
110	254.47	25.95	338.80	34.55
160	253.01	25.80	341.37	34.81
200	253.31	25.83	340.24	34.69
315	252.99	25.80	339.85	34.65

As can be seen in this comparative table, PVC pipes transmit pressure better. That is to say, a liquid flows faster in a PVC pipe than it does so in a polyethylene pipe. This is an advantage of PVC pipe. The liquid will not wear the pipe in time as it flows more conveniently inside the pipe.

WATER HAMMER IN PE PIPES

Short term pressure changes and the effect of water hammer do not create damage in HDPE pipes. In the following model table, it is stated how much the recent pressure value to emerge with short-term water hammer for several safety factors at 20°C, may increase in proportion to nominal pressure. Pressure increases to emerge in these rates do not damage the pipe.

SAFETY FACTOR WATER HAMMER RELATION IN PE PIPES

Total operation Coefficient C (Safety Factor)	The ratio of Short Term Water Hammer and Pressure Increase to Nominal Pressure
1.25	50%
1.6	100%

DISPERSION VELOCITY OF PRESSURE WAVE IN U-PVC PIPES :

Outside diameter (mm)	4 ATU		6 ATU		10 ATU		16 ATU		20 ATU	
	a	a/g	a	a/g	a	a/g	a	a/g	a	a/g
20							479.83	48.93	543.15	55.38
25							483.15	49.27	534.04	54.45
32					389.00	39.67	479.83	48.93	529.82	54.02
40			335.70	34.23	378.88	38.63	479.83	48.93	535.57	54.61
50			299.63	30.55	380.92	38.84	476.48	48.59	534.04	54.45
63			300.43	30.63	379.37	38.68	478.50	48.79	534.23	54.47
75	267.55	27.28	296.23	30.21	380.92	38.84	478.71	48.81	529.95	54.04
90	243.97	24.88	299.63	30.55	380.02	38.75	477.97	48.74	531.32	54.18
110	243.97	24.88	270.61	27.59	338.80	34.55	427.34	43.57	475.26	48.46
125	243.97	24.88	272.03	27.74	339.79	34.65	424.38	43.27	475.14	48.45
140	243.97	24.88	273.14	27.85	340.56	34.73	424.70	43.31	475.04	48.44
160	243.97	24.88	273.14	27.85	341.37	34.81	425.03	43.34	475.64	48.50
180	243.97	24.88	266.92	27.22	339.49	34.62	425.29	43.37	476.11	48.55
200	243.97	24.88	270.36	27.57	340.24	34.69	425.49	43.39	474.80	48.41
225	243.97	24.88	270.05	27.54	338.99	34.57	425.70	43.41	475.73	48.51
250	241.49	24.62	272.03	27.74	339.79	34.65	424.38	43.27	475.14	48.45
280	241.75	24.65	271.16	27.65	338.95	34.56	424.70	43.31	475.04	48.44
315	242.00	24.68	270.05	27.54	339.85	34.65	424.99	43.34	475.31	48.47
355	242.22	24.70	270.40	27.57	339.38	34.61	425.26	43.36	474.87	48.42
400	242.42	24.72	270.36	27.57	339.11	34.58	424.57	43.29	474.80	48.41

5-C) IMPACTS OF TEMPERATURE CHANGES ON U-PVC PIPES

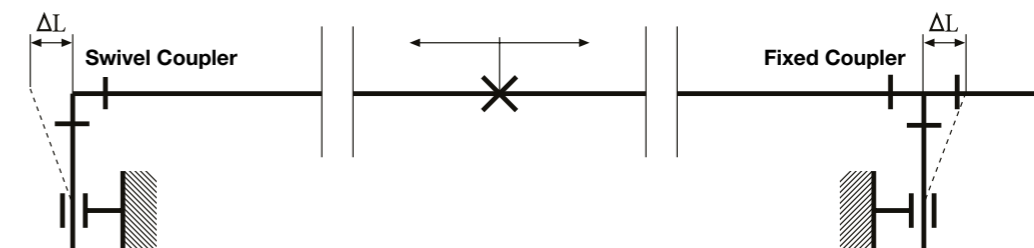
Any and all pipe times in the world are more or less affected by temperature changes. While exposure to temperature changes is the least in concrete pipes, metal pipes are affected a little more by temperature changes. Plastic pipes are the pipe types which are mostly affected by temperature changes.

Plastic pipes may extend 6 times of their length in temperature increases without rupture. If the temperature at the moment of performance of installation has increased when the pipe is used, the length of plastic pipe extends. If liquid flows inside the plastic pipe at a temperature lower than the level of the temperature at the moment of installation, then the length of the pipe is shortened, that is, the pipe shrinks.

U-PVC pipes are the pipe types that are least affected by temperature changes among other pipes manufactured from plastic. Because, as it can be seen in the following table, U-PVC raw material has the lowest thermal expansion capacity with a thermal expansion coefficient of 0.07 mm/mK among other plastic pipe types. This feature brings more convenience and advantage in U-PVC pipes during installation in comparison to other pipes. As U-PVC pipes are less affected in terms of length by temperature increases and decreases as compared to other plastic raw materials, no deformation or damage takes place in these cases in U-PVC lines. Therefore, it is not essential to take special precautions to prevent deformations likely to take place in U-PVC lines if there aren't very significant temperature differences.

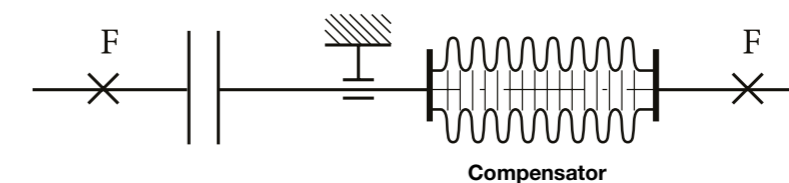
Some coefficients of linear expansion of polymers	
Material	a=mm/m K
ABS	0.10
PE	0.15 - 0.20
PP	0.16 - 0.18
PVC-U	0.07 - 0.08
PVC-C	0.06 - 0.071

In case of very significant temperature differences, it is essential to take required measures in order to prevent deformation and damage to U-PVC lines due to extensions and shrinkages likely to take place.



Placing swivel couplers or special expansion joints (compensator) in certain areas so that installation could move back and forward without deformation in case of linear extension may be considered as a primary precaution.

It is essential that the diameter of utilized fixed couplers is a little bit larger than the pipe diameter so that the pipe could move back and forth inside the coupler and the installation wouldn't be damaged.



CALCULATION OF EXTENSION AND SHRINKAGE AMOUNTS TO TAKE PLACE IN PVC PIPES BASED ON TEMPERATURE

Amount of linear extension and shrinkage to take place in plastic pipes due to temperature changes may be calculated with the following $\Delta L = L \cdot \Delta T \cdot a$ formula in advance.

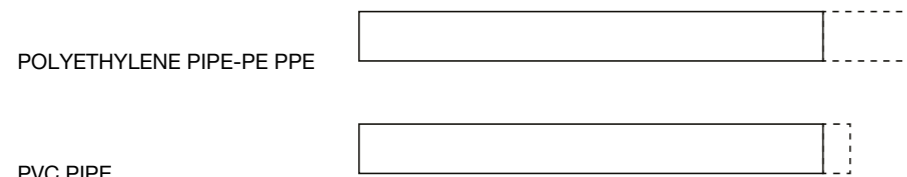
Wherein, L refers to amount of linear change in millimeter to take place in length.

- L = the length of pipe in meter at the time when the pipe is installed
- ΔT = Temperature difference (K),
- a = linear expansion coefficient based on length (mm/m.K).

Now, let's calculate the amount of linear change based on temperature change in polyethylene and U-PVC pipes; Suppose that, the pipes 10 meter in length, manufactured from Polyethylene and U-PVC are installed at an ambient temperature of 20°C.

And think that water at is transferred at 40 °C inside these two types of pipes. Do you happen to know how much the lengths of these two pipe types will extend?

- a) For polyethylene pipe; ($\Delta T = 40-20 = 20$ °C)
 $\Delta L = L \cdot \Delta T \cdot a$
 (For polyethylene pipe a = 0.18 mm/m.K)
 $\Delta L = 10 \cdot 20 \cdot 0.18 = 36$ mm b) for U-PVC Pipe
 ($\Delta T = 40-20 = 20$ °C)
 $\Delta L = L \cdot \Delta T \cdot a$
 (For U-PVC pipe a = 0.07 mm/m.K)
 $\Delta L = 10 \cdot 20 \cdot 0.07 = 14$ mm



Quantities of shrinkage in case of temperature decrease

That is to say, U.PVC pipe will extend only 14 mm whereas the polyethylene pipe, 10 meter in length extends 36 mm in length under the same conditions. In the same way, suppose that ambient temperature was 30°C when these two pipes were installed. How much will their length shrink when liquid at 5°C is transferred through these pipes?

- a) For polyethylene pipe; ($\Delta T = 5-30 = -25$ C)
 $\Delta L = L \cdot \Delta T \cdot a$
 (For polyethylene pipe a = 0.18 mm/m.K)
 $\Delta L = 10 \cdot (-25) \cdot 0.18 = -45$ mm
- b) For U-PVC Pipe; ($\Delta T = 5-30 = -25$ °C)
 $\Delta L = L \cdot \Delta T \cdot a$
 (For U-PVC pipe a = 0.07 mm/m.K)
 $\Delta L = 10 \cdot (-25) \cdot 0.07 = -17.5$ mm

In other words, linear shrinkage in U.PVC pipe will be only 17,5 mm in this case while Polyethylene pipe shrinks 45 mm in length.

5-D-) PVC SIZES AND STANDARDS

DIN 8062:2009-10 TABLE 1- OUTSIDE DIAMETERS, WALL THICKNESSES, S/SDR SERIES AND MASSES

mm	Pipe Series S																					
	63		25		20		16.5		12.5		10		8		6.3		5		4			
	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m	c	Mass ^b kg/m		
5																						
6																						
8																						
10																						
12																						
16																						
20																						
25																						
32																						
40																						
50																						
53																						
75																						
90																						
110	1.6	0.964	2.2	1.18	2.7	1.41	3.2	1.66	4.2	2.14	5.3	2.65	6.6	3.24	8.1	3.91	10.0	4.700	12.3	5.64	7.28	
125	1.6	1.10	2.5	1.50	3.1	1.84	3.7	2.16	4.8	2.75	6.0	3.39	7.4	4.13	9.2	5.04	11.4	6.094	14.0	7.28	9.14	
140	1.6	1.23	2.8	1.86	3.5	2.31	4.1	2.69	5.4	3.47	6.7	4.24	8.3	5.18	10.3	6.30	12.7	7.593	15.7	9.14	11.9	
160	1.6	1.41	3.2	2.44	4.0	2.99	4.7	3.49	6.2	4.55	7.7	5.55	9.5	6.75	11.8	8.23	14.6	9.963	17.9	11.9	15.0	
180	1.8	1.59	3.6	3.06	4.4	3.71	5.3	4.43	6.9	5.66	8.6	6.97	10.7	8.54	13.3	10.4	16.4	12.589	20.1	15.0	18.6	
200	1.8	1.77	3.9	3.67	4.9	4.56	5.9	5.44	7.7	7.02	9.6	8.64	11.9	10.5	14.7	12.8	18.2	15.522	22.4	18.6	23.5	
225	1.8	1.99	4.4	4.67	5.5	5.77	6.6	6.85	8.6	8.81	10.8	10.9	13.4	13.4	16.6	16.2	20.5	19.640	25.2	23.5	28.9	
250	2.0	2.43	4.9	5.73	6.2	7.22	7.3	8.43	9.6	10.912	11.9	13.3	14.8	16.4	18.4	20.0	22.7	24.152	27.9	28.9	35.5	

TABLE -1

Dimensions in millimeters

d	Pipe Series S																					
	63		25		20		16.5		12.5		10		8		6.3		5		4			
	127 ^a		51		41		31.4		26		21		17		13.6		11 ^c		g ^c			
e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	e	Mass ^b	
mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	mm	kg/m	
280	2.2	3.03	5.5	7.21	6.0	7.81	8.2	10.6	12.0	15.1	16.8	16.8	20.8	20.6	25.1	25.4	30.3	31.3	36.4			
315	2.5	3.83	6.2	9.15	7.7	11.2	9.2	13.3	13.5	19.2	21.2	18.7	26.0	23.2	31.8	28.6	38.3					
355	2.8	4.79	7.0	11.6	8.7	14.3	10.4	17.0	15.2	24.3	26.8	21.1	33.1	26.1	40.2							
400	3.2	6.19	7.9	14.7	9.8	18.1	11.7	21.4	17.1	30.8	34.2	23.7	41.8	29.4	51.0							
450	3.6	7.76	8.8	18.4	11.0	22.8	13.2	27.2	19.2	38.9	43.3	26.7										
500	4.0	9.51	9.8	22.7	12.3	28.3	14.6	33.4	21.4	48.1	53.4	29.7										
560	4.4	11.8	11.0	28.5	13.7	35.3	16.4	42.0	23.9	60.1	66.8											
630	5.0	14.9	12.3	35.9	15.4	44.6	18.4	53.0	26.9	76.1	84.4											
710	5.6	18.8	13.9	45.6	17.4	56.8	20.7	67.1	30.3	96.6												
800	6.3	23.9	15.7	58.0	19.6	72.0	23.3	85.1														
900	7.1	30.3	17.6	73.1	22.0	90.7	26.3	108														
1 000	7.9	37.2	19.6	90.4	24.5	112	29.2	133														
1 200	9.5	53.6	23.5	130	29.4																	
1 400	11.1	73.1	27.4	177																		
1 600	12.6	94.5	31.3	231																		

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TABLE 2- TOLORANCES ON MEAN OUTSIDE DIAMETER AND OUT-OF ROUNDNESS

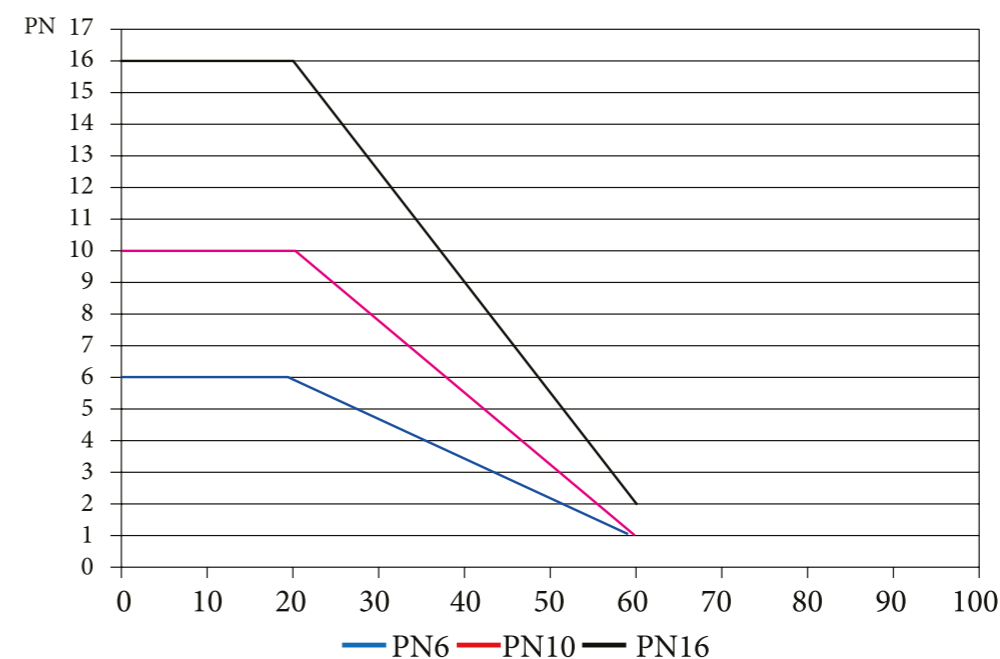
Outside diameter d	Tolerance on mean outside diameter ^a	Tolerance on out-of-roundness ^b	
		SDR 51 and SDR 34,4 ^c	SDR 26 to SDR 9 ^d
5	0.2	1.2	0.5
6	0.2	1.2	0.5
8	0.2	1.2	0.5
10	0.2	1.2	0.5
12	0.2	1.2	0.5
20	0.2	1.2	0.5
25	0.2	1.2	0.5
32	0.2	1.3	0.5
40	0.2	1.4	0.5
50	0.2	1.4	0.6
63	0.3	1.5	0.8
75	0.3	1.6	0.9
90	0.3	1.8	1.1
110	0.4	2.2	1.4
125	0.4	2.5	1.5
140	0.5	2.8	1.7
160	0.5	3.2	2.0
180	0.6	3.6	2.2
200	0.6	4.0	2.4
225	0.7	4.5	2.7
250	0.8	5.0	3.0
280	0.9	6.8	3.4
315	1.0	7.6	3.8
355	1.1	8.6	4.3
400	1.2	9.6	4.8
450	1.4	10.8	5.4
500	1.5	12.0	6.0
560	1.7	13.5	6.8
630	1.9	15.2	7.6
710	2.0	17.1	8.6
800	2.0	19.2	9.6
900	2.0	21.6	10.8
1 000	2.0	24.0	12.0
1 200	2.1	28.8	14.4
1 400	2.2	33.6	16.8
1 600	2.5	38.4	19.2

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TABLE TOLORANCES ON WALL THICKNESS

Wall thickness e	Tolerance a	Wall thickness e	Tolerance a
up to 1	+0.3 0	over 16 up to 17	+1.9 0
over 1 up to 2	+0.4 0	over 17 up to 18	+2 0
over 2 up to 3	+0.5 0	over 18 up to 19	+2.1 0
over 3 up to 4	+0.6 0	over 19 up to 20	+2.2 0
over 4 up to 5	+0.7 0	over 20 up to 21	+2.3 0
over 5 up to 6	+0.8 0	over 21 up to 22	+2.4 0
over 6 up to 7	+0.9 0	over 22 up to 23	+2.5 0
over 7 up to 8	+1 0	over 23 up to 24	+2.6 0
over 8 up to 9	+1.1 0	over 24 up to 25	+2.7 0
over 9 up to 10	+1.2 0	over 25 up to 26	+2.8 0
over 10 up to 11	+1.3 0	over 26 up to 27	+2.9 0
over 11 up to 12	+1.4 0	over 27 up to 28	+3 0
over 12 up to 13	+1.5 0	over 28 up to 29	+3.1 0
over 13 up to 14	+1.6 0	over 29 up to 30	+3.2 0
over 14 up to 15	+1.7 0	over 30 up to 31	+3.3 0
over 15 up to 16	+1.8 0	over 31 up to 32	+3.4 0

The graphic for acceptable application pressure, which changes based on temperature factor is as follows;

As can be understood from the graphic, after 20 °C, application pressure decreases based on temperature factor and it approaches to a value very close to zero at 60 °C degrees


Pipe Socket Measurement

It should be considered for pipe socket internal diameter measurement that point of measurement in pipe socket internal diameter measurement is right in the middle of pipe socket length.

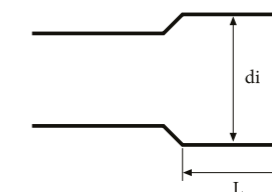


Table for pipe socket measurements according to EN 1452-2 is as follows;

Pipe Socket Nominal Internal Diameter (d-mm)	Average Internal Diameter of Pipe Socket		The biggest deviation from roundness for di (mm)	The Smallest Pipe Socket Length (L-mm)
	d Min.	d Max.		
20	20.1	20.3	0.25	16.0
25	25.1	25.3	0.25	18.5
32	32.1	32.3	0.25	22.0
40	40.1	40.3	0.25	26.0
50	50.1	50.3	0.30	31.0
63	63.1	63.3	0.40	37.0
75	75.1	75.3	0.50	43.5
90	90.1	90.3	0.60	51.0
110	110.1	110.4	0.70	61.0
125	125.1	125.4	0.80	68.5
140	140.2	140.5	0.90	76.0
160	160.2	160.5	1.00	86.0
200	200.3	200.6	1.20	106.0
225	225.3	225.7	1.40	118.5
250	250.3	250.8	1.50	131.0
280	280.3	280.9	1.70	146.0
315	315.4	315.0	1.90	163.5

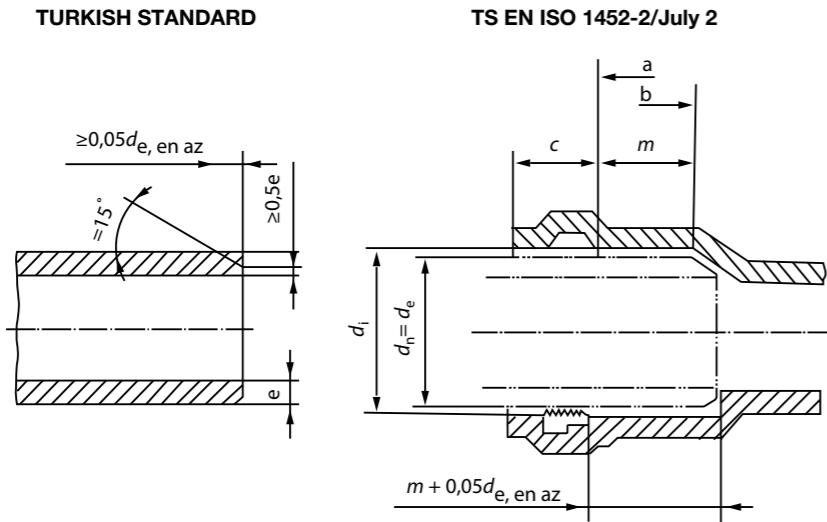
DIN 8062:2009-10
TABLE -4 ALLOWABLE WORKING PRESSURE FOR PVC-U PIPES WITH A SAFETY FACTOR (SF)=2,5

Temperature °C	Years of service	Pipe series S									
		63	25	20	16.7	12.5	8	20	6.3	5	4
		Standard dimension ratio SDR									
		127	51	41	34.4	26	21	17	13.6	11	9
Allowable working pressure ^a bar											
10	5	2.1	5.2	6.5	7.8	10.4	13.0	16.3	20.9	26.0	32.8
	10	2.0	5.1	6.4	7.6	10.2	12.7	15.9	20.4	25.4	32.0
	25	2.0	4.9	6.2	7.4	9.9	12.3	15.4	19.7	24.6	30.9
	50	1.9	4.8	6.0	7.2	9.6	12.0	15.1	19.3	24.0	30.2
	100	1.7	4.7	5.9	7.1	9.4	11.8	14.7	18.8	23.5	29.5
20	5	1.7	4.4	5.5	6.6	8.8	11.0	13.7	17.5	21.3	27.5
	10	1.6	4.3	5.3	6.4	8.5	10.7	13.4	17.1	20.5	26.8
	25	1.6	4.1	5.1	6.2	8.2	10.3	12.9	16.4	20.5	25.8
	50	1.5	4.0	5.0	6.0	8.0	10.0	12.5	16.0	20.0	25.0
	100	1.4	3.9	4.9	5.8	7.8	9.7	12.2	15.6	19.4	24.4
30	5	1.3	3.5	4.4	5.3	7.1	8.8	11.1	14.1	17.6	22.2
	10	1.1	3.4	4.3	5.1	6.8	8.6	10.7	13.7	17.1	21.5
	25	1.0	3.3	4.1	4.9	6.6	8.2	10.3	13.2	16.4	20.7
	50	1.0	3.2	4.0	4.8	6.4	8.0	10.0	12.7	15.9	20.0
40	5		2.7	3.4	4.1	5.4	6.8	8.5	10.8	13.5	17.0
	10		2.6	3.3	3.9	5.2	6.5	8.2	10.4	13.0	16.4
	25		2.5	3.1	3.7	5.0	6.2	7.8	9.9	12.4	15.6
	50		2.4	3.0	3.6	4.8	6.0	7.5	9.6	12.0	15.1
50	5		1.9	2.4	2.9	3.8	4.8	6.0	7.6	9.5	12.0
	10		1.8	2.3	2.7	3.6	4.6	5.7	7.3	9.1	11.5
	25		1.7	2.2	2.6	3.5	4.3	5.4	6.9	8.6	10.9
60	5		1.2	1.5	1.8	2.4	3.0	3.8	4.8	6.0	7.5
	10		1.1	1.4	1.7	2.3	2.8	3.6	4.5	5.7	7.1
	25		1.1	1.3	1.6	2.1	2.6	3.3	4.2	5.3	6.6

DIN 10-8062:2009
TABLE -5 ALLOWABLE WORKING PRESSURE FOR PVC-U PIPES WITH A SAFETY FACTOR (SF)=2,0

Temperature °C	Years of service	Pipe series S									
		63	25	20	16.7	12.5	8	20	6.3	5	4
		Standard dimension ratio SDR									
		127	51	41	34.4	26	21	17	13.6	11	9
Allowable working pressure ^a bar											
10	5	2.6	6.5	8.2	9.8	13.0	16.3	20.4	26.1	32.5	40.9
	10	2.5	6.3	8.0	9.5	12.7	15.9	19.9	25.4	31.7	39.9
	25	2.4	6.1	7.7	9.2	12.3	15.4	19.3	24.6	30.7	38.7
	50	2.4	6.0	7.5	9.0	12.0	15.1	18.8	24.1	30.0	37.8
	100	2.3	5.9	7.4	8.8	11.8	14.7	18.4	23.5	29.3	36.9
20	5	2.2	5.5	6.9	8.2	11.0	13.7	17.1	21.9	27.3	34.4
	10	2.1	5.3	6.7	8.0	10.7	13.4	16.7	21.4	26.6	33.5
	25	2.0	5.1	6.4	7.7	10.3	12.9	16.1	20.6	25.6	32.3
	50	2.0	5.0	6.3	7.5	10.0	12.5	15.6	20.0	25.0	32.0
	100	1.9	4.8	6.1	7.3	9.7	12.2	15.2	19.4	24.2	30.5
30	5	1.8	4.4	5.5	6.6	8.8	11.1	13.4	17.7	22.0	27.8
	10	1.7	4.3	5.4	6.4	8.6	10.7	12.9	17.1	21.3	26.9
	25	1.6	4.1	5.2	6.2	8.2	10.3	12.4	16.5	20.6	25.9
	50	1.6	4.0	5.0	6.0	8.0	10.0	10.6	15.9	19.9	25.0
40	5	1.3	3.4	4.2	5.1	6.8	8.5	10.2	13.5	16.9	21.2
	10	1.2	3.2	4.1	4.9	6.5	8.2	9.7	13.0	16.3	20.5
	25	1.2	3.1	3.9	4.6	6.2	7.8	9.4	12.4	15.5	19.5
	50		3.0	3.8	4.5	6.0	7.5	7.4	12.0	15.0	18.8
50	5		2.4	3.0	3.6	4.8	6.0	7.1	9.5	11.9	14.9
	10		2.3	2.9	3.4	4.6	5.7	8.6	9.1	11.4	14.3
	25		2.1	2.7	3.2	4.3	5.4	6.0	8.6	10.8	13.6
60	5		1.5	1.9	2.2	3.0	3.8	4.7	6.0	7.5	9.4
	10		1.4	1.8	2.1	2.8	3.6	4.4	5.7	7.1	8.9
	25		1.3	1.7	2.0	2.6	3.3	4.1	5.3	6.6	8.3

ICS 23.040.20; 23.040.45;
91.140.60; 93.025



Description

- a The start of leak-proof area
- b Cylindrical edge of pipe and pipe socket

Figure 3 - Pipe socket and pipe spigot for elastomeric ring sealed pipes

Schedule 5 - Pipe socket dimensions for elastomeric sealing ring type joints

Measurements are in mm.

Nominal internal diameter of pipe socket	The smallest internal average diameter of pipe socket	The biggest allowable deviation from roundness for d, b)		The smallest insertion depth	The length of pipe socket entry and tightness area
d _n	d _{im,min} ^{a)}	S20 to S16	S12,5 to S5	d _{min} ^{c)}	C ^{d)}
20	20.3	-	0.3	55	27
25	25.3	-	0.3	55	27
32	32.3	0.6	0.3	55	27
40	40.3	0.8	0.4	55	28
50	50.3	0.9	0.5	56	30
63	63.3	1.2	0.6	58	32
75	75.4	1.2	0.7	60	34
90	90.4	1.4	0.9	61	36
110	110.5	1.7	1.1	64	40
125	125.5	1.9	1.2	66	42
140	140.6	2.1	1.3	68	44
160	160.6	2.4	1.5	71	48
180	180.7	2.7	1.7	73	51
200	200.7	3.0	1.8	75	54
225	225.8	3.4	2.1	78	58
250	250.9	3.8	2.3	81	62
280	281.0	5.1	2.6	85	67
315	316.1	5.7	2.9	88	72
355	356.2	6.5	3.3	90	79
400	401.3	7.2	3.6	92	86
450	451.5	8.1	4.1	95	94
500	501.6	9.0	4.5	97	102

5-E) PE CALCULATION TECHNIQUES

PE PIPE AND FITTINGS CALCULATION PRINCIPLES

Calculating Wall Thickness

Calculation of wall thickness required for nominal pressure of PE pipe is made with pipe calculation formula in ISO 1-161

$$\sigma_S \cdot PN \cdot \frac{da-s \min}{20 \cdot s \min} = PN \cdot S$$

- PN : Nominal pressure (bar), 1 bar=0,1 N/mm²
- S : Wall thickness (mm)
- S : Pipe service S=da/2.s (-)
- σ_S : Environmental stress (N/mm²)
- SDR : Standard Length ratio SDR=da/s=2S+1
- da : Pipe outside diameter (mm)

Accordingly minimum wall thickness is as follows.

$$S_{\min} = \frac{PN \cdot da}{20 \cdot \sigma_S + PN}$$

Calculation of environmental stress is based on safety coefficient and this safety coefficient should be taken into consideration in the calculation.

$$\sigma_S = \frac{MRS}{C} \quad \text{MRS: Minimum Required Strength}$$

Safety coefficient is stated with operation coefficient in safety factor of ISO 12162 and it has many functions. First and foremost, accuracy of pipe calculations (dimensioning) as well as safety in case of nominal pressure increase in the pipes should be ensured.

- For water pipe C_{min}=1.25
- For gas pipe C_{min}=2.0

Environmental Stress Table for HDPE

PE category	MRS (N/mm ²)	Tension σ _S (N/mm ²)	Safety Factor C	Sample Pipe	
				Wall Thickness s (mm)	Weight (kg/m)
PE 63	6.3	5.0	1.25	10.0	3.14
PE 80	8.0	6.3	1.25	8.1	2.62
PE 100	10.0	8.0	1.25	6.6	2.17

RELATION BETWEEN PN, MRS, S AND SDR

Pipe Series (S)

$$S = ([SDR] - 1) / 2$$

Calculation between outer dimension, SDR (Standard dimension ratio), minimum wall thickness

$$SDR = d/e$$

Design stress (σ_s)

$$\sigma = [MRS] / C$$

C: Total service (design) coefficient or safety factor

Relation between PN (Nominal pressure), MRS (Minimum required strength), S and SDR

$$[PN] = 10 \sigma_s / [S] \text{ or}$$

$$[PN] = 20 \sigma_s / [SDR - 1]$$

SDR	S	Rated pressure for material class in bar (PN)	
		PE 80	PE 100
41	20	3.2	4
33	16	4	5
26	12.5	5	6
21	10	6	8
17.6	8.3	-	-
17	8	8	10
13.6	6.3	10	12.5
11	5	12.5	16
9	4	16	20
7.4	3.2	20	25
6	2.5	25	32

Chart 1: When value C is taken as C= 1,25 at 20°C, samples for the relation between PN, MRS, S and SDR (for water)

SDR	S	Rated pressure for material class in bar (PN)	
		PE 80	PE 100
41	20	2	2.5
33	16	2.5	3.1
26	12.5	3.2	4
21	10	4	5
17.6	8.3	4.8	6
17	8	5	6.2
13.6	6.3	6.3	7.9
11	5	8	10
9	4	10	12.5
7.4	3.2	12.5	15.6
6	2.5	16	20

Chart 2: When C=2 is taken at 20°C, samples for the relation between PN, MRS, S and SDR (for gas)

Symbol	Minimum Required Strength MPa	s^a MPa
PE 100	10.0	8.0
PE 80	8.0	6.3
PE 63	6.3	5.0
PE 40	4.0	3.2

^a Design stress (s), total service (design) coefficient or safety coefficient was derived from MRS taking C value as C=1,25.

Note: A bigger C value can be used. For example the biggest rate/value for design strength (s) regarding PE 80 must be 4,0 MPa and 5,0 MPa for PE 100 by taking C value

Chart 3: Indicating the material with markers and the biggest design stress rates corresponding to these

CALCULATION OF TEST PRESSURE FOR DETERMINING RESISTANCE TO INNER PRESSURE AT CONSTANT TEMPERATURE

$$P = 10 \cdot \sigma \cdot \frac{2 \cdot e \cdot \min}{d_m \cdot e_{\min}}$$

Wherein;

σ : Environmental stress due to applied pressure, MPa;

d_m : Average measured outer dimension of test piece, mm;

e_{\min} : Minimum measured wall thickness of free length of test piece is mm.

PE80		PE100	
Tension ()	Test	Tension ()	Test
MPa	Period	MPa	Period
	h		h
4,5	165	5,4	165
4,4	233	5,3	256
4,3	331	5,2	399
4,2	474	5,1	629
4,1	685	5,0	1000
4,0	1000		

Chart 4: Test parameters for strength against hydrostatic internal pressure in water at 80°C

PE80		PE100	
Tension ()	Test	Tension ()	Test
MPa	Period	MPa	Period
	h		h
10	100	12,4	100

Chart 5: Test parameters for strength against hydrostatic internal pressure in water at 20°C

PE80		PE100	
Stress ()	Test	Stress ()	Test
MPa	Period	MPa	Period
	h		h
10	100	12,4	100

PRESSURE REDUCTION COEFFICIENTS

If PE100 and PE 80 piping system will be constantly used at a temperature more than 20°C but less than 40°C, operating pressure, allowed by following pressure reduction coefficients may be found.

Temperature (°C)	Coefficient (fT)
20	1,00
30	0,87
40	0,74

It is possible to perform interpolation for other temperatures between each steps.

Allowed Operating Pressure (PFA) may be calculated from the following equation.

$$PFA = fT \times fA \times PN$$

fT: Pressure reduction coefficient

fA: Based on the Application (for water conduction fA=1), decrease factor (or increase factor)

PN: Nominal Pressure

CALCULATION OF PIPE SIZE BASED ON FLOW RATE

Desired pipe sizes may be calculated from the following formula for provided flow rates.

$$d = 18,8(Q / v)^{2/1} \text{ or } d = 35,7(Q / v)^{2/1}$$

V= flow rate (m/s)

d =internal diameter of pipe (mm) i

Q = rate of flow m³/h 1

Q =rate of flow l/s 2

18,8 conversion coefficient

35,7 conversion coefficient

DESIRED PIPE DIAMETER

Liquids

v= 1,0-0,5 m/s (for vacuum)

v= 3,0-1,0 m/s (for distribution)

Gases

v=30-10 m/s

Hydraulic loses are not taken into consideration while calculating the pipe diameter.

After the external diameter is determined, actual rate of flow is calculated using the following formula.

$$v = 1275(Q2/d^2) \text{ or } v = 354(/) i$$

V=flow rate m/s

d =internal diameter of the pipe mm i

Q =rate of flow m³/h 1

Q =rate of flow l/h 2

354=Conversion coefficient

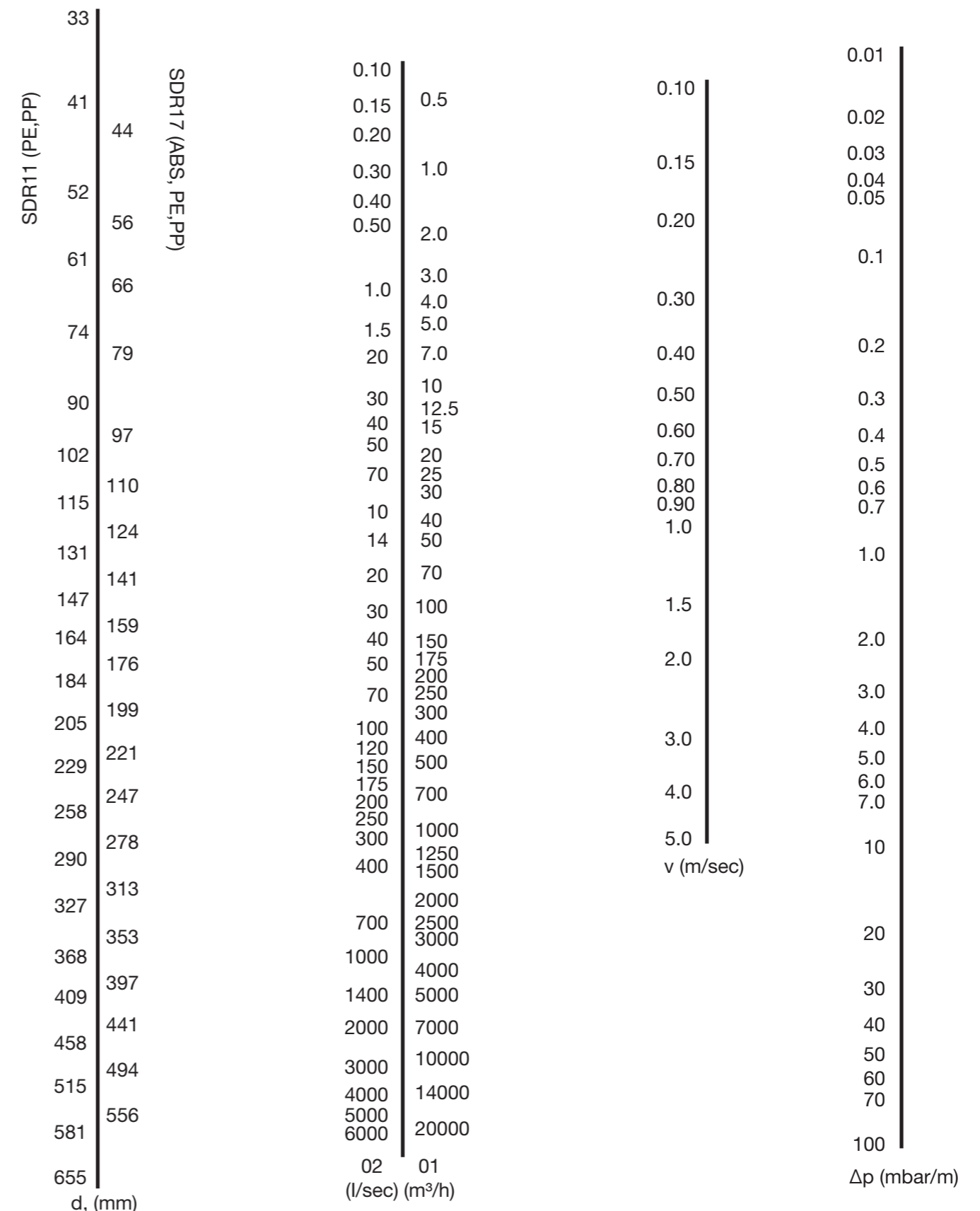
1275=Conversion coefficient

Q d

USE OF NOMOGRAM TO CALCULATE PRESSURE LOSS AND THE SIZE OF THE DIAMETER

Following nomogram facilitates to calculate desired diameter and the pressure loss, observed in each pipe 1 meter in length. In order to use the nomogram, it is essential to know at least two rates (such as internal diameter and flow rate). A line is drawn from these two rates. The point where the line cuts ΔP bend is the pressure difference for the pipe for which internal diameter is provided. For instance, it is drawn in reductions and ΔP value is read. The difference between ΔP rates refers to the pressure reduction.

Note: Pressure loss in this nomogram is applicable for the liquids with a density of 1000 kg/m³ (e.g., water)



Şekil 2: Flow Nomogram

6-COUPLING TECHNIQUES

6-A) PVC COUPLING TECHNIQUES

6-A-1) Mechanical Coupling

6-A-1a) Flange Coupling

Flanges: PP-V, flange adapters for bonding and socket fusion
 Flange adapters for PP steel and PVC-U Butt fusion
 Insulations: Flat gasket, o-ring gasket, profile ring gasket,



- Connection:**
- Plastic - plastic (same or different materials)
 - Plastic- metal



In flange couplings, the flange is used as a holder and the flange adaptor is used as a fitting. Referred to as an open-end gasket, a flat gasket must be used as a seal between the surface of the flange adaptor and opposite surface. Here it is essential that the surface of the flange adaptor and the opposite surface must be smooth and assembled completely parallel to each other. Flange coupling is especially preferred due to the fact that it is easily demounted in large diameters. It is possible to remove a fitting between two flange connections easily without damaging the line. It is used to carry out maintenance disassembly especially in cases where large diameter fitting, valve and special parts require maintenance.

APPROXIMATE SCREW USAGE AMOUNT BASED ON PIPE DIAMETERS

NOMINAL PART SIZE	UTILIZED SCREW SIZE	APPLIED FORCE (NEWTON METER)
20-25-32	M12	8-15
40-50-63-75-90-110-125-140	M16	15-41
160-200-225-250-315	M20	46-70
400-500	M24	

The status of force to be used in screw tightening in flange assembly based on diameters is stated in the above table.

Installation method is important in flange assembly. Bolts must be tightened in the order, stated below. All force shouldn't be applied during the first tightening operation. Tightening in the first tour must be applied until the nut contacts with the flange, tightening in the second tour must be performed with a force up to 51% of the force to be applied, and the part must be tightened in the turd tour up to the nominal force. In addition to all these operations, tightening force may vary based on the requirement. Minimum tightening force not to ensure tightness is the adequate level for any installation. This is considered as a factor to reduce the risks by decreasing the tension in the part.

FLANGE STANDARDS for Inch SIZES

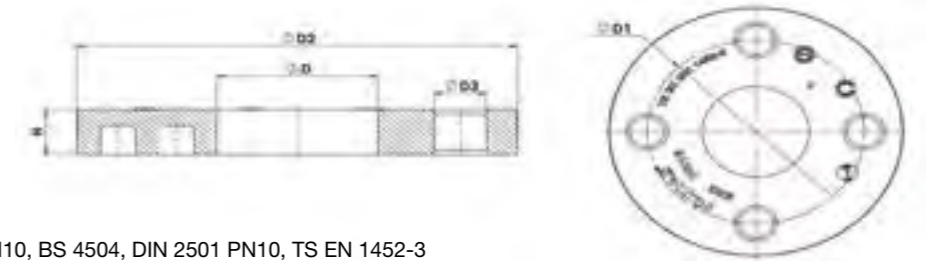
- Connection measurements of the flanges with the following standards comply with each other.
- EN 1092 - Pn 10-Pn16 Steel flange standard.
 - ANSI B 16,5 ,Class 150. Steel flange standard.
 - ASTM D 4024 Thermoset-fiberglass flange standard.
 - BS-EN 1759-1 Steel flange standard.

FLANGE STANDARDS in metric SIZES

- Connection measurements of the flanges with the following standards comply with each other.
- EN 1452-3 -PVC-U Plastic flange standard.
 - BS 4504 -Pn 10-Pn16 Steel flange standard.
 - DIN 2501 -Pn 10-Pn16 Steel flange standard.
 - ISO 7005-1 - Pn 10-Pn16 Steel flange standard.

FREE FLANGE SIZE TABLE

TS EN MOULD

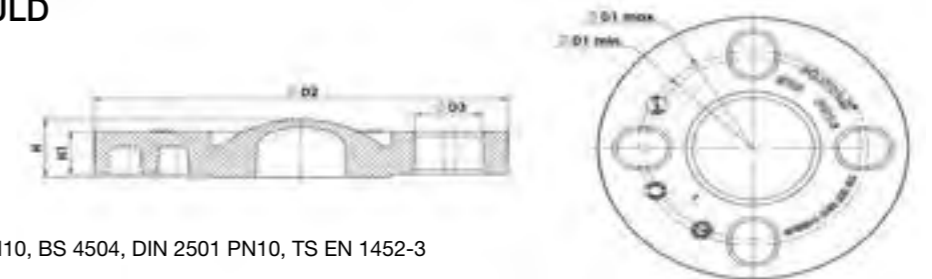


Connection sizes: ISO 7005 PN10 , EN1092 PN10, BS 4504, DIN 2501 PN10, TS EN 1452-3
 Screw circle axis: PN10 Screw circle axis: PN10

Diameter	Pressure Pn	D	D1	D2	D3	N	z
20	16	28	65	95	14	4	11
25	16	34	75	105	14	4	12
32	16	42	85	115	14	4	14
40	16	51	100	140	18	4	15
50	16	62	110	150	18	4	16
63	16	78	125	165	18	4	18
75	16	92	145	185	18	4	20
90	16	110	160	200	18	8	22
110	16	133	180	220	18	8	24
125	16	150	210	250	18	8	26
140	16	167	210	250	18	8	26
160	16	190	240	285	22	8	28
200	16	226	295	340	22	8	32
225	10	250	295	340	22	8	32
250	10	277	350	395	22	12	36
280	10	310	350	395	22	12	36
315	10	348	400	445	22	12	36
355	10	388	460	505	22	16	38
400	10	442	515	565	26	16	42
* 450	10						
* 500	10						

BLIND FLANGE SIZE TABLE

TS EN - ASTM COMMON MOULD

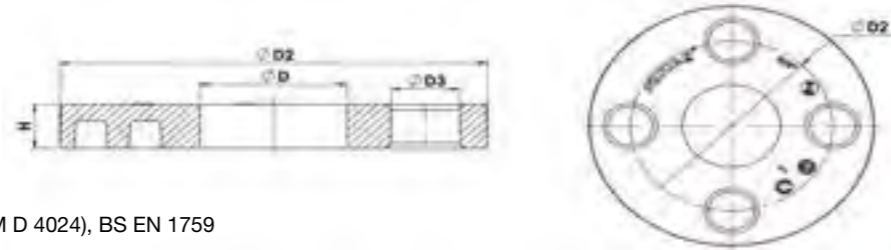


Connection sizes: ISO 7005 PN10 , EN1092 PN10, BS 4504, DIN 2501 PN10, TS EN 1452-3
 Screw circle axis: PN10

D	D1min	D1max	D	D4	D2	D3	N	H	H1
20	60.5	65	15	34	95	15.75	4	15	11
25	69.9	75	20	41	105	15.75	4	16	12
32	79.2	85	25	50	115	15.95	4	19	14
40	88.9	100	34	61	140	18	4	20	15
50	98.6	110	44	74	150	18	4	22	16
63	120.6	125	57	91	165	19	4	25	18
75	139.7	145	69	106	185	19	4	28	19
90	152.5	160	82	125	200	19	8	32	20
110	180	190.5	102	150	220	19	8	34	22

FREE FLANGE SIZE TABLE

ASTM MOULD

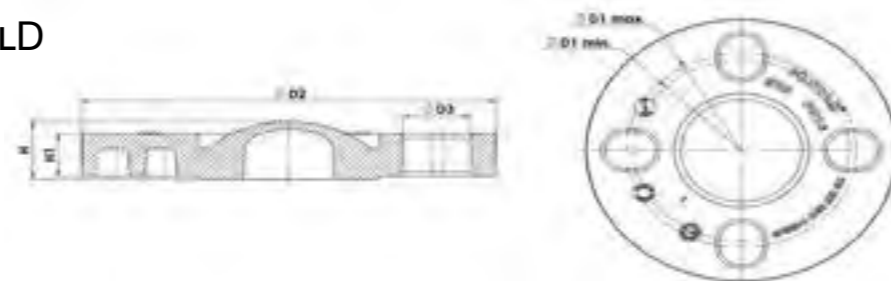


Connection sizes:ANSI B 16,5 CLASS 150(ASM D 4024), BS EN 1759

DIAMETER	Pn	D	D1	D2	D3	N NUMBER OF HOLES	H
20x1/2"	16	28	60.5	88.9	15.75	4	11
25x3/4"	16	34	69.9	98.6	15.75	4	12
32x1"	16	42	79.2	107.9	15.75	4	14
40x1 1/4"	16	51	88.9	117.3	15.75	4	15
50x1 1/2"	16	62	98.6	127	15.75	4	16
63x2"	16	78	120.6	152.4	19	4	18
75x2 1/2"	16	92	139.7	177.8	19	4	19
90x3"	16	110	152.4	190.5	19	4	20
110x4"	16	133	190.5	228.6	19	8	22
125x4"	16					8	
140*5'	16					8	
160*6'	16					8	
200*8'	16					8	
225*8'	10					8	
250*10'	10					12	
280*10'	10					12	
315*12'	10					12	
355*14'	10					16	
400*16'	10					16	
* 450	10						
* 500	10						

SLAVED FLANGE SIZE TABLE

TS EN - ASTM COMMON MOULD



Connection sizes: ISO 7005 PN10 , EN1092 PN10, BS 4504, DIN 2501 PN10, TS EN 1452-3 , ANSI B 16,5 CLASS 150(ASM D 4024)

Screw hole as long hole version.

D	D1min	D1max	D2	D3	D4	N	H1	H
20	60.5	65	95	15.75	27	4	12	21.5
25	70	75	105	15.75	33	4	12	21.5
32	79.2	85	115	15.75	41	4	14	25
40	88.9	100	140	18	50	4	15	29
50	98.6	110	150	18	61	4	16	34
63	120.6	124	165	19	76	4	18	40.5
75	139.7	145	185	19	90	4	19	46.5
90	152.4	160	200	19	108	8	20	56
110	180	190.5	220	19	131	8	22	66

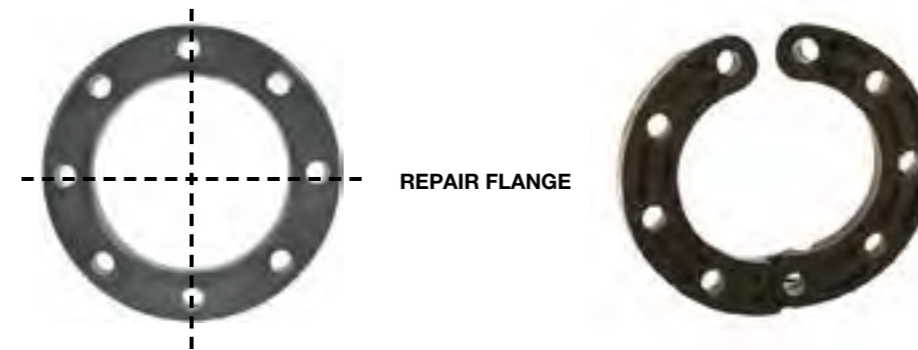
FORMATION OF FLANGE CONNECTIONS

When a flange connection is performed, following issues must be taken into consideration:

There is a general difference between the connections of adaptor connections to indicate the passage from one plastic pipe to a metal pipe or a metal valve with plastic pipes. Bolts and flanges must be chosen accordingly.

Flanges with adequate heat and mechanical strength must be used. PIMTAŞ flange types meet these requirements.

Direction of bolts outside the main axis, horizontal pipe lines indicate the direction of bolts to escape if the leaking substance drops on the bolts.



Information: As bending load will result in leakages within the area where there are flexible sections and/or expansion joints, flange connections will not be used.

Flange adaptor, flange and screw must be aligned so as to be centered with pipe axis.

When a gasket is attached between flange connections, the dimensions of the seals must be checked so that they comply with internal and external dimensions of flange adaptors. If the deviation between the internal diameter of the gasket and the adaptor is more than 10 mm, there may be a problem with the flange connection.

Before tightening the bolts, connection surfaces must be at the same level and sit on the gasket very well. Due to tensile strength, it must be definitely avoided to pull the pipes each other within the flange connection.

The length of the bolts must be selected in a way that the thread in the nut must be 0 or it mustn't protrude more than 3 tours. A washer must be placed under the screw head and under the nut at the same time.

In order to ensure that connection bolts are removed easily after a long utilization period, for instance thread must be coated with molibden sulfide. Bolts must be tightened diagonally and evenly. First the bolts must be attached and nuts must be tightened manually. In this way, the screw is placed perfectly and flange adaptors will have the minimum balance. Then the bolts must be tightened diagonally up to 50% of recommended torque and then they must be tightened up to 100% of the torque.

Tightening again after 24 hours of installing the bolts, we recommend them to be controlled at a later time, if required.

Following the pressure test, they must be controlled and tightened if required.

For more information about flange connections, see DVS 2210-1 Annex 3

SCREW TIGHTENING TORQUE

The torque of the bolts is especially important in flange connections. We apply some different methods in practice:

As far as possible: And this will definitely compel to a flange connection in plastic piping systems.

By feeling: Requires a great experience and material information.

Using a torque wrench: This is a good method. Recommended rates are provided below as a list. However, there may be deviations in practice. These may be, for instance, due to self-locking nuts or the use of pipe axes, which are not at the same level. At the same time shore hardness of the screw may have an impact on the required torque force (also see the following information regarding insulation materials).

Screw tightening torque regulations about metric (ISO) flange connections, which are PP-V, PP steel and PVC flanges.

Pipe Diameter d	Nominal Diameter, DN	Screw Tightening Torque, (Nm)		
		Flat gasket at 40°C up to 10 bar maximum pressure	Profile gasket up to 16 bar maximum pressure	O ring gasket up to 16 bar maximum pressure
		16	10	10
20	15	10	10	10
25	20	10	10	10
32	25	15	10	10
40	32	20	15	15
50	40	25	15	15
S3	50	35	20	20
75	65	50	25	25
SO	80	30	15	15
110, 125	100	35	20	20
140	125	45	25	25
160, 180	150	60	35	30
200, 225	200	70	45	35
250, 280	250	65	35	30
315	300	90	50	40
355	350	90	50	-
400	400	100	60	-
450, 500	500	190	70	-
560, 630	600	220	90	-

UP TO 6 BAR MAXIMUM OPERATING PRESSURE

Information: With respect to butterfly valves, please consider specific tightening torques, provided for suggested DN250 and DN300. See the article titled "Principles of Manually Operated Valves".

Indicated torques are suggested by PIMTAŞ company. Under these torques, it is ensured that flange connections are adequately tight. These deviate from the data, which will be understood as top limit values, provided in DV3 2210-1 Annex 3. Of course, the components of flange connection (adapters, flanges) are designed so as to withstand these top limit values.

SIZES OF METRIC (ISO) FLANGE CONNECTIONS

Pipe Diameter d	Nominal diameter, DN	Min. screw length (calculated)	Max. screw length (calculated)	Number of screws x outside diameter
16	10	51	51	4x M12
20	15	52	69	4x M12
25	20	56	73	4x M12
32	25	60	75	4 x M 12
40	32	70	91	4x M16
50	40	72	95	4x M16
63	50	78	102	4x M16
75	65	82	110	4x M16
90	80	86	114	8x M16
110.125	100	89	119	8x M16
140	125	101	137	8x M16
160, 180	150	108	145	8x M20
200.225	200	130	167	8x M20
250, 280	250	134	177	12 x M20
315	300	150	185	12 x M20
355	350	168	192	16 x M20
400	400	179	207	16 x M24
450, 500	500	249	253	20 x M24
560, 630	600	291	295	20 x M27

Minimum and maximum screw lengths are provided only for guidance. These are based on the types of flanges and flange adapters. Full rates may be calculated from the information indicated in the following article titled "The length of the Bolts".

THICKNES OF THE VALVES INSTALLED BETWEEN THE ADAPTERS

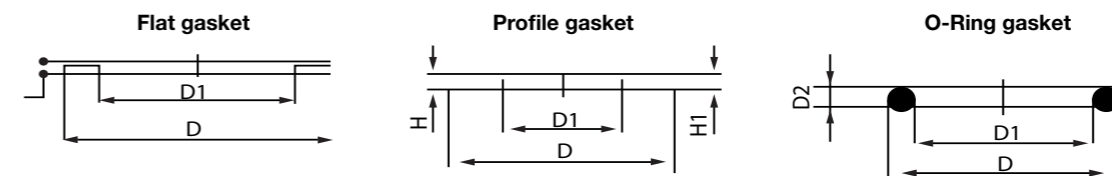
	Butterfly valve	Check valve
	-	15 mm
DN40	-	16 mm
DN50	45 mm	18 mm
DN65	46 mm	20 mm
DN80	49 mm	20 mm
DN100	56 mm	23 mm
DN125	64 mm	23 mm
DN150	72 mm	26 mm
DN200	73 mm	35 mm
DN250	113 mm	40 mm
DN300	113 mm	45 mm
DN350	129 mm	-
DN400	169 mm	-
DN450	179 mm	-
DN500	190 mm	--
DN600	209 mm	

Selection of seals for flange connections

In consideration of operating conditions and sealing forces, selection of proper flange seals in thermoplastic piping systems is based on following factors:

- Shape
- Dimensions
- Material

Type of the gasket



In applications with low operating pressures, conventional flat gasket, made of plate material 2-5 mm in thickness is used (based on nominal diameter). For flange connections with flat seals, adequately durable flanges are required in order to withstand higher torque required to fix the bolts into such connections. All flanges supplied from PIMTAŞ company comply with these conditions.

Profile flange seals and o ring seals were proved to be useful for increasing operating and test pressures. When compared to flat gasket, profile flange gasket was made of two components. One of them is the stony flat gasket piece, reinforced with steel and the other is the profile piece inside the gasket (gasket with o-ring, lipped gasket).

Flange gasket with stabilized profile and O-Ring seals have the following advantages:

- Safe gasket with less screw torque.
- Available with higher internal pressure and internal vacuum.
- Easy to install
- Less affected from flange surface.
- Safe when pipes, made of different materials are connected.

Selection of seals, fit for the shape, may be carried out with the following table:

Type of the gasket	Recommended limits	Flange model
Flat gasket	P = 1-10 bar, Only up to 6 bars above DN200 standard T = maximum 40°C	Leak-proof eye
profile flange gasket	P = 0*) - 16 bar T = Entire application range	Leak-proof eye or blind
O-Ring gasket	P = 0*) - 16 bar T = Entire application range	Eye

GASKET MATERIAL

Selection of a gasket is dependent upon flow ambient Find detailed information about gasket material or chemical resistance in particular, in reference tables.

As the flange or adaptor may be deformed under strong sealing forces, the use of gasket materials with high hardness degrees, as in steel pipes, is restricted in thermoplastic pipe systems. Elastomer materials such as EPDM, CSM or FPM, Shore-A hardness of which is maximum 75° are preferred.

GASKET SIZES

Sizes of the gasket are specified in general standards regarding pipe connection components. When compared to flange adaptor, very big differences in internal or external diameter of the gasket may result in increase of mechanical stress of the flange connection, quick abrasion of internal part of the gasket and accumulation of residuals inside the pipe.

EVERYTHING IS FOR A GASKET

PIMTAŞ Piping Systems helps you find the correct gasket. New standardized gasket is ideal both for butt fusion and socket fusion systems. Now no difference is brought in for the things held by SDR pipe system. Save time while choosing the right gasket. Avoid mistakes and stockless changes. Everything is much easier. New standardized gasket available as profile flange gasket or flat gasket always gives you confidence.

6-A-1-b THREADED COUPLINGS



Equipment ring for the connections and plastic fittings without parallel internal taper thread

Insulation: PTFE band, thread insulation wire, cement

Connection:

Plastic - plastic (same or different materials)

Adaptor threaded fittings



Plastic fittings with A2 stainless equipment ring or taper internal threads

Male thread fittings (nozzle)

Internal and external threaded fittings

Insulation: PTFE band, hemp rope, liquid gasket, O-Ring

Connection:

- Plastic - plastic (same or different materials)
- Plastic- metal

This method is the most widely used coupling type in metal fitting in particular.

This method is based on coupling of two threads, in compliance with each other, which are referred to as male and female, through screwing method. In this coupling, it is essential to place filling material between two fittings.

The amount of filling material must be taken into consideration in PVC thread assembly.

Today PTFE (teflon) band is the most widely used method as filling material. Upon increasing demand, there are many kinds of teflon bands in the market and the distinction is made in accordance with the box color of the teflon band Utilization areas based on the color of the teflon bands is classified as follows.

White Package:

This is the single density band. Used for NPT threads up to ¾ inch.

Yellow Package:

This is double density teflon band. Ideal filling material used in gas connections.

Red Package:

This is the three density band. Used in joints at and above ½ inch.

Green Package:

These are fat-free specific teflon bands. Used as coupling filler in welding oxygen and medical oxygen lines.

Copper Color Package:

These bands contain copper granules. These bands are used for specific pipe and screw connections.

Regardless of utilized type of teflon band, it is important to carry out teflon band application properly. Use of bands with correct thickness and characteristics increases the efficiency of the application. In minimum band rolling, it is essential that it should cover ½ or 2/3 of the first step. In addition, correct thickness is the application that ensures tightening of parts at a level so as not to result in leakage. In band rolling, it is important to roll the band as tight as possible.

Different types of threads, specified below are used:

Thread name	Standard	Typical usage	Description
Rp	ISO 7-1	Adaptor and threaded fittings	Parallel internal pipe threads where pressure-tight joints are made on the threads.
Re	SC 7-1	Not used in GF company	Taper internal pipe threads where pressure-tight joints are made on the threads.
R	SO 7-1	Adaptor and threaded fittings	Parallel external pipe threads where pressure-tight joints are made on the threads.
G	ISO 223-1	Pipe Unions	Parallel internal or external pipe threads where pressure-tight joints are not made on the threads.
NPT = National (American Standard) Pipe Taper	ASTM F 1498	Adaptor and threaded fittings	Tapered female or male pipe threads where pressure-tight joints are made on the threads.
Acme thread		Pipe Unions	Lock thread for ABS, PVC-U and PVC-C pipe unions in sizes of d75, d90, d110
Buttress thread		Pipe Unions	Lock thread for PE, PP and PVDF pipe unions in sizes of d75, d90, d110

G AND R OUTER COMBINATION

Rp parallel female thread in compliance with ISO 7-1 standard and G parallel male thread combination in compliance with EN ISO 228-1 standard in A or B tolerance class requires special importance. When it is required to obtain this combination, positive and negative tolerance of female thread, in compliance with ISO 7-1 standard must be taken into consideration in the respective product standard where G parallel external threads are used. Such a thread combination isn't necessarily required to reach a leak-proof point.

NPT

As they are in different pitch, combination of R or G thread with NPT is possible.

THREAD STANDARDS

ISO 7/1 tightness is obtained through pipe threads.(Taper male thread and parallel female thread).

Pipe threads where pressure-tight joints are made on the threads.(Taper external threads and parallel internal threads.)

TS EN 10226-1-1 tightness is obtained through pipe threads.(Taper external threads and parallel internal threads.)

Pipe threads where pressure-tight joints are made on the threads. .(Taper external threads and parallel internal threads.)

ISO 228-1 tightness isn't obtained through pipe threads (Parallel male thread and parallel female thread.

Pipe threads where pressure-tight joints are not made on the threads.(Parallel external and internal threads.)

ASTM D 2464(Sch 80). ASTM F 1498. -Taper pipe threads.

6-A-1-c) COUPLINGS WITH PIPE UNIONS

Adaptor unions to couple plastic pipe components

Where available, pipe unions are the preferred option for plastic pipe connections rather than flange adapters. Without metal parts, corrosion is beside the point and the weight decreases at the same time. In addition, smaller outside diameter refers to the fact that distance from pipe axis to pipe axis is smaller in comparison to a flange connection.

Pipe unions are made of several materials:

PVC-U sealing connections with sealing socket



ABS, PVC-U, PVC-C sealing connections with sealing socket



PP socket fusion pipe union



Pipe unions for adaptor connections made from different plastics

Component parts of butt fusion union, made of PE, PP, PVDF (d20 - dS3) materials may be coupled with each other and with PVC or ABS unions. This is not applicable to larger sizes (d75-d110).

Union bearings and union nuts must be manufactured from the same material. Union flange adaptor may be manufactured from another material.



Adaptor pipe unions between plastic and metal pipes (malleable iron pipe union socket)

PIMTAŞ fittings contain several adaptor and threaded fittings. In order to connect plastic pipe components with metal pipes, fittings or valves with threaded joints, adaptor unions with metal connections are preferred.

Insulation in metal thread may be performed with hemp or a PTFE band.

For the following plastics, these adaptor unions with EPDM or FPM o-rings are available:

Stainless steel or plastic adaptor unions



In the following industries, adaptor unions, made of several materials from stainless steel to PVC-C and PVC-U plastics, (it is possible to connect additional plastics from standard single parts) may be used.

- Chemical industry
- Food industry
- Automotive industry
- Swimming pool construction
- Metal surface finishing technology
- Cooling and air-conditioning

PRODUCT SPECIFICATIONS

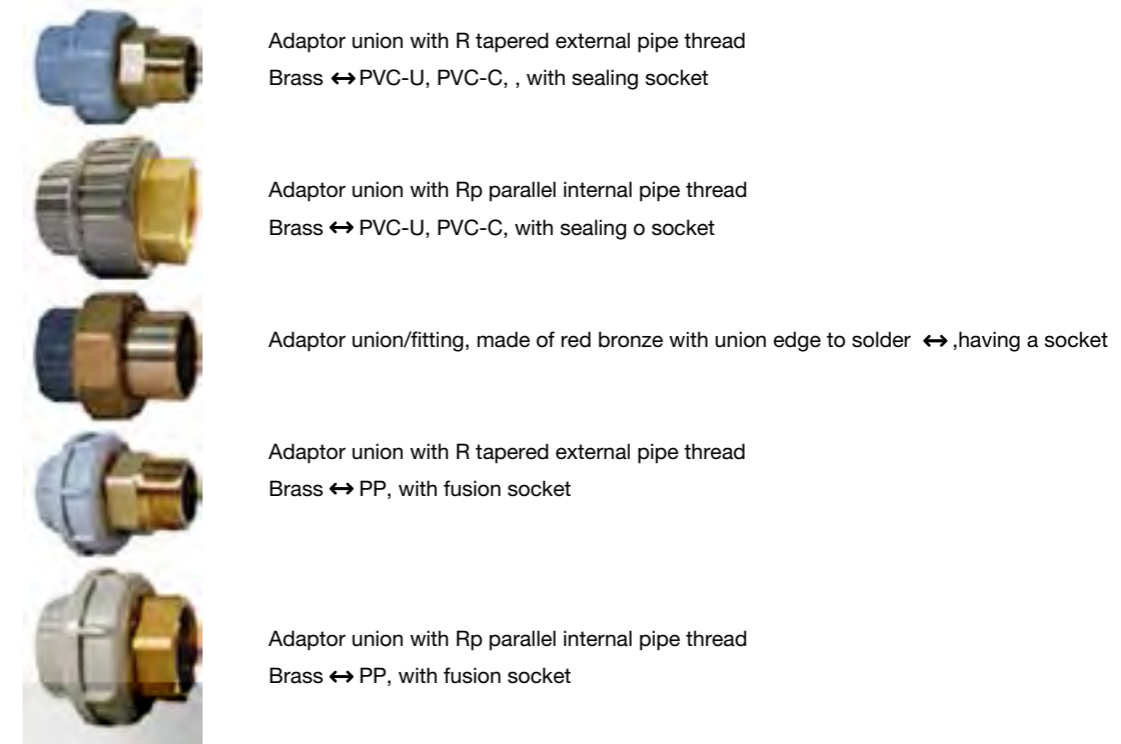
Tightness of passage specific to plastic is ensured with o-ring seals, made of EPDM or FPM materials. Stainless steel, which is the material that the edges of the union are made of, (also the cover edges in fusion models) is an austenite steel with molibden mixture (V4A) that provides high resistance to abrasion. This alloy is also resistant to rust and acid. Therefore, it is very suitable for use in industrial applications and hard environments. Low carbon content and good fusion characteristic obtained accordingly are the other advantages of this material. Plastic or stainless steel union adaptor is available in three alternative connections, namely female thread, male thread and fusion edge connection. In any case, it is d 16-3/8" - d63-2" in size.

Adaptor unions between plastic and non-ferrous pipes (brass union edge)

Preferably adaptor unions with brass connector must be used in order to connect plastic pipe components to the pipes, made of non-ferrous metals, fittings or valves with threaded connections.

Insulation in brass thread may be performed with hemp or a PTFE band.

For the following plastics, these adaptor unions with EPDM or FPM o-rings are available:



Other plastics are supplied upon demand.

Remark: In order to avoid electrochemical corrosion, preferably malleable iron fittings must be used in steel transitions, and brass fittings must be preferably used in non-ferrous metal transitions.

Installation tips regarding adaptor and threaded fittings

It is particularly important that pipe installation should be low-voltage. Avoid using adaptor or threaded fittings at the points that are exposed to bending stress in pipe systems.

In major circular temperature changes, adaptor unions are a preferable option.



Attention: In order to avoid the damages in plastic fittings remove any and all flanges (if any) in the areas where there are metal threads.

Adaptors and threaded fittings are mostly tightened manually. Never apply force when plastic fittings are installed. Using a proper tool, fittings are tightened until one or several thread pitches are seen.

In order to ensure tightness, we recommend using PTFE band (e.g., Teflon) in plastic and threaded fittings. Alternatively, it is also possible to use Henkel TangitUni-Lock or Loctite 55 thread tightness wire and/or Loctite 5331 thread tightness cement. Please, comply with proper installation regulations of the manufacturer.

In case of use of other sealing/tightness materials, first check if such are in compliance with the plastics to be used.



Attention: Never use hemp! When hemp is used, over load to plastic fittings or damage risk to thread is possible. At the same time hemp is not resistant to chemical substances

based on the utilized material.

GENERAL REMARKS ABOUT INSTALLATION

In order to prevent unknown stress during installation, unions with sealing rings must be used where applicable.

Do not tighten union nut manually. Generally wrenches used in steel pipe production are not allowed. For large-sized ones, a pipe wrench with belt may be used.

Pay attention to perform the installation with low-stress while using the unions.

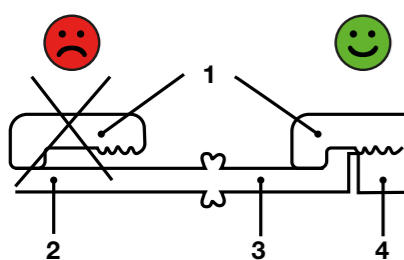
As bending load will result in leakages within the area where there are flexible sections and/or expansion joints, flange joints will not be used.



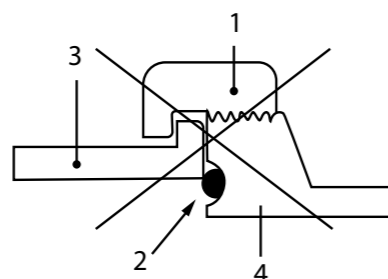
Tip: Dampen the union nut in order to facilitate the installation of the union

Use only union bushings and union edges with the same nominal diameter

As shown in the Figure, it is not allowed to couple a union edge with butt fusion in sizes of d75, with a union edge with butt fusion in sizes of d90 as it may result in leakage.



1. Union nut
2. Pipe
3. Union flange adaptor
4. Casting



1. Union nut, d75
2. Inadequate gasket
3. Butt fusion union flange adaptor, d90
4. Butt fusion casting, d75

6-A-1-d-) COUPLING WITH HOSE ADAPTOR

Hose connections in plastic piping systems

PIMTAS company has a wide range of products for hose connections in plastic piping systems.

Hose Connections

Please use proper hose clips to attach the hose to the hose adaptor.

Pvc-U Pipes

Hose adaptor one side of which is sealed and the other side has taper hose connection



R taper external pipe thread and pressure pipe adaptor



Single side female thread hose adaptor



Polyethylene and polypropylene pipes
Socket or butt fusion, pressure hose adaptor



This feature, makes this type of a connection available especially for the following application areas:

- Connecting pipe lines with equipment, machinery and fittings
- Connecting sensors
- Connecting threaded areas

**SEALED PIPE SOCKET-UNION
HOSE ADAPTOR**



**VALVE COMPATIBLE
HOSE ADAPTOR**



6-A-2-) COUPLING WITH ADHESIVE

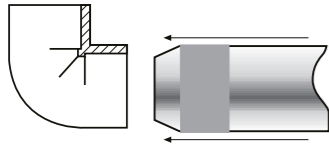
Acceptable dimensions regarding the shortest bonding length are as follows.

Installation must be performed immediately after the adhesive is applied. Remaining adhesive must be cleaned following the coupling.

For diameters above Ø90mm, two operators are suggested for cleaning and sealing operations.

Minimum waiting time after the installation is 1 hour for each bar. 24 hours should pass to ensure the most proper sealing.

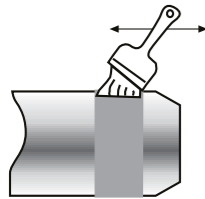
Installation should be carried out in an environment with adequate ventilation between -5 and 30°C. Otherwise, proper coupling may not be possible.



Never forget during all these procedures that the adhesive is a quickly flammable chemical and keep fire away.



Check the density of the adhesive before application. Adhesive must be oily and it shouldn't be more viscous or dense. Adhesive must be used for sealing purposes. It shouldn't be applied for leaks or cracks.



Adhesive should be applied on the entire surface to be coupled so as not to leave any space in a way that it takes the form of a layer. Adhesive should be applied on both of the surfaces to be joined and it must be performed with a brush in compliance with the diameter of the pipe.

PVC-U adhesive is supplied as ready for use. Mix thoroughly before use. Adhesive with the correct consistency will flow over a wooden leaned spatula smoothly. Now, it is not possible to use an adhesive which fails to flow smoothly. Adhesive shouldn't be thinned.

Adhesive and cleaner series should be kept in a dry place (5-35°C)! Under these conditions adhesive and cleaner can withstand 24 months as from filling date (pressed into a can).

SEALING

Clean the external side of the pipe and inner part of the socket thoroughly with a cleaner and absorbing paper. Use a new piece of paper for each constituent. Eliminate any concentration to emerge inside the pieces.

Important: Pipe end and socket of the fittings should be dry, grease and dirt must be removed, they shouldn't be touched once cleaned.



Cleaning the pipe and the socket

PVC-U pipes may have a waxed surface. In such a case, cleaning operation must be repeated until pipe surface is seen opaque in the eye for correct coupling operation.

In some cases, it may be required to have pipe surface machined mechanically for the sizes between d250 – 400. Lack of, or inadequacy regarding the adhesion of welded parts after cleaning is one of the expected indications of inadequate welding quality ("tab control"). Afterwards, welding surfaces must be smoothly sandpapered with grain 80 or a more finely grained emery paper in consideration of allowed maximum space.

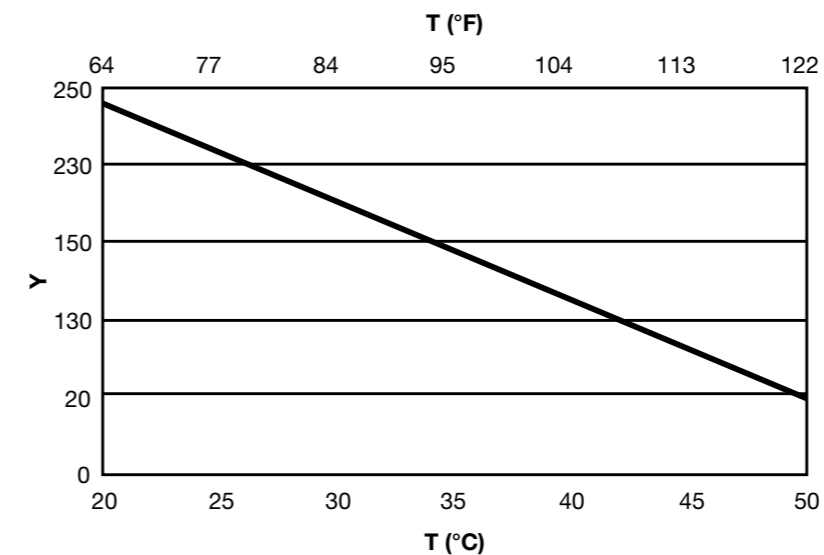
PVC-U pipes must be sealed at temperatures between 5°C – 40°C. In case of deviation of temperatures from the foregoing temperature range, following protective measures must be taken:

In lower temperatures, potential concentration or freezing must be eliminated for example through hot air. Adhesive and cleaner should be kept in room temperatures.

When sealing operation is performed at higher temperatures, avoid irregular excessive heating by protecting the welding area from direct sunlights → (shorten the opening period).

Fast drying period of the adhesive requires performance of the welding within the opening period after the adhesion is started to be applied.

Opening period for PVC-U adhesive changes based on the ambient temperature and the thickness of the applied adhesive:



T: Temperature, °C, °F

Y: Opening period (seconds)

Remarks: When the adhesive is applied, opening period is shortened up to 1 minute at 20 °C, and 30 seconds at 40°C. Therefore, maximum dimensions are limited to 110 mm.



Applying the adhesive

Start the operation by applying normally one coat of adhesive on the socket of the fitting and then a thicker coat of adhesive agent on the pipe end with a brush by pressing. Apply thoroughly. Brush strokes must always be in axial direction.

In order to ensure that both of the welding surfaces are completely covered with proper adhesion layer, adhesive should be placed on the brush

MINIMUM ADHESIVE COUPLING LENGTH IN SEALED PIPE SOCKET COUPLINGS

d	L (mm)
20	18
25	18.50
32	22
40	28
50	31
63	37.5
75	43.5
90	51
110	61
125	68.5
140	76
160	98
200	108
225	118.5
250	131
280	146
315	163.5
355	183.5
400	206

Apply adhesive in d75 size range maximum

Adhesive welds may be prepared with only one person.

Weld

After the adhesive is applied, immediately insert the pipe into the full depth of the socket without bending and bring it to the correct alignment. Make sure that fitting outlets are in the correct position. Keep them in this position for a while to allow the adhesion to get dry.

Waiting time during sealing operation

Before the next welding operation, wait at least for 5 minutes. Extend the waiting time up to 15 minutes for temperatures below 10°C.

Dimensions between d90 – d225
Apply adhesive

Socket of the fitting and the pipe end must be covered at the same time with adhesive by two persons. Otherwise, it won't be possible to monitor the opening time of the adhesive.

Weld

After the adhesive is applied, immediately insert the pipe into the full depth of the socket without bending and bring it to the correct alignment. Make sure that fitting outlets are in the correct position.

Keep them in this position for a while to allow the adhesion to get dry.

Waiting time during sealing operation

Before the next welding operation, wait at least for 5 minutes. Extend the waiting time up to 15 minutes for temperatures below 10°C.

Dimensions between d250 – d400
Apply adhesive

Declining the usual application method, directly pour the adhesive from the can into the middle of the adhesion surface and completely distribute with a flat brush first radially and then axially. Make sure that adhesion layer is in the right consistency so as to comply with higher tolerances and that it cover the whole surface. Apply a coat of Tangit on the fittings, which is thinner than that of pipe ends. Sealing the pipes in these sizes must be carried out at least by 2 persons. Minimum thickness of adhesion layer for fittings is 1 mm. Apply more on the pipe ends.

Weld

After the adhesive is applied, pipe or fitting must be pushed towards each other slowly without bending by 3-4 persons until they stop or up to the marker. Make sure that fitting outlets are in the correct position. Keep them in this position for a while to allow the adhesion to get dry.

Waiting time during sealing operation

Comply with waiting time for 15 minutes before the next welding operation. This time must be extended up to 30 minutes at temperatures below 10°C.



Change the cover of the adhesive at breaks.

Remove the excessive adhesive immediately, using an absorbing paper

A bar around the entire external sphere of the weld indicates excessive solvent adhesive and a smaller bar around the entire internal sphere of such indicates that welding has been performed correctly.

After using the brush, clean the excess adhesive with a dry absorbing paper and then clean thoroughly with the cleaner. Brushes must be dry before using again (shake them).

In order to prevent contamination of solvent, change the cover of the adhesive after use. Use of tapered cover enables leaving the brush inside the sealing can during the breaks.

Both the solvent and cleaner solves the PVC-U material. Therefore, pipes and fittings shouldn't be laid on spilt adhesive or the paper containing adhesive wastes inside or they shouldn't be allowed to contact with these substances.

Do not completely close pipe lines with adhesive during the drying process. This is particularly important at temperatures under +5°C. Otherwise, the material may be damaged.

Following the drying procedure (see the waiting times provided below) pipe lines may be filled. In order to remove current solvent vapor, it is suggested that pipe line should be thoroughly washed before use.

For the pipes which are not immediately put into place, it is recommended that they should be filled with water after cleaned carefully and washed regularly.

Do not use pressurized air for washing.

Drying time and pressure test

Before applying test or operating pressure, drying time of the adhesive is based on drying temperature, sizes and drying conditions.

Waiting times required between the completion of final welding process and pressure test are presented in the following table.

If the pipe sample is only exposed to operating pressure after adaptation or repair work, following basic rule is applied for waiting time of drying process:

1 hour waiting time at 1 bar operating pressure

At temperatures above 20°C, test pressure should be reduced in accordance with the conditions, specified in the section titled, "Final test and Commissioning".

Remarks: When adhesive is used (only up to sizes of d110) waiting time is shortened up to 12 hours or up to 1/4 waiting time at 1 bar operating temperature.

Sizes	Nominal drying pressure (PN), 20°C, water	Maximum operating pressure 20°C, water
maximum d225	PN10 or PN16	10 or 16 bar
d250	PN10	10 bar
d2S0	PN10	10 bar
d315	PN6	6 bar
d350	PN6	6 bar
d400	PN6	6 bar

Sizes	Maximum test pressure, 20°C, water	Waiting time from final adhesion process to the test
maximum d225	15 or 21 bar	15 or 24 hours
d250	15 bar	24 hour
d2B0	15 bar	
d315	9 bar	
d350	9 bar	
d400	9 bar	

Safety Measures

There are very volatile solvents in the adhesive and cleaner. And this requires good ventilation or adequate fume exit in the dosed areas. As the fume of the solvent is heavier than the air, there must occur extraction at ground level or at least under the level of operation. In order to minimize the amount of solvent fume in the air, place the paper, which is used for cleaning purposes or to remove the excess adhesive into sealed containers.

Adhesive and cleaner is flammable. Extinguish direct fires before starting the work. Turn off unprotected electrical devices, electrical heaters etc. Avoid static load. Don't smoke! Do not continue welding operations. Furthermore, comply with all instructions by the manufacturer of solvent adhesive (e.g., the label of the can and complementary documents).

Protect the pipe and fittings from spilt adhesive, cleaner and the absorbing paper, used to clean the adhesive. Never throw excessive solvent adhesive or cleaner inside the drainage systems.

It is suggested to use protective gloves to avoid contact with skin. In case of contact of adhesive or cleaner with the eye, immediately wash with water. Consult a doctor! Immediately change the clothes, contaminated with solvent adhesive.

Always comply with safety regulations, issued by responsible authorities.



Workplace must be adequately ventilated



Smoking and open flames are not allowed during adhesion process.

BRUSH SIZES SUGGESTED FOR THE APPLICATION

Main Diameter	Brush Type / Length
< 32 mm < 32 mm	Round brush diameter 8mm 8mm
40 - 63 mm 40 - 63 mm	Flat brush 1 "
75 - 160 mm 75 - 160 mm	Flat brush 2 "
225 - 280 mm 225 - 280 mm	Flat brush 2 ½ "
> 315 mm > 315 mm	Flat brush > 3 "

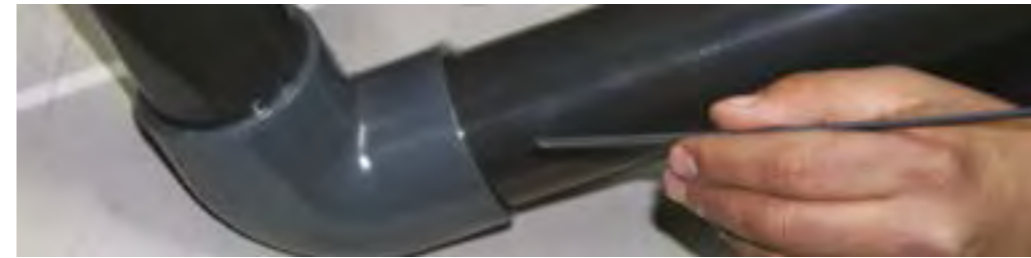
APPROXIMATE ADHESIVE USAGE AMOUNT BASED ON PIPE DIAMETERS

d	Amount of adhesive Required for one coupling process (kg)	Number of parts to be coupled with 1 kg adhesive
20	0,005	200
25	0,006	166
32	0,008	125
40	0,011	90
50	0,015	66
63	0,017	58
75	0,022	45
90	0,040	25
110	0,080	12
140	0,130	7
160	0,190	5
200	0,240	4
225	0,260	3
250	0,310	3
280	0,380	2
315	0,520	1
355	0,620	1
400	0,720	1

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ
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6-A-3-) COUPLING WITH WELDING METHOD

Coupling process in welding method is carried out with PVC electrodes. The process is carried out through filling method with electrode heating for the coupling of two materials to be connected on the coupling point. In this application, it is essential that the points where welding will be applied must be clean, and that the surface shouldn't be humid, oily, dusty or adhesive. There shouldn't be sunburn spots on the pipes. Therefore, the pipes and fittings should be checked before starting the operation, they should be cleaned or rubbed with emery if needed.



In order to increase the safety of coupling, adhesive may be applied on the pipe socket section of the surface before welding. In this application, called as secret sealing weld should by no means contact with welding point. Proper welding machine nozzle must be selected for welding application and the heat of the welding machine must be properly adjusted according to welding electrode and pipe length.



Coupling with weld method is an efficient method that can be used in garment industry additional part manufacture, collector manufacture and all coupling methods. Adhesive may also be used as additional safety increaser. However, it may result in pipe deformation, fitting deformation, openings in welding parts or burns in the pieces in case of failure to carry out proper welding. Therefore, experience and skill is very important in this practice. This method is nor recommended for the assembler, not experienced in this application earlier.



6-A-4-) SEALED COUPLING

Sealed coupling is carried out by sealing method in which the seal/gasket placed into the seal channel opened outside the muffs ensures tightness. These seals are rubber and they shouldn't be contacted with chemical substances such as petrol, acid or oil during stocking or operations. It is essential to protect the rubber from stresses to spoil the shape of the rubber during stocking.

Seals are installed in the recesses for the seals fitting ends. After the seal is installed, liquid soap is applied as lubricant agent at the end of the fitting. (Oil is not used) two pieces are coupled by pushing alongside the Pipe socket bed. At this moment, the seal inside the Pipe socket should be taken into consideration, the seal/gasket shouldn't be slid.

- Material : PVC-U
- Density: 1,4 g/cm³
- Color: Gray RAL 7011.
- Dimensions: From D63 to D315
- Standards: Dimensions and characteristics according to EN 1452

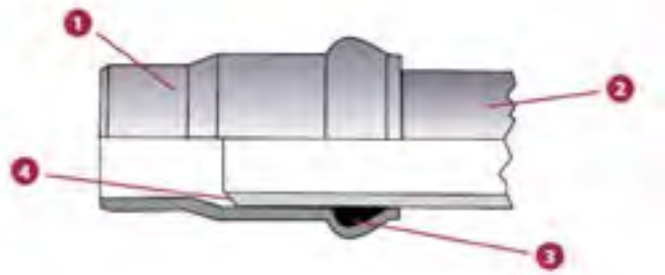
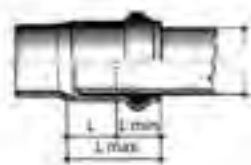


FIG.	Parts	Desplace	Material
1	Union socket	Manguito union	PVC-U
2	Pipe	Tuberia	-
3	Gasket	Junta	NBR
4	Chamfer to make an easier installation	Chafilán para una inserción más fácil	-



D (mm)	63	75	90	110	125	140	160	200
L Max	96.8	102.3	107.6	113.1	118.1	123.3	128.7	136.9
L	58	60	61	64	66	68	71	75

6-B) PE COUPLING TECHNIQUES: 6B-1-) WELD COUPLING (FUSION COUPLING)

Butt Welding (Butt Fusion)

Butt welding quality is directly based on the ability of the butt welder and the observer to ensure the application of utilized equipment and standards. Butt welding process should be monitored from a to z. Before starting butt welding process, the direction of butt welding parameters must be determined. Any butt welder must be educated with required trainings and have essential certificates. Issues to be taken into consideration before starting butt welding process.

- The temperature of the environment where the butt welding is carried out should be above 5°C. A top covered area should be selected in rainy and cold weathers.
- Pipe ends should be covered in order to prevent fast cooling due to air circulation during butt welding.
- Before performing butt welding in pipes in the form of tubes, it is essential to eliminate ovalness to emerge during tubing.

Butt Welding

Polyethylene pipes may be produced so as to be coupled with butt welding based on the nature of the project to be applied. However, there are technical restrictions in this welding method either for diameter or wall thickness. Coupling through this welding method is carried out from a diameter of 50 mm. to 2500 mm and from a wall thickness of minimum 5 mm to 150 mm based on the diameters. Butt welding process is carried out in accordance with DVS 2207 standard.

Issues to be taken into consideration while coupling the PE pipes through butt welding:

- Wall thicknesses of the pipes to be connected must be equal, if there is a difference, the wall thickness difference of two pipes in the same SDR group mustn't go beyond %10 maximum.
- Butt welding machine to be used in welding process should have a certificate.
- Before welding process starts, welding surfaces should be trimmed and oxidation should be removed and welding surfaces must be ensured to contact with each other.
- After trimming the surface where welding will be applied, contamination for any reason should be avoided. If contamination takes place again, trimming should be performed once again.
- The surface to be welded should be cleaned with alcohol before heating with the smoothing iron.
- Although the weld iron temperature is between 220-200°C, it must be determined based on the raw material of the pipe and application standard. Upper heating rates should be selected for the pipes with low wall thickness and lower heating rates must be selected for the pipes with high wall thickness.
- After welding process has started, pipe coupling pressure rates must be kept equal during weld cooling period.
- As the air circulation to emerge inside the pipe accelerates the cooling process of performed welding unevenly, one end of the pipes should be covered during welding process.
- Before starting the welding process, the thermal value of the machine should be controlled and the welding process must be started after five minutes once the desired heating value is reached.
- Ironing section of the machine and the part of the pipe to be welded must be cleaned before welding.
- Welding pressure test for pressurized drinking water pipes is conducted in compliance with EN 805 standard.

Butt welding process steps

1. Ensure required butt welding conditions (e.g., covering the top of butt welding area)
2. Check if the butt welding machine operates by connecting the machine with the generator or electric line.
3. Place the pipes to be butt welded on the machine and ensure that pipes may easily move in axial direction.
4. Trim the connection area.
5. Remove the trimming apparatus from the machine
6. Clean the burrs from butt welding area (via brush or paper towel).
7. Cover the pipe ends against air circulation.
8. Check the parallelism of connection surfaces by touching the surfaces to each other. Mismatches must be at 0,1x wall thickness maximum in case of worst scenario.
9. Check the heater surface temperature (Graphic 1).
10. Clean the heater surfaces with a non-abrasive and lint-free cloth or paper towel.
11. Read the motion pressure form the manometer of butt welding machine.
12. Determine the approach,unpressurized heating and coupling pressure in accordance with the calculations and tables provided by the

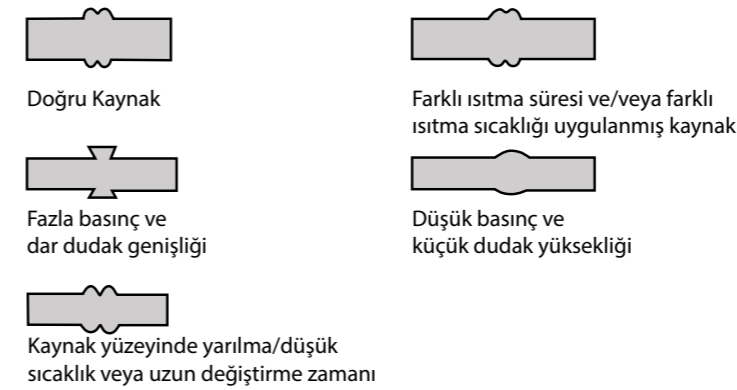
13. Apply the values/rates in Table 1 on the butt welding machine.
14. Adjust the heater to the pressure of butt welding.
15. Approach the coupling areas quickly to the heater and wait for formation of minimum lip heights, provided in 2nd column of Tale 1 at approach pressure.
16. Reduce the pressure down to P2 pressure. This pressure is close to zero $\leq 0,02$ N/mm². At P2 pressure, wait up to the time period, specified in 3rd column in Table 1
17. Take the pipes from the heater to another heater without damaging the coupling sections of the pipes.
18. Approach the coupling surfaces so as to nearly touch each other within the time period, specified in 4th column in Table 1. Then, carry out 100% contact approximately with zero speed and after a bit, increase the coupling pressure to PE in a linear way within the time period, specified in column 5 in Table 1.
19. Lip must have been formed after a coupling pressure of 0,15 N/mm². K rate must be bigger than zero at each section according to Figure 6.
20. Wait for cooling under coupling pressure for a time period, specified in column 5 in Table 2.
21. Remove the welded parts from the machine following the cooling process.

Issues to be taken into consideration regarding the quality of butt welding

- Make sure that materials to be butt welded are in compliance with each other in appearance.
- Protect the machine operation area from the impacts of vapor, wind and low temperatures in windy, humid and low-temperature environments so that butt welding parameters wouldn't be affected by such influences.
- Protect the butt welding area from influences such as direct daylight etc. in order to be able to make sure that the butts parts of pipes to be butt welded be at the same warmth at the end of the heating period.
- Clean the butts of the pipes to be welded before butt welding process so that there wouldn't be any dust, burr etc.
- Fix the pipes tightly to the heads before starting the butt welding process. This is not only required to fully center the parts and obtain a correct butt fusion but also important in terms of preventing the escape of parts from the head during the trimming process and damage to the operator.
- During butt fusion process (including the cooling time), never expose the butt welded parts to any mechanical force or strain. The other part of the butt welded pipe must be located on a slippery ground where it can easily move. This is required so that forward-backward feed can be achieved without applying any force on the butt welding area.
- Make sure that the trimming knife has the adequate sharpness. Sharpen or replace the knife at certain intervals.
- Make sure that there are no deep scratches, notches etc. in the teflon coating of the heater. Check the surface of the heater at certain intervals for this.

Butt welding problems and potential reasons

- Excessive lip width
- Excessive space height to emerge in the middle part of the lip
- Upper part of the lip is flat
- Nonuniform lip around the pipe
- Lips are very small.
- Lips hadn't overlapped the external surface of the pipe
- Lips are very big.
- External side of the lips are square.
- Rough lip surface
- Overheating; excessive coupling force
- Excessive coupling force; insufficient heating;
- Applying pressure in unpressurized heating during heating process
- Excessive coupling force; Overheating;
- Wrong positioning (centering); Defective heating apparatus;
- Wrong equipment; Insufficient coupling force
- Inadequate heating; Insufficient coupling force
- Space, emerging in the middle section of the lip is little;
- Inadequate heating and insufficient coupling pressure
- Space, emerging in the middle section of the lip is much;
- Inadequate heating and much coupling force
- Excessive heating time
- Pressure application during heating
- Hydrocarbon contamination during butt welding in butt welding area

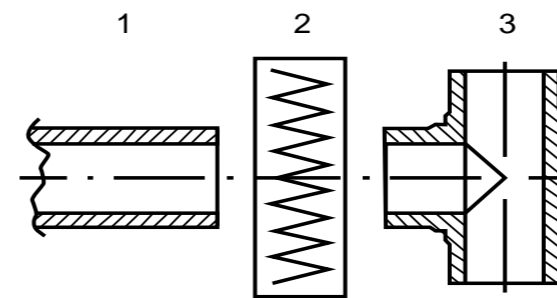


6-B-1-a-) FUSION COUPLING

Butt fusion welding- butt welding of polyethylene piping systems

Fusion sections - butts of pipes and fittings are heated up to fusion temperature and welding is carried out with the help of pressure without making use of additional mechanical materials. A homogeneous weld is achieved. Butt fusion must only be performed with fusion welding machines that enable the adjustment of welding pressure.

Fusion - Butt welding principle



1. Pipe
2. Heating element
3. Connector

General Conditions

Including preparation process, following DVS 1-2207 "Welding thermoplastics- Welding pipes, made of polyethylene, pipe line components with heated instrument" standard should be considered in fusion process.

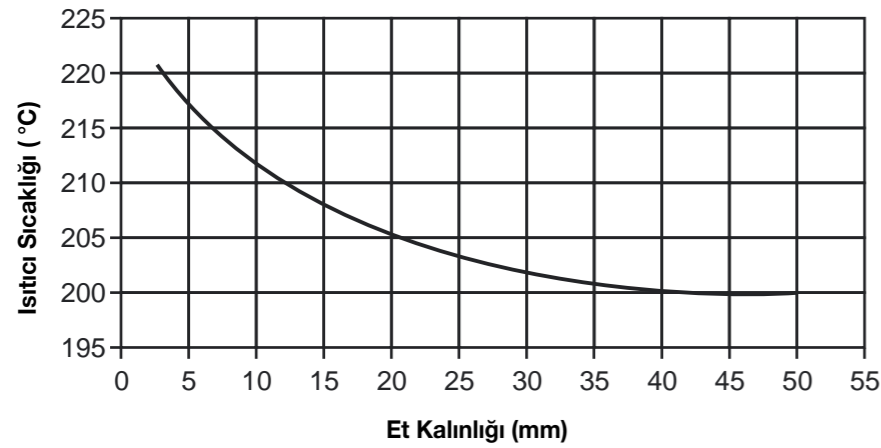
The details of the conditions regarding the machinery and equipment, used for fusion welded thermoplastics are included in DVS 2208 Part 1.

Butt welding process

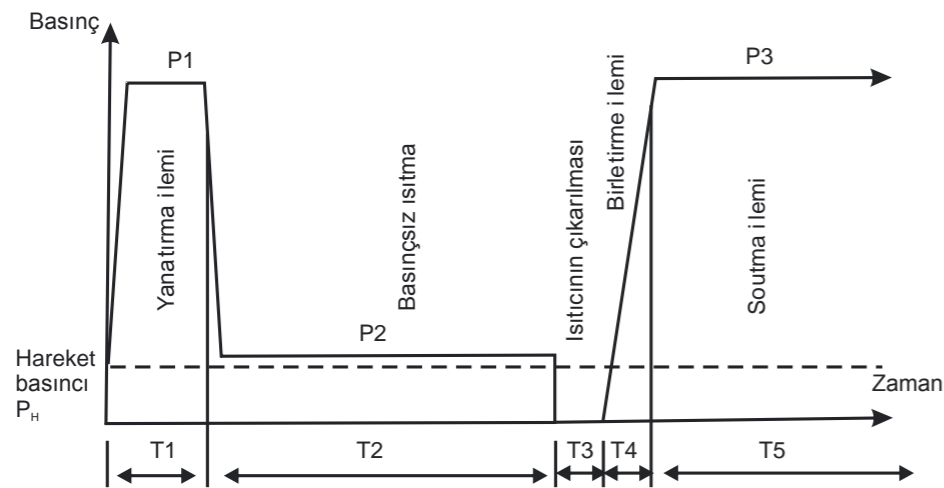
In butt welding process, butt welding areas are heated with a heater up to butt welding temperature and coupling operation is performed under pressure once the heater is removed. Heating temperature must be between °220-200C.

While high temperature is valid for thinner wall thickness, low temperature is applicable to larger wall thicknesses.

(Grafik 1).



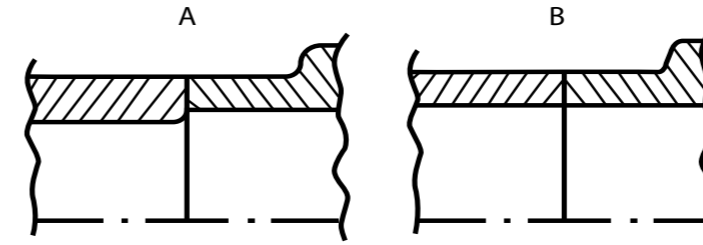
Grafik 1: Et kalınlığına göre ısıtıcı sıcaklığı değerleri



Grafik 2: Alın kaynak işleminin grafikte gösterimi

Apply welding to the components with similar wall thicknesses only.

It is the basic rule to be able to perform welding on the similar materials only (i.e., such as polyethylene). This is also applicable to welding for PE80 material and PE100 material. In order to achieve the best results, fusion welding must be applied only on the components with a fusion flow coefficient between MFR 1,7 – 0,3 5/190 gr/10 minutes. This requirement is fulfilled via fittings with polyethylene butt fusion, supplied from PIMTAŞ company. Components to be welded must have the same wall thicknesses in the welding area.



A: Wrong

B: True

Fusion welding process through a heated equipment should only be carried out by an adequately experienced personnel.

Necessary Equipment

Butt fusion welding process requires a special welding machine in addition to the equipment (e.g., pipe cutter, guided cutting saw) normally used for the manufacture of plastic pipes. Fusion welding machine should fulfill the following minimum requirements:

Tightening equipment must grab several pieces safely without damage to surfaces. Potential ovalness may be balanced to a large extent by tightening the components to be welded from the middle. At the same time, it must be possible to keep all parts at the same alignment tightly.

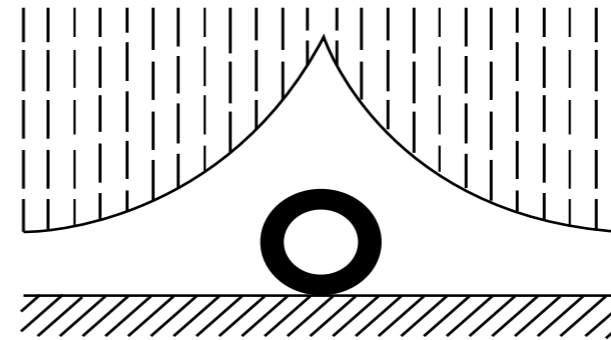
The machine must also be able to apply planing process on the fusion surfaces of the pipes and fittings.

Fusion welding machine must be durable enough to be able to absorb the pressures emerging during fusion process without seriously damaging the shape of the weld.

Heating surfaces of heating element should be smooth and parallel. Temperature change within the operation area shouldn't exceed °10C. Machine must be installed and operated in accordance with the instructions of the Manufacturer.

General Conditions

Protect the area where fusion welding is applied from adverse weather conditions such as rain, snow or wind. At temperatures under °5+C or above °45+C, measures must be taken to ensure that temperature at the operation area be sufficiently within the required range to perform welding and that it should not prevent necessary manual works.



Protect the fusion area

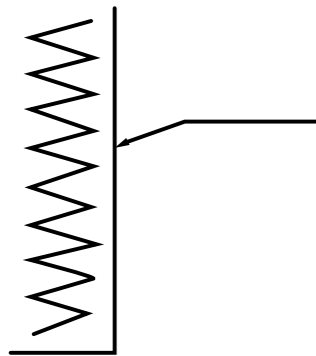
Concealing the fusion area may ensure a better heat distribution around the entire pipe, which is exposed to direct sunlights. When it is possible to minimize the cooling of fusion areas likely to be created by wind, pipe ends at the opposite edge of the fusion areas must be covered.

Preparing fusion weld

The quality of the fusion process must be carefully directed with performance of preparatory work. Therefore, this part of the process requires special care.

Heating equipment

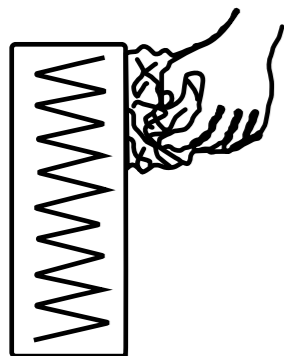
Set the temperature of the heating elements to °220C. Check the temperature. Fusion temperature must be between °210C – °230C.



Check the temperature.

Check the temperature before starting the fusion welding process in order to test the thermostat This is best carried out with the help of a digital thermometer. However, the thermometers with a sensor are suitable to measure the surface temperature only.

Fusion temperature must be controlled from time to time during the welding operation in order to keep it at the correct level. Temperature of heating element is sensitive to wind in particular.



Clean the heating element

Clean the heating element with a dry, clean paper after any fusion welding process!

Protect the operation surface of heating equipment from getting dirty. Clean both surfaces of heating element with a dry lint-free paper before any fusion welding process. Protect heating equipment from wind, damage and contamination from time to time while performing fusion weld.

Planing/shaping and controlling later on

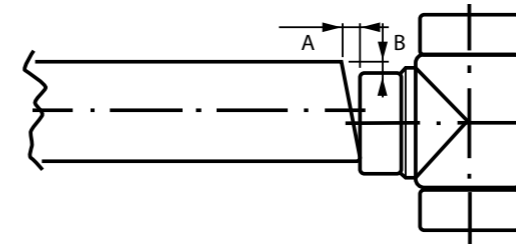
After the welding surfaces are machined, make sure that equipment and operation parts are clean and that there is no grease in any area other than the actual fusion area. Clean with a sanitation liquid if necessary.

All components packed inside the fusion welding machine are planed with a thickness planer, supplied simultaneously. Trimmings shouldn't be thicker than 0,2mm. 2 mm. This stage would be completed when there are not unprocessed areas left with any one of the parts to be welded. This comes into question when there isn't much more trimming on the processed surface normally.

Remove the shavings likely to drop into the pipe or fittings with a brush. Never touch fusion surfaces manually under any conditions. Otherwise, these areas must be cleaned with a sanitation liquid.

When the parts are machined, they must be moved until they touch each other. Space between the two pieces mustn't go beyond the rates, included in the following table.

Pipe diameter (mm)	Maximum space (mm)
≤355	0.5
400 ... <630	1.0
630 ... < 800	1.3
800 ... <1000	1.5
≥ 1000	2.0



- A. Maximum space
- B. Maximum displacement: %10 of wall thickness

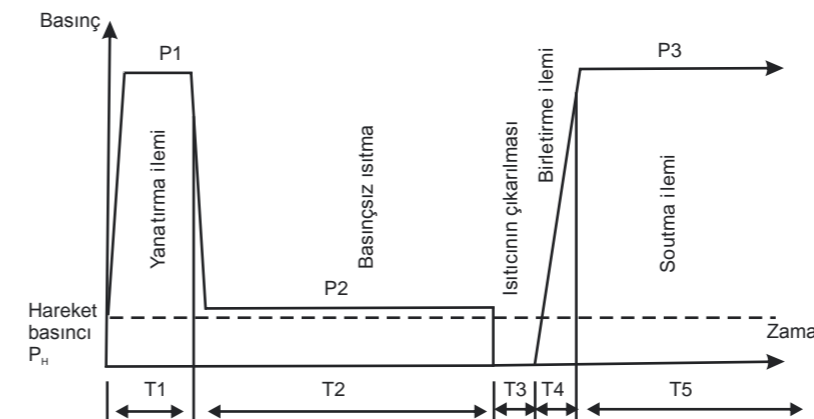
Check the wall thickness and the space

Alignment of the two pieces must be checked at the same time. Any potential wrong alignment outside mustn't go beyond %10 of the wall thickness. In the event when this limit is exceeded, a better tightening position should be sought by rotating the pipe for instance. In such a case, the surface must yet be planed again.

important: Surfaces must be planed just before performing fusion weld.

Setting fusion pressure

Fusion welding process requires application of different pressures during stabilization and welding process on the one hand and during heating process on the other. Please consider the following diagram.

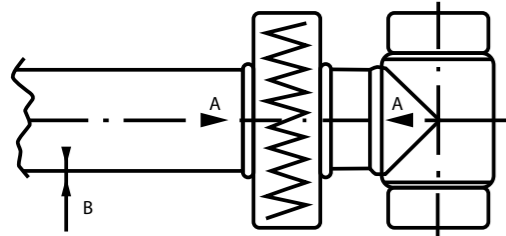


Grafik 2: Alın kaynak işleminin grafikte gösterimi

Specific welding pressure required for stabilization and fusion may be calculated from the following table with heating and cooling periods. In the table, time periods for different wall thicknesses are included as a list. Calculate the interim values/rates.

Force required for stabilization and weld (FA) is provided with the result of fusion area and specific welding pressure (FA = A * p). The force required to move the pipe (FB) must be added to this (Ftot= FA+ FB). This last force arises out of the structural strength of the machine and the resistance of axially portable pipe or fittings compressed inside the machine. Resistance of longer pipes must be reduced as far as possible by placing a cylinder under them. Kinetic force (FB) mustn't exceed welding force (FA).

Stabilize and heat



- A. Contact force
- B. Bar height (see the rates in the table)

Approximate rates for butt fusion of polyethylene 1)		
Wall thickness (mm)	Stabilization at p= 0,15 N/mm2 value Weld height (mm)	Heating period 2) p=0,01 N/mm2 (sn)
maximum 4,5	0.5	maximum 45
4.5 ... 7	1.0	45 ... 70
7 ... 12	1.5	70 ... 120
12 ... 13	2.0	120 ... 130
19 ... 26	2.5	130 ... 260
26 ... 37	3.0	260 ... 370
37 ... 50	3.5	370 ... 500
50 ... 70	4.0	500 ... 700

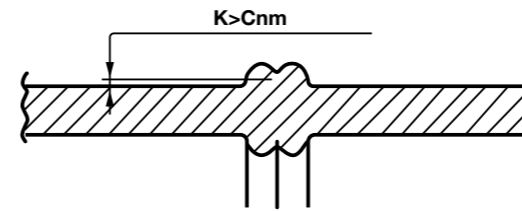
Wall thickness (mm)	Maximum Transition period (sc)	Time to reach full welding (sc)	Cooling period under weld 2) p= 0,15 N/mm2 (min)
maximum 4,5	5	5	6
4.5 ... 7	5 ... 6	5 .. 6	6 ... 10
7 ... 12	6 8	6... 8	10 ... 16
12 ... 13	8 ... 10	3 ... 11	16... 24
19 ... 26	10 ... 12	11 ..14	24 ... 32
26 ... 37	12 ... 16	14..19	32 ...45

- 1) complies with DVS 1-2207 standard
- 2) Time periods are affected by pipe wall thickness, external temperature and wind resistance.

Determine the stabilization and values to be adjusted for welding before fusion process in consideration of the instructions by the manufacturer of fusion welding machine and based on the foregoing information.

Wall thickness	1	2	3	4	5	
	Approaching	Unpressurized heating (T2)	Removing the Heater (T3)	Coupling		
mm	Lip height of the pipe, observed on the heater	Heating time	s (max)	Coupling time (T4)	Coupling time (T5)	
mm (min)	s	s	s	min.		
4.5	0.5	55	6	5	7	
4.5-7	1.0	55-84	5-6	5-6	7-11	
7-12	1.5	84-135	6-6	6-8	11-18	
12-19	2.0	135-207	8-10	8-11	18-28	
19-26	2.5	207-312	10-12	11-14	28-40	
26-37	3.0	312-435	12-16	14-19	40-55	
37-50	3.5	435-600	16-20	19-25	55-75	
50-70	4.0	600-792	20-25	20-25	75-100	

Table 1: Welding parameters considered for PE 100 material, recommended in butt welding process.



A welding lip must consist all around the pipe. Value K on the left of the shape must be within the positive rate all the time.

Performing pressure test

Before performing a pressure test, allow cooling of all fusion welds completely. As a rule, wait approximately for 1 hour after last welding process is completed.

6-B-1-b) SOCKET-PIPE SOCKET FUSION WELDING

Socket - Pipe Socket Fusion Welding

In this method, outer surface of the pipe and the internal surface of the fitting, made of the same PE material are heated at the same time by means of non-adhesive aluminum molds. Once the surfaces have melted adequately, pipe and the fitting inserted into each other by removing the molds. Melted surfaces are ensured to interpenetrate and then cooled for homogeneous coupling.

In principle, it is possible to connect only the same type of materials (PE with PE). Although small-diameter pipes and fittings are coupled with this method, in general it is used to couple PPRC installation pipes and fittings.

IR 63 Plus: For fusion welds, d63- 20 mm in size



IR 110 Plus: For fusion welds, d110- 20 mm in size

IR 225 Plus: For fusion welds, d225 -62 mm in size



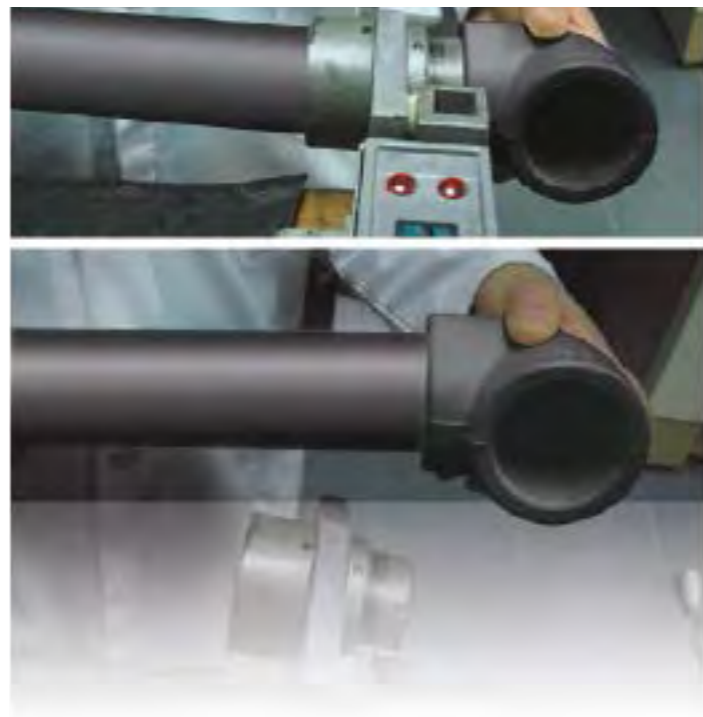
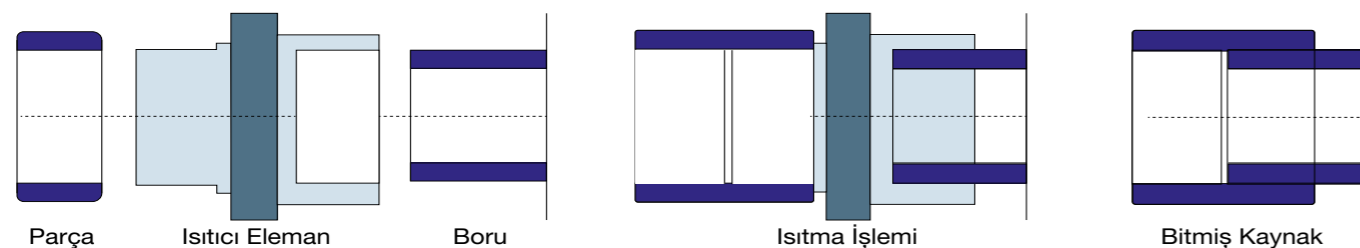


Figure 8.2 Socket Fusion Welding Technique



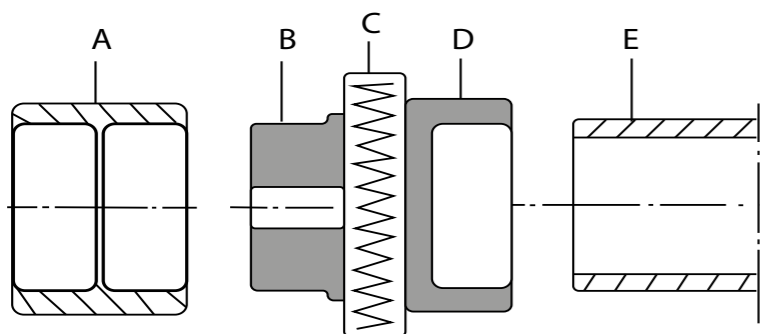
Socket fusion welding of polyethylene welding systems

Socket fusion welding method

In this fusion welding method in which heating instruments are required, pipe end is attached to the socket of the fitting. No additional materials are used. Fitting socket and pipe end are respectively heated up to fusion temperature using a heating bush and a heating cap and then pushed towards each other.

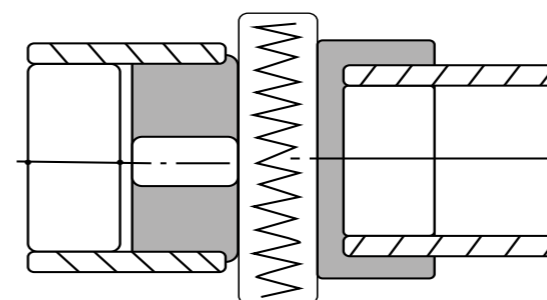
Pipe end, fitting socket and heating devices are placed so as to obtain the required welding pressure during the welding process so that a homogeneous lath would be obtained.

Fusion welding process

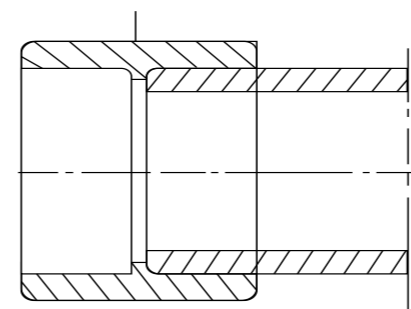


- A. Connector
- B. Heating plug
- C. Heating bush
- D. Pipe

Heating



Finished Welding



General Conditions

Including preparation process, following DVS 1-2207 "Welding thermoplastics- Welding pipes, made of polyethylene, pipe line components and metal plates with heated instrument" standard should be considered in fusion process.

The details of the conditions regarding the machinery and equipment, used for fusion welded thermoplastics are included in DVS 2208 Part 1. It is the basic rule to be able to perform welding on the similar materials only (i.e., such as polyethylene). This is also applicable to welding for PE80 material and PE100 material.

Minimum wall thicknesses of the pipes must be taken into consideration in socket fusion. Melting flow coefficients of the pipes to be welded must be within the following limits: 1,7 – 0,3 gr/10 minutes MFR 5/190 (melting flow rate, °190C/5 kg).

This requirement is fulfilled with polyethylene socket fusion fittings to be supplied from PIMTAŞ company.

Necessary Equipment

Socket fusion welding method requires some special equipment other than the equipment (e.g., pipe cutter, guided cutting saw) normally used for the manufacture of plastic pipes.

In addition to polyethylene, equipment described here may be used for PIMTAŞ socket fusion fittings, made of polypropylene and PVDF material.

Pipe peeling and beveling equipment



This tool is used to calibrate the pipe end and mark the length of the fusion weld. At the same time, it removes the oxidized layer to be formed as a result of infrared radiation which may otherwise have an adverse impact on the fusion weld. It is vital to remove the oxidized layer so as to have a quality welding process.

Note: Please obtain other information about fusion welding equipment and leasing service as well as training courses from PIMTAŞ.

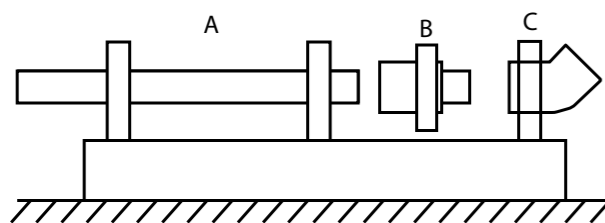
Heating equipment for manual fusion welding



Equipment is heated with electricity. Heating bush and plug may be removed. A different pair is required for every pipe size.

Important: There must be a non-adhesive coating on the surfaces of heating equipment to contact with the pipe and fitting.

Fusion welding machine



- A. Pipe
- B. Heating element
- C. Fitting

For the fittings with a diameter of $d = 63$ mm or more, a fusion welding machine is suggested. At the same time, it is better to use a machine for smaller welds as well if a large number of welds will be performed.

Machine must be installed and operated in accordance with the instructions of the Manufacturer. Process, described in detail below (including the preparation) is the fusion welding process, carried out by means of a manual welding tool.

Preparing fusion weld



Set the temperature of the heating equipment to 260°C. Check the temperature. Fusion temperature must be between 250°C and 270°C. In order to test the thermostat, check the fusion temperature from time to time in a thermoson which quickly moves outside the heating bush or using thermopile bars (at 253°C or 274°C). This is especially important in operations during strong wind



Use a clean cloth or a dry paper to clean the heating bush or heating plug. Tools must be cleaned after each fusion welding process.



Use a shear to cut the plastic pipes and clean the burrs on the inner sides with a knife. Make sure that tools and liquids are clean and that there is no grease even outside the fusion area. Clean with a sanitation liquid if necessary.

Pipe in sizes of d16

Open a hole around 2 mm for the pipes with a diameter of $d = 16$ mm, at the pipe end with an angle of 15° . Prepare a pipe around 15 mm with a rasper.

Mark a 13 mm weld length on the pipe.

Pipes in sizes of d20 – d11



Peel the pipe end until the knives are on the same line with pipe ends.

In the event that ovalness of the pipe prevents proper application of peeling equipment, first round off the pipe (e.g., with a clamp or screw clamp).

Use a rasper to complete the peeling of an area in which ovalness damages the impact of peeling equipment.

If the peeling equipment may be pushed onto the pipe without removing any material, in this case the outer diameter of the pipe and the dimensional precision of the peeling equipment must be checked.

Call PIMTAŞ company in order to sharpen or replace the knives. If this work is performed independently, use a mileometer to set the knives to the following diameters.

External pipe diameter d (mm)	Peeled diameter (mm)	Pipe thread b (mm)	Peeling length l (mm)
16	15.85-15.95	2	13
20	19.85-19.95	2	14
25	24.85-24.95	2	16
32	31.85-31.95	2	ia
40	39.75-39.95	2	20
50	49.75-49.95	2	23
63	62.65-62.95	3	27
75	74.65-74.95	3	31
90	89.65-89.95	3	35
110	109.55-109.95	3	41



If SDR pipes with a diameter of $d = 20$ or 25 mm are used, insert a support union manually to the pipe end as far as possible before starting to peel or use pipes with smaller SDR rates.



Clean the socket of the fitting thoroughly with an absorbing paper and sanitary liquid (e.g., a Tangit cleaner). Always use a new paper.

Fusion welding process Heating



First, insert the fitting onto the heating plug quickly until the depth. Then, push the pipe axially inside the heating bush without bending the pipe and hold tightly.

16 mm pipes must be inserted inside the heating bush until the previously placed sign.

Pipes with dimension between $d = 20$ mm – 110 mm must be inserted until the edge of the peeled surface be on the same line with the edge of heating bush. In fusion welding machines, this is regulated by fixed stops. Following heating periods are measured as from this point. Fusion welds shouldn't be used for the pipes, walls of which are thinner than the rates included in the table.

minimum external pipe diameter for socket fusion welds mm	Heating periods and				
	Heating time PN10 SDR11	Heating time PN6 SDR17	Maximum transition period s	Cooling fixed s	Cooling total minutes
16	5	-	4	6	2
20	5	-	4	6	2
25	7	-	4	10	2
32	8	-	6	10	4
40	12	-	6	20	4
50	18	-	6	20	4
63	24	-	8	30	6
75	30	18	8	30	6
90	40	26	8	40	6
110	50	36	10	50	8

Strictly follow the temperature and heating periods.

Welding (Manually)



As soon as the heating period elapses, pull the fitting and pipe from the heating equipment with "removal motion". In consideration of alignment signs, pull them to each other without bending. Keep them together for a period which is the same with heating period.

Performing pressure test

Before performing a pressure test, allow cooling of all fusion welds completely. As a rule, wait approximately for 1 hour after last welding process is completed.

6-B-2-) ELECTROFUSION WELDING

Electrofusion

General Conditions

Including preparation process, following DVS 1-2207 "Welding thermoplastics- Welding pipes, made of polyethylene, pipe line components with heated instrument" standard should be considered in fusion process.

The details of the conditions regarding the machinery and equipment, used for fusion welded thermoplastics are included in DVS 2208 Part 1.

Applying electrofusion process to connect polyethylene pipes and valves enables safe, systematic, economic and efficient installation of polyethylene piping systems.

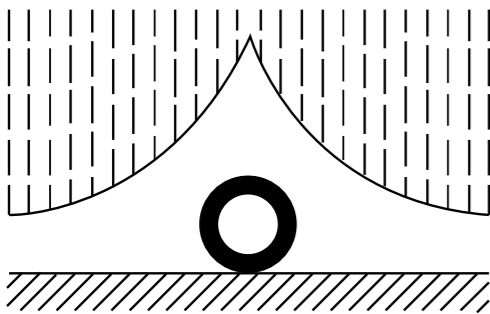
Electrofusion products are supplied with a magnetic card in which all information (tracking code) regarding the products as well as fusion information is included. In general there are barcode readers on the electrofusion welding machines. Although welding parameters are stored on the machine through barcode, it is also possible to perform welding process by entering the welding parameters, written on the fittings, manually into the welding machine.



Process notes

The quality of the welding is based on the care taken while preparatory work is performed to a large extent. Electrofusion welding process must be carried out by qualified personnel only.

Melting flow rates of electrofusion products are between (MFR) 1,4 – 0,4 gr/10 minutes. These may be coupled with polyethylene pipes, melting flow rates of which are between 1,4 – 0,2 gr/10 minutes.



Protect the fusion area against bad weather conditions such as rain, snow or wind. Allowed temperature rates for electrofusion are between -10 °C – +45°C.

Follow national regulations. It is possible to have a proper temperature distribution all around the pipe thereby protecting the fusion area from direct sunlights and bad weather conditions.

Check if the automatic electrofusion machine in particular, and the fusion area have the same climate conditions.

Storage

Electrofusion fittings are packaged individually in a polyethylene bag. If the fittings are kept from direct sunlights in their original packages and provided that they are not stored at temperatures over 40°C, they are likely to be stored approximately for 10 years.

Storage period starts on the date of manufacture of fittings.

Protecting fusion area

Surfaces of the pipes and fittings to be welded must be attentively protected from dust, grease, oil and lubricants. Cleaning agents in compliance with polyethylene must be used only.

Attention: There shouldn't be any grease on the fusion area (such as hand cream, oily cloths, silicon etc.!) Интернет: www.tisys.ru www.tisys.kz www.tisys.by www.tesec.ru www.ти-системс.рф

Телефоны: +7 (495) 7774788, 7489626, (925) 5007155, 54, 65

Эл. почта: info@tisys.ru info@tisys.kz info@tisys.by

Getting ready for fusion process

The pipe must be cleaned, scratched and finally cleaned with a polyethylene cleaner Rotating scratching equipment may be used to prepare the pipes properly and save time.

Please comply with installation and operation instructions

Comply the following scraping measurements.		
d Pipe	Minimum chip thickness	Maximum chip thickness*
16	0.20 mm	0.20 mm
20	0.20 mm	0.25 mm
25	0.20 mm	0.30 mm
32	0.20 mm	0.35 mm

Tip: Maximum allowed pipe ovalness is %1,5.

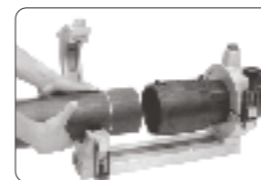
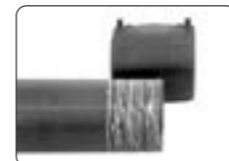
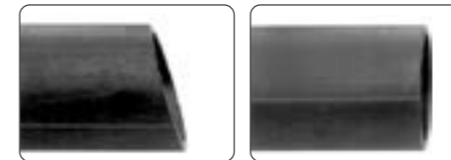
* The data indicate the inner diameter of the pipe without "e+ tolerance".



Welding indicators

After the welding operation, check the welding indicators. In the following picture change of the welding indicator is shown. These only show that energy arrived in fusion area. These are not a guaranty of welding quality. Rise in welding indicators is based on the utilized connector, pipe material and pipe tolerance.

Electrofusion Sleeve Welding Procedure



1. The pipe must be cut so that it will make a straight angle with its own axis and that edges to be welded will be straight and smooth. Failure to cut the pipe properly results in non-contact of metal threads in the electrofusion fitting in some areas with the pipe. This results in overheating and flow of melted material inside the pipe.

2. Fittings to be welded must be removed from their packages at the welding stage, electrofusion surfaces to be welded must be cleaned with alcohol, and hand contact must be avoided after the surfaces of the pipe and fittings, which will be welded are cleaned.

3. Surface oxidation must be removed with a rasper before welding upon cleaning of the pipe surface to be welded.

4. Then the fitting to be welded is placed into the marked section of the pipe until the threshold of tolerance of the fitting.

5. Electrofusion welding ends are fixed so as to be upwards after they are controlled with the pipe straightly. Sockets of the welding machine are placed on the welding ends of the fitting and made available for welding.

6. Welding operation is started after having the barcode read once machine ready signal is obtained. In general, welding machines indicate the welding time and installation on the display and terminate the welding process automatically by giving a completion signal.

7. Ovality may be observed during the storage. Ovalness on the pipe shouldn't be more than %1,5 of pipe external diameter. Otherwise a pipe clamp (positioner) must be used.

Advantages of electrofusion welding

Today, electrofusion is accepted as an easy to apply welding process that meets the needs in gas and water distribution companies, and that is generally safe in pressurized fluids.

1. Welding operation in electrofusion process is carried out after the installation is completed and the parts to be connected were tightly brought together. This is why there is no movement between the pipe and the sleeve at the moment of welding.
2. It enables installation of any pipes between 315 - 200 mm. This is the only technique that enables the use of pipes with a diameter of up to 125 mm for long distances. Furthermore, it can be used everywhere during all stages of system construction, in coupling performed under pressure and repair works.
3. Electrofusion welding technique eliminates the need for control following the process. It is possible to repeat ideal welding conditions from one welding process to the other. Once the requirements are fulfilled, welding operation is carried out on the automatic machines. In general there are barcode readers on the electrofusion welding machines and the barcodes containing welding parameters on the electrofusion fittings. Although welding parameters are stored on the machine through barcode, it is also possible to perform welding process by entering the welding parameters, written on the fittings, manually into the welding machine. Therefore a simple training would be enough in electrofusion.
4. No reduction in pipe internal diameter.
5. Utilization flexibility of machines-equipment, lightness and low-cost
6. High welding speed
7. No reduction regarding resistance to pressure in the welding area is one of the reasons why electrofusion welding technique is preferred.

Welding Capability

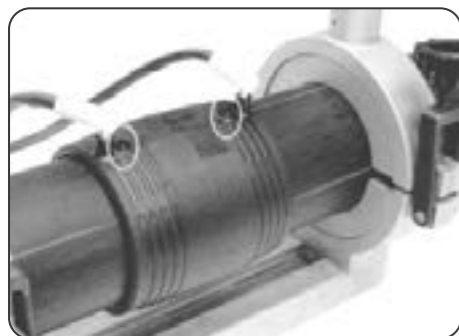
In PE pipe coupling with electrofusion welding technique, electrofusion fittings such as sleeve, made of PE material into which resistance wires were placed, service-T and reduction are used. Heat emerging due to supply of electric current to metal resistance wires inside electrofusion fittings results in melting of the material by spreading on a large area. Number of turns of resistance wires and resistance rates are determined based on the amount of energy required for melting of the material.

Regardless of the type and diameter of electrofusion fittings, basic principle of the welding is the same. Heat required for electrofusion welding is obtained through joule impact, produced by metal resistance wires.



Şekil 7: Kaynak anında kaynak bölgesi

Operation is started by entering the welding parameters manually or after having the barcode read once the machine provides a signal indicating that it is ready for welding process. In general welding machines indicate the welding time and voltage on the display. It signals by terminating the welding process automatically. Once the welding process is completed, it must be observed that the indicator on the sleeve turn towards outside.

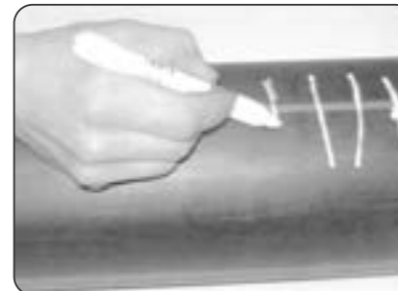


6-C 3) SERVICE TEES

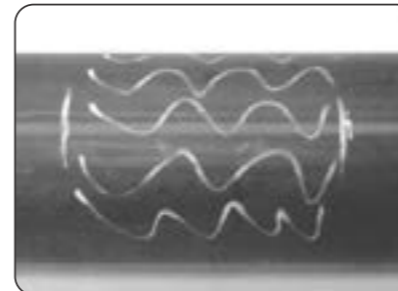
Electrofusion Service Tees Welding Procedure



1.) Dimensions of Service Tee piece to be installed are marked with a pen on the pipe.

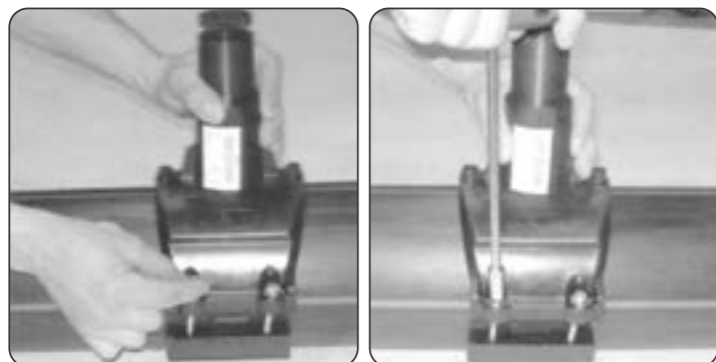


2.) After the marking is made, the areas between the marked places are dashed with the pen. Dashed parts are scratched with a rasper so as to eliminate ant oxidized layer, oil and dirt. During the scratching process of oxidized layer from the pipe, scratching should be made approximately 0,1 mm for the pipes dn<63 mm and 0,2mm for the pipes dn>63 mm. Failure to scratch the oxidized layer completely may result in leakages in the connections.



3.) Clean the scratched area of the pipe, inner surface of service Tee to be welded and outlet ends with industrial alcohol.





4.) Place the bottom piece of Service Tee into the scratched bottom area of the pipe.

5.) Tighten the mounting bolts mutually crosswise.



6.) Attach the cables of welding machine to the lead terminals on the Service Tee. Have the tag on the fitting read by the welding machine by means of barcode pen. Perform welding by starting the machine. Never move the welding places during the welding operation.



7.) Remove the fusion indicator when the welding is completed.



Start to turn the the driller clockwise with the help of allen drilling wrench. After the drilling operation is successfully completed, pull back the driller again upwards.

After the welding process is completed and cooling period has elapsed, remove the cap in the drilling section of Service TEE and leave aside in an area where it won't be contaminated.

6-B-4) VALVE SERVICE TEES

Parts used before and after Service TEE welding with EF Valve.

1. EF saddle
2. Valve TEE
3. Extension shaft electrofusion



Follow the steps on page 45-44-43 for preparing PE pipe and saddle ready for welding. After the area of TEE with valve to be mounted on the saddle is cleaned with alcohol, place the outlet so as to be in the same direction as desired. Perform EF welding process in accordance with the steps included on page 45. Perforation Process: Once the cooling time has ended following the anticipated welding process, extension shaft is placed into the mouth of the tetragon wrench on the TEE with valve. Perforation is carried out with the help of proper wrench. Apply 16 complete tours to open or close completely.



CONTROL OF PIMTAŞ SERVICE TEE WELDING THROUGH PRESSURE - LOADING TEST METHOD

Pressure test can be applied once the cooling period has ended following the envisaged welding process. Before perforation takes place, mains water, which is approximately 6 bars is proper for test. Tightness cover of Service TEE is removed so that test pressure can be provided and red pressure test kit is attached instead of the cover. With the help of test pressure pump, mains water pressure is transferred to the welding area. If there is no leakage within the welding area, it means that welding operation has been successfully completed.



6-B-5) EXTRUSION WELDING (FILLET WELDING)

It is possible to couple PE pipes from pipe socket transition points inside and outside with fillet welding. Although it is possible to make fillet welding in straight pipes, manufactured without Pipe socket, this welding method is generally used in manufacture of fittings such as pipe elbow, pipe arm, made of pipes in special projects and special technical applications such as manhole and tank.

Fillet welding is not applicable to coupling of pipes to be utilized in the high pressure lines, it is only applicable to pipes and manholes to be used in low pressure gravity lines. Although extrusion welding machines operate with the same principle they have two types.

- Hot Air Vent welding machine operating with electrode
- Hot air vent welding machines to extrude granular raw material

Fillet welding (extrusion welding) is performed pursuant to DVS 2207 standard.



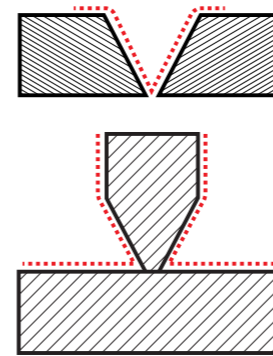
Issues to be taken into consideration while connecting PE pipes with Fillet welding process.

- Ambient temperature where fillet welding will be performed shouldn't be under 5°C.
- Fillet welding should not be used in gas pipes and pressurized drinking water lines.
- Material of the parts to be welded and the welding electrodes must be the same category and the diameters of utilized welding electrodes must be 3 or 4 mm.
- Surfaces to be welded must be very clean, welding must be executed by removing the surface oxidation with a rasper immediately after welding.
- Welding process should be performed by holding the welding extruder to the surface where welding will be applied with an angle of 45° all the time.
- In big and deep welds, welding with a thickness of maximum 4 mm must be performed at one time, welding operation must be continued until desired thickness is achieved by applying welding on welding following the cooling operation once the area is cleaned with a rasper.

Types of Fillet Welding Process

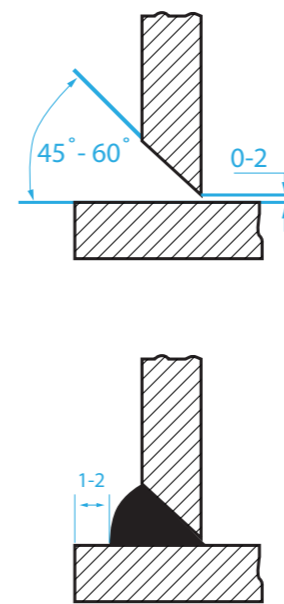
Fillet Welding Preparation

Fillet Welding Preparation Details



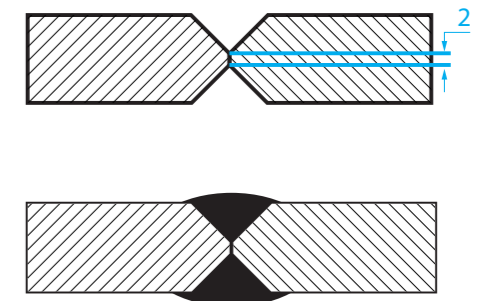
Filler Welding Vertical Piece Welding Types

Single Sided Vertical Fillet Welding View



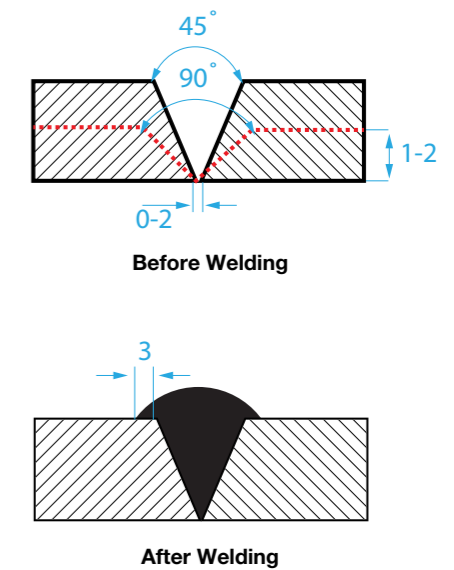
Fillet Welding Flat Piece Welding Types

Double Sided Horizontal Fillet Welding View



Fillet Welding Flat Piece Welding Types

Single Sided Horizontal Fillet Welding View



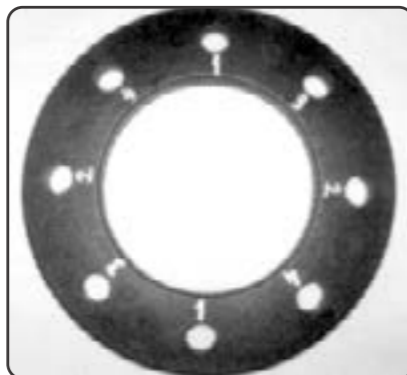
DVS 2207 Fillet Welding Parameters (Ambient Temperature 20 °C)

Category of the Material to be welded	Welding Force (N)		Welding Extruder Temperature Air Thermal Value (°C)	Hot Air Flow Rate (l/min)
	3 mm Electrode	4 mm Electrode		
HDPE	10...16	25...30	300...350	40...60
PP	10...16	25...30	280...330	40...60

Outlet diameter of extruder's hot air vent terminal must be 5 mm.

6-B-6-) OUPLING WITH PP COATED FLANGE

1. Flange holes are mutually numbered.



2. Seals are placed between the flange adapters.

3. Flanges are placed so as to be in parallel with the head sections of the flange adapters.



4. Bolts and nuts are fixed to the numbered flanges.

5. Bolts and nuts are tightened in two tours so that corresponding numbers corresponds to each other.



6. A mutual tightening operation is carried out in the first tour at the half rate of maximum tightening torque value (Table 2).

7. In the second tour, bolts are tightened at the maximum torque rate.

8. After mutual tightening is completed, two tours of tightening is carried out at the same rate and installation process is completed.

Note: Flanges with PN 10 pressure category mustn't be used in stead of PN 16.

TORQUE RATES FOR PP COATED FLANGES

DIAMETER (mm)	PRESSURE CLASS	BOLT TYPE	TORQUE (Nm)
20	PN 16	M 12	15
25	PN 16	M 12	15
32	PN 16	M 12	15
40	PN 16	M 16	20
50	PN 16	M 16	30
63	PN 16	M 16	35
75	PN 16	M 16	40
90	PN 16	M 16	40
110	PN 16	M 16	40
125	PN 16	M 16	40
140	PN 16	M 16	50
160	PN 16	M 20	60
180	PN 16	M 20	60
200	PN 16	M 20	70
225	PN 16	M 20	70
250	PN 16	M 24	80
280	PN 16	M 24	80
315	PN 16	M 24	100
355	PN 16	M 24	120
400	PN 16	M 27	140
200	PN 10	M 20	70
225	PN 10	M 20	70
250	PN 10	M 20	80
280	PN 10	M 20	80
315	PN 10	M 20	100
355	PN 10	M 20	120
400	PN 10	M 24	140
450	PN 10	M 24	150
500	PN 10	M 24	150
560	PN 10	M 27	170
630	PN 10	M 27	170

Table 2 : Turning moment for PP coated objects

6-B-7) COUPLING METHOD WITH COUPLING ADAPTOR

After the pipes to be connected to each other with coupling adaptor are cut so as to be perpendicular to their axis, their edges are tapered with an angle of approximately 15 ° and the pipe is turned and pushed up to the protrusion inside the coupling. Once both of the pipes are thoroughly placed, nuts are manually tightened and thus the connection would have been completed. If the pipe diameter is 40 mm or over, it will be more proper to tighten the nut with a special wrench rather than manual tightening. Coupling adapters may resist to a pressure rate of 16 bars, however they are suggested for the coupling of the pipes, diameters of which exceed 110 mm.



System I Coupling

General Information

Benefits of compression fittings

I Coupling polypropylene compression fittings combine the two main advantages of the mechanical connection systems, push-fit and compression: easy installation fitting (mechanical compensation). I Coupling is used in water applications.



The I Coupling range contains straight and reducing join ers, tees, elbow, threaded connectors and end caps, ranging from d20 to d110 mm and threads from 1/2" to 4".

Fast and easy installation

The clamp ring made of polyacetal does not come into contact with the pipe during insertion of the pipe and there is no need to disassemble the I Coupling fitting before installation. This combined with a defined stop position for the nut and that the nut can be fixed with less than one turn makes installation easy.

High resistance and no corrosion

The special coated NBR gasket which is approved for potable water in combination with the unique body design ensure high performance in terms of pressure and pull-out resistance, vacuum as well as suction. The body made of polypropylene is completely corrosionfree and guarantees top performance as well as high resistance to stress in long lifetimes. The fittings are suitable for applications under and above ground thanks to very high resistance to UV rays.

Safe design

The special design allows perfect resistance to water hammer and pull-out forces without having a negative impact on the connection lifetime. The stop ring for the nut works as a helpful indicator of a proper nut closing position and the nut does not loosen by itself due to an anti-rotation nut locking system. The clamp ring and all other components are contained in the body so that they cannot be lost even when disassembling the fitting or during transportation.

Application

The I Coupling system is designed for new installations as well as renovations or extensions of existing water lines. I Coupling is used for bypass systems, where temporarily laid lines need to be disassembled, bled in a quick and easy way, leaving the coupler intact by simply unscrewing and sliding the joint back from the pipe.

- 1
 - Water Distribution Lines
 - House Connections and Service Lines
 - Pressure Sewage
- 2
 - Industrial Applications
 - Mining Industry
- 3
 - Leisure Parks
 - Golf Courses
 - Camping Grounds
- 4
 - Farming
 - Greenhouses

Features

I Coupling compression fittings have been developed for use in water and drinking water systems, assuring a quicker and easier installation compared to a traditional compression fitting.

The coated sealing system makes this product both unique and long-lasting. I Coupling comprises the benefits of plastics: no rust and no incrustation, lightweight construction, high pressure resistance, excellent cost benefit ratio with a life cycle of at least 50 years.

Features

The I Coupling focuses on safety and ergonomic handling - real benefits for our customers.

The new line of compression fittings from Pimtas Piping Systems has been developed for use in water systems, assuring you of a quicker and easier installation compared to a traditional compression fitting. The coated sealing system makes this product both unique and long lasting. Superb quality and innovative features predestine I Coupling for the drinking water market worldwide. I Coupling comprises all the benefits of plastics : no rust and no incrustation, lightweight construction, no leakage, excellent pressure resistance just to name a few.

To sum it up: I Coupling provides an excellent cost benefit ratio with a life cycle of at least 50 years.



1) Somun:

Boru montajına hazır vaziyettedir, yaklaşık bir tur döndürme ile sıkıştırılmış olur.

2) Conta:

Sızdırmazlığa karşı yüksek emniyetli dudaklı conta.

3) Sıkıştırma Parçası:

Borunun sökülmesine-takılmasına engel olmayan özel dizayn.

4) Stop Yüzeyi:

Sistemin sızdırmaz ve kilitli olduğunu gösteren,somunun temas ettiği halka yüzey.

TEKNİK ÖZELLİKLER

Bütün önemli standartlara uygun olması ve geniş boru çapı aralığı ile PİMTAŞ Akıllı kaplinleri sizin birinci seçiminiz olacaktır.

PİMTAŞ Akıllı kaplinler PE 80,PE 100 and PEX-a bütün polietilen boru çeşitleri için uygundur.Akıllı kaplin ek parçalar, herhangi bir hazırlık yapmadan ambalajından çıktığı haliyle kullanılmaya hazırdır.Ek parçalar dağıtılmadan,somun sökülmeden boru direkt olarak kaplin ek parçalara takılabilir.Dünya çapında en zorlu kurallara uygun olarak,bütün akıllı kaplin ek parçaları 16 bar işletme basıncına dayanıklıdır.

PİMTAŞ sahip olduğu uluslararası satış-lojistik zinciri sayesinde sistemin gerektirdiği vana,ek parça,boru,ölçü-kontrol sistemlerini eksiksiz müşterinin hizmetine sunmaktadır.

Technical Data

General comments to plastics oriented pipeline design

The design and installation of thermoplastic pipe systems requires designers and installers alike to take into account the fact that plastics have different physical characteristics to metal. Although Pimtas Piping Systems offers very robust systems, nevertheless, care should be taken during handling and transport to avoid damage. Also thermoplastics have certain physical characteristics, such as a high expansion coefficient, which need to be taken into account in the design phase. Pimtas Piping Systems has been successfully developing and providing plastic pipe systems into a spectrum of high performance installations for over 50 year, and experience has shown that when engineers and installers take into account the advice given in our technical literature plastics are an economical and reliable alternative to metals. As a general rule for designing and installing plastics one of the major differences is that plastics can and should be allowed to move after commissioning i.e. move under the influence of temperature fluctuation and pressure changes. For instance using pipe brackets that allow horizontal movement and not clamping the system in place is a must for plastic piping installations.

The following technical information covers the fundamental information required to ensure an economical and trouble free installation: Not all details however are published in this document, for more detailed information or if you have a specific

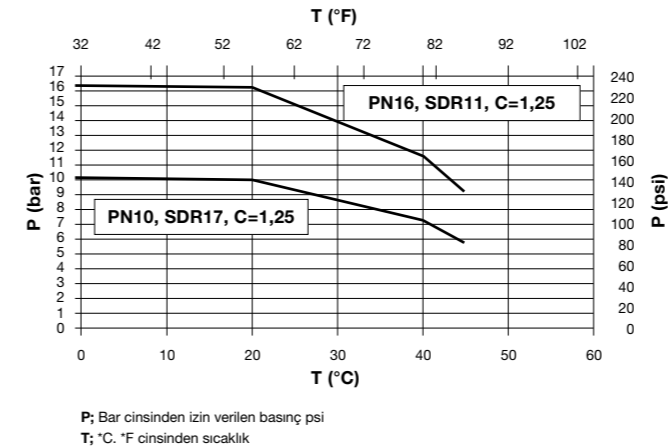
question please ask your local Pimtas Piping Systems company, consult www.pimtasplastik.com or email us at pimtas@pimtasplastik.com.tr

Pressure - Temperature Diagram

Pressure ratings for thermoplastic pipe are always quoted for water at 20° C. It can be used at higher temperatures but it is a fundamental principle in thermoplastic pipework that if the working temperature is increased then the working pressure must be reduced.

The diagram shows for PE pipes and PP fittings the maximum permissible pressures at various temperatures up to the maximum allowable working temperature of +45° C. The diagram is based on an ambient temperature of 20° C with water as the medium. A safety factor is incorporated into all calculations with a minimum life time of 50 years.

Pressure - temperature diagram for system I Coupling (with water as medium)



For working temperatures below 0° C an antifreeze has to be used in the water to prevent freezing. The above pressure temperature curve applies only when the medium is water, therefore for non pure water mediums a derating factor has to be applied to the above curve. This is standard procedure for all plastic piping systems.

Flange Connections

Flanged joint with metal flange

Material: Steel ST37-2

(1.0038 OR S235JR)

The flange can be connected to the PE or PEX-a pipe without disassembling. The gasket is PTFE coated NBR, and has drinking water quality.

Boyutlar;

İnch	İnternal	External	Hole Circle
1 1/2	80	150	110
2	99,6	160	125
2 1/2	119	186,5	145,5
3	134,8	204,5	160
4	156,3	220	180

Benefits

I Coupling the new generation of polypropylene compression fittings, combines the best in jointing technology-for both push-fit and compression.

I Coupling, is the result of Pimtas Piping Systems unrelenting commitment to continuous improvement and a culture based on innovation and ingenuity. The innovative design provides essential benefits like fast, forgiving and effort-free installation methods in challenging trench and weather situations, ensuring maximum lifetime for top performance in water applications. The I Coupling range contains straight and reducing joiners, tees, elbows, threaded connectors and end caps, ranging from d20 to d110 mm.



Fast and easy installation

The clamp ring made of polyacetal does not come into contact with the pipe during insertion or removal of the pipe and there is no need in any situation to disassemble the I Coupling fitting before installation. This combined with a defined stop position for the nut and that the nut can be fixed with less than one turn makes installation extremely easy. No special tools or equipment are necessary for installation.



High resistance and no corrosion

The special coated NBR gasket- which is approved for potable water-in combination with the unique body design ensure high performance in terms of pressure and pull-out resistance, vacuum as well as suction. The body made of polypropylene is completely corrosion-free and guarantees top performance as well as suction. The body made of polypropylene is completely corrosion-free and guarantees top performance as well as high resistance to stress in long lifetimes. The fittings are suitable for applications under and above ground thanks to very high resistance to UV rays.



Safe Design

The special design allows perfect resistance to water hammer and pull-out forces without having a negative impact on the connection lifetime. The end-stop for the nut works as a very helpful indicator of a proper nut closing position and the nut does not loosen by itself due to an anti-rotation stop. The clamp ring and all other components are contained in the body so that they cannot be lost even when disassembling the fitting or during transportation. High traceability is thus ensured.

Technical specifications

Conformity to all important standards and availability in a wide range of diameters makes I Coupling your first choice.

I Coupling compression fittings are suitable with all types of polyethylene pipes PE 80, PE 100 and PEX-a. The fitting is ready to be installed out of the box without any preparation. The pipe can be inserted directly without loosening the nut or disassembling the fitting. There is a 16 bar resistance throughout the complete range of I Coupling fittings, with approvals according to the most stringent regulations worldwide. Thanks to the complete product selection of with approvals according to the most stringent regulations worldwide. Thanks to the complete product selection of valves, fittings, pipes and measurement and control systems, Pimtas Piping Systems is your one stop solution provider, including worldwide training and supply chain management.



Pressure range: MOP of 16 bar for the complete range of I Coupling fittings from d20 to d110 mm (complete range DVGW approved PN16)

Temperature range: -10°C to +45 °C

Materials

Body (and thrust ring from d75 to d110 mm) UV stabilized polypropylene (PP)

Nut UV stabilized blue polypropylene (PP)

Clamp ring Polyacetal (POM)

Gasket Food safe coated NBR rubber suitable for potable water.

Reinforcement ring (for female thread) Stainless steel AISI 430

Regulation for drinking water I Coupling compression fittings comply with the strictest regulations in existence worldwide, e.g.:

-W270 and KTW (Germany)

-ATA (Netherlands)

-DM 174-06/04/2004 (Italy)

-Global Mark (Australia)

-ACS (France)

Approvals

-DVGW (Germany)

-IIP (Italy)

-SVGW (Switzerland)

-KIWA (Netherlands)

-ACS (France)

-Global Mark (Australia)

Standards

For PE pipes:

DIN EN 12201; ISO 11922-1; DIN8074; EN 12201-1/2; AS/NZS 4130;

BS 6572; BS 6730; ISO 4427; UNI 7990; ISO 12162

Threads

DIN EN 10226 (ISO 7-1); BS 21; AS 1722.1

Flanges

DIN EN1092-1; DIN2501.1

Test standards ISO 14236; DIN 8076-3; AS/NZS 4129; BRL K534/03-UNI; ISO 3501; ISO 3503; ISO 3458; ISO 3459; VP609

Insert Depth

Fittings

Dia	20	25	32	40	50	63
PN10	41	47,5	49	63,5	70,5	80,5
PN16	50	52	54	72	84	95

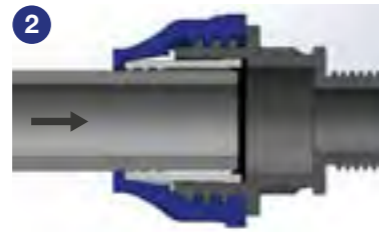
Instructions

Ø20 - 63 mm

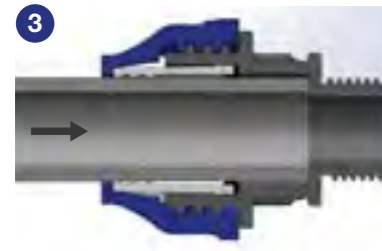
Before proceeding with the assembly, check the presence of all components (clamp ring, gasket).



Cut the pipe square and deburr it. Mark the insert depth on the pipe (see table: insert depth.)



Push the pipe into the fitting through the clamp ring until the first stop, meaning you have reached the gasket.



Push the pipe through gasket until you reach the pipe stop of the fitting (lubrication and chamfering of the pipe end will facilitate insertion.) Check the mark of the insert depth on the pipe for correct assembly.



Tighten the nut until the stop ring using the Georg Fischer tool or a wrench for fittings.

Ø75 -110 mm

Before proceeding with the assembly, check the presence of all components (clamp ring, thrust ring, gasket).



Cut the pipe square and deburr it without chamfering.

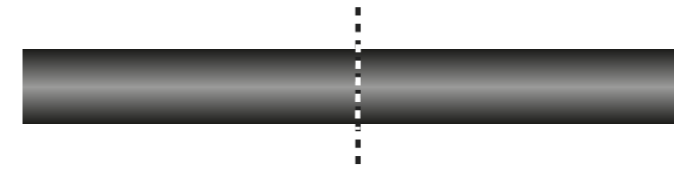


Push the pipe into the fitting until you have reached the pipe stop.

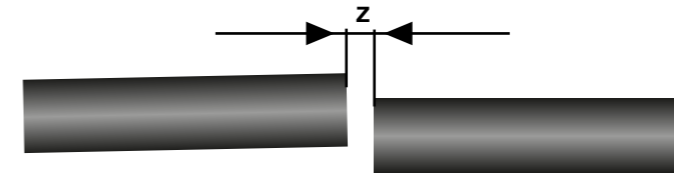


Tighten the nut until the stop ring using the Georg Fischer tool or a wrench for fittings.

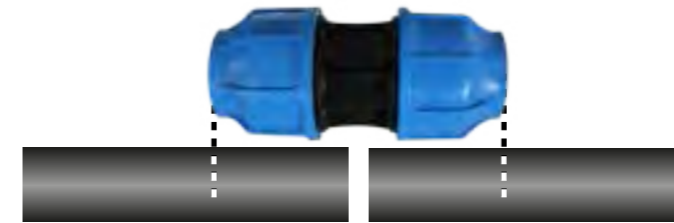
TAMİR MANŞONLARI d 20-110



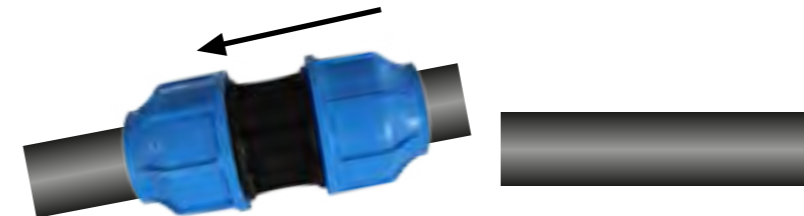
Hasarlı yere yakın bir yerden boruyu kesin.



Boru ve ek parça çapına uygun olarak (Tablo A daki ölçülere göre) borular arasında aralık bırakılır. Boru traşlanır ve gerekirse contaya gres sürülür.



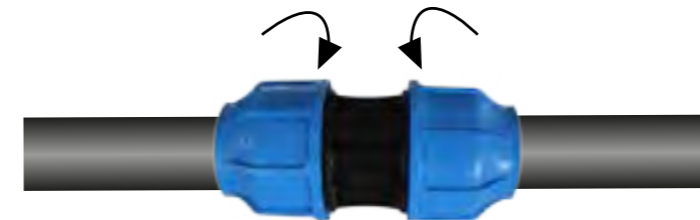
Borular yukarıda gösterildiği gibi işaretlenir.



Borunun bir tarafından manşon takılır.



İki boru hizalanır ve manşon borunun üzerindeki işarete kadar kaydırılır.



Somunlar stop yüzeylerine kadar sıkılır.

Installation Instructions

General

The installation manual is part of the product and an important module of the safety concept. Non-observance could result in serious injury or death. Read and observe the installation manual. The installation manual must be available with the product. Pass installation manual to further users of the product.

Transport and Storage

The I Coupling fittings should be transported and stored in the original packaging. The I Coupling fittings must be protected from harmful influences such as dirt and especially heat and UV radiation. The technical data are not binding. They neither constitute expressly warranted characteristics, nor guaranteed properties nor guaranteed durability. They are subject to modification.

Notice

Requirements for used and operator responsibility

For safety use and to guarantee the operation please note:

The I Coupling fittings must only be used according to the specifications.

Assembly and installation must be carried out by qualified personnel.

Piping system must be installed by professionals, its functionality checked regularly. Users and operators must be instructed on a regular basis in all aspects of work safety and environmental protection especially those pertaining to pressure-bearing piping systems.

Users and operators must be familiar with the operating instructions and must adhere to the information contained therein.

Intended use

I Coupling fittings are intended exclusively for conveying media in the allowable pressure and temperature range or for controlling flow in piping systems into which they have been installed. Application: Water before proceeding with the assembly, check the presence of all components

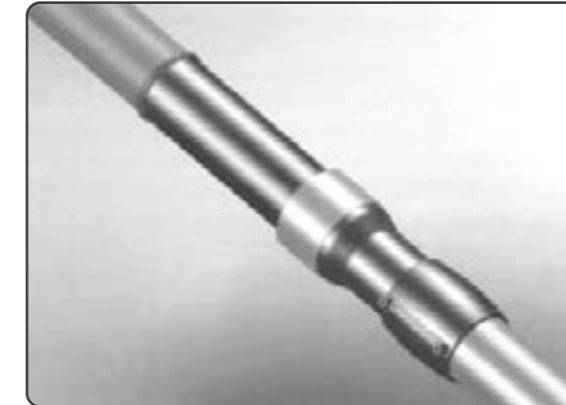
(clamp ring, gasket).

INSTALLATION OF PE-STEEL TRANSITONS

Issues to be taken into consideration during the installation of metal parts

- 1) Welding grooves must have been properly opened at welding tips of the fitting and steel pipe.
- 2) Align the fitting and steel pipe ends to each other properly.
- 3) Welding process must be carried out by experienced personnel with a certificate so as not to leave a space inside.
- 4) In case of any nonconformity or welding failure, metal end of attachment shouldn't be shortened more than twice.
- 5) During the welding process, PE section of attachment shouldn't be affected and melted by the heat.

See electrofusion information for installation of PE section. (Pg.40)



6-B-8) MISTAKES LIKELY TO TAKE PLACE WHILE WELDING AND POTENTIAL CAUSES

a) Bad weather conditions

During the welding process, bad weather conditions have an impact on the welding quality in electrofusion welding technique just as in all welding techniques. Above all, they lead to formation of new mistakes as they influence the welders. Protected from bad weather conditions, pipe and pipe fittings would have been protected from heating due to sun, as well as adverse impacts to directly influence the welding quality such as undesired contamination and wetting of welding area.

b) Air-gas stream and gas entrapment

If pressure air remains inside the pipe to be welded, this is considered as before welding or after welding. Replacement of damaged pipe sections is encountered on the live line at sleeve sources. If the gases penetrating into the pipe from throttling area are not discharged during welding process, such will affect the welding area if pressure increases a lot.

c) Ambient temperature

Although low or high temperature around the pipe (it must be between °0 C°35-C) seems to be insignificant but it is an erroneous process to decrease welding quality and life. External ambient temperature is taken into consideration while welding period is selected in welding parameters and it is accepted that the temperatures of pipe and pipe fittings are close to ambient temperature.

d) To maintain an unfinished welding process

In electrofusion welding technique, sometimes welding may not be completed at an unexpected moment. The reasons for this may be voltage cutoff or removal of connection sockets of welding machine pipe fitting from their place. What should be done for the welding operator is to wait for the complete cooling of pipe fitting and perform the welding again within the required time as if it was a new welding. To carry out the welding again without cooling the weld impairs the quality of the welding and result in visible mistakes.

e) Exposure of welding area to mechanical forces

Preventing exposure of the pipe and pipe fittings to any load during the welding and cooling process is another welding criteria. If the pipes are in the form of tubes, it is essential to straighten them with the help of positioner before welding.

f) Failure to clean welding areas thoroughly.

Sanitation of the welding surface is one of the criteria to affect the welding quality in electrofusion welding technique. Oxidized layer in the welding area must be scratched just before welding and cleaned with solvent. No manual contact is allowed after cleaning process. In contrary cases, welding fails to take place but it seems to be completed physically and pipe fitting indicators will also indicate the welding to have been completed.

G) Failure to straighten the pipes before welding, using oval pipes

PE pipes may have oval shapes. This may arise out of manufacture or cutting process This type of pipes are straightened before welding with the help of clamp or a throttling apparatus. Manufacture will be at fault if welding is carried out without straightening.

h) Welding with low voltage or selection of incorrect welding period.

Voltage must be provided to the resistances to create required pressure and heat in the welding area so that welding could reach desired performance. If fixed current (39-18 Volt) and welding periods, completely determined under laboratory conditions by the manufacturer are not applied in general in electrofusion welding, desired quality couldn't be achieved in welding. If excessive periods are applied, there occurs excessive melting and flow or welding fails to take place if insufficient periods are applied.

i) Use of pipes, manufactured for butt welding in electrofusion technique

PE pipes are manufactured on the basis of outer diameter and these are divided into two categories being A (fine-tolerance) and B (normal tolerance). Class A pipes are used in electrofusion welding technique, and pipes with normal tolerances are used in butt welding. Outer diameter tolerances of the pipes, manufactured for butt welding are not with fine-tolerance.

j) Insufficient insertion of PE pipes inside the sleeve and existence of space between the butts of the pipes

Or failure to cut one or both of the pipe ends perpendicularly
During welding process, PE pipes must be prepared in consideration of the sleeve. In contrary cases, there will be spaces between the pipe butts once the pipes are placed. This will result in flow of melting material inside the sleeve through the space.

k) Use of pipes and electrofusion fittings, manufactured from different resins

Material between the sleeve internal surface and pipe external surface must melt so that welding process takes place. Amount of melting material will vary based on the characteristics of polyethylene resin. When pipes and electrofusion fittings, manufactured from two different resins are used, welding quality will decrease since melting operations will not take place at equal rates.

l) Failures due to utilized electrofusion fittings

It is possible to encounter some defective electrofusion fittings although electrofusion materials are controlled after manufacture. That electrofusion fittings have an ovalness other than that of the standard is the the most important among these failures such as ovalness of pipes. If welding process is carried out with such electrofusion fittings, results, similar to that of oval pipe welding will be obtained.

m) Excessive insertion of PE pipes inside electrofusion fittings.

If installation is carried out before starting the welding operation without marking the parts required to be inserted into the sleeve, there will be welding failures. If it is inserted inadequately, flows will take place with the material. If such passes the middle point of the sleeve, welding process will seem to have been completed physically but strength will reduce as the other end is not adequately located inside.

6-B-9) PRESSURE TEST FOR PE PIPE LINE

Pressure Test for PE Pipe Line



Pressure reduction PE Pipes

Pipe	Nominal Pressure	Pressure Reduction
HDPE	10	2
HDPE	16	3
LDPE	10	2

Note: Water temperature, filled in the pipe system and test ambient temperature is important in line test. For the conditions above 20 °C, pressure reduction coefficients dependent upon temperatures will be used. No test should be performed at temperatures over 40 °C.

$$\Delta V_{max} = 1,5 \cdot v \cdot p \cdot \left[\frac{1}{E_w} \frac{D}{e \cdot E_R} \right]$$

ΔV_{max} = allowed max water outlet
 E_w = Water Compaction Module (2000 N/mm²)
 E_R = HDPE Elasticity Module (800 N/mm²)
 e = Pipe wall thickness



Standards

Procedure

Line pressure test must strictly be applied on installation process of pipe lines before they are put into service by observing the following procedure steps.

a. Pre-Testing

1. Fill the line with water. Eliminate the air entrapment inside the line by opening the valve at the highest point during the filling operation.
2. Close the line.
3. Set the test pressure so as to be PN (operating pressure) + 5 bars or PN x 1.5 (whichever is lower).
4. Set the line to the pressure within 10 minutes with a pump.
5. Continue pumping for 10 minutes in order to stabilize test pressure.
6. Stop pumping. Leave the supply pipe alone for 60 minutes.
7. Pipe line exposes to visco-elastic deformation. It is essential that pressure drop shouldn't be more than 30% within 60 minutes. Refers to a pressure decrease more than 30%. In each case, the test is ended. Following the observation and temperature control to be made on the line, all stresses within the line are removed and preliminary test is applied again..

a. Main Test

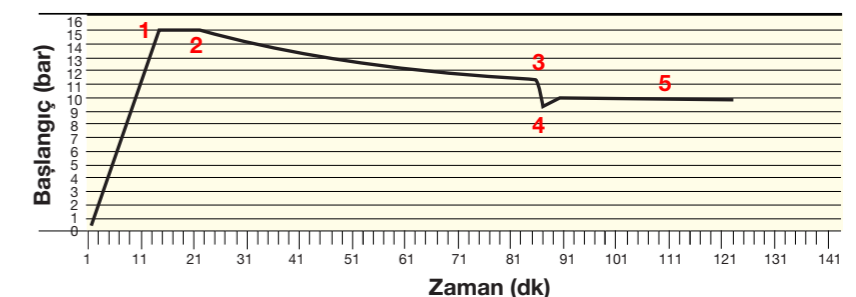
One of the two methods are preferred in the main test

1st Pressure Reduction Method

- After 60 minutes, the pressure of the line is reduced to the extend the rates, indicated in Table 1.
- Once the pressure is reduced, 30 minute-time contraction time period is set. It is agreed that the line is leak-proof if the pressure remains fixed or increase during such 30 minutes.. In case of ambiguity, test period is extended up to 1,5 hours. It is possible to determine only after the end of this period that there is a leakage with the supply pipe if the most pressure drop is observed.

Water Volume Loss Method in Pressure Reduction

- Determine the volume of the water to arise during pressure reduction process. Maximum water volume from the line is calculated with the following (Vt)
- ΔV_{max} formula. The test is considered valid if $V_t \leq V$.



1. Pumping must continue under test pressure for 30 minutes.
2. It must rise up to test pressure within 10 minutes
3. The pump must be stopped and the line should be observed for 60 minutes.
4. If dropping is less than 30%, pressure must be reduced 2 bars at once.
5. Wait for 30 minutes. The TEST is SUCCESSFUL if the pressure remains stable or increases.

7 BALL VALVES: PVC-PP-PE

7-A-) PVC VALVES

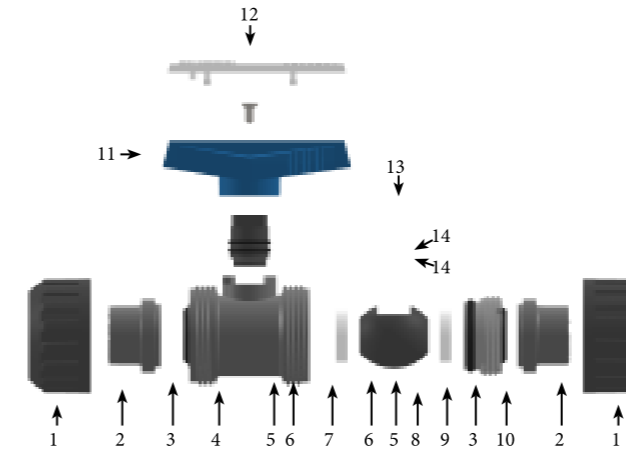
7-A-1) TECHNICAL SPECIFICATIONS-VALVE SELECTION

BALL VALVE TECHNICAL SPECIFICATIONS

1. PIMTAŞ ball valves are compatible with all industrial applications. Valve connections are in compliance with international standards such as ISO, ANSI, BS.
2. In order to be able to carry out visual open-closed control of valve, valve lever in open position is always in parallel to flow direction. Cover on the lever enables assembly or disassembly of the valve without a need for special tools.
3. Tightening tool - enables tightening of valve thanks to torque setting. PIMTAŞ tightening tool must be tightened with hand force, never use additional tools. If different tools are used, tightening tool may be damaged, in addition it is possible to damage to threads if excessive tightening process is applied.
4. Handle cover is designed as a tool to remove the tightening tool. Tightening tool is designed as a left thread in order to prevent separation of threads or fittings from the pipe.
5. Minimum pressure loss is ensured in all flow section thanks to floating ball design. It has a maintenance-free, liquid seal design with double seal step.
6. Thanks to one-piece, smooth, non-stop step - body pattern, it has a liquid seal design not allowing damage to, or cutting of seals.
7. PTFE ball seals have some characteristics such as requiring minimum friction force, having high resistance to abrasion and high chemical resistance and not requiring maintenance for very long periods (i.e., maintenance-free).
8. O-Rings under the PTFE seals automatically withstand expansion and stresses in the ball and valve. They enable the ball to move freely and without damage.
9. For sealing function in tightening tools, there is an additional third function in PIMTAŞ ball valves in which the seal is pressed at the bottom and smashed whereas competitors have dual functions. Thus tightness is ensured without applying much torque on the valve and the ball. Thus the operation, opening - closing forces of the valves are facilitated, abrasion and friction is minimized
10. Thread profile in the valve body and nuts is saw thread. Thus, the nut, especially when it is under pressure, remains in locked position with the help of the saw threads on the body. It ensures extra safety against nut retaining or thread skip.
11. It is possible to create a wide range of functions and application options in ball valves with actuators, attached to valves by means of actuator adaptor tool. Direct connection with actuator equipment to electrical or pneumatic actuators is in compliance with ISO 5211 standards.
12. Service - Maintenance; Ball valves are maintenance-free under normal operation conditions. Periodical sealing/tightness check of the valves is enough. If a ball valve functions uninterruptedly in the same position for 1-2 years, we recommend that a control test be made for the valves. In the event that valves with automation, which are processed very often or the seal material contact with chemical fluids, it may be required to replace the valve components. In these cases, valves must be separated from pipe systems.
13. Lubrication; Use of incorrect lubricants damage valve material or seals. Never use petrol-based grease or petrolatum. All seals must be oiled with silicon or polyglycol-based grease. All seals (made of EPM, FPM) are organic materials, affected by natural effects. Therefore, they should be kept in original packages in order to be able to prevent hardening or impairment before assembly.
14. If desired, an alternative lockable handle may be mounted instead of standard handle.

Ball Valve Parts

- Ball Water Valves are used between 0-50°C. They carry out the control of the water within the system. Just as there are pneumatic or electrical automatic control alternatives, manual control alternative is also available.
- Ball acid valves are those, acid strength of which are increased with special ball gasket component. In compliance with PVC and EPDM, they are used to control any and all acids within the system.
- Ball acid valves with FPM gasket are used in acids which EPDM fails to show resistance. They have high acid resistance.



1. NUT: (PVC-PP-HDPE)

These are used to connect two fittings (flange adaptor) with the body.

2. FLANGE ADAPTOR (FITTING): (PVC-PP-HDPE)

This is used to connect the valve to the system.

3. BODY SEAL: (EPDM-FPM)

Ensures sealing between the flange adaptor and body.

4. BODY: (PVC-PP-HDPE)

refers to valve main body. This is the external wall for water transition and closing.

5. BACKING SEAL: (EPDM-FPM)

Ensures sealing between ball gasket and the body.

6. BALL GASKET: (PE-PP-PTFE)

Refers to motion contact surface of the ball. Used to close water transition.

7. BALL: (PVC-PP-HDPE)

Used to prevent water transition. Portable component of the valve

8. TIGHTENING ATTACHMENT O-RING: (EPDM-FPM)

Ensures tightness between ball tightening part and the body.

9. BALL TIGHTENING ATTACHMENT: (PVC-PP-HDPE)

Refers to ball opposite panel. Ensures tightening of the ball inside the body.

10. TIGHTENING ATTACHMENT BEARING (SEGMENT): (PVC-PP-HDPE)

Refers to threaded piece which ensures tightening of the panel on the body.

11. VALVE HANDLE: (ABS)

Refers to the piece where manual force is applied to ensure the movement of valve ball.

12. HANDLE COVER: (PVC)

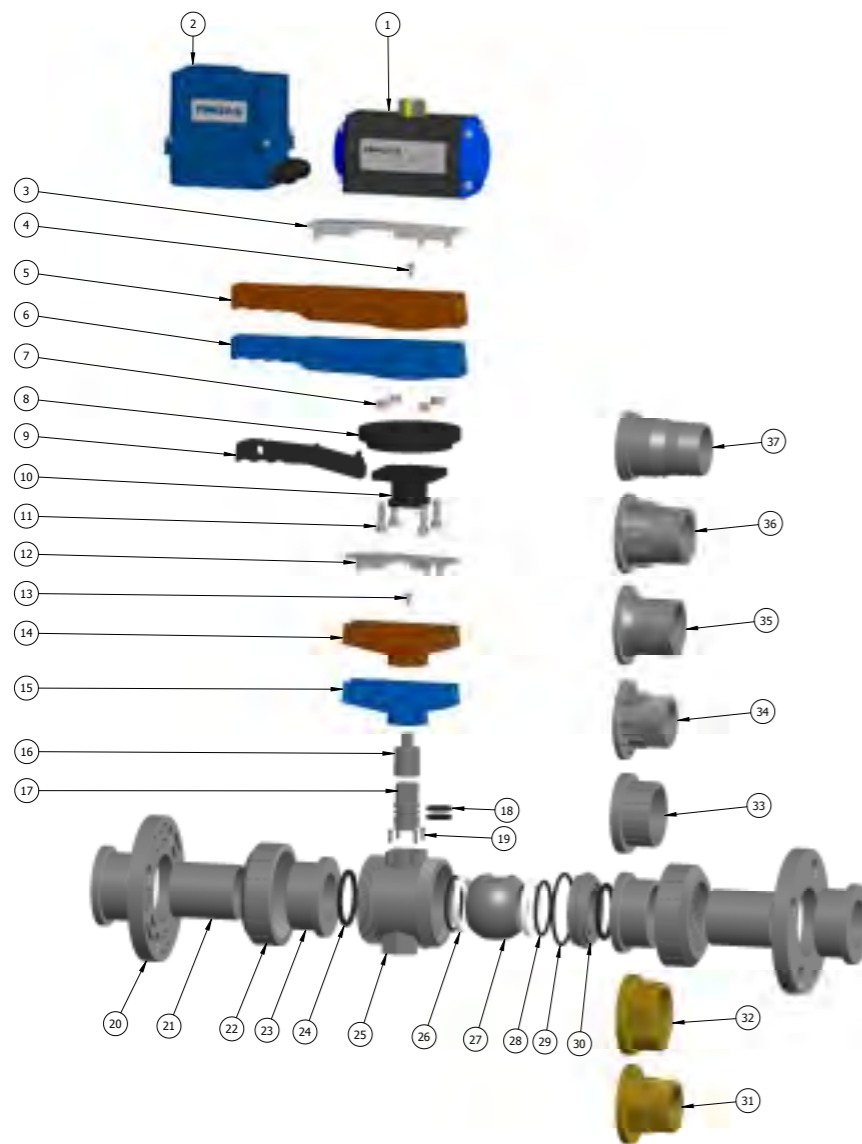
Refers to top accessory of valve handle. At the same time, it is used as a segment wrench thanks to the teeth below.

13. PIN: (PVC-PP-HDPE)

Ensures motion transmission between the valve handle and the ball.

14. PIN GASKET: (EPDM-FPM)

Ensures sealing between the step and the body.



No:	Part
1	Pneumatic Actuator
2	Electrical Actuator
3	Kol Kapağı / Handle Cover
4	Civata / screw
5	Kol / Handle (ASİT VANA KOL)
6	Kol Kapağı / (SU VANA KOL)
7	Somun / Nut
8	Çark / Index Plate
9	Mandal / Lever Catch
10	Adaptor Connecting Piece
11	ISO 4762 M8 x 255 --- 25
12	Kol Kapağı / Handle Cover
13	Civata / screw
14	Kol Handle (ASİT)
15	Kol Handle (SU)
16	Step Extension Piece
17	Pim / Step
18	Pim O-Ringi / Step O-Ring
19	Vida / screw
20	Flanş / Flange
21	Flange adaptor connection piece
22	Somun / Union Nut
23	Adaptor
24	Gövde O-Ringi / Body O-Ring
25	Gövde / Body
26	Conta / Gasket
27	Küre / Ball
28	Conta Altı O-Ring / Backing Seals
29	Bush O-Ring
30	Küre Dayama / Union Bush
31	Male thread Adaptor
32	Female thread Adaptor
33	Internal Threaded Adaptor
34	External Threaded Adaptor
35	Adaptor
36	External Sealing Adaptor
37	Hose Adaptor

Material Selection

In order to select correct material, pressure-temperature diagram may be useful. Pressure-temperature diagram is based on a curve to indicate the course of the pressure at a certain diagram. As each material is not resistant to the same pressure rate, it is possible to determine the material. Based on the design of the valve, pressure-temperature diagrams may be different than that of the pipes and fittings. E.g.: Limited temperature range based on tightness or low pressure loading in hot temperatures must be taken into consideration in this pipe system dimensioning.

Pressure-temperature Diagram

- Detailed information is included in different valve sections.

Chemical Resistance

Pipes, made of plastic are not only used for drinking water, general utilization and waste water but also for transportation of aggressive fluids and gases. However, it is important to select the proper plastic material for each application. Chemical Resistance List, included in this section may render a useful service in this respect. PIMTAŞ product range contains basic thermoplastic and elastomers. So much so that, these may directly contact with the ambient thorough the substances or through the external impacts.

Chemical Resistance

- Further detailed information "is available in Material selection-chemical resistance" section.

Other Criteria to Select Material

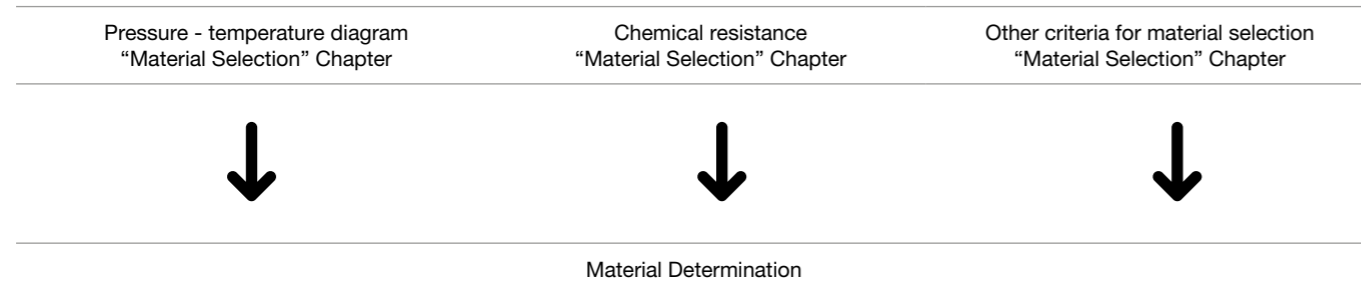
Following criteria should be taken into consideration while selecting materials.

- Internal pressure
- Earth and traffic loads
- Cold
- Temperature
- UV
- Chemical substance
- Rupture
- Gas impact
- Vapor pressure
- Diffusion
- Static electric
- Inflammables
- Explosives
- Corrosion
- Air
- Humid
- Water
- Ambient temperature
- Average Temperature

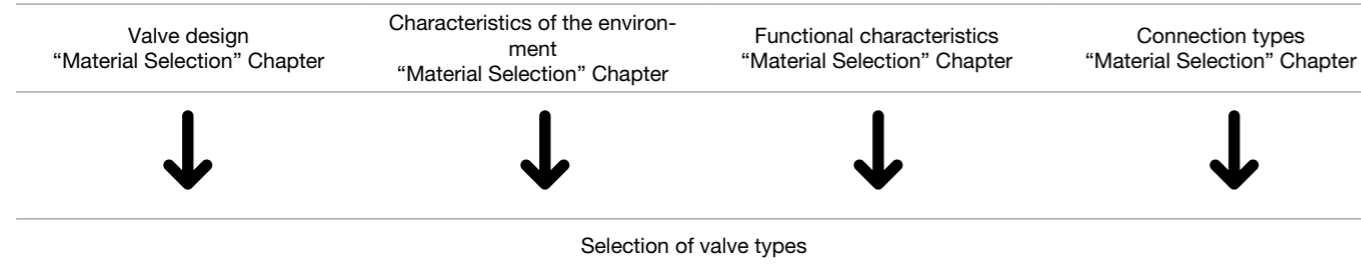
Apart from this, proper transportation at maximum service life is also important. Regular maintenance is another important factor to be considered.

III.) Material Selection

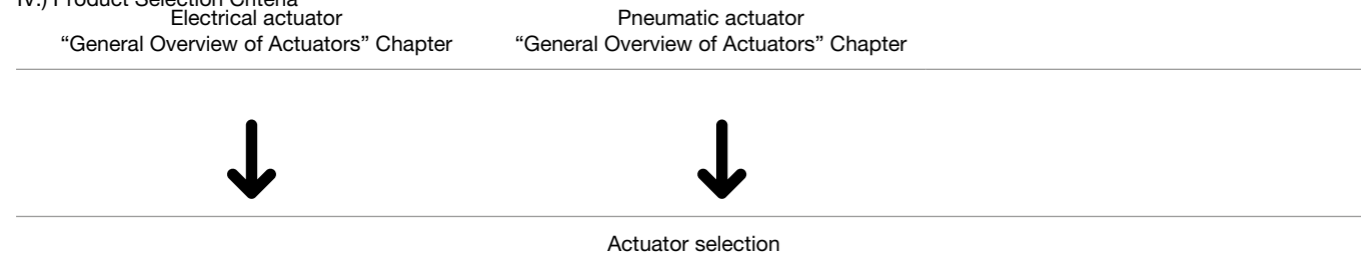
Several factors are important to carry out the correct selection for the valve. Following table may be helpful to make correct material and valve type selection.



IV.) Product Selection Criteria



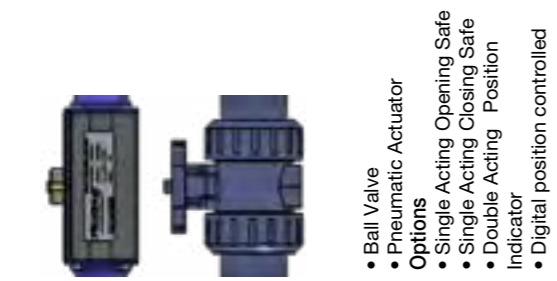
IV.) Product Selection Criteria



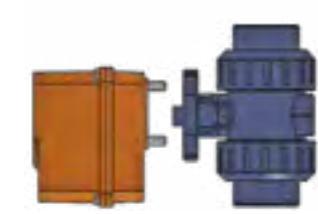
BALL VALVE CONFIGURATION TABLE

Malzeme / Material			
PVC-U	PVC-C	PP-H	↓
Dimensions			
DN 10 3/8"	DN 15 1/2"	DN 20 1/4"	DN 25 1" DN 32 1 1/4" DN 40 1 1/2" DN 50 2 1/2" DN 80 3" DN 100 4" style="text-align: right;">↓
Contalar / Seals			
EPDM	FPM		↓
Küre Contaları / Ball Seal			
PTFE			↓
Ek Parçalar / Connections			
FLANGE ADAPTOR	PUSH - FIT	THREADED FLANGE ADAPTOR	FLANGE style="text-align: right;">↓
PVC-U Flange Adaptor - Metric	Compression Outlet	PVC-U Female thread flange adaptor	PVC-U Flange - Metric
PVC-U Flange Adaptor - Inch ASTM	Latch pipe socket	PP Female thread Flange Adaptor with PVC-U Flange - ANSI/ASTM	PP Fiber Glass Flange - Metric
PVC-U Flange Adaptor - Inch BS		Fiber Glass	PP Fiber Glass Flange - Metric
PP-H Flange Adaptor Welded - Metric		Brass Female thread Flange Adaptor	PP Flange - ANSI
PP-H Flange Adaptor Welded - Inch		Brass male thread Brass Flange Adaptor	
ASTM			
PE 100 - Flange Adaptor Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric	With Coupling		PVC-U Flange - Metric
	With Latch Socket	PVC-U Female Threaded	PVC-U Flange - ANSI/ASTM
PVC-U Flange Adaptor - Metric		Flange Adaptor	PP-Glass Fiber Flange - Metric
PVC-U Flange Adaptor - Inch ASTM		PP - Glass Fibrefemale	PP Flange - ANSI
PVC-U Flange Adaptor - Inch BS		Threaded Flange Adaptor	
PP - H - Flange Adaptor Metric		Brass Female Threaded Flange Adaptor	
PP - H Flange Adaptor - Inch AST		Brass Malet Hreded Flange Adaptor	
PE 100 - Flange Adaptor - Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			
Kol / Handle			
Su için mavi / Blue for water	Asit için kırmızı / Macenta for acid	Kilitli / Kol ayarlı With lockable handle for valve Ø63 / Ø75 / Ø90 / Ø110	↓
Elektrikli Aktüatör / Electric Actuator			
24 V AC / DC	110 - 260 V AC / DC		↓
Pnömatik Aktüatör / Pneumatic Actuator			
Tek Etkili Açma Emniyetli. / Single acting open safe.		Çift Etkili. / Double Acting	↓
Tek Etkili Kapama Emniyetli. / Single acting close safe.			

PVC BALL VALVE TYPES



- Ball Valve
- Pneumatic Actuator
- Options**
- Single Acting Opening Safe
- Single Acting Closing Safe
- Double Acting Position Indicator
- Digital position controlled



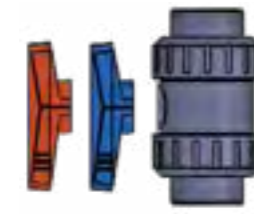
- Ball Valve
- Electric Actuator
- Options**
- 24 V AC / 24 V DC
- 110 - 260 V 50 - 60 Hz



- Ball Valve
- Lockable Handle Control
- for Ø63 / Ø75 / Ø90 / Ø110 valve.
- Unauthorized persons are not allowed to change the settings of the valve following the installation.



- Ball Valve
- Actuator Adaptor
- Electric or pneumatic actuator may optionally be applied by the customer.
- Surface of contact complies with ISO 6211.



- Ball Valve
- Handle Control
- Handle blue for water, red for acid.

Note :

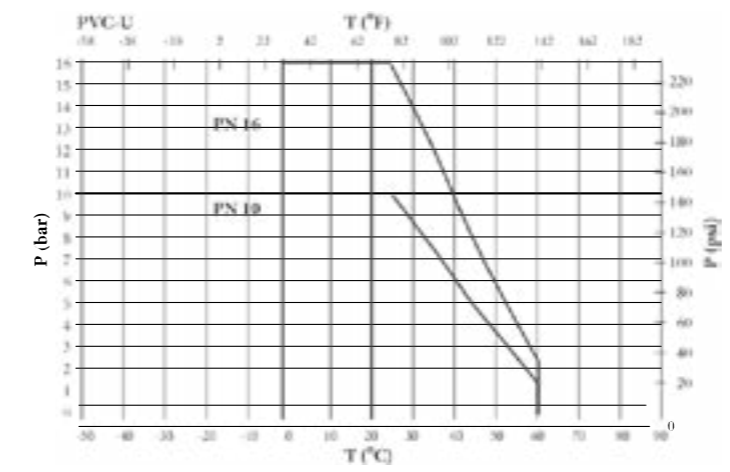
- Ball valve system has a modular design. Thus, it is possible to apply desired options on the main body easily and quickly.
- Seals on the valves are made of EPDM and FPM. It is possible to apply seals from other materials as well, if desired.
- Complies with piping systems in Metric - DIN, EN, ISO or Inch BS, ASTM standards.
- Ball gaskets are made of PTFE material
- In compliance with TS EN ISO 16135 Industrial Valves - Ball Valve (thermoplastic material) standard.
- In compliance with EN 558 - Flange Valve Connection standard.
- Saw threads within the valve body carry 50% more load in comparison to trapezoidal threads. Therefore, it prevents loosening of valve nut and ensures maximum protection including the water hammer impact in the water.

PRESSURE - TEMPERATURE TABLE - MAX. OPERATING PRESSURE

Pressure-temperature table shows operating life for water or similar fluid for 25 years.

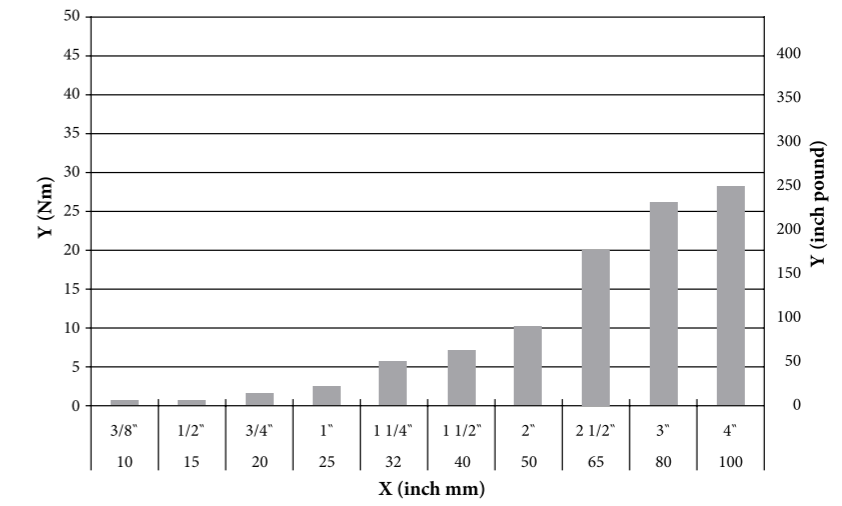
- 1.) Ball valves with sizes of DN 50 10 are designed based on PN 16 pressure.
- 2.) Ball valves with sizes of DN 65 DN 100 are designed based on PN 10 pressure.
- 3.) Based on the fittings used in ball valves

Operating pressure is reduced as PN 10 for DN 50 - DN 100 sizes.



BALL VALVE OPERATION FORCES

Operation torque values for ball valves are indicated in the following graphic.



TEMPERATURE °C	MINIMUM RATE FACTOR FOR BODY MATERIAL					
	ABS	PE	PP	PVC-C	PVC-U	PVDF
-40	1,0	1,0	-	-	-	a
-30	1,0	1,0	-	-	-	a
-20	1,0	1,0	-	-	-	1,0
-10	1,0	1,0	-	-	-	1,0
0	1,0	1,0	-	-	-	1,0
+5	1,0	1,0	1,0	-	-	1,0
10	1,0	1,0	1,0	1,0	1,0	1,0
20	1,0	1,0	1,0	1,0	1,0	1,0
25	1,0	1,0	1,0	1,0	1,0	1,0
30	0,8	0,76	0,85	0,85	0,80	0,9
40	0,6	0,53	0,70	0,65	0,60	0,8
50	0,4	0,33	0,55	0,50	0,35	0,71
60	0,2	0,24	0,40	0,35	0,15	0,63
70	-	-	0,27	0,25	-	0,54
80	-	-	0,15	0,15	-	0,47
90	-	-	-	-	-	0,36
100	-	-	-	-	-	0,25
110	-	-	-	-	-	0,17
120	-	-	-	-	-	0,12
130	-	-	-	-	-	a
140	-	-	-	-	-	a

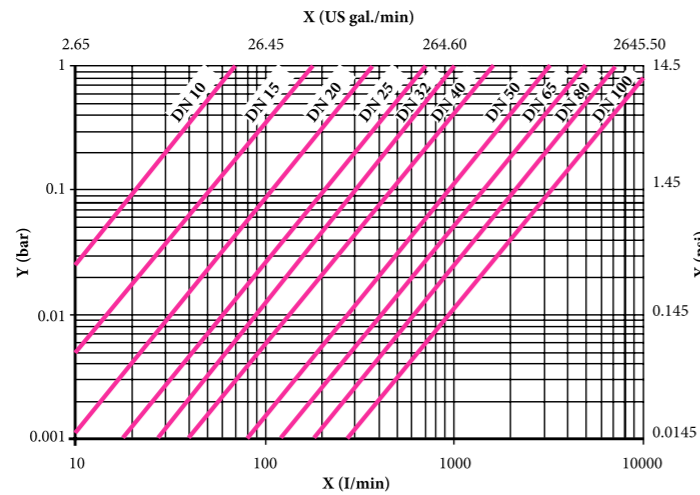
Remark: This is not compatible with applicable factors for the rates and fittings.

FRICION PRESSURE LOSS

Ball valves cause pressure losses at certain amounts in transitions.

These losses are indicated in the following graphic.

For hydraulic dimensioning of this piping system, pressure loss to emerge with middle flow through a valve is required. For individual valve types, with completely opened position, applicable pressure loss according to desired flow volume is included in pressure loss diagrams.



Remark: This is not compatible with applicable factors for the rates and fittings.

Flow Characteristics

Flow characteristics of individual valve types in percentages are provided as a diagram. It is possible to determine kV value percentage from the diagram based on space angle in percentage (%0= valve closed, %100= valve completely open).

kv 100 rates

kV value is a characteristic value/rate for a valve flow volume at a certain level of pressure loss in the valve. 100 kV rates for applicable nominal diameters of valves are stated in tabular form. This is also applicable to a completely open valve.

These are included in the following units:

- kV 100 value as l / m at 1 bar pressure loss
- kV 100 value as mVh at 1 bar pressure loss
- Cv 100 value as US gal / min at 1 psi pressure loss

Flow volume of valve at an interim position is determined based on 1000 kV value by multiplying the flow volume with the percentage of kV value from flow characteristics diagram.

Conversion Factor

kv - Cv

In Europe, kV value is related to a flow rate and a pressure loss of 1 bar at 16°C, between 1 m³ / hour. In USA, it is called as CV and it is related to a pressure loss of 1 psi at a temperature of 60° F at a flow rate of 1 US gal / min. This means as follows:

$$Cv = \frac{264.1722 \cdot \sqrt{1}}{60 \cdot 14.50377} \cdot kv = 1.1561 \cdot kv$$

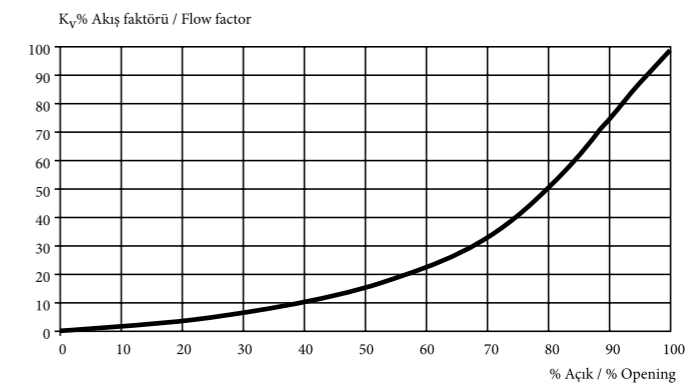
Cv: Cv rate at US gal/dak

Kv: refers to kV value in Europe as m²/hour

1m³: 264.1722

1 bar: 14.50377 psi

	kv	kv	Cv
kv	1 m³/h	16.67 l/min	1 1561 US gal/min
kv	0.06 m³/h	1 l/min	0.069 US gal/min
Cv	0,865 m³/h	14.42 l/min	1 US gal/min



Optimum fluid design; The improved Kv value allows for reduced pressure loss and energy savings.

DN mm	DN Inch	d mm	kv 100 L/min Δp=1 bar	kv 100 m³/h Δp=1 bar
10	3/8"	16	80	5
15	1/2"	20	200	12
20	3/4"	25	385	23
25	1"	32	770	46
32	1 1/4"	40	1100	66
40	1 1/2"	50	1700	102
50	2"	63	3400	204
65	2 1/2"	75	6000	300
80	3"	90	7000	420
100	4"	110	11000	660

O-RING MATERIAL CHARACTERISTICS

NBR : Superior mechanical strength and resistance strength. Low resistance against mineral oils, heat, fuel and external flows.

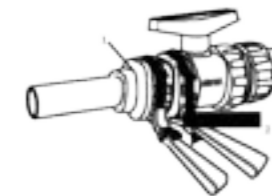
EPDM : Good resistance to water, vapor, pressured liquids, alkali and dilute acid. Substantial air resistance

FKM(FPM) : High temperature resistance. High chemical resistance. Poor low temperature elasticity

VALVE SYSTEM INSTALLATION

Proposed method of nut tightening during system installation of the valve:

Valves 20-25-32 must be strongly tightened manually. Larger dimensions must be tightened with a special apparatus as is shown in the next diagram. Never use standard pipe wrench. Use of standard pipe wrench may result in deformation in the nuts and fractures in the fittings.



HOW TO DISMANTLE COMPONENTS OF BALL VALVE



Assembled ball valve is in one piece.



Handle cover of ball valve is pulled and removed by holding it on the groove.



The union nut on the bush side is turned clockwise and removed. Union nut and pipe connection is removed.



Teeth beneath the handle cover are placed their slots on the tightening component bearing (ring).



Ring is opened by turning counter clockwise.



When ring threads are detached from the body, it can be removed with the lever lid.



The ball in the valve is seen at open position.



By turning the valve lever clockwise the ball is switched to off position.



Ball is held with fingers on both edges and removed. Here, ball can be pushed on the bottom to support the removing force.



The screw on the handle is removed with a screwdriver.



Handle is pulled and removed from the valve.



Pin is pulled from outside to inside and removed. It is held by the other hand at inside. Pin is taken out after removed.



The union nut on the casing side is turned clockwise and removed.



Ball inside casing is taken out together with its seal ring.



Ball inside bush is taken out by hand together with its seal ring.

O-RING

How to operate O-Ring?

When O-Ring is placed into a channel with liquid pressure inside, it applies a force to the opposite surface. Change in the shape of the seal is directly proportional to the pressure change. Contact area increases as pressure increases. Seal is generally compatible with the pressure deviation inside the channel.

Channel depth is smaller than the diameter of seal cross-section. Contact force arising out of the change in the shape of the seal increases the efficiency of the product. When the pressure of the fluid is low or there is no pressure at all, no additional strength is applied to insulation areas of the seal.

As the hardness of the seal increases its resistance to tightening increases. Chemical incompatibility results in change of characteristics of rubber components. Accordingly which o-ring, produced from what material, must be used for which chemical is indicated in the following table.

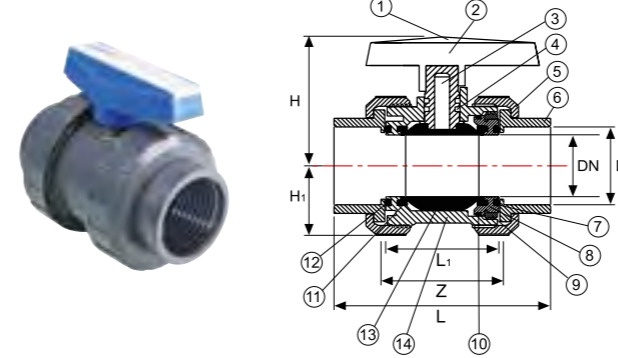
CHEMICAL	RECOMMENDED O-RING MATERIAL			REACTION, INDICATED		
	NBR	EPDM	FKM (FPM)	NBR	EPDM	FKM (FPM)
Acetaldehyde	-	+	-	NR	A	NR
Acetamine	+	+	-	A	A	AB
Aluminum Acetate	-	+	+	B	A	AB
Butyl Acetate	-	+	-	NR	BC	NR
Ethyl Acetate	-	+	-	NR	A	NR
Methyl Acetate	-	+	-	NR	AB	NR
Isopropyl Acetate	-	+	-	A	AB	NR
Acetylene	+	+	-	CNR	A	A
Vinegar	+	+	+	B	A	A
Acetophenone	-	+	-	BC	A	C
Acetone	-	+	-	NR	A	NR
Fatty Acid	+	-	-	NR	NR	A
Acetic Acid	-	+	-	NR	A	NR
Hydroxyanic Acid	-	+	+	CNR	A	A
Hydrochloric Acid	-	-	+	NA	BC	AB
Chromic Acid	-	+	+	NR	B	A
Hydrofluoric Acid	-	+	-	A	B	C
Formic Acid	-	+	-	A	A	BC
Phosphoric Acid	-	+	+	BC	A	A
Nitric Acid	-	-	+	A	C	BC
Sulphuric Acid	-	+	+	NR	B	AB
Tannic Acid	+	+	+	NR	A	A
Sea Water	+	+	-	AB	A	A
Hydrogen Peroxide	-	-	+	A	BC	A
Drinking Water	+	+	-	AB	A	A
Saturated Steam	-	+	-	AB	A	B
Steam 100 °C	-	+	-	A	A	C
Turpentine	+	-	+	AC NR	NR	A
Dirty Water	+	+	-	A	A	A
Butyl Alcohol	+	+	+	A	AB	A
Ethyl Alcohol	+	+	+	NR	A	A
Methyl Alcohol	+	+	-	NR	A	A
Amine	-	+	-	NR	AB	NR
Ammonia Gas	+	+	-	AB	A	NR
Ammonia Solution	+	+	-	A	A	AB

RECOMMENDED O-RING MATERIAL

CHEMICAL	REACTION, INDICATED					
	NBR	EPDM	FKM (FPM)	NBR	EPDM	FKM (FPM)
Aniline	-	+	-	AB	AB	C
Benzene	-	-	+	A	NR	C
Butadiene	-	-	+	B	NR	AB
Creosote	+	-	+	AB	NR	AB
Sulfur Hexafluoride SF	-	+	-	A	A	NR
-Isopropyl ether	+	-	-	AB	NR	NR
Ethylene glycol+water	+	+	+	A	A	A
Formaldehyde	-	+	-	B	A	A
Freon 114 B2	++	-	+	AB	AB	B
Freon 12	-	-	+	A	AB	B
ASTM ref Feul c	-	-	+	BC	NR	A
Yak+t Fam I	-	-	+	C	C	A
Yak+t Fam II (MIS)	+	-	+	C	C	A
Diesel Ya+	-	-	-	A	NR	A
Hydrazine	-	+	-	B	A	NR
Sodium Hydroxide 25%	+	+	-	A	A	A
Sodium Hydroxide 50%	+	+	-	A	A	B
+yot	-	+	+	AB	AB	A
Sodium Hypocloritc	+	+	+	B	AB	C
Kerosene (IP1)	+	-	+	A	NR	A
LPG	+	-	+	A	NR	A
Ya+lama Ya++ (Synthetic)	+	-	+	D	NR	A
MEK Methyl ketone	+	-	-	NR	AB	NR
Mercury	+	+	+	A	A	A
Methane (100 base)	+	-	+	A	NR	A
Methanol/Water 50%-50%	-	+	-	C	A	A
ASTM ref. Nr 1 oil	+	-	+	A	NR	A
ASTM ref. Nr 2 oil	+	-	+	A	NR	A
ASTM ref. Nr 3 oil	+	-	+	A	NR	A
ATF Fluid	+	-	+	A	NR	A
Brake Yak+t+	-	+	-	NR	A	NR
SAE 20W20	+	-	+	A	NR	A
Silicon Ya+	+	+	+	A	A	A
Liquid Oxygen	-	-	+	NR	NR	NR
Ozon	+	+	+	BC	A	A
Petrol	+	-	+	A	NR	AB
Propane Gas+	+	-	+	A	NR	A
Artificial Refine	-	+	-	NR	A	NR
Xylol	-	-	+	NR	NR	AB

7-A-2-) BALL VALVES and CONNECTION TYPES

U-PVC Ball Valve



No	Part	Material	Number
1	Handle Cover	U-PVC	1
2	Handle	ABS	1
3	Step	U-PVC	1
4	Step O-Ring	EPDM-FPM	2
5	Nut	U-PVC	1
6	Fitting	U-PVC	1
7	Body O-Ring	EPDM-FPM	1
8	Tightening Piece Bearing	U-PVC	1
9	Ball Bush	U-PVC	1
10	Tightening Piece O-Ring	EPDM-FPM	1
11	Ball Seal	HDPE-FPM	2
12	Backing Seals O-Ring	EPDM-FPM	2
13	Ball	U-PVC	1
14	Body	U-PVC	1

Diameter	BSP (Inch)	PN	DN (mm)	kV l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	Kg / Pieces	Parcel / Pieces
16	3/8"	16	12	80	50	42	80	47	25	0.195	55
20	1/2"	16	15	200	52	45	83	47	27	0.142	55
25	3/4"	16	20	385	56	50	95	51	31	0.198	56
32	1"	16	25	770	60	54	106	63	33	0.254	60
40	1 1/4"	16	32	1100	71	65	125	67	41.5	0.412	30
50	1 1/2"	16	40	1700	82	75	145	86	46	0.672	20
63	2"	16	50	3400	95	89	172	101	58	1.168	12
75	2 1/2"	16	65	6000	118	111	205	110	73	1.468	9
90	3"	16	80	7000	137	127	240	137	89	5.544	4
110	4"	16	100	11000	162	152	284	150	105	5.296	2

Injection Product

One side female threaded



Both side female threaded



Double side flange connection



One side brass female thread



Double side brass female thread



Single side brass male thread



Double side brass male thread



Single side brass male thread-single side female thread

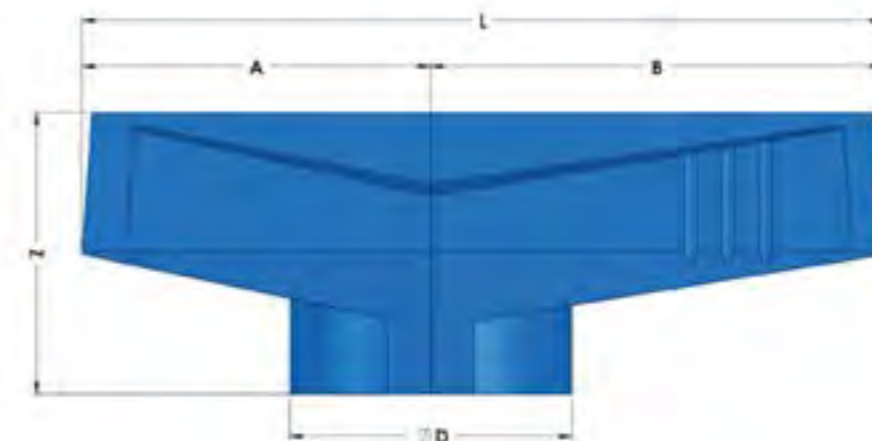


COMPRESSION OUTLET TRUE UNION BALL VALVES

- 1 Double side compression outlet true union ball valves.
- 2 Female Thread -Single side compression outlet true union ball valves
- 3 Solvent Cement -Single side compression outlet true union ball valves
- 4 Male thread-Single side compression outlet true union ball valves



BALL VALVES HANDLE (BLUE for water/ RED for Acid)



Nominal Diameter	ØD	L	A	B	z
20	22.4	70	32	38	26
25	22.4	70	32	38	26
32	29	80	35	45	29
40	28.5	96	42.5	53.5	28.5
50	38.5	105	47.5	57.5	37.2
63	45.2	128	56	72	45
75	44.5	157	69	88	46
90	54.2	185	76	109	52
110	53.8	236	102	134	52.5

SAFETY INFORMATION

ATTENTION

Environments containing solid substance

May result in these damages/leakage due to abrasion.

- Cavitation must be prevented during control process,

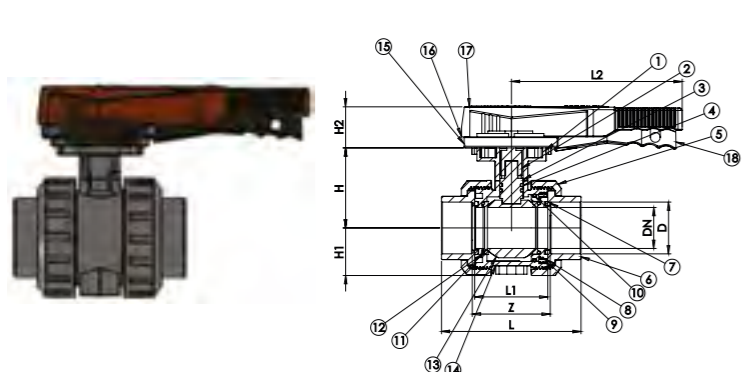
WARNING

Removing pipe line

Uncontrolled escape from the environment may lead to injuries.

- Piping system must be completely cleaned from dangerous combustive or explosive environment and flushed before the valve is demounted.
- Make sure that proper safety measures are taken in the setting.
- Open the demounted 546 half type (45° position) ball valve and allow drainage of 546 in vertical position, take the substance into a mold.

U-PVC Solvent Cement Socketed Ball Valve (Position Adjusted)



No.	Part	Material	Number
1	Handle Cover	U-PVC	1
2	Handle	ABS	1
3	Step	U-PVC	1
4	Step O-Ring	EPDM-FPM	2
5	Nut	U-PVC	2
6	Fitting	U-PVC	2
7	Body O-Ring	EPDM-FPM	2
8	Tightening Piece Bearing	U-PVC	1
9	Ball Bush	U-PVC	1
10	Tightening Piece O-Ring	EPDM-FPM	1
11	Ball Seal	HDPE-FPM	2
12	Backing Seals O-Ring	EPDM-FPM	2
13	Ball	U-PVC	1
14	Body	U-PVC	1

Diameter	BSP (Inch)	PN	DN (mm)	kV l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	Kg / Pieces	Parcel / Pieces
63	2"	16	50	3400	95	89	172	101	58	1.162	12
75	2 1/2"	16	65	6000	118	111	205	110	73	1.458	9
90	3"	16	80	7000	137	127	240	137	89	3.516	4
110	4"	16	100	11000	162	152	284	150	105	5.296	2

Injection Product

Both Sides Cemented

Single Side Female Male

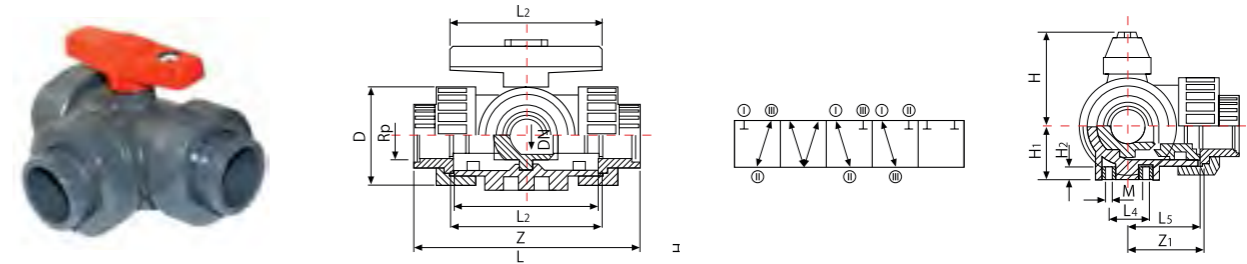


Double Sides Female Male

Double Sides Flanges



U-PVC Solvent Cement Socketed Ball Valve (Position Adjusted)

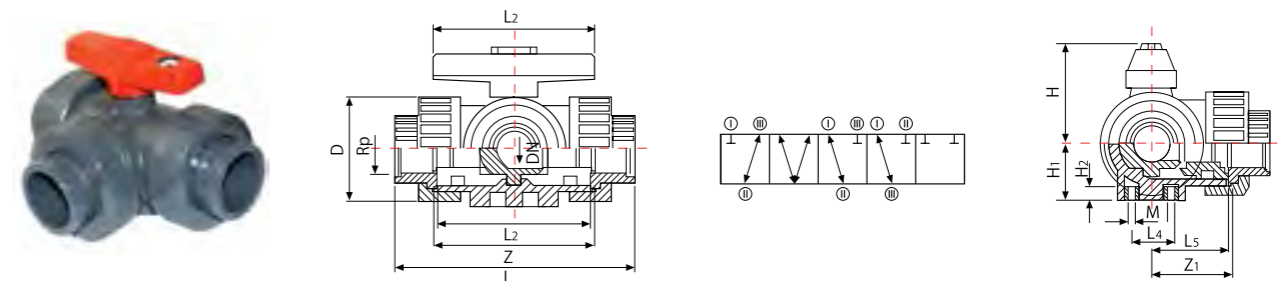


D (mm)	Code	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L3 (mm)	L4 (mm)	L5 (mm)	L6 (mm)	L7 (mm)	H (mm)	Kg / Pieces	Parcel / Pieces	Pressure PN
20	210 00 020 4	45	134	78	72	139	25	36	67	70	50	0.119	1	10
25	210 00 025 4	53	156	92	86	161	25	43	78	81	60	0.370	1	10
32	210 00 032 4	65	172	100	96	177	25	48	86	89	68	0.504	1	10
40	210 00 040 4	78	202	110	116	207	45	58	101	104	79	0.838	1	10
50	210 00 050 4	92	238	120	137	242	45	69	119	121	90	1.359	1	10
63	210 00 063 4	116	290	146	179	294	45	90	145	147	109	2.622	1	10

Injection Product

- T-Port ball
- Ball seal PTFA
- For easy installation and removal
- Pneumatic or electric actuator available separately
- Angle of operation 90°, without turn limiter
- O-Ring : EPDM

U-PVC Three Ways Female Thread Ball Valve (T Port)



D (mm)	Code	Rp (Inch)	D (mm)	L (mm)	L1 (mm)	L2 (mm)	L4 (mm)	L5 (mm)	H (mm)	H1 (mm)	H2 (mm)	Kg / Pieces	Parcel / Pieces	Pressure PN
20	211 00 020 4	1/2"	45	111	78	72	25	36	50	27	8	0.119	1	10
25	211 00 025 4	3/4"	53	131	92	86	25	43	60	33	8	0.370	1	10
32	211 00 032 4	1"	65	148	100	96	25	48	68	36	8	0.504	1	10
40	211 00 040 4	1 1/4"	78	176	110	116	45	58	79	44	9	0.838	1	10
50	211 00 050 4	1 1/2"	92	206	120	137	45	69	90	49	9	1.359	1	10
63	211 00 063 4	2"	116	262	146	179	45	90	109	62	9	2.622	1	10

Injection Product

- T-Port ball
- Ball seal PTFA
- For easy installation and removal
- Pneumatic or electric actuator available separately
- Angle of operation 90°, without turn limiter
- O-Ring : EPDM

7-A-3-) ACTUATOR VALVES

AUTOMATION

All valves may be operated with electrical or pneumatic actuators with automation and fluid control so as to respond to the requirements of market.

Thanks to several number of accessories, it enables simple reports, position control, digital and analog reporting options.

With the know how of PIMTAŞ automation department, even the special requirements of the customers are met.

General Overview of Actuators

Actuators support turning on or off the electric motor or the valve with pneumatic assistance. Actuators are divided into two groups as electrical actuators and pneumatic actuators. Furthermore, they are also distinguished as rotating and linear actuators

A special type of actuators is electric motor actuators are for pipe valves. It is used in cases where compressed air is not available as auxiliary energy

for operation. These are preferably used in pipe line and industry - factory construction. These are preferably used in pipe line and factory construction.

Pneumatic actuators are the actuators that operate with compressed air and that never require any electric energy. Partial rotating actuators are a special type of rotating actuators and used for the automation of 1/4 turn valves such as butterfly valves or ball valves. They generally have an outlet movement less than 360°. In general, they interior drive gear segment is designed for 90° movement. Following table gives a general overview for each actuator and specific details of different actuator types, tables indicate connection measures, options and accessories. It will also help you with your decision.

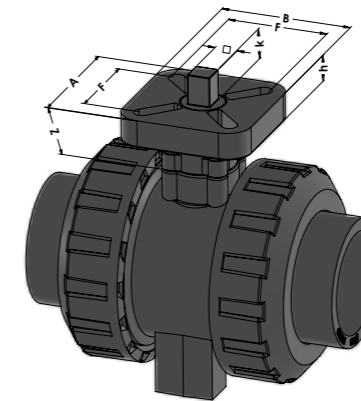
-While selecting actuator, an actuator with a torque value 20-30% more than real need must be selected.

-If operating temperature is more than PN10, a big actuator must be selected.

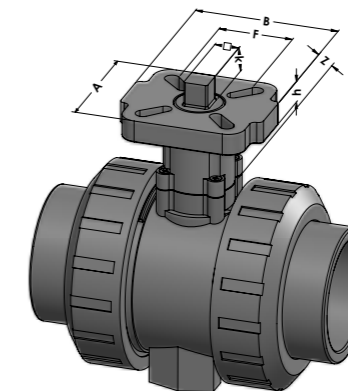
-Based on the operating conditions, a (2,5-4) times bigger torque value must be selected while selecting the actuator for butterfly valves (in consideration of on-off time, temperature, pressure, fluid value of conveyed liquid.....etc).

-Torque value for the actuators was measured at (Nm) 20C water and 30% safety factor was accepted.

BALL VALVE - ACTUATOR ADAPTOR SIZES



Nominal Diameter	Inch	ISO 5211 Flange	D	B	F	z	h	k	Square Steel mil	TORQUE (Nm 6 Bar)
20	1/2"	F03	37.5	37.5	25.5	25	10	12	9	10
		F05	52	52	35.4	25	12	12		
25	3/4"	F03	37.5	37.5	25.5	25	10	12	9	10
		F05	52	52	35.4	25	12	12		
32	1"	F03	37.5	37.5	25.5	25	10	12	9	10
		F05	52	52	35.4	25	12	12		
40	1 1/2"	F03	37.5	37.5	25.5	25	10	12	9	20
		F05	52	52	35.4	25	12	12		
50	3 1/2"	F03	37.5	37.5	25.5	35	10	11	11	20
		F05	52	52	35.4	35	12	14	14	



Nominal Diameter	Inch	ISO 5211 Flange	D	B	F	z	h	k	Square Steel mil	TORQUE (Nm 6 Bar)
63	2"	F05	72	84	35.4	48	12	11	11	20
		F07	72	84	49.5	48	15	14	14	
75	2 1/2"	F05	72	84	35.4	48	12	14	11	30
		F07	72	84	49.5	48	15	17	14	
90	3"	F07	72	84	35.4	48	12	17	14	40
110	4"	F07	72	84	49.5	48	15	17	14	45

ACTUATOR COMPATIBLE VALVES

- 1- Solvent Cement Socketed
- 2- Single side female thread
- 3- Double side female thread
- 4- Double side flange connection

ELECTRIC BALL VALVES



Options:

- Battery powered on off may be safety controlled.
- Proportional control unit, potentiometer, local control unit,
- Options for position transmitter are available.
- Actuator flange connection sizes ISO 5211
- 24 V DC / 24 V AC
- It is possible to add option based on need.
- 110 - 260V.

Accessories:

- Thermostat control heater against moisture
- Valve position indicator.
- Ex. Proof protection limit option
- Digital control units.
- On-site or remote control actuator.

Electric Actuator	
Advantages	<ul style="list-style-type: none"> • Easy to install • Well defined performance • No energy consumption at switch on/off breaks • Intermediary position is possible • Easy maintenance • Additional elements may be attached later • Very good chemical resistance • Durable PP-GF case, very good chemical resistance • Modular design and flexible composition, easy to use • Additional safety thanks to unit and battery set (Optional) • Long service life thanks to durable design and best electronic use • Thanks to wide power supply and standard interface, compatible for universal use • Many monitoring and control capabilities that have smart, self-learning access
Properties	<ul style="list-style-type: none"> • Relatively high cost • Low maintenance cost • Long cycle period • Additional hardware required for defined edge positions
Versions	<ul style="list-style-type: none"> • Heating equipment and turning unit for much safety • Additional mechanical limit feedback wrench • Optional adaptor for F04 and F05 interface pursuant to EN ISO 5211 • Operation status monitoring • Driver monitoring in additional panel: Respond time monitoring, loop number monitoring, cycle period extension • Position detection and 4-20 mA position feedback • Positioner

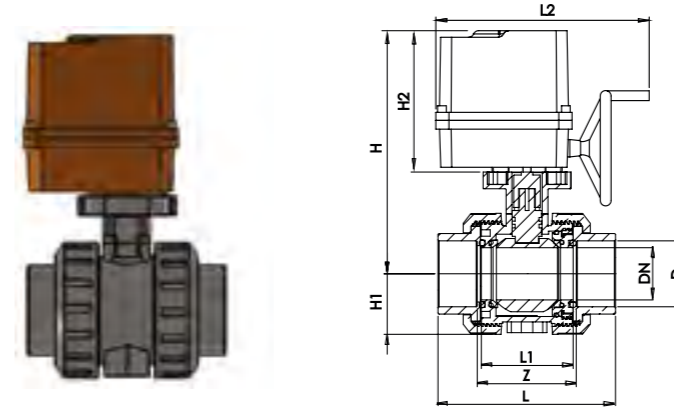
ATTENTION

Actuator Control

There may be injuries in case of failure to use as specified. Actuator control, when mounted on a valve and dependent upon a system audit,

- Activate the valves (valves and butterfly valves) by turning 90°.
- Indicate the valve ending positions, calibrated beforehand through electrical signal to system control (accessory).
- Actuator data must correspond to electric controller and the valve and make sure that actuator / valve remain in the current position in case of voltage outage.
- Use the emergency guide or mount the turning unit with failure protection.

PVC-UH Electric Actuator Solvent Cement True Union Ball Valve (24 V DC) Manual Emergency Controlled



Positions: Battery powered on off may be safety controlled.

Proportional control unit, potentiometer, local control unit,
Position transmitter options are available.

Actuator flange connection sizes ISO 5211

24 V DC / 24 V AC

It is possible to add option based on need.

Dimater	BSP (Inch)	PN	DN (mm)	kv-value l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	ISO 5211 Flange
20	1/2"	16	15	200	52	45	83	47	27	F03
25	3/4"	16	20	385	56	50	95	51	31	F03
32	1"	16	25	770	60	54	106	63	33	F03
40	2 1/4"	16	32	1100	71	65	125	67	41	F05
50	1 1/2"	16	40	1700	82	75	145	86	46	F05
63	2"	16	50	3400	95	89	172	101	58	F07
75	2 1/2"	16	65	6000	118	111	205	110	63	F07
90	3"	16	90	7000	137	127	240	137	89	F07
110	4"	16	100	11000	162	152	284	150	105	F07

Electric Actuator
(260-110 V AC)



Electric Actuator Single Side Female
Threaded (24 V DC)

Electric Actuator Single Side Female
Thread (260-110 V)



Flange Connection
(24 V AC)

Flange Connection
(110-260 V AC)



PNEUMATIC BALL VALVES



Options:

- Single Acting Open Safe.
- Single Acting Close Safe.
- Double Acting.
- Easy mounting demounting opportunity
- Positioner, Limit switch box, Namur solenoid valve, hand control unit.
- Actuator flange connection sizes ISO 5211
- It is possible to add option based on need.

Accessories:

- Epoxy coating, polyamide, nickel coating, anodized coating hull material.
- Three -position actuator
- With position indicator.
- Adjustable manual stop.

Pneumatic Actuator	
Advantages	<ul style="list-style-type: none"> • Short switch on/off time • Low cost • Variable pressure control performance • Identified edge position • Easy maintenance • Impact limiter (to change manually) • Additional elements may be mounted later • Flow control is possible with additional parts • Completely plastic actuator • Position indicator with integrated NAMUR interface • Fast cycle periods • Very good price/performance ratio in all versions • Wide torque range, from 8Nm to 3840 Nm • Formation of several limit switch versions without any problem • Low installation
Properties	<ul style="list-style-type: none"> • Required control valve • Required pressurized air • Required position feedback for additional parts • More effort is required for interim positions
Versions	<ul style="list-style-type: none"> • Position feedback • Digital positioner • Opportunity for bus bar connection asAS-i • Adapters for F04 and F05 interface

Safety Information

Following safety instructions are especially applicable to ball valves. These instructions must identify the risks recommendations for different utilizations and assembly / commissioning

ATTENTION

Pneumatic actuators

*If pneumatic actuators with failure protections in OPEN and CLOSED positions (FO and FC type additional letters) are operated under pressure-free status, they have pre-stressed springs.

WARNING

Removing Actuators

- Incorrect removal may result in serious injuries or death.
- Removal of these actuators may only be carried out under supervision of a safety expert.
- Removal can only be made in safe position once the air inlet connection is disconnected.
- Electrical connections must primarily be disconnected while working on electrical auxiliary components of pneumatic operation.
- Any essential live line adjustment may only be carried out with specially insulated instruments.

Intended Use

Following identifications and instructions are applicable to pneumatic actuators:

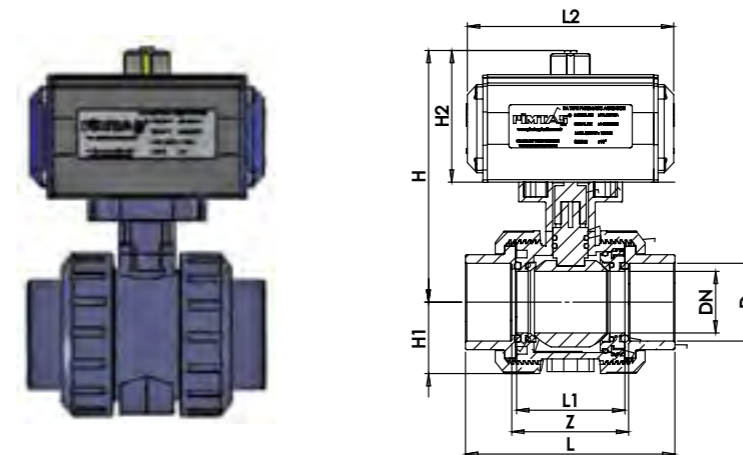
BALL VALVE PNEUMATIC ACTUATOR OPTIONS

- 1st Single Acting Open Safe
- 2nd Single Acting Open Safe
3. Double Acting Position Indicator
- 4th Digital Position Controllers

TYPES OF CLOSURE-SAFE SINGLE EFFECT PNEUMATIC BALL VALVES

- 1.) U-PVC Single Acting Close Safe Pneumatic Actuator Ball Valve
- 2.) Single Acting Close Safe Pneumatic Actuator Ball Valve (Single Side Female Threaded)
- 3.) U-PVC Single Acting Close Safe Pneumatic Actuator Ball Valve (Double Side Female Threaded)
- 4.) U-PVC Single Acting Close Safe Pneumatic Actuator Ball Valve (Single Side Flange Connection)
- 5.) PVC-UH Single Acting Close Safe Pneumatic Solvent Cement Socketed Actuator Ball Valve (Single Side Brass Female Threaded)
- 6.) PVC-UH Single Acting Close Safe Pneumatic Actuator Ball Valve (Double Side Brass Female Threaded)
- 7.) PVC-UH Single Acting Close Safe Pneumatic Actuator Ball Valve (Single Side Brass Female Threaded)
- 8.) PVC-UH Single Acting Close Safe Pneumatic Actuator Ball Valve (Double Side Brass Male Threaded)
- 9.) PVC-UH Single Acting Close Safe Pneumatic Actuator Ball Valve (One Side Brass Female Thread, One Side Male Thread, Brass)

U-PVC Single Acting Close Safe Pneumatic Actuator Ball Valve



Positions: Easy mounting demounting opportunity

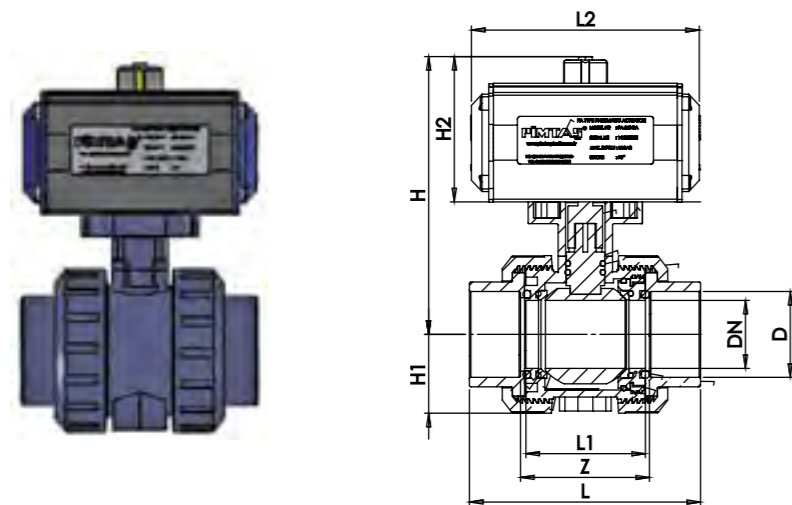
Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Actuator flange connection sizes ISO 5211

It is possible to add option based on need.

Diameter	BSP (Inch)	PN	DN (mm)	kv-value l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	ISO 5211 Flange
20	1/2"	16	15	200	52	45	83	209	27	F03
25	3/4"	16	20	385	56	50	95	215	31	F03
32	1"	16	25	770	60	54	106	225	33	F03
40	2 1/4"	16	32	1100	71	65	125	238	41	F05
50	1 1/2"	16	40	1700	82	75	145	253	46	F05
63	2"	16	50	3400	95	89	172	288	58	F07
75	2 1/2"	16	65	6000	118	111	205	305	63	F07
90	3"	16	90	7000	137	127	240	352	89	F07
110	4"	16	100	11000	162	152	284	385	105	F07

U-PVC Single Acting Open Safe Pneumatic Actuator Ball Valve



Options Easy mounting demounting opportunity

Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Actuator flange connection sizes ISO 5211

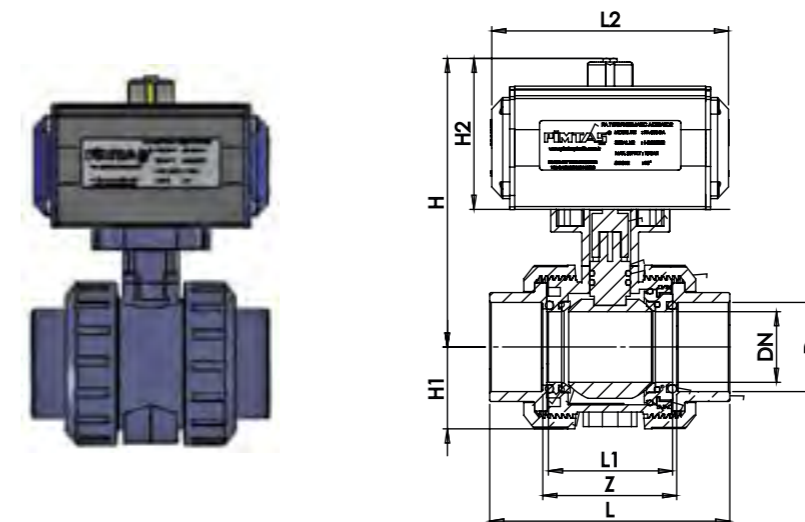
It is possible to add option based on need.

Diameter	BSP (Inch)	PN	DN (mm)	kv-value l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	ISO 5211 Flange
20	1/2"	16	15	200	52	45	83	131	27	F03
25	3/4"	16	20	385	56	50	95	133	31	F03
32	1"	16	25	770	60	54	106	141	33	F03
40	2 1/4"	16	32	1100	71	65	125	157	41	F05
50	1 1/2"	16	40	1700	82	75	145	182	46	F05
63	2"	16	50	3400	95	89	172	218	58	F07
75	2 1/2"	16	65	6000	118	111	205	228	63	F07
90	3"	16	90	7000	137	127	240	252	89	F07
110	4"	16	100	11000	162	152	284	276	105	F07

TYPE OF OPENING-SAFE SINGLE EFFECT PENUMATIC ACTUATOR BALL VALVES

- 1.) U-PVC Single Acting Open Safe Pneumatic Actuator Ball Valve
- 2.) Single Acting Open Safe Pneumatic Actuator Ball Valve (Single Side Female Threaded)
- 3.) U-PVC Single Acting Open Safe Pneumatic Actuator Ball Valve (Double Side Female Threaded)
- 4.) U-PVC Single Acting Open Safe Pneumatic Actuator Ball Valve (Double Side Flange Connection)
- 5.) PVC-UH Single Acting Open Safe Pneumatic Solvent Cement Socketed Actuator Ball Valve (Single Side Brass Female Threaded)
- 6.) PVC-UH Single Acting Open Safe Pneumatic Actuator Ball Valve (Double Side Brass Female Threaded)
- 7.) PVC-UH Single Acting Open Safe Pneumatic Actuator Ball Valve (Single Side Brass Male Threaded)
- 8.) PVC-UH Single Acting Open Safe Pneumatic Actuator Ball Valve (Double Side Brass Male Threaded)
- 9.) PVC-UH Single Acting Open Safe Pneumatic Actuator Ball Valve (One Side Female Thread, One Side Male Thread, Brass)

U-PVC Pneumatic Actuator Double Acting Ball Valve



Options: Easy mounting demounting opportunity

Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Actuator flange connection sizes ISO 5211

It is possible to add option based on need.

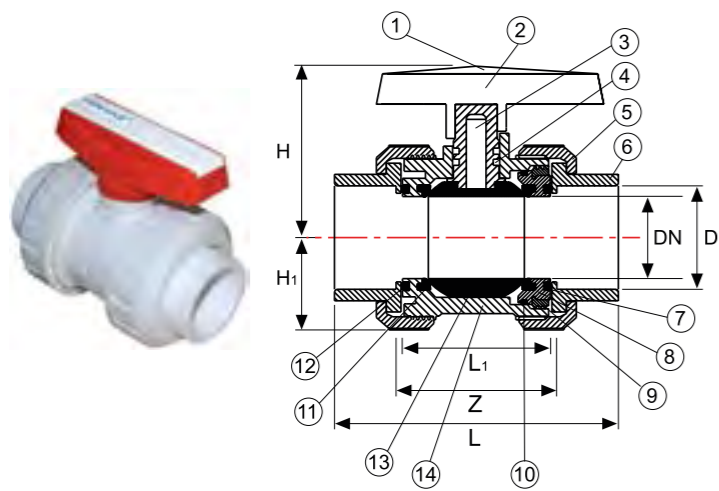
Diameter	BSP (Inch)	PN	DN (mm)	kv-value l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	ISO 5211 Flange
20	1/2"	16	15	185	60	48	85	131	27	F03
25	3/4"	16	20	350	55	45	95	133	31	F03
32	1"	16	25	700	68	49	107	141	33	F03
40	2 1/4"	16	32	1000	82	54	128	157	41	F05
50	1 1/2"	16	40	1600	94	65	154	182	46	F05
63	2"	16	50	3,100	95	74	172	218	58	F07
75	2 1/2"	16	65	5,000	119	87	196	228	63	F07
90	3"	16	90	7,000	156	98	241	252	89	F07
110	4"	16	100	11,000	185	150	289	276	105	F07

U-PVC DOUBLE ACTING PNEUMATIC ACTUATOR BALL VALVE TYPES

- 1.) U-PVC Pneumatic Actuator Double Acting Ball Valve
- 2.) U-PVC Pneumatic Actuator Double Acting Ball Valve (Single Side Female Threaded)
- 3.) U-PVC Pneumatic Actuator Double Acting Ball Valve (Double Side Female Threaded)
- 4.) U-PVC Pneumatic Actuator Double Acting Ball Valve (Double Side Flange Connection)
- 5.) PVC-UH Pneumatic Actuator Double Acting Ball Valve (Single Side Brass Female Threaded)
- 6.) PVC-UH Pneumatic Actuator Double Acting Ball Valve (Double Side Brass Female Threaded)
- 7.) PVC-UH Pneumatic Actuator Double Acting Solvent Cement Socketed Ball Valve (Single Side Brass Male Threaded)
- 8.) PVC-UH Pneumatic Actuator Double Acting Ball Valve (Double Side Brass Male Threaded)
- 9.) PVC-UH Pneumatic Actuator Double Acting Ball Valve (Single Side Female Thread, Single Side Male Thread, Brass)

7-B-) PP BALL VALVES

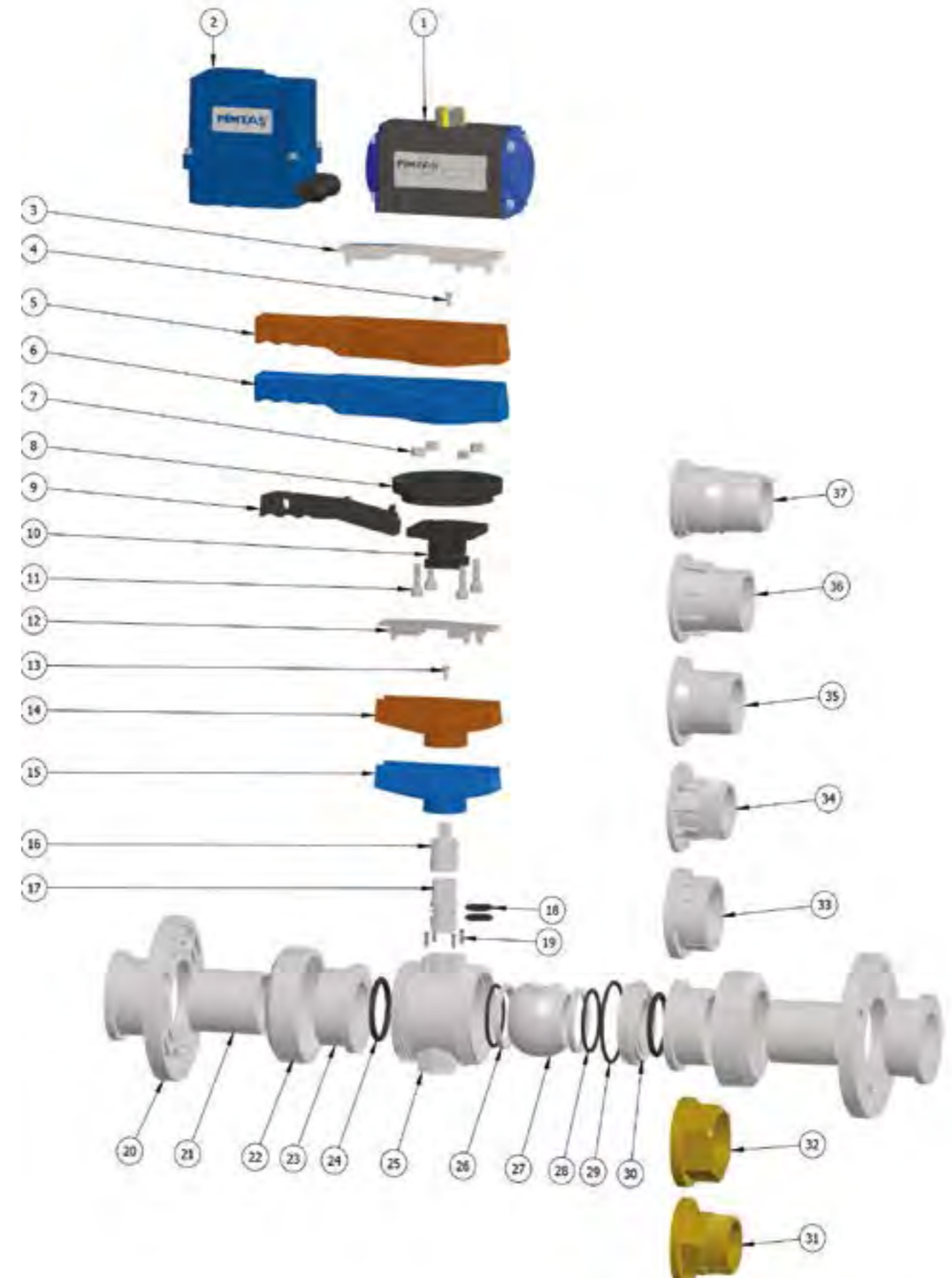
7-B-1-) PP VALVE TECHNICAL SPECIFICATIONS-VALVE SELECTION



No.	Part	PN	DN (mm)
1	Handle Cover	PP-GF	1
2	Handle	ABS	1
3	Step	PP-GF	1
4	Step O-Ring	EPDM-FPM	2
5	Nut	PP-GF	1
6	Fitting	PP-GF	1
7	Body O-Ring	EPDM-FPM	1
8	Tightening Piece Bearing		1
9	Ball Bush		1
10	Tightening Piece O-Ring	EPDM-FPM	1
11	Ball Seal	EPDM-FPM	2
12	Backing Seals O-Ring	EPDM-FPM	2
13	Ball	PP-GF	1
14	Body	PP-GF	1

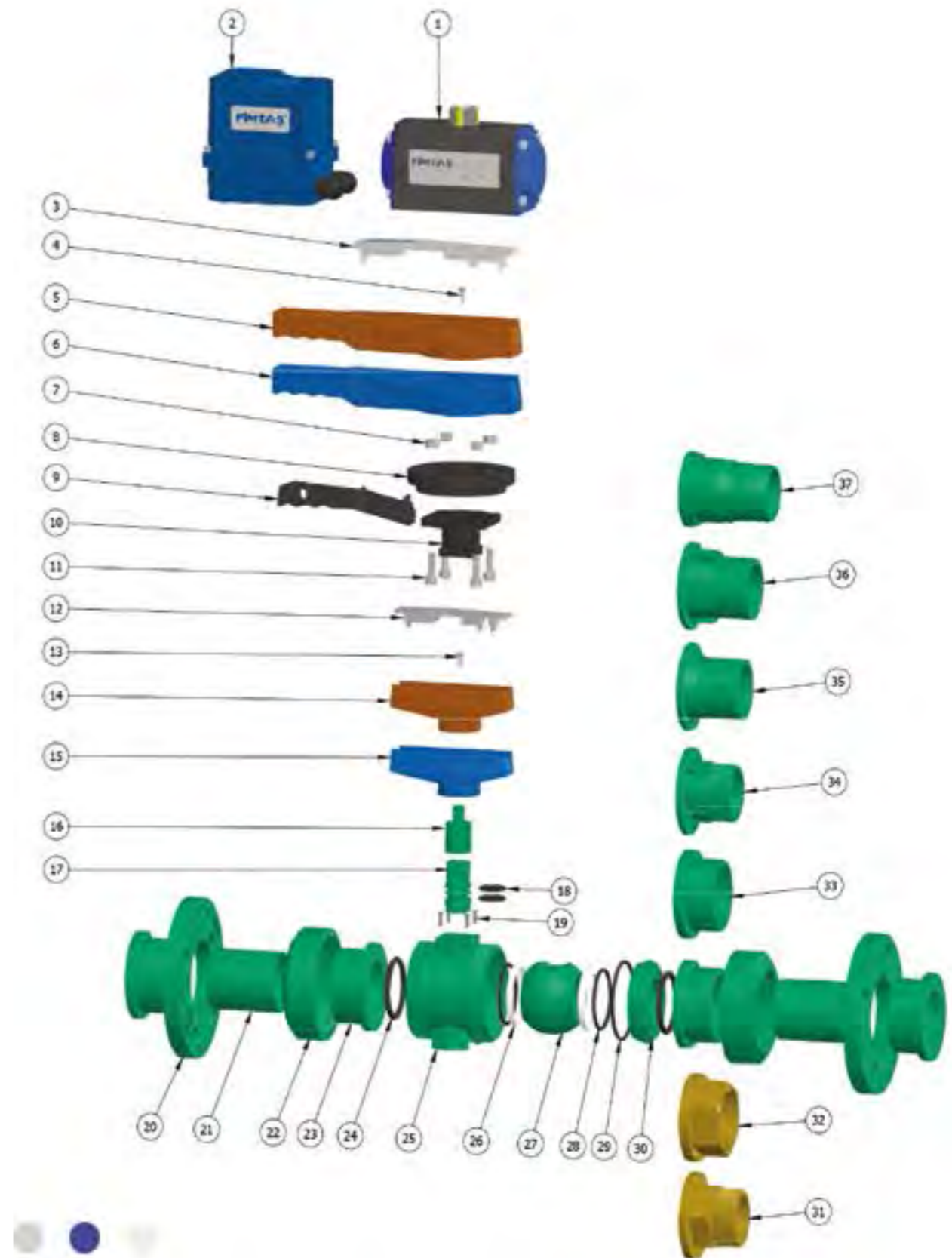
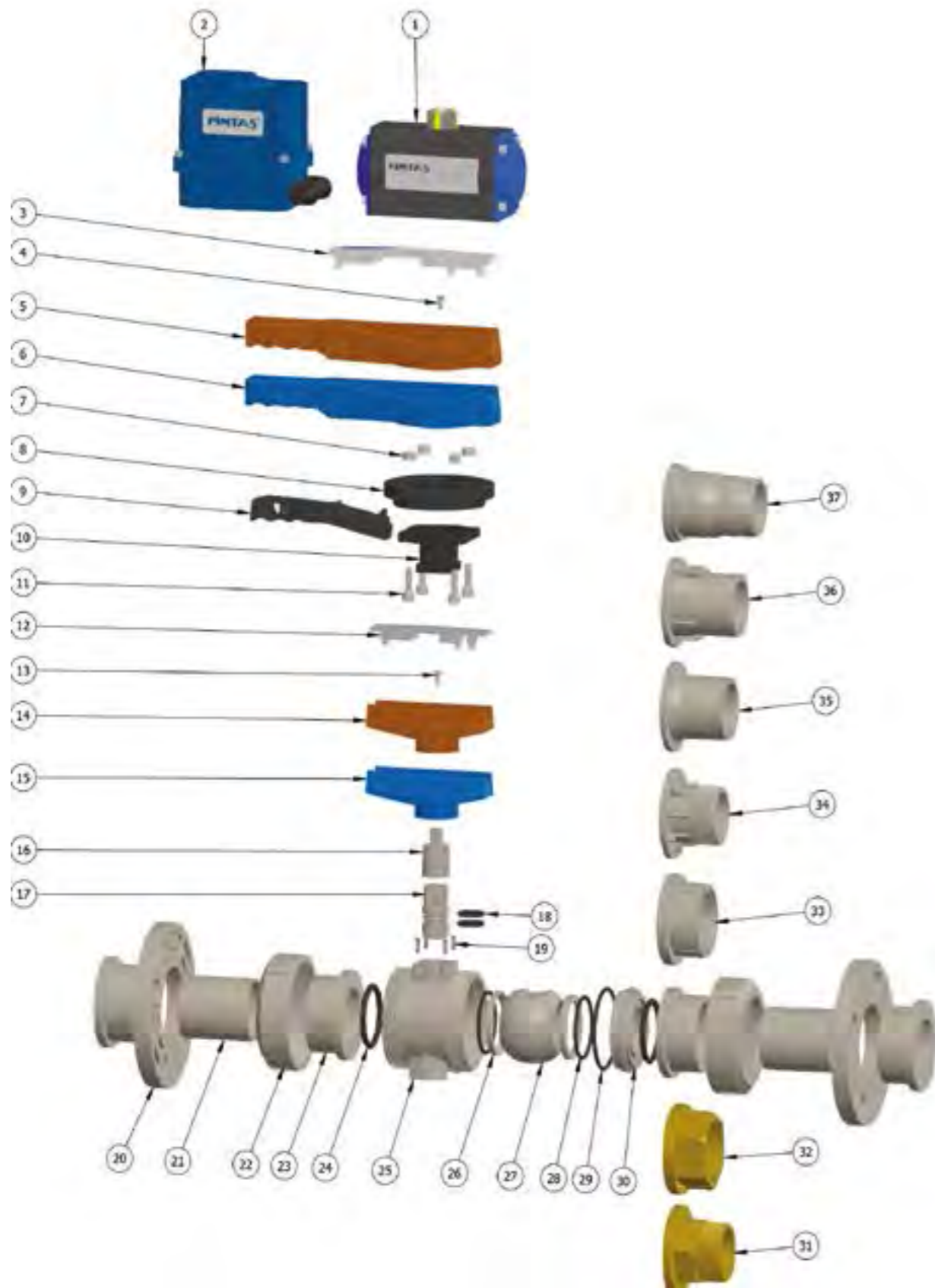
Diameter	BSP (Inch)	PN	DN (mm)	kv-value l/min.	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	Parcel/Pieces
16	3/8"	16	12	80	50	42	80	47	27	55
20	1/2"	16	15	200	52	45	83	47	27	55
25	3/4"	16	20	385	56	50	95	51	31	75
32	1"	16	25	770	60	54	106	63	33	60
40	1 1/4"	16	32	1100	71	65	125	67	41	30
50	1 1/2"	16	40	1700	82	75	145	86	46	20
63	2"	16	50	3400	95	89	172	101	58	12
75	2 1/2"	16	65	6000	118	111	205	110	63	9
90	3"	16	80	7000	137	127	240	137	89	4
110	4"	16	100	11000	162	152	284	150	105	2

PP WHITE VALVE

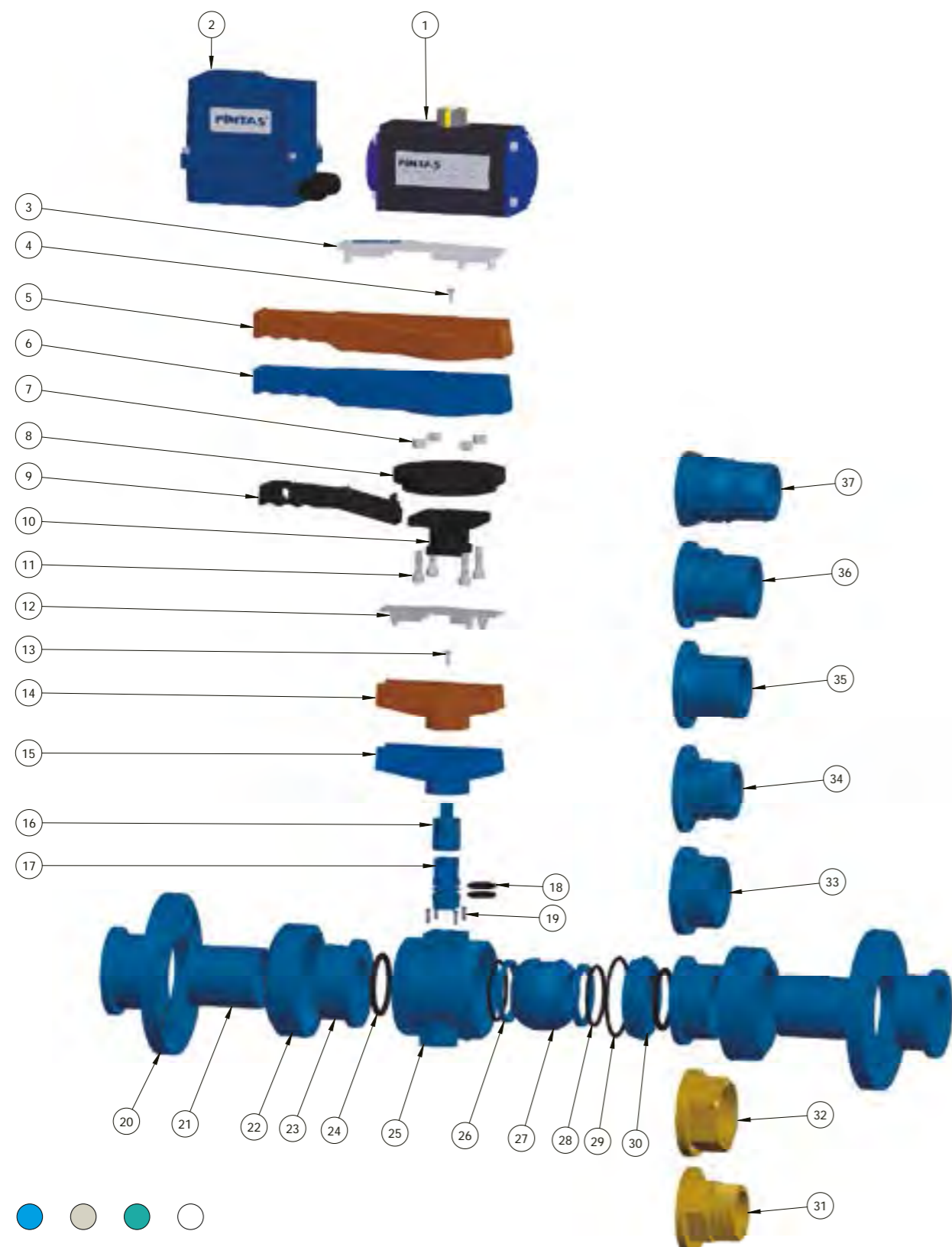


PP BEIGE VALVE

PP GREEN VALVE



PP BLUE VALVE



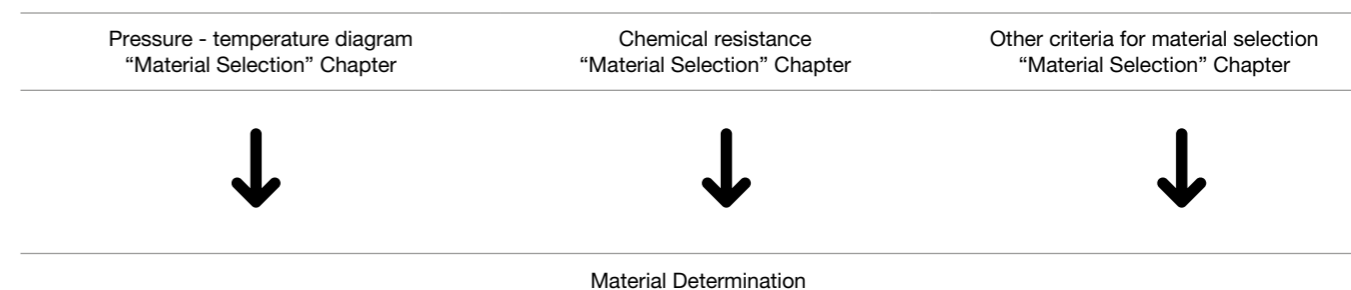
PP VALVE PART LIST

No.	Part	Material
1	Pneumatic Actuators	
2	Electrical Actuators	
3	Kol Kapağı / Handle Cover	ABS
4	Civata / screw	INOX
5	Kol / Handle (ACID VALVE HANDLE)	ABS
6	Kol / Handle (WATER VALVE HANDLE)	ABS
7	Somun / Nut	PP-B
8	Çark / Index Plate	PP-GF
9	Mandal / Lever Catch	PP-GF
10	Adaptor Connecting Piece	PP-GF
11	ISO 4762 M8 x 25 --- 25S	INOX
12	Kol Kapağı / Handle Cover	ABS
13	Civata / screw	INOX
14	Kol / Handle (ACID)	ABS
15	Kol / Handle (WATER)	ABS
16	Step Extension Piece	PP-GF
17	Pim / Step	PP
18	Pim O-Ringi / Step O-Ring	EPDM / FPM
19	Vida / screw	INOX

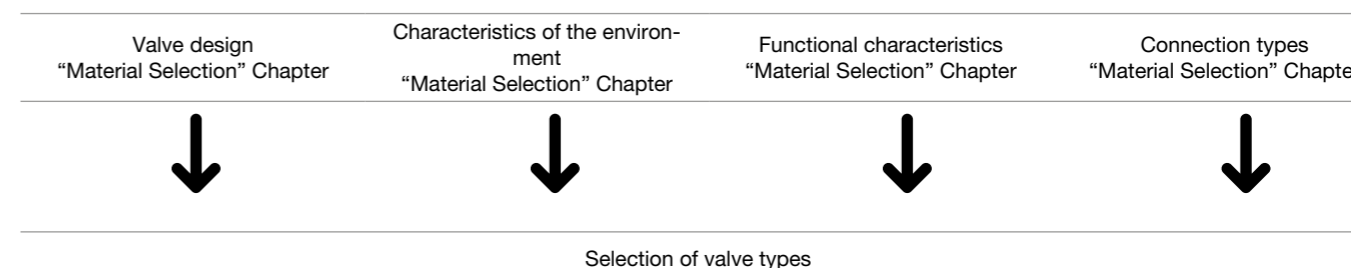
No.	Part	Material
20	Flanş / Flange	PP-GF
21	Flange adaptor connection piece	PP
22	Somun / Union Nut	PP
23	Adaptor	PP
24	Gövde O-Ringi / Body O-Ring	EPDM / FPM
25	Gövde / Body	PP-B
26	Conta / Gasket	HDPE
27	Küre / Ball	PP
28	Conta Altı O-Ring / Backing Seals	EPDM / FPM
29	Bush O-Ring	EPDM / FPM
30	Küre Dayama / Union Bush	PP
31	Male Thread Adaptor	BRASS
32	Female thread Adaptor	BRASS
33	Internal Threaded Adaptor	PP
34	External Threaded Adaptor	PP
35	Adaptor	HDPE
36	External Sealing Adaptor	PP
37	Hose Adaptor	PP

III.) Material Selection

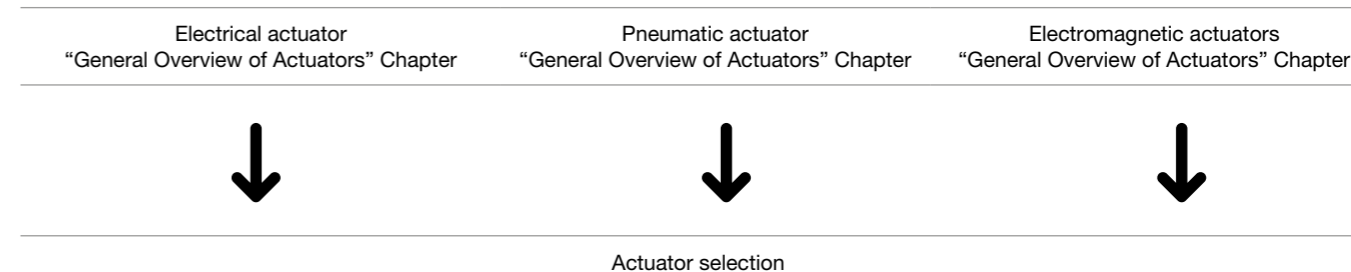
Several factors are important to carry out the correct selection for the valve. Following table is helpful for correct calve and valve type selection.



IV.) Product selection criteria



V.) Selection criteria for actuators



BALL VALVE CONFIGURATION TABLE

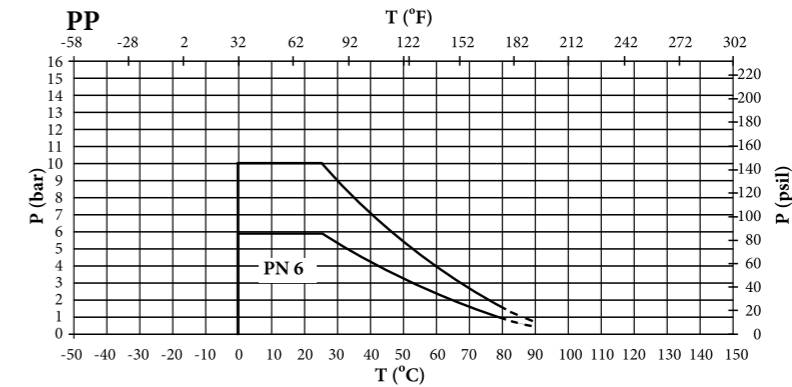
Malzeme / Material			
PVC-U	PVC-C	PP-H	↓
Dimensions			
DN 10 3/8"	DN 15 1/2"	DN 20 1/4"	DN 25 1"
DN 32 1 1/4"	DN 40 1 1/2"	DN 50 2 1/2"	DN 80 3"
DN 1000 4"	↓		
Seals			
EPDM	FPM	↓	
Ball Seal			
PTFE	↓		
Connections			
<u>FLANGE ADAPTOR</u>	<u>PUSH - FIT</u>	<u>THREADED FLANGE ADAPTOR</u>	<u>FLANGE</u>
PVC-U Flange Adaptor - Metric	Compression Outlet	PVC-U Female thread flange adaptor	PVC-U Flange - Metric
PVC-U Flange Adaptor - Inch ASTM	Latch pipe socket	PP Female thread Flange Adaptor with Fiber Glass	PVC-U Flange - ANSI/ASTM
PVC-U Flange Adaptor - Inch BS		Brass Female thread Flange Adaptor	PP Fiber Glass Flange - Metric
PP-H Flange Adaptor Welded - Metric		Brass male thread Brass Flange Adaptor	PP Flange - ANSI
PP-H Flange Adaptor Welded - Inch ASTM			
PE 100 - Flange Adaptor Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric	With Coupling		PVC-U Flange - Metric
	With Latch Socket	PVC-U Female Threaded Flange Adaptor	PVC-U Flange - ANSI/ASTM
PVC-U Flange Adaptor - Metric		PP - Glass Fiber Female Threaded Flange Adaptor	PP-Glass Fiber Flange - Metric
PVC-U Flange Adaptor - Inch ASTM		Brass Female Threaded Flange Adaptor	PP Flange - ANSI
PVC-U Flange Adaptor - Inch BS		Brass Male Threaded Flange Adaptor	
PP - H - Flange Adaptor Metric			
PP - H Flange Adaptor - Inch AST			
PE 100 - Flange Adaptor - Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			
Handle			
Blue for water	Magenta for acid	With lockable handle for valve Ø63 / Ø75 / Ø90 / Ø110	↓
Electric Actuator			
24 V AC / DC	110 - 260 V AC / DC	↓	
Pneumatic Actuator			
Tek Etkili Açma Emniyetli. Single acting open safe.		Çift Etkili. / Double Acting	↓
Tek Etkili Kapama Emniyetli. / Single acting close safe.			

PRESSURE - TEMPERATURE TABLE - MAX. OPERATING PRESSURE

Pressure-temperature table shows operating life for water or similar fluid for 25 years.

- 1.) Ball valves with DN 10 - DN 50 dimensions are designed according to PN 10 pressure.
- 2.) Ball valves with DN 65 - DN 100 dimensions are designed based on PN 6 pressure.
- 3.) Based on the fittings used in ball valves

Operating pressure is reduced as PN 10 for DN 50 - DN 100 sizes.

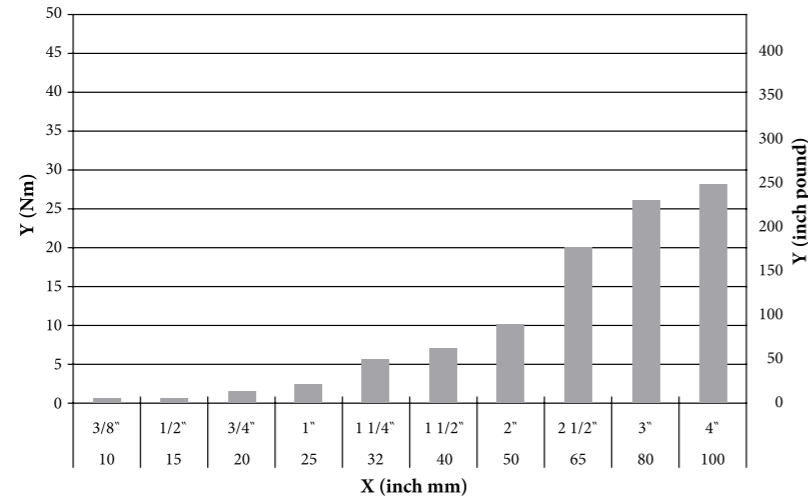


Remark: For the applications with service lives different than 25 years and / or with fluids which have an impact on physical and/ or chemical characteristics of valve body material, ratio factor fr is included in the following table pursuant to TS EN ISO 2012-16135.

TEMPERATURE °C	MINIMUM RATE FACTOR FOR BODY MATERIAL					
	ABS	PE	PP	PVC-C	PVC-U	PVDF
-40	1.0	1.0	-	-	-	a
-30	1.0	1.0	-	-	-	a
-20	1.0	1.0	-	-	-	1.0
-10	1.0	1.0	-	-	-	1.0
0	1.0	1.0	-	-	-	1.0
+5	1.0	1.0	1.0	-	-	1.0
10	1.0	1.0	1.0	1.0	1.0	1.0
20	1.0	1.0	1.0	1.0	1.0	1.0
25	1.0	1.0	1.0	1.0	1.0	1.0
30	0.8	0.76	0.85	0.85	0.80	0.9
40	0.6	0.53	0.70	0.65	0.60	0.8
50	0.4	0.33	0.55	0.50	0.35	0.71
60	0.2	0.24	0.40	0.35	0.15	0.63
70	-	-	0.27	0.25	-	0.54
80	-	-	0.15	0.15	-	0.47
90	-	-	-	-	-	0.36
100	-	-	-	-	-	0.25
110	-	-	-	-	-	0.17
120	-	-	-	-	-	0.12
130	-	-	-	-	-	a
140	-	-	-	-	-	a

BALL VALVE OPERATION FORCES

Operation torque values for ball valves are indicated in the following graphic.



Pressure Loss

For hydraulic dimensioning of this piping system, pressure loss to emerge with middle flow through a valve is required. For individual valve types, with completely opened position, applicable pressure loss according to desired flow volume is included in pressure loss diagrams.

Flow Characteristics

Flow characteristics of individual valve types in percentages are provided as a diagram. Percentage of kV rate may be determined from the diagram based on a space angle in percentage (%0= valve closed, %100 = valve completely opened).

kv 100 Rates

kV rate is a characteristic value for a valve flow volume regarding a certain pressure loss in valve. 100 kV rates for applicable nominal diameters of valves are stated in tabular form. This is also applicable to a completely open valve. These are provided in the following units.

- kV 100 rate as l/m at 1 bar pressure loss
- 1kV 100 rate as mVh at 1 bar loss
- Cv 100 rate as US gal/min at 1 psi pressure loss

Flow volume of valve at an interim position is determined based on 100 kV rate by multiplying the flow volume with the percentage of kV value from flow characteristics diagram.

Conversion Factors

In Europe, kV rate is related to a flow speed at a temperature of 16 °C between 1 m³ / hour as well as a pressure loss of 1 bar. In USA, it is called as CV and it is related to a pressure loss of 1 psi at a temperature of 60° F at 1 US gal / min flow rate. This means as follows;

$$Cv = 264.1722 \cdot \sqrt{kV}$$

$$\frac{1}{60} \cdot \frac{1}{14.50377} \cdot kV = 1.1561 \cdot kV$$

C: Cv rate at US gal / min

Kv: Refers to kv rate in Europe as m³/hour

1m³: 264.1722

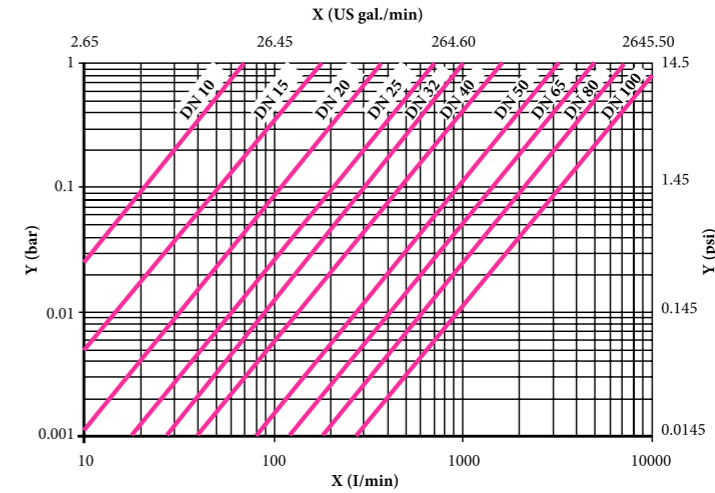
1 bar: 14.50377 psi

	kv	kv	Cv
kv	1m ³ /sa	16.67 l/min	1 1561 US gal/min
kv	0.06 m ³ /sa	1 l/min	0,069 US gal/min
Cv	0,865 m ³ /sa	14.42 l/min	1 US gal/min

FRICIONAL PRESSURE LOSS

Ball valve, causing a loss of pressure in specific proportions.

The graph showing these losses is as follows.



Optimum fluid design; The improved Kv value allows for reduced pressure loss and energy savings.

DN mm	DN Inch	d mm	kv 100 L/min Δp=1 bar	kv 100 m ³ /h Δp=1 bar
10	3/8"	16	80	5
15	1/2"	20	200	12
20	3/4"	25	385	23
25	1"	32	770	46
32	1 1/4"	40	1100	66
40	1 1/2"	50	1700	102
50	2"	63	3400	204
65	2 1/2"	75	6000	300
80	3"	90	7000	420
100	4"	110	11000	660

O-RING MATERIAL CHARACTERISTICS

NBR : Superior mechanical strength and resistance strength. Low resistance against mineral oils, heat, fuel and external flows.

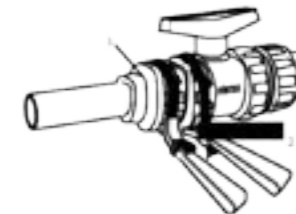
EPDM : Good resistance to water, vapor, pressured liquids, alkali and dilute acid. Substantial air resistance

FKM(FPM) : High temperature resistance. High chemical resistance. Poor low temperature elasticity

VALVE SYSTEM INSTALLATION

Proposed method of nut tightening during system installation of the valve:

Valves 20-25-32 must be strongly tightened manually. Larger dimensions must be tightened with a special apparatus as is shown in the next diagram. Never use standard pipe wrench. Use of standard pipe wrench may result in deformation in the nuts and fractures in the fittings.



7B-2) PP BALL VALVES-CONNECTION TYPES (White-blue-green-beige)



GREEN



WHITE



BLUE



BEIGE

PP VALVE CONNECTION TYPES



Single side female threaded



Both sides female threaded



Double sides flange connection



Single side brass female threaded



Double side brass female threaded



Single side brass male thread



Double sides brass male thread



One side brass male thread one side female thread

7-B-3) ACTUATOR VALVES

General Overview of Actuators

Actuator supports opening or closing the electric motor or the valve with pneumatic assistance. Actuators are divided into two groups as electric actuators and pneumatic actuators. Furthermore, they are also distinguished as rotating actuators and linear actuators.

A special type of actuators is electric motor actuators which are for pipe valves. It is used in cases where compressed air is not available as auxiliary energy for operation. These are preferably used in pipe line and factory construction.

Pneumatic actuators are the actuators that operate with pressure air and that requires no electric energy. Partial rotating actuators are a special type of rotating actuators and used for the automation of 1/4 turn valves such as butterfly valves or ball valves. They generally have an outlet movement less than 360°. In general internal drive gear segment is designed for 90° movement. Following table gives a general overview for each actuator and specific details of different actuator types. It will also help you with your decision.

PNEUMATIC BALL VALVES



Options:

- Single Acting Open Safe.
- Single Acting Close Safe.
- Double Acting.
- Easy mounting demounting opportunity
- Positioner, Limit switch box, Namur solenoid valve, hand control unit.
- Actuator flange connection sizes ISO 5211
- It is possible to add option based on need.

Accessories:

- Epoxy coating, polyamide, nickel coating, anodized coating hull material.
- Three -position actuator
- With position indicator.
- Adjustable manual stop.

Pneumatic Actuator	
Advantages	<ul style="list-style-type: none"> • Short switch on/off time • Low cost • Variable pressure control performance • Identified edge position • Easy maintenance • Impact limiter (to change manually) • Additional elements may be mounted later • Flow control is possible with additional parts • Durable PP-GF bearing • Completely plastic actuator • Position indicator with integrated NAMUR interface • Fast cycle periods • Very good price/performance ratio in all versions • Wide torque range, from 8Nm to 3840 Nm • Formation of several limit switch versions without any problem • Low installation weight
Properties	<ul style="list-style-type: none"> • Required control valve • Required pressurized air • Required position feedback for additional parts • More effort is required for interim positions
Versions	<ul style="list-style-type: none"> • Position feedback • Digital positioner • Opportunity for bus bar connection asAS-i

ELECTRIC BALL VALVES



Options:

- Battery powered on off may be safety controlled.
- Proportional control unit, potentiometer, local control unit,
- Options for position transmitter are available.
- Actuator flange connection sizes ISO 5211
- 24 V DC / 24 V AC
- It is possible to add option based on need.
- 110 - 260V.

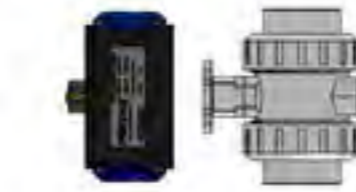
Accessories:

- Thermostat control heater against moisture
- Valve position indicator.
- Ex. Proof protection limit option
- Digital control units.
- On-site or remote control actuator.

Electric Actuator	
Advantages	<ul style="list-style-type: none"> • Easy to install • Well defined performance • No energy consumption at switch on/off breaks • Intermediary position is possible • Easy maintenance • Additional elements may be attached later • Very good chemical resistance • Durable PP-GF case, very good chemical resistance • Modular design and flexible composition, easy to use • Additional safety thanks to unit and battery set (Optional) • Long service life thanks to durable design and best electronic use • Thanks to wide power supply and standard interface, compatible for universal use • Many monitoring and control capabilities that have smart, self-learning access
Properties	<ul style="list-style-type: none"> • Relatively high cost • Low maintenance cost • Long cycle period
Versions	<ul style="list-style-type: none"> • Additional hardware required for defined edge positions • Heating equipment and turning unit for much safety • Additional mechanical limit feedback wrench • Optional adaptor for F04 and F05 interface pursuant to EN ISO 5211 • Operation status monitoring • Driver monitoring in additional panel: Respond time monitoring, loop number monitoring, cycle period extension • Position detection and 4-20 mA position feedback • Positioner

7-B-3 PP ACTUATOR VALVES

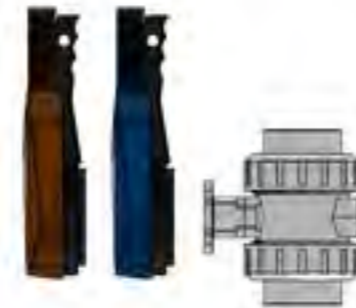
PP KÜRESEL VANA ÇEŞİTLERİ



- Ball Valve
- Pneumatic Actuator Options
- Single Acting Opening Safe
- Single Acting Closing Safe
- Double Acting, Position Indicator
- Digital position controlled



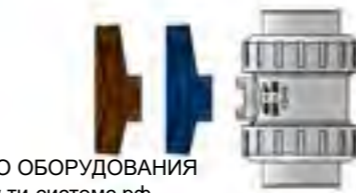
- Ball Valve
- Electric Actuator Options
- 24 V AC / 24 V / DC
- 110 - 260 V 50 - 60 Hz



- Ball Valve
- With Lockable Handle Control
- For valves 063 / 075 / 090 / 0110
- Unauthorized persons cannot alter valve setting after assembly.



- Ball Valve
- With Actuator Adapter
- Electric or pneumatic actuator can be chosen by customer.
- Connection surface is compliant to ISO 5211



- Ball Valve
- With Handle Control
- Blue handle for water, red handle for acid

Not :

- The ball valve system is designed in a modular fashion. Therefore, desired options can be made on the casing easily and swiftly.
- Seals used in the valves are EPDM and FPM. If desired, seals made of other materials can be applied.
- Compliant to pipe systems in Metric - DIN, EN, ISO or Inch BS, ASTM standards.
- Ball seals are made of PTFE material.
- Compliant to TS EN ISO 16135 Industrial valves - Ball valve (thermoplastic material) standard.
- Compliant to EN 558 - Flange Valve Connection standard.
- Sawteeth on the valve casing carry 50% more load compared to trapezoidal teeth. So that, it prevents ball seal from loosening and provided maximum protection even under the hammerhead impact in water.

CLOSE SAFE SINGLE ACTING PNEUMATIC PP BALL VALVES

- 1) Close Safe Single Acting Pneumatic Actuator Ball Valve
- 2) Single Acting Close Safe Pneumatic Actuator Ball Valve (Single Side Female Threaded)
- 3) Close Safe Single Acting Pneumatic Actuator Ball Valve (Double Side Female Threaded)
- 4) Close Safe Single Acting Pneumatic Actuator Ball Valve (Double Sides Flange Connection)
- 5) Close Safe Single Acting Pneumatic solvent Cement Socketed Actuator Ball Valve (Single Side Brass Female Threaded)
- 6) Close Safe Single Acting Pneumatic Actuator Ball Valve (Double Sides Brass Female Threaded)
- 7) Close Safe Single Acting Pneumatic Actuator Ball Valve (Single Side Brass Male Threaded)
- 8) Close Safe Single Acting Pneumatic Actuator Ball Valve (Double Sides Brass Male Threaded)
- 9) Close Safe Single Acting Pneumatic Actuator Ball Valve (One Side Female Thread, One Side Male Thread, Brass)

OPEN SAFE SINGLE ACTING PNEUMATIC ACTUATOR PP BALL VALVES

- 1) Open Safe Single Acting Pneumatic Actuator Ball Valves
- 2) Open Safe Single Acting Pneumatic Actuator Ball Valve (Single Side Female Threaded)
- 3) Open Safe Single Acting Pneumatic Actuator Ball Valve (Double Sides Female Threaded)
- 4) Open Safe Single Acting Pneumatic Actuator Ball Valve (Double Sides Flange Connection)
- 5) Open Safe Single Acting Pneumatic Solvent Cement Socketed Actuator Ball Valve (Single Side Brass Female Threaded)
- 6) Open Safe Single Acting Pneumatic Actuator Ball Valve (Double Sides Brass Female Threaded)
- 7) Open Safe Single Acting Pneumatic Actuator Ball Valve (Single Side Brass Male Threaded)
- 8) Open Safe Single Acting Pneumatic Actuator Ball Valve (Double Side Brass Male Threaded)
- 9) Open Safe Single Acting Pneumatic Actuator Ball Valve (One Side Female Thread, One Side Male Thread, Brass)

- 1) Pneumatic Actuator Double Acting Ball Valve
- 2) Pneumatic Actuator Double Acting Ball Valve (Single Side Female Threaded)
- 3) Pneumatic Actuator Double Acting Ball Valve (Double Sides Female Threaded)
- 4) Pneumatic Actuator Double Acting Ball Valve (Double Sides Flange Connection)
- 5) Pneumatic Actuator Double Acting Ball Valve (Single Side Brass Female Threaded)
- 6) Pneumatic Actuator Double Acting Ball Valve (Double Sides Brass Female Threaded)
- 7) Pneumatic Actuator Single Acting Solvent Cement Socketed Ball Valve (Single Side Brass Male Threaded)

Universal actuator interface according to EN ISO 5211 Instructions for use

7-C-) USER MANUAL- SAFETY INFORMATION

PIMTAŞ BALL VALVES - GENERAL INFORMATION

1-Safety Information

As in the piping system in which it is installed, same safety suggestions are taken in to consideration for ball valves as well. PIMTAŞ Ball Valve is intended especially for stopping the flow or ensuring the maintenance of environment with proper pressure and temperature measurements. Maximum service life is for 25 years.

WARNING: Please pay attention: Maximum operating pressure of entire valve is identified as maximum allowed nominal pressure of valve end.

Persons in charge of installation, removal, operation, handling, maintenance, control, service and repair operations within the installation where the valve is installed must read and understand the user manual completely. They should particularly pay attention to this chapter regarding safety information.

We recommend them fulfill what is written herein. Furthermore;

- Use only the valves having perfect operation and follow these safety information all the time.
- This documentation should be kept at a place of easy access near the valve. Piping system engineer/official or the operators of this kind of systems in which ball valves are included, are liable to guarantee the following issues:
- Piping system was installed properly by the professionals and its functionality is periodically controlled.
- Only qualified and authorized personnel assemble, operate, repair the valve and renders required service. Employees must be trained so as to adopt as a principle regularly environmental protection and work safety, specified by applicable regulations. Especially in pipe lines resistant to pressure;
- As stated in this paragraph, valves must only be used for their intended purpose.
- Installation in a position and status likely to create undesired manipulations must be avoided.

2-Dangerous Situations

WARNING: Never use the ball valve in areas containing solid particles.

Avoid formation of cavitation during control process.

This may lead to damage/leakage due to wear.

WARNING: Removing PIMTAŞ Ball Valve from the Pipe Line

If the pressure is not completely classified, fluid material in the valve may flow out in an uncontrollable way.

Based on the type of the fluid, injuries may happen.

Entire pressure within the piping system must be set to zero before removal process. Piping system must be completely discharged and flushed before removing the valve against dangerous, flammable or explosive materials. (Attention: There still may be remaining waste material.)

In pressured piping system, if used as the final valve, liquid material must be discharged from PIMTAŞ Ball Valve.

Fluid material may flow out, splash in an uncontrollable manner.

There may be injuries based on the type of the fluid material.

WARNING: Make sure that fluid material is discharged properly and safely. (i.e., connect the released fluid into a channel.)

Keep or disassemble PIMTAŞ Ball Valve once it is removed from the pipe.

Remaining wastes may flow out uncontrollably

There may be injuries based on the type of the fluid material.

WARNING: Half open removed PIMTAŞ Ball Valve (in a position of 45 degrees) Ensure that it is dried in vertical position. Discharge the fluid material through a proper channel.

3-Handling and Storage

PIMTAŞ Ball Valves must be handled, transported and stored carefully. Consider following issues:

- PIMTAŞ Ball valves must be handled stored in original unpacked packages.
- They must be protected from harmful physical influences such as light, dust, temperature, humid and ultraviolet radiation.

• Ball valve fittings must be protected against mechanical and thermal impacts in particular.

• PIMTAŞ Ball valve must be stored in the open position as supplied with handle cover- thrust wrench.

4-Before Installation

First, check the ball valve for handling damages. Never use damaged valves.

Perform a function test –(close the valve manually and open it again). Never use the valves that fail to operate properly.

WARNING: Always mount the ball valves into the system in an open position.

Only install ball valves, pressure rate, connection type and dimensions of which comply with operating conditions.

Attach identical materials to each other in fusion/combination and reinforcing connections.

5-Installation of PIMTAŞ Ball Valve

WARNING: If the utilized materials and mounting dimensions are different than those, identified for PIMTAŞ Ball valves, this may result in damage to piping systems.

Compare the usage dimensions and specifications in the technical document with the materials in hand.

It is recommended that ball valve be removed from the original package just before performing the installation. Ball valve and pipe must be in a free position in order to protect such from effects such as mechanical pressure. Follow the applicable coupling instructions regarding solvent cementing, fusion and screw fastening operations while installing valve to the piping system. For additional information please refer to user manuals of fusion machines or sealing instructions of cement manufacturer. Please find flange screw tightening torques and other useful information in PIMTAŞ catalog and Internet website. Install the ball valve in accordance with drawings of pipe installation. Based on the type and material of pipe ends (fusion, adhesion, flanges, threaded), couple with proper fittings.

PIMTAŞ Ball Valve coupling nut must be tightened manually. Don't use any additional equipment.

Nut may be damaged if other equipment such as pliers are used. Besides, screw thread may be damaged if tightened very strongly.

Operation of a valve may result in reactive power in the pipe, it is connected to. This is why it is important to mount the ball valve (if any) integrated/separately fixing

under the body or strengthen the pipe line before or after ball valve with a proper support.

Please consider maximum insertion depth of screws, if you use integrated fixing system of PIMTAŞ Ball Valve under the body.

WARNING: It is possible to damage the ball valve body in case of failure to obey the rules. Pressure on the damaged body may result in fractures. If heat expansion is prevented in piping systems in case of temperature fluctuation, bending or longitudinal forces may emerge. These strengths must be absorbed through proper fasteners in front of or behind the valve so as not to damage the valve operation.

6-Pressure Test

Ball valve pressure test is subject to same regulations with that of the piping system. Further implementations:

- Check if all valves are in required open or closed position.
- Fill in the piping system and control carefully.

WARNING: Test pressure in a valve mustn't exceed the rate of 1.5*PN (maximum PN+5 bar). Fittings with low PN rates determine the maximum allowed test pressure in piping system.

- Test the valves and connections for leakages. Document the results.

7-Intended Use

If leak test is successfully completed, fluid material may be discharged System may be used for its intended purpose.

8-Service-Maintenance

Ball valves are maintenance-free under normal operating conditions. Periodical sealing/tightness check of the valves is enough. In case of fracture or any other failure, follow the dangerous situation instructions as well as the safety information included in paragraph 1 and 2.. We recommend that control test for the valves should be conducted in case of non-stop use in the same position for 1-2 years.

It may be required to replace the valve parts in cases where very frequently operated automation valves or seal material contact with chemical fluids. For this purpose, valve must be disintegrated from the pipe system. Pay attention to dangerous situations in paragraph 2.

WARNING: Lubricants

Incorrect lubricants may cause damage to ball valve material or the seals. Never use petrol-based grease or petrolatum.

WARNING: All sealing elements must be lubricated with silicon or polyglycol-based oil.

All sealing elements are organic materials to be affected by the EPDM, FPM nature influences. Therefore they must be kept in original packages and stored under cool, dry and dark environments. Before mounting the sealing elements, check for wear and tear of the sealing elements etc.



BUTTERFLY VALVES

BUTTERFLY VALVES

8-BUTTERFLY VALVES

8-A)PVC BUTTERFLY VALVES

8-A-1)TECHNICAL SPECIFICATIONS - VALVE SELECTION



PIMTAŞ BUTTERFLY VALVES INNOVATION CHARACTERISTICS

1) Modular part in the design is one of the most important innovative designs. Thus, it is enabled to manufacture the butterfly valve with the same plastic material of the pipe line in which it will be used. Plastic material of the pipeline may be selected as PVC-U, PVC, ABS, PP, or PVDF based on the characteristics of the fluid that will flow through it, usage conditions (temperature, pressure...), and the surfaces of butterfly valve to contact with the fluid are in the form of replaceable (modular design) parts. Therefore, it becomes possible to manufacture the butterfly valves from the same plastic material of the pipeline. Such an opportunity is not available with the current valves in the market.

2) Double eccentric operation principle; disc has no connection with the seal when the valve disc is in ON position thanks to the disc and body, designed based on double eccentric operation principle. And this prevents tear and wear of the seal. Due to decrease of frictional force rotating force of disc decreases 50-70. Thus, the operation conditions are facilitated and smaller and economic actuators could be used. Moreover, this operation principle also protects the butterfly valves against increase or decrease to take place in fluid pressure, i.e., pressure fluctuations. Thus, longer service life and less maintenance is required in butterfly valves.

3) Ease of use, increase in efficiency and safety; valve disc and body are not contaminated by mud, dirt or solid substances etc., thanks to smooth, bright surfaces of modular parts in PIMTAŞ butterfly valves. Efficiency of the valves increase and the need for maintenance decrease. Rubber seals cover 70-80 of the material flow surface in valve body in the current butterfly valves while the disc is in open or closed position. As is known, materials such as mud, dirt, solid particles etc., adhere to rubber materials and leads to narrowing of flow surface of the valve in time as well as blocking of the same. As the rubber surfaces of the seals in PIMTAŞ design do not contact with the fluid, they do not cause obstruction.

Compliance with the standards; PIMTAŞ butterfly valves are in compliance with the following international standards.

- Metric system; DIN, EN, ISO
- Inch system; BS, ASTM
- Industrial valves, manufactured from prEN ISO 16136 Thermoplastic material, Butterfly valves.
- ISO 9393 Thermoplastic valves-pressure test methods and specification
- En 558
- Standard connection plate for electric or pneumatic actuator is available in compliance with ISO 5211.
- For precise controller control, a handle mechanism, which can be opened under control with 5 degree angles, was designed. Besides, there is lockability opportunity for handle safety and controller convenience.
- Based on the material of pipeline, it is possible to use different seal materials. EPDM, FPM, or optional special seal

Materials may be used. Double seal system is used for tightness control.

- As plastic valves are lighter, they are easier to handle, mount therefore, they have a lower cost. Thanks to rich diversity,

It is possible to select the product that best fits the requirements of the client and the project.

USAGE AREAS OF PIMTAŞ BUTTERFLY VALVES

- Industrial water treatment plants
- Drinking water installations
- Swimming pool installations
- Aqua parks, aquariums
- Domestic water, waste water treatment plants
- Chemical substances transport facilities
- Electro-coating installations
- Energy production plants

ADVANTAGES OF PLASTIC VALVES IN COMPARISON TO METAL VALVES

- High resistance to chemical substances
- High resistance to marks likely to arise out of abrasion and friction
- Smooth, bright surface
- As plastic valves are lighter, they are easier to handle, mount therefore, they have a lower cost.

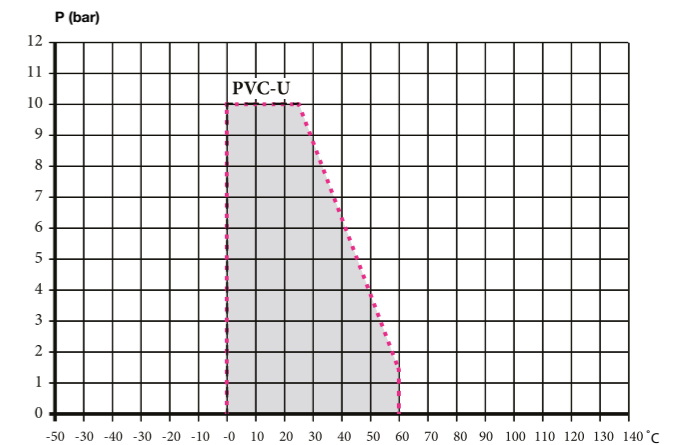
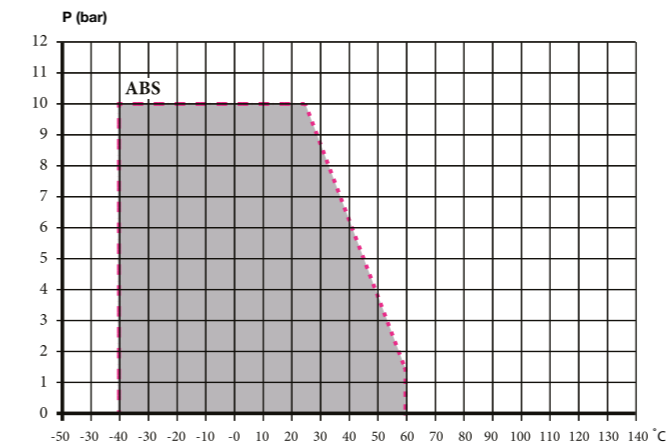
Valve pressure loss diagram is as follows.

It is possible to calculate how many bars of pressure reduction will be experienced thanks to the data regarding % opening status of the valve, flow rate of passing water and valve nominal diameter.

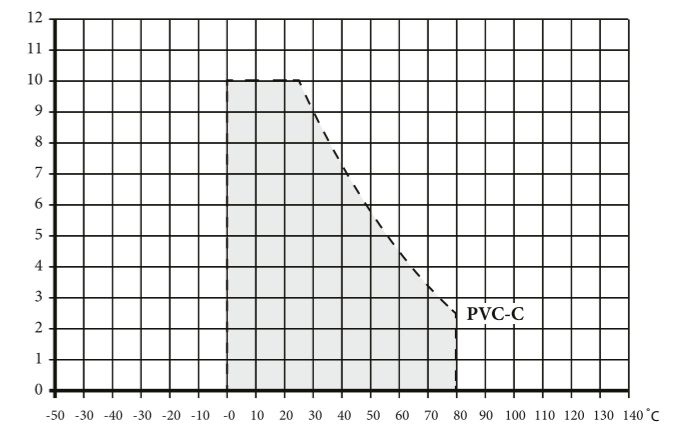
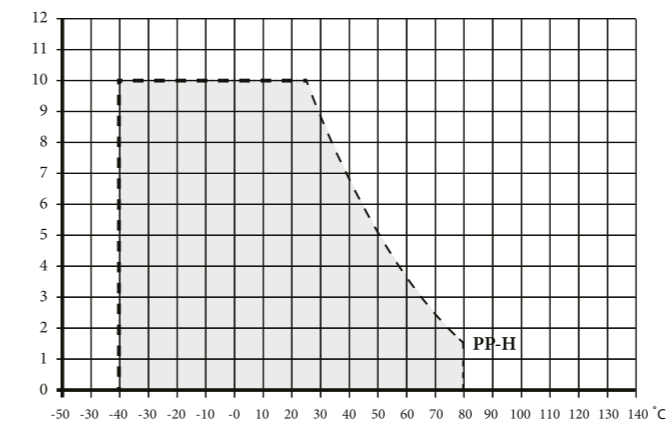
For instance;

When a handle of a butterfly valve with a nominal diameter of 125 is in 50% open position at a water flow rate of 10m³/hour, pressure reduction in the water will be 0,01 bar.

PRESSURE - TEMPERATURE DIAGRAM



Pressure -temperature table indicates a service life for 25 years for water or a similar fluid.



Pressure -Temperature table indicates a service life for 25 years for water or a similar fluid.

TEMPERATURE °C	MINIMUM RATE FACTOR FOR BODY MATERIAL					
	ABS	PE	PP	PVC-C	PVC-U	PVDF
-40	1.0	1.0	-	-	-	a
-30	1.0	1.0	-	-	-	a
-20	1.0	1.0	-	-	-	1.0
-10	1.0	1.0	-	-	-	1.0
0	1.0	1.0	-	-	-	1.0
+5	1.0	1.0	1.0	-	-	1.0
10	1.0	1.0	1.0	1.0	1.0	1.0
20	1.0	1.0	1.0	1.0	1.0	1.0
25	1.0	1.0	1.0	1.0	1.0	1.0
30	0.8	0.76	0.85	0.85	0.80	0.9
40	0.6	0.53	0.70	0.65	0.60	0.8
50	0.4	0.33	0.55	0.50	0.35	0.71
60	0.2	0.24	0.40	0.35	0.15	0.63
70	-	-	0.27	0.25	-	0.54
80	-	-	0.15	0.15	-	0.47
90	-	-	-	-	-	0.36
100	-	-	-	-	-	0.25
110	-	-	-	-	-	0.17
120	-	-	-	-	-	0.12
130	-	-	-	-	-	a
140	-	-	-	-	-	a

Note - These values do not comply with the applicable factors regarding the pipes and fittings. Torque value required to be applied to bring the butterfly valve in the closed position is included in the following graphic.

Pressure Loss

For hydraulic dimensioning of a piping system, pressure loss to emerge with middle flow with a valve is required. For individual valve types, with completely opened position, applicable pressure loss according to desired flow volume is included in pressure loss diagrams.

Flow Characteristics

Flow characteristics of individual valve types in percentages are provided as a diagram. Percentage of kV rate may be determined from the diagram based on a space angle in percentage (% 0= valve closed, % 100= valve completely open).

kv 100 Rates

kV value is a characteristic value/rate for a valve flow volume at a certain level of pressure loss in the valve. 100 kV rates for applicable nominal diameters of valves are stated in tabular form. This is also applicable to a completely open valve. These are included in the following units:

- kV 100 rate as l/m at 1 bar pressure loss
- kV 100 rate as mVh at 1 bar pressure loss
- Cv 100 rate as US gal / min at 1 psi pressure loss

Flow volume of valve at an interim position is determined based on 100 kV value by multiplying the flow volume with the percentage of kV value from flow characteristics diagram.

Conversion Factors

kv - Cv

In Europe, kV rate is related to a flow rate at a temperature of 16°C between 1 m³ / hour as well as a pressure loss of 1 bar. In USA, it is called as CV and it is related to a pressure loss of 1 psi at a temperature of 60° F at a flow rate of 1 US gal / min. This means as follows:

$$Cv = \frac{264.1722 \cdot \sqrt{1}}{60} \cdot kv = 1.1561 \cdot kv$$

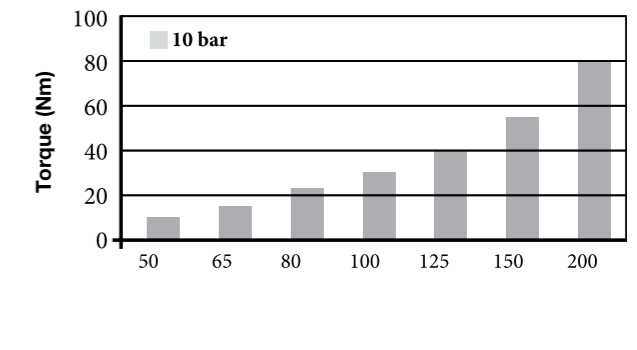
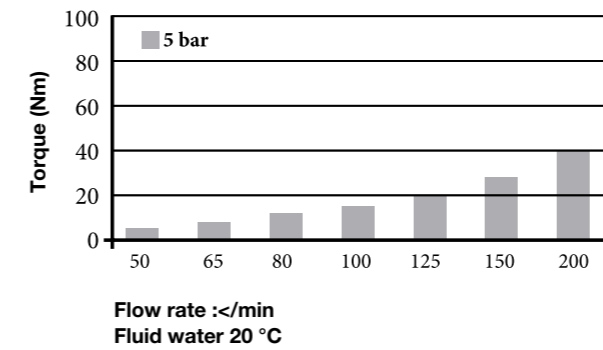
C: Cv rate at US gal / min

Kv: Refers ro kv rate in Europe as m³/hour

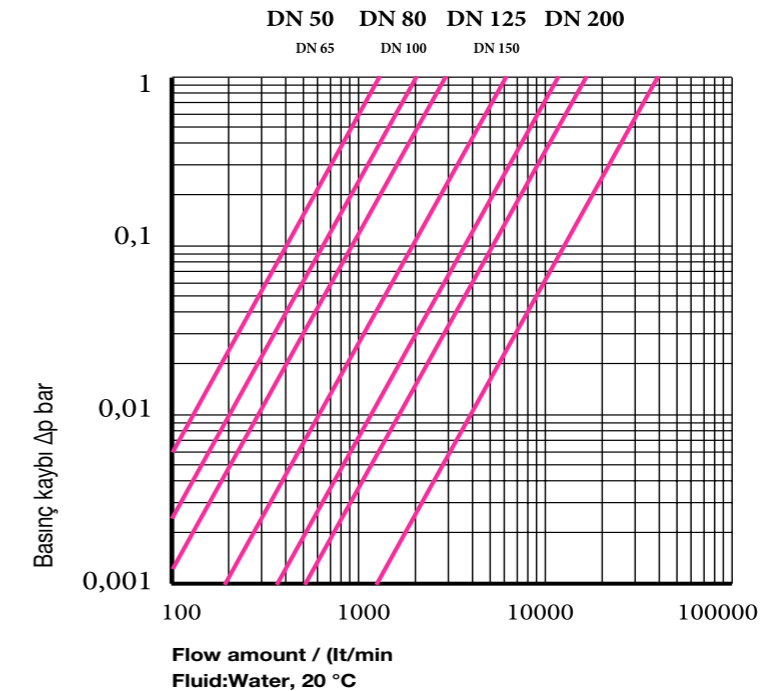
1m³: 264.1722

1 bar: 14.50377 psi

	kv	kv	Cv
kv	1m³/sa	16.67 l/min	1 1561 US gal/min
kv	0.06 m³/h	1 l/min	0,069 US gal/min
Cv	0,865 m³/h	14.42 l/min	1 US gal/min



Pressure Loss

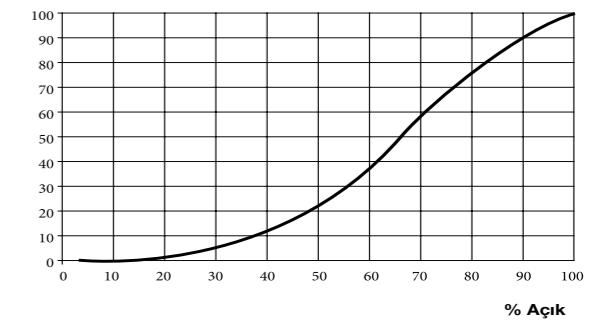


Kv % Flow Factor

DN mm	DN Inch	d mm	kv 100 L/min Δp=1 bar	kv 100 m³/h Δp=1 bar
50	2"	63	2050	123
65	2 1/2"	75	2800	168
80	3"	90	4100	246
100	4"	110	6800	408
140	5"	125-140	11500	690
150	6"	160	16500	990
200	7-8"	200-225	38500	2310
250	9-10"	250-280	53500	3210
300	12"	315	78600	4716

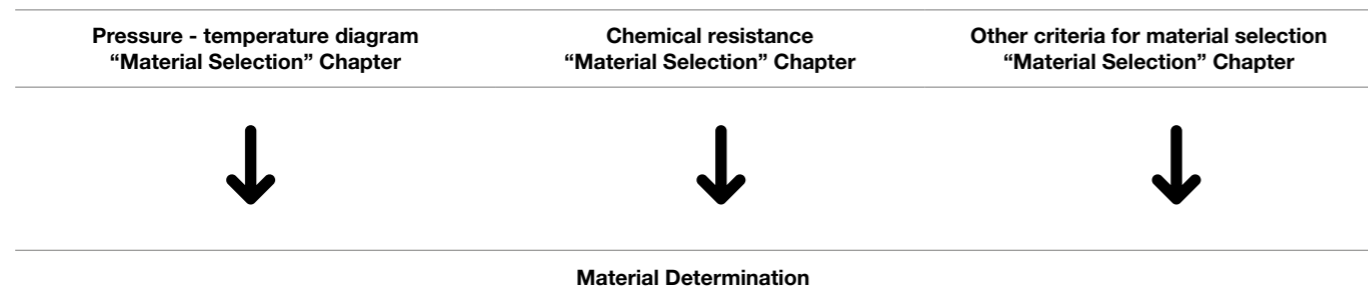
Flow amount / (lt/min) Fluid: Water, 20 °C

Kv % Flow Factor

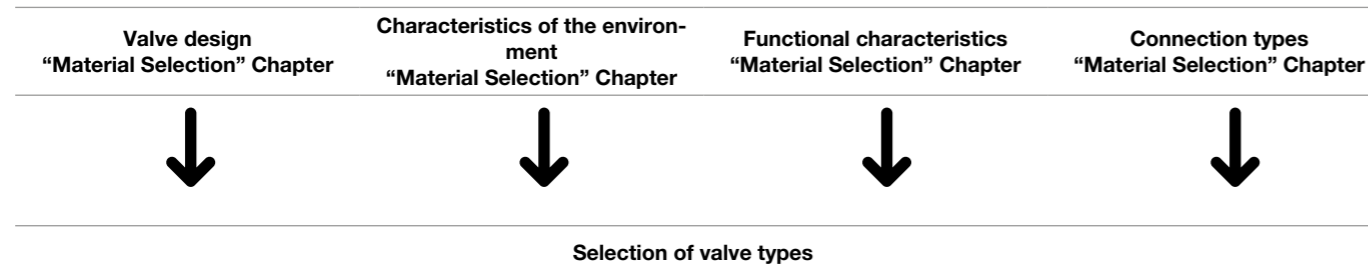


III.) Material Selection

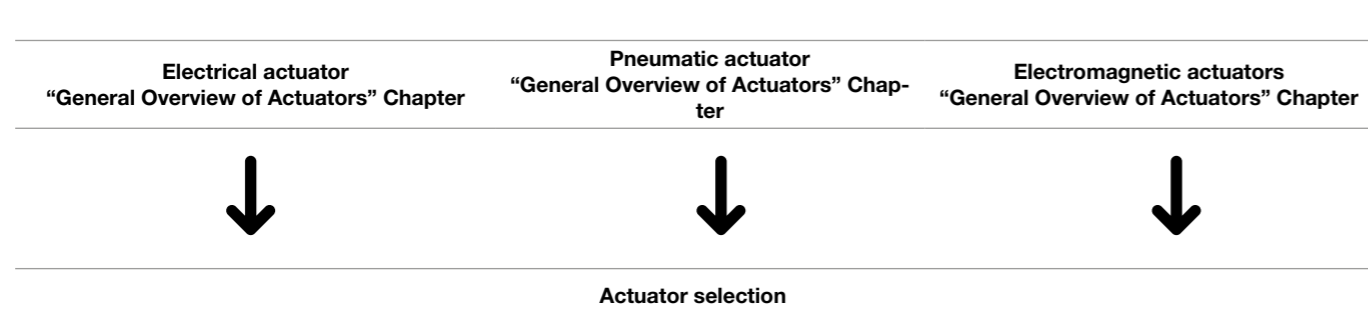
Several factors are important to carry out the correct selection for the valve. Following table is helpful for correct calve and valve type selection.



IV.) Product selection criteria

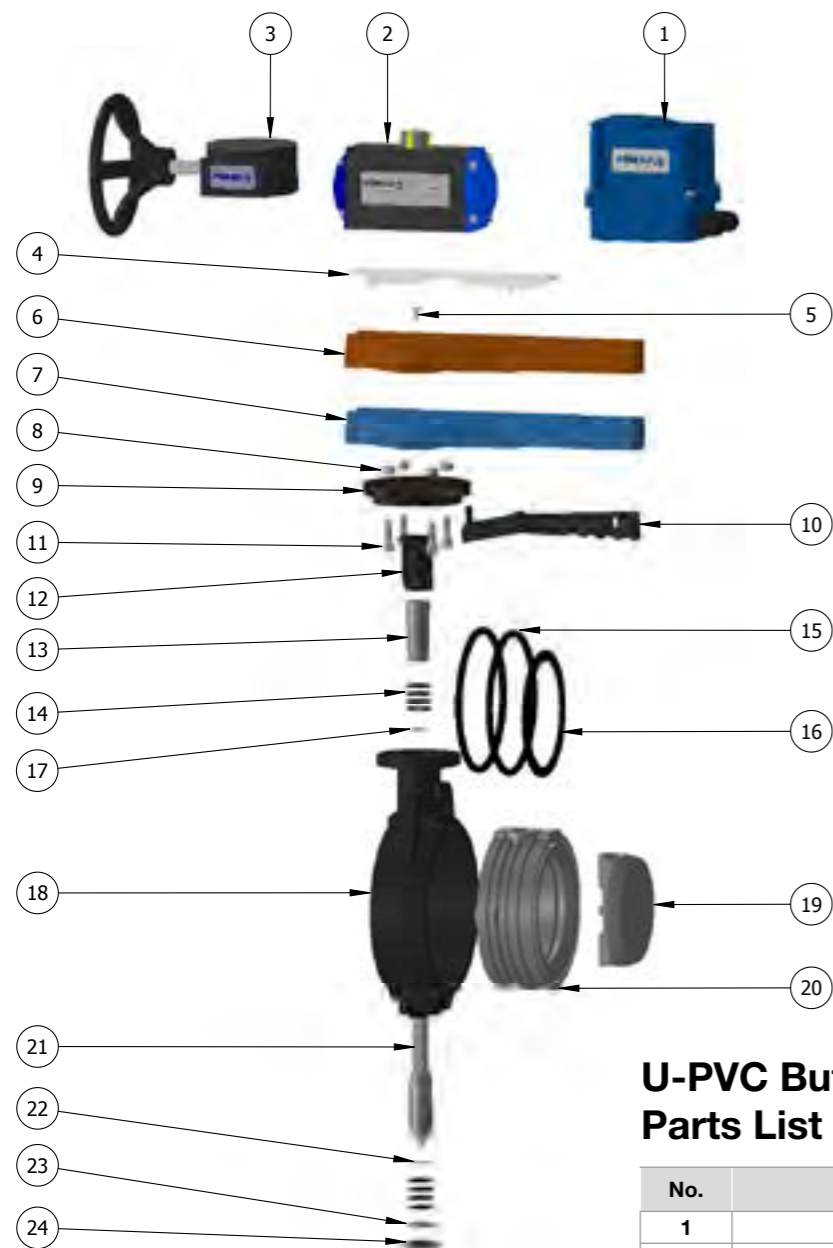


V.) Selection criteria for actuators



BALL VALVE CONFIGURATION TABLE			
Malzeme / Material			
PVC-U	PVC-C	PP-H	↓
Dimensions			
DN 10 3/8"	DN 15 1/2"	DN 20 1/4"	DN 25 1"
DN 32 1 1/4"	DN 40 1 1/2"	DN 50 2 1/2"	DN 80 3"
DN 1000 4"	↓		
Seals			
EPDM	FPM		↓
Ball Seal			
PTFE			
↓			
Connections			
FLANGE ADAPTOR	PUSH - FIT	THREADED FLANGE ADAPTOR	FLANGE
PVC-U Flange Adaptor - Metric	Compression Outlet	PVC-U Female thread flange adaptor	PVC-U Flange - Metric
PVC-U Flange Adaptor - Inch ASTM	Latch pipe socket	PP Female thread Flange Adaptor with PVC-U Flange - ANSI/ASTM	PP Fiber Glass Flange - Metric
PVC-U Flange Adaptor - Inch BS		Fiber Glass	PP Fiber Glass Flange - Metric
PP-H Flange Adaptor Welded - Metric		Brass Female thread Flange Adaptor	PP Flange - ANSI
PP-H Flange Adaptor Welded - Inch ASTM		Brass male thread Brass Flange Adaptor	
PE 100 - Flange Adaptor Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			PVC-U Flange - Metric
	With Coupling	PVC-U Female Threaded	PVC-U Flange - ANSI/ASTM
PVC-U Flange Adaptor - Metric	With Latch Socket	Flange Adaptor	PP-Glass Fibre Flange - Metric
PVC-U Flange Adaptor - Inch ASTM		PP - Glass Fiber Female	PP Flange - ANSI
PVC-U Flange Adaptor - Inch BS		Threaded Flange Adaptor	
PP - H - Flange Adaptor Metric		Brass Female Threaded Flange Adaptor	
PP - H Flange Adaptor - Inch ASTM		Brass Male Threaded Flange Adaptor	
PE 100 - Flange Adaptor - Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			
Handle			
Blue for water	Magenta for acid		↓
		With lockable handle for valve	↓
		Ø63 / Ø75 / Ø90 / Ø110	
Electric Actuator			
24 V AC / DC	110 - 260 V AC / DC		↓
Pneumatic Actuator			
Tek Etkili Açma Emniyetli. Single acting open safe.		Çift Etkili. / Double Acting	
Tek Etkili Kapama Emniyetli. / Single acting close safe.		↓	

8-A-2) PRODUCTS - APPLICATIONS



U-PVC Butterfly Valve Spare Parts List Q63 - Q400

No.	Part	Material
1	Electrical Actuators	
2	Pneumatic Actuators	
3	Steering gear	
4	Kol Kapađı / Lever Clip	ABS
5	Civata / screw	INOX
6	Kol / Handle (Use of Water Valve)	ABS
7	Kol / Handle (Use of Acid Valve)	ABS
8	Somun / Nut	INOX
9	Çark / Index Plate	PP GF
10	Mandal / Lever Catch	PP GF
11	Civata / screw	INOX
12	Stop Parçası / End Stop	PP GD
13	Pim / Step	U-PVC / PP / C-PVC
14	Pim O-Ring / Step O-Ring	EPDM / FPM
15	Inner Body Butt O-Ring	EPDM / FPM
16	İç Gövde O-Ring / Inner Seal	EPDM / FPM
17	Segman / Retaining Rings	INOX
18	Dış Gövde / Body	U-PVC / PP / C-PVC
19	Klape / Disc	U-PVC / PP / C-PVC
20	Şaft / Steel Shaft	STEEL
21	Segman / Retaining rings	INOX
22	Pul / Washer	INOX
23	Tapa / Cap	PP GF
24	Yay / Spring	INOX

TYPES of BUTTERFLY VALVE



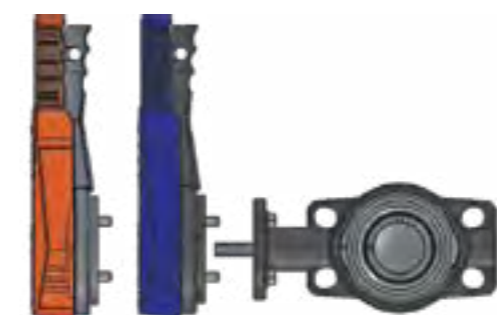
- Butterfly Valve with Pneumatic Actuator
- Options**
 - Single Acting Opening Safe
 - Single Acting Closing Safe
 - Double Acting



- Butterfly Valve with Electrical Actuator
- Options**
 - 24 V AC / 24 V / DC
 - 110 - 260 V



- Butterfly valve with Thread Reductor controller



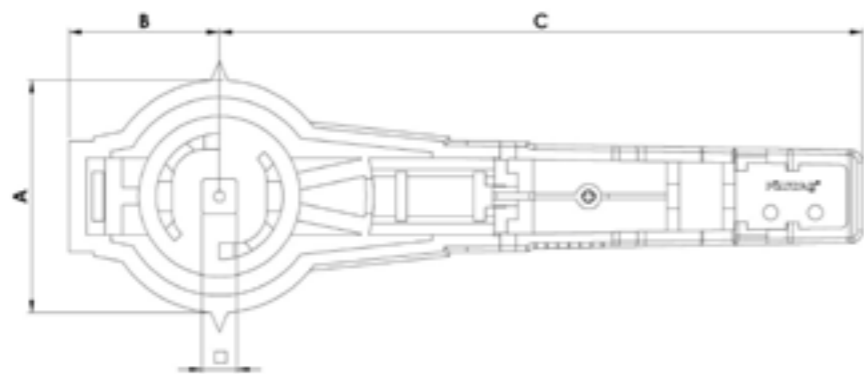
- Butterfly valve with Handle control



- Butterfly valve without flange

Note:

- Butterfly valve has a modular design. Thus, it is possible to apply desired options on the main body easily and quickly.
- Surfaces of butterfly valve in contact with water may be PVC - U, PP - H, PVC - C, ABS based on the characteristics of the fluid.
- Seals on the valves are made of EPDM and FPM. It is possible to apply seals from other materials as well, if desired.
- Complies with piping systems in Metric - DIN, EN, ISO or Inch BS, ASTM standards.
- Complies with TS EN ISO 16136 Industrial Valves - Butterfly Valves (thermoplastic material) standard.
- Complies with (ISO 9393 - thermoplastic valves - pressure test methods and requirements) standards.
- In compliance with EN 558 - Flange Valve Connection standard.

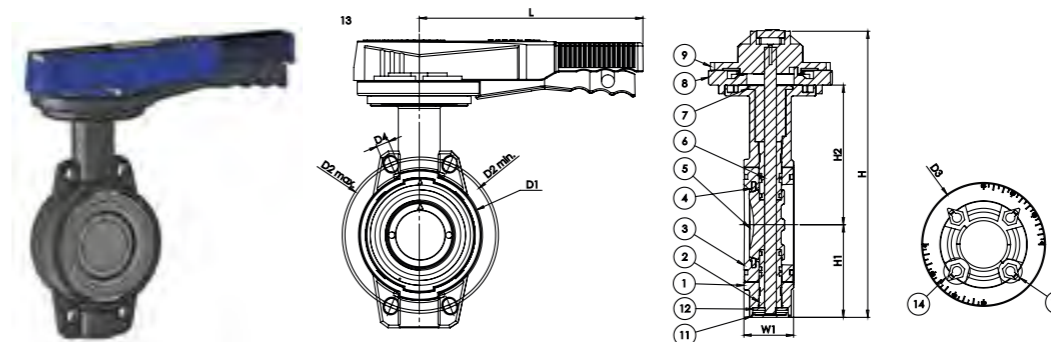


Nominal Diameter	D	B	C	□	ISO 5211
63	94	60.5	207.5	11	F07
75	94	60.5	207.5	11	F07
90	94	60.5	207.5	11	F07
110	94	60.5	259.5	14	F07
125	94	60.5	259.5	14	F07
140	94	60.5	259.5	14	F07
160	94	60.5	259.5	14	F07
200	94	60.5	335	17	F07
225	94	60.5	335	17	F07
250	130	81	335	17	F10
280	130	81	410	17	F10
315	130	81	410	22	F10
355				22	F12



Diameter	D	D
63	115	F 07
75	115	F 07
90	115	F 07
110	115	F 07
125	115	F 07
140	115	F 07
160	115	F 07
200	115	F 07
225	115	F 07
250	156	F 10
280	156	F 10
315	156	F 10
355		
400		

PVC UH Butterfly Valve (Without Flange)

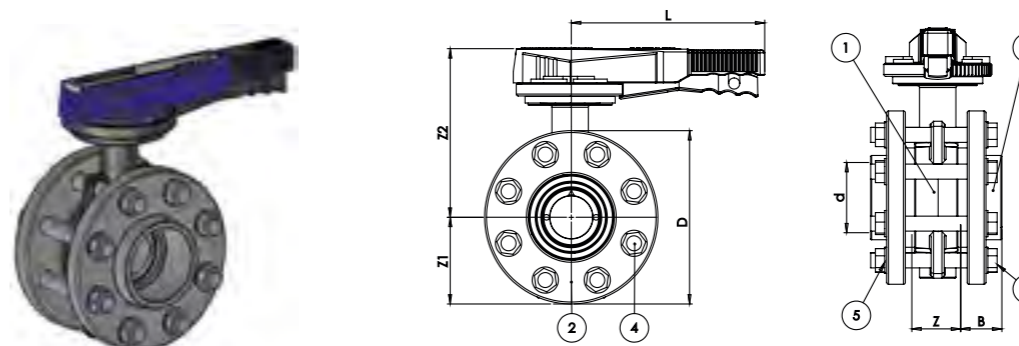


No.	Part	Material	Number
1	Outer Body	PP-GF	1
2	Step	PVC-UH	2
3	Inner Body	PVC-UH	1
4	Inner Body Seal	EPDM-FPM	1
5	Disc	PVC-UH	1
6	Shaft	Stainless Steel	1
7	Stop Piece	PP-GF	1
8	Wheel	PP-GF	1

No.	Part	Material	Number
9	Handle	ABS	1
10	Latch	PP-GF	2
11	cap	PP-GF	1
12	Washer	Stainless Steel	1
13	Handle Cover	PVC-UH	1
14	Screw	Stainless Steel	1
15	Union Nut	Stainless Steel	1

Dia	DN	D1 (mm)	D2 min. (mm)	D2 max. (mm)	D3 (mm)	D4 (mm)	L (mm)	H (mm)	H1 (mm)	H2 (mm)	W1 (mm)	nøe	ISO 5211
63	50	104	120	125	115	19.5	207.5	256	82	126	45	4x19	F07
75	65	115	140	145	115	19.5	207.5	265	86	129	46	4x19	F07
90	80	131	150	160	115	19.5	207.5	272	89	132	48	8x19	F07
110	100	160	175	190	115	19.5	259.5	311	103	156	56	8x19	F07
125	110	190	210	216	115	23	259.5	338	116	169	63	8x23	F07
140	125	190	210	216	115	23	259.5	338	116	169	63	8x23	F07
160	150	214	241	241	115	24	259.5	364	129	182	66	8x24	F07
200	175	268	290	295	115	24	335	414	158	203	75	8x24	F07
225	200	268	290	295	115	24	335	414	158	203	75	8x24	F07
250	250	333	353	362	156	24	335	507	198	242	113	8x24	F10
280	250	333	353	362	156	24	410	507	198	242	113	8x24	F10
315	300	379	400	432	156	24	410	580	228	285	113	8x25	F10

PVC UH Flange Butterfly Valve (Set)

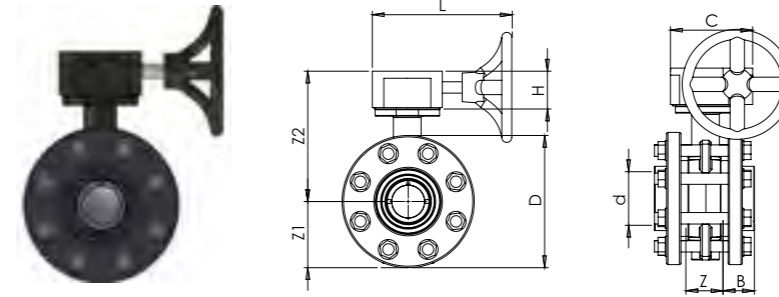


No.	Part	Material	Number
1	Outer Body	PP-GF	1
2	Flange	PVC-UH	2
3	Flange Adaptor	PVC-UH	1

No.	Part	Material	Number
4	Screw	ABS	1
5	Washer	PP-GF	2
6	Union Nut	PP-GF	1

Diameter	DN	D (mm)	z (mm)	Z1 (mm)	Z2 (mm)	B (mm)	L (mm)	nøe	ISO 5211
63	50	165	51	82	188	38	207	4x19	F07
75	65	185	52	92	180	43	207	4x19	F07
90	80	200	58	100	183	51	207	8x19	F07
110	100	220	66	110	208	60	258	8x19	F07
125	110	250	73	125	221	69	258	8x23	F07
140	125	250	73	125	221	75	258	8x23	F07
160	150	285	76	142	235	86	258	8x24	F07
200	175	340	87	170	255	106	335	8x24	F07
225	200	340	87	170	255	120	335	8x24	F07
250	250	395	123	198	309	131	410	8x24	F10
280	250	395	119	198	309	146	410	8x24	F10
315	300	445	121	228	370	164	410	8x25	F10

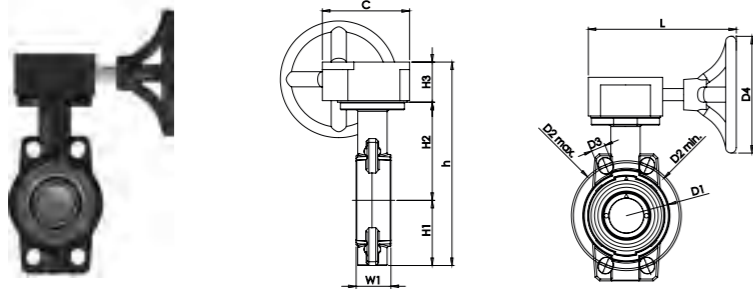
PVC UH Reductor Threaded Butterfly Valve (Set)



No.	Part	Material	Number
1	Outer Body	PP-GF	1
2	Flange	PVC-UH	2
3	Flange Adaptor	PVC-UH	1

No.	Part	Material	Number
4	Screw	Galvanized	1
5	Washer	Galvanized	2
6	Union Nut	Galvanized	1

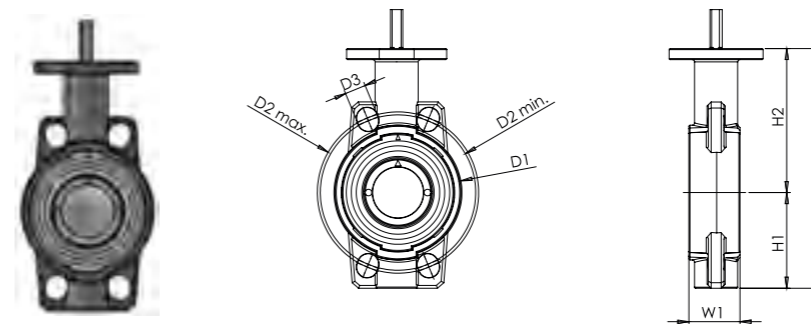
PVC UH Reductor Threaded Butterfly Valve (Without Flange)



Diameter	DN	D (mm)	z (mm)	Z1 (mm)	Z2 (mm)	B (mm)	L (mm)	nøe	ISO 5211
63	50	165	51	82	196	38	192	4x19	F07
75	65	185	52	92	191	43	192	4x19	F07
90	80	200	58	100	190	51	192	8x19	F07
110	100	220	66	110	227	60	192	8x19	F07
125	110	250	73	125	228	69	192	8x23	F07
140	125	250	73	125	228	75	192	8x23	F07
160	150	285	76	142	232	86	192	8x24	F07
200	175	340	87	170	259	106	192	8x24	F07
225	200	340	87	170	259	120	192	8x24	F07
250	250	395	123	198	287	131	250	8x24	F10
280	250	395	119	198	287	146	250	8x24	F10
315	300	445	121	228	353	164	250	8x25	F10
400									

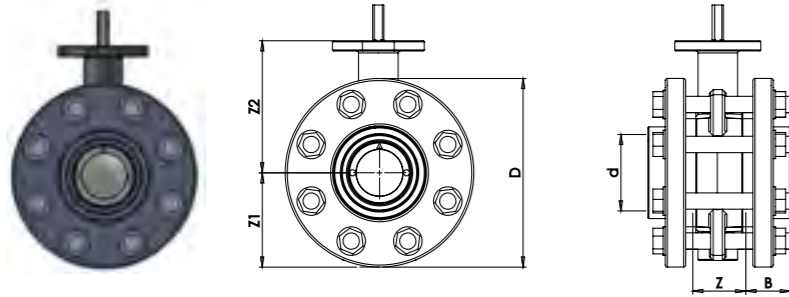
Dia	DN	D1 (mm)	D2 min. (mm)	D2 max. (mm)	D3 (mm)	L (mm)	H (mm)	H1 (mm)	H2 (mm)	W1 (mm)	nøe	ISO 5211
63	50	104	120	125	115	19.5	207.5	77	134	45	4x19	F07
75	65	115	140	145	115	19.5	207.5	86	129	46	4x19	F07
90	80	131	150	160	115	19.5	207.5	89	132	48	8x19	F07
110	100	160	175	190	115	19.5	259.5	103	156	56	8x19	F07
125	110	190	210	216	115	23	259.5	116	169	63	8x23	F07
140	125	190	210	216	115	23	259.5	116	169	63	8x23	F07
160	150	214	241	241	115	24	259.5	129	182	66	8x24	F07
200	175	268	290	295	115	24	335	158	203	75	8x24	F07
225	200	268	290	295	115	24	335	158	203	75	8x24	F07
250	250	333	353	362	156	24	335	198	242	114	8x24	F10
280	250	333	353	362	156	24	410	198	242	114	8x24	F10
315	300	379	400	432	156	24	410	228	285	113	8x25	F10
400												

PVC UH Actuator Compatible Butterfly Valve (without Flange)



Diameter	DN	D1 (mm)	D2 min. (mm)	D2 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	W1 (mm)	nøe	ISO 5211
63	50	104	120	125	115	211	77	134	45	4x19	F07
75	65	115	140	145	115	216	86	129	46	4x19	F07
90	80	131	150	160	115	222	89	132	48	8x19	F07
110	100	160	175	190	115	269	103	156	56	8x19	F07
125	110	190	210	216	115	285	116	169	63	8x23	F07
140	125	190	210	216	115	285	116	169	63	8x23	F07
160	150	214	241	241	115	311	129	182	66	8x24	F07
200	175	268	290	295	115	361	158	203	75	8x24	F07
225	200	268	290	295	115	361	158	203	75	8x24	F07
250	250	333	353	362	156	410	198	242	114	8x24	F10
280	250	333	353	362	156	410	198	242	114	8x24	F10
315	300	379	400	432	156	513	228	285	113	8x25	F10
400											

PVC UH Actuator Compatible Butterfly Valve (Set)



No.	Part	Material	Number
1	Outer Body	PP-GF	1
2	Flange	PVC-UH	2
3	Flange Adaptor	PVC-UH	1

No.	Part	Material	Number
4	Screw	Galvanized	1
5	Washer	Galvanized	2
6	Union Nut	Galvanized	1

Diameter	DN	D (mm)	z (mm)	Z1 (mm)	Z2 (mm)	B (mm)	nøe	ISO 5211
63	50	165	51	83	134	38	4x19	F07
75	65	185	52	93	130	43	4x19	F07
90	80	200	58	100	133	51	8x19	F07
110	100	220	66	110	156	60	8x19	F07
125	110	250	73	125	169	69	8x23	F07
140	125	250	73	125	169	75	8x23	F07
160	150	285	76	142	182	86	8x24	F07
200	175	340	87	170	203	106	8x24	F07
225	200	340	87	170	203	120	8x24	F07
250	250	395	123	198	242	131	8x24	F10
280	250	395	119	198	242	146	8x24	F10
315	300	445	121	228	285	164	8x25	F10
400								

BUTTERFLY VALVE SAFETY WARNINGS

WARNING:

Intended Use

- Butterfly valves are not recommended for the environments that contain solid substance. Cavitation must be avoided in control operations.
- In case of deoiling or substance cementing, butterfly valves can only be used after negotiating with PIMTAŞ Piping Systems representative.
- They will be used as interim installation valve or edge valve.

DANGER

Butterfly Valve as Edge Valve

When butterfly valve is opened with the piping system under pressure as edge valve, the substance may disperse uncontrollably! This may result in death or severe injuries.

- Edge valve of the pipe system can only be opened under pressure only if the substance is collected or steered off safely and measures to prevent splashing are taken.

DANGER

Valve Opening and Closing

Opening or closing the valve joltily may result in death or severe injuries.

- Especially when using the hand lever, prevent pressure fluctuations within the piping system.
- Use high current speeds for manual operation and manual gear box drive for the applications.

8-A-3) ACTUATOR BUTTERFLY VALVES

General Overview of Actuators

Actuators support turning on or off the electric motor or the valve with pneumatic assistance. Actuators are divided into two as electric actuators and pneumatic actuators. Furthermore, they are also distinguished as rotating and linear actuators.

A special type of actuators is electric motor actuators which are for pipe valves. It is used in cases where compressed air is not available as auxiliary energy for operation. These are preferably used in pipe line and factory construction.

Pneumatic actuators are the actuators which operate with compressed air and that never require any electric energy. Partial rotating actuators are a special type of rotating actuators and used for the automation of 1/4 turn valves such as butterfly valves or ball valves. They generally have an outlet movement less than 360°. In general internal drive gear segment is designed for a 90° motion. Following table gives a general overview for each actuator and specific details of different actuator types. It will also help you with your decision.

PIMTAŞ BUTTERFLY VALVE ACTUATOR SELECTION

Diameter	INCH	ISO5211 FLANGE	SQUARE STEEL	H	Operating Pressure TORQUE Nm for 5 Bars	Operating Pressure TORQUE Nm for 10 Bars
63	2	F 07	11	15	6	12
75	2 1/2	F 07	11	15	11	22
90	3	F 07	11	15	18	35
110	4	F 07	14	15	25	50
125	4 1/2	F 07	14	15	25	50
140	5	F 07	14	15	30	60
160	6	F 07	14	15	40	75
200	7	F 07	17	15	50	95
225	8	F 07	17	15	75	115
250	9	F 10	17	20	80	125
280	10	F 10	17	20	85	145
315	12	F 10	22	20	110	180
355	14	F 10	22	20	125	200



TORQUE Nm rates of foregoing actuators were selected 25% more than the open-close torque value on average.

-While selecting actuators, actuators with a torque value 25-30% more than the actual need should be selected.

-If operating temperature is more than PN10, a big actuator must be selected.

Based on the operating conditions, in actuator selection for the butterfly valves (based on opening-closing time, temperature, pressure, flow rate of transmitted liquid.....etc.), a (2,5--4)-times

Bigger TORQUE value must be selected.

-Torque value for the actuators (Nm) was measured at 20C water and 30% safety factor was accepted.

PIMTAŞ BUTTERFLY VALVE OPENING-CLOSING TORQUE Nm RATES

Diameter	INCH	ISO5211 FLANGE	SQUARE STEEL	Operating Pressure TORQUE Nm for 5 Bars	Operating Pressure TORQUE Nm for 10 Bars
63	2	F 07	11	5	10
75	2 1/2	F 07	11	9	18
90	3	F 07	11	14	28
110	4	F 07	14	20	40
125	4 1/2	F 07	14	25	40
140	5	F 07	14	25	50
160	6	F 07	14	35	60
200	7	F 07	17	40	75
225	8	F 07	17	50	90
250	9	F 10	17	60	100
280	10	F 10	17	70	115
315	12	F 10	22	90	145
355	14	F 10	22	120	-

BUTTERFLY VALVES - F 03 ACTUATOR INTERMEDIATE FLANGE

DIAMENT	ACTUATOR SIZE	VALVE FLANGE SIZE	SQUARE MIL	H	Operating Pressure TORQUE Nm for 5 Bars	Operating Pressure TORQUE Nm for 10 Bars
63	F 03	F 07	11	15	6	12
75	F 03	F 07	11	15	11	22
90	F 03	F 07	11	15	18	35
110	F 03	F 07	14	15	25	50



In PIMTAŞ butterfly valves, an ACTUATOR INTERMEDIATE FLANGE must be used so that F 03 size actuators could be connected. Sizes are included in the above table. An insert adaptor must be used when it is required to reduce steel square mil size from 11 to 9.

PNEUMATIC ACTUATOR BUTTERFLY VALVE



Options

- Single Acting Open Safe.
- Single Acting Close Safe.
- Double Acting.
- Easy mounting demounting opportunity
- Positioner, Limit switch box, Namur solenoid valve, hand control unit.
- Actuator flange connection sizes ISO 5211
- It is possible to add option based on need.

Accessories

- Epoxy coating, polyamide, nickel coating, anodized coating hull material.
- Three-position actuator
- With position indicator.
- Adjustable manual stop.

Pneumatic Actuator

Advantages	<ul style="list-style-type: none"> • Short switch on/off time • Low cost • Variable pressure control performance • Identified edge position • Easy maintenance • Impact limiter (to change manually) • Additional elements may be mounted later • Flow control is possible with additional parts • Durable PP-GF bearing • Completely plastic actuator • Position indicator with integrated NAMUR interface • Fast cycle periods • Very good price/performance ratio in all versions • Wide torque range, from 8Nm to 3840 Nm • Formation of several limit switch versions without any problem • Low installation
Properties	<ul style="list-style-type: none"> • Required control valve • Required pressurized air • Required position feedback for additional parts • More effort is required for interim positions
Versions	<ul style="list-style-type: none"> • Position feedback • Digital positioner • Opportunity for bus bar connection asAS-i • Adapters for F04 and F05 interface

ELECTRICAL ACTUATOR BUTTERFLY VALVE



Options

- With Position Indicator
- Optional battery-powered on off safety control.
- Proportional control unit, potentiometer, local control unit.
- Options for position transmitter are available.
- Actuator flange connection sizes ISO 521
- 24 V DC / 24 V AC

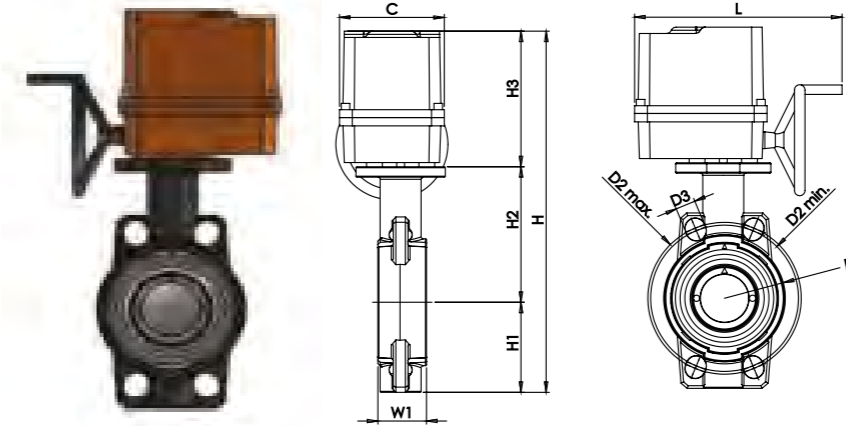
Accessories

- Thermostat control heater against moisture
- Valve position indicator.
- Ex. Proof protection limit option
- Digital control units.
- On-site or remote control actuator.

Electric Actuator

Advantages	Properties
<ul style="list-style-type: none"> • Easy to install • Well defined performance • No energy consumption at switch on/off breaks • Intermediary position is possible • Easy maintenance • Additional elements may be attached later • Very good chemical resistance • Durable PP-GF case, very good chemical resistance • Modular design and flexible composition, easy to use • Additional safety thanks to unit and battery set (Optional) • Long service life thanks to durable design and best electronic use • Thanks to wide power supply and standard interface, compatible for universal use • Many monitoring and control capabilities that have smart, self-learning access 	<ul style="list-style-type: none"> • Relatively high cost • Low maintenance cost • Long cycle period • Additional hardware required for defined edge positions
Versions	
<ul style="list-style-type: none"> • Heating equipment and turning unit for much safety • Additional mechanical limit feedback wrench • Optional adaptor for F04 and F05 interface pursuant to EN ISO 5211 • Operation status monitoring • Driver monitoring in additional panel: Respond time monitoring, loop number monitoring, cycle period extension • Position detection and 4-20 mA position feedback • Positioner 	

PVC UH Electric Actuator Butterfly Valve (24 V DC) Manual Emergency Controller-Without Flange



Options: Battery powered on off may be safety controlled.

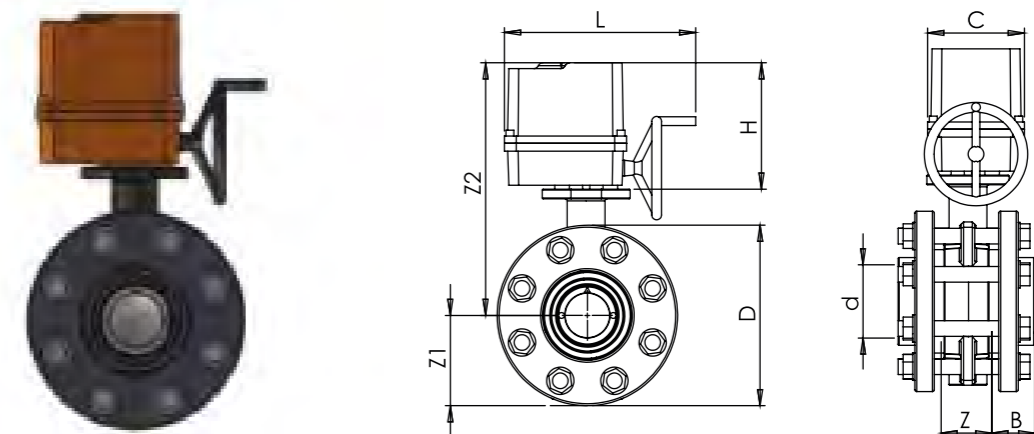
Proportional control unit, potentiometer, local unit, position transmitter options are available.

Pipe flange connection sizes EN 1092 PN10, ISO 7005 PN10, ANSI B 16,5 class 150, BS, 1560 ,1958

Actuator flange connection sizes ISO 5211 24 DC - 24 V AC

Diameter	DN	D1 (mm)	D2 min. (mm)	D2 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	W1 (mm)	nøe	ISO 5211
63	50	54	120	125	19	446	77	134	45	4x19	F07
75	65	57	140	145	19	451	86	129	46	4x19	F07
90	80	131	150	160	19	457	89	132	48	8x19	F07
110	100	160	175	190	19	504	103	156	56	8x19	F07
125	110	190	210	216	23	520	116	169	63	8x23	F07
140	125	190	210	216	23	546	116	169	63	8x23	F07
160	150	214	241	241	24	596	129	182	66	8x24	F07
200	175	268	290	295	24	596	158	203	75	8x24	F07
225	200	268	290	295	24	748	158	203	75	8x24	F07
250	250	333	341	362	24	748	198	242	114	8x24	F10
280	250	333	341	362	24	748	198	242	114	8x24	F10
315	300	379	400	432	25	923	228	285	113	8x25	F10
400											

PVC UH Electric Actuator Butterfly Valve (24 V DC) Manual Emergency Controller-Set



Options: Battery powered on off may be safety controlled.

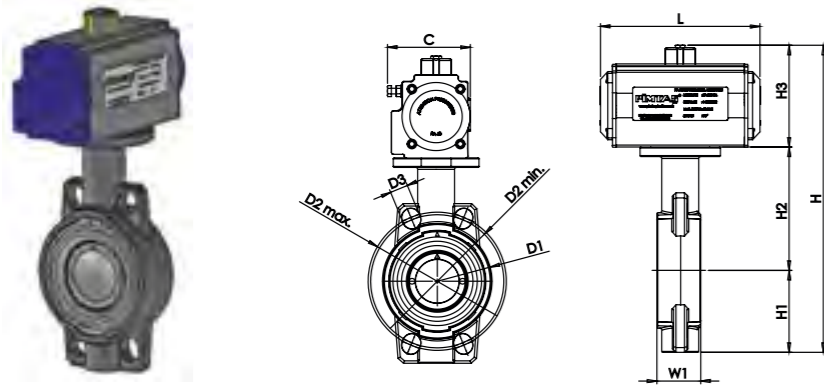
Proportional control unit, potentiometer, local unit, position transmitter options are available.

Pipe flange connection sizes EN 1092 PN10, ISO 7005 PN10, ANSI B 16,5 class 150, BS, 1560 ,1958

Actuator flange connection sizes ISO 5211 24 DC - 24 V AC

Diameter	DN	D (mm)	z (mm)	Z1 (mm)	Z2 (mm)	B (mm)	nøe	ISO 5211
63	50	165	51	83	395	38	4x19	F07
75	65	185	52	93	399	43	4x19	F07
90	80	200	58	100	398	51	8x19	F07
110	100	220	66	110	438	60	8x19	F07
125	110	250	73	125	447	69	8x23	F07
140	125	250	73	125	447	75	8x23	F07
160	150	285	76	142	459	86	8x24	F07
200	175	340	87	170	509	106	8x24	F07
225	200	340	87	170	509	120	8x24	F07
250	250	395	123	198	625	131	8x24	F10
280	250	395	119	198	629	146	8x24	F10
315	300	445	121	228	802	164	8x25	F10
400								

PVC UH Close Safe Single Acting Pneumatic Actuator Butterfly Valve (Without Flange)



Options: Battery powered on off may be safety controlled.

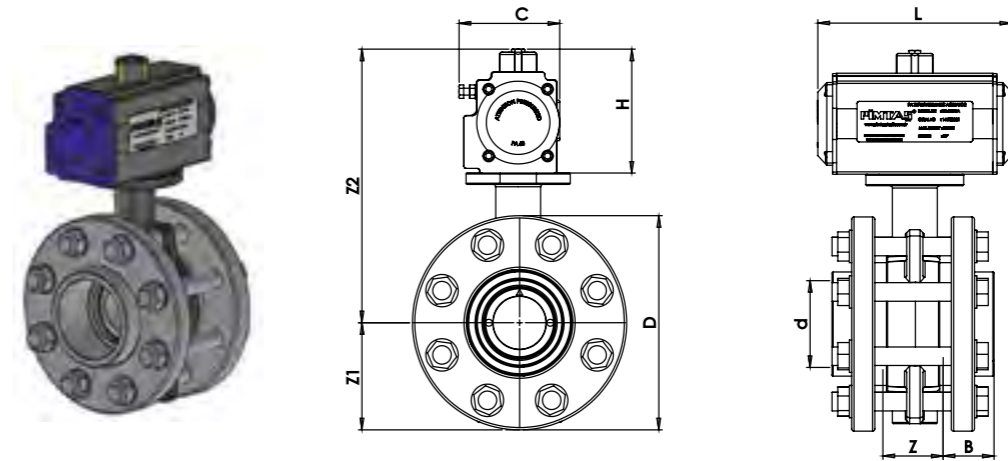
Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Actuator flange connection sizes ISO 5211

It is possible to add option based on need.

Diameter	DN	D1 (mm)	D2 min. (mm)	D2 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	C (mm)	W1 (mm)	L	ISO 5211
63	50	54	120	125	19	303	77	134	92	72	45	147	F07
75	65	57	140	145	19	307	86	129	92	72	46	147	F07
90	80	131	150	160	19	307	89	132	108	83	48	168	F07
110	100	160	175	190	19	379	103	156	120	95	56	184	F07
125	110	190	210	216	23	405	116	169	120	95	63	184	F07
140	125	190	210	216	23	405	116	169	120	100	63	184	F07
160	150	214	241	241	24	441	129	182	130	100	66	204	F07
200	175	268	290	295	24	501	158	203	140	108	75	262	F07
225	200	268	290	295	24	501	158	203	140	108	75	262	F07
250	250	333	341	362	24	593	198	242	153	122	114	268	F10
280	250	333	341	362	24	593	198	242	153	122	114	268	F10
315	300	379	400	432	25	668	228	285	175	142	113	296	F10

PVC UH Close Safe Single Acting Pneumatic Actuator Butterfly Valve (Set)



Options: Easy mounting demounting opportunity

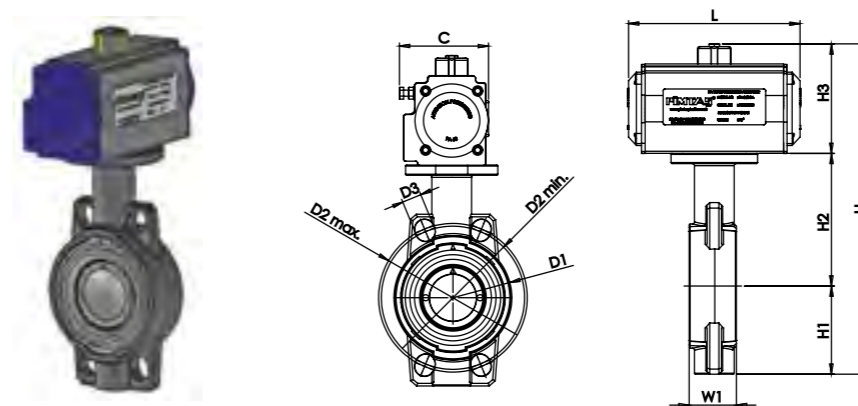
Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Flange connection sizes: ISO 7005 / EN 1092 / DIN 2501 PN10 / BS4504

It is possible to add option based on need.

Diameter	DN	C (mm)	D (mm)	z (mm)	B (mm)	Z1 (mm)	Z2 (mm)	B (mm)	L (mm)	L (mm)	nøe	ISO 5211
63	50	72	165	51	38	83	395	38	147	90	4x19	F07
75	65	72	185	52	43	93	399	43	147	90	4x19	F07
90	80	63	200	58	51	100	398	51	168	108	8x19	F07
110	100	95	220	66	60	110	438	60	184	120	8x19	F07
125	110	95	250	73	69	125	447	69	184	120	8x23	F07
140	125	100	250	73	75	125	447	75	184	130	8x23	F07
160	150	100	285	76	86	142	459	86	204	140	8x24	F07
200	175	108	340	87	106	170	509	106	262	140	8x24	F07
225	200	108	340	87	120	170	509	120	262	153	8x24	F07
250	250	122	395	123	131	198	625	131	268	153	8x24	F10
280	250	122	395	119	146	198	629	146	268	153	8x24	F10
315	300	142	445	121	164	228	802	164	296	175	8x25	F10

PVC UH Double Acting Pneumatic Actuator butterfly Valve (Without Flange)



Options: Easy mounting demounting opportunity

Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Actuator flange connection sizes: ISO 7005 / EN 1092 / DIN 2501 PN10 / BS4504

It is possible to add option based on need.

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ

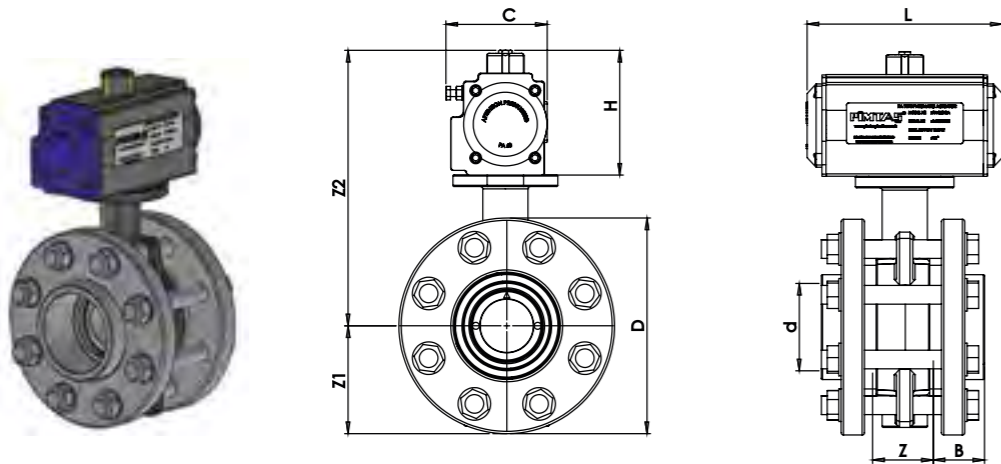
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Diameter	DN	D1 (mm)	D2 min. (mm)	D2 max. (mm)	D3 (mm)	H (mm)	H1 (mm)	H2 (mm)	H3 (mm)	C (mm)	W1 (mm)	L	ISO 5211
63	50	54	120	125	19	303	77	134	92	72	45	147	F07
75	65	57	140	145	19	307	86	129	92	72	46	147	F07
90	80	131	150	160	19	307	89	132	108	83	48	168	F07
110	100	160	175	190	19	379	103	156	120	95	56	184	F07
125	110	190	210	216	23	405	116	169	120	95	63	184	F07
140	125	190	210	216	23	405	116	169	120	100	63	184	F07
160	150	214	241	241	24	441	129	182	130	100	66	204	F07
200	175	268	290	295	24	501	158	203	140	108	75	262	F07
225	200	268	290	295	24	501	158	203	140	108	75	262	F07
250	250	333	341	362	24	593	198	242	153	122	114	268	F10
280	250	333	341	362	24	593	198	242	153	122	114	268	F10
315	300	379	400	432	25	668	228	285	175	142	113	296	F10

PVC UH Double Acting Pneumatic Actuator Butterfly Valve (Set)



Options: Easy mounting demounting opportunity

Positioner, Limit switch box, Namur solenoid valve, hand control unit.

Flange connection sizes: ISO 7005 / EN 1092 / DIN 2501 PN10 / BS4504

It is possible to add option based on need.

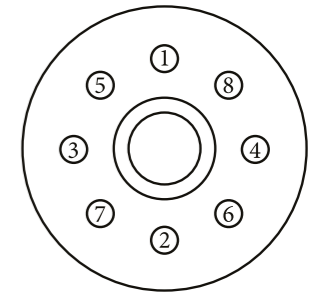
Diameter	DN	C (mm)	D (mm)	z (mm)	Z1 (mm)	B (mm)	L (mm)	H (mm)	nøe	ISO 5211
63	50	72	165	51	83	38	147	90	4x19	F07
75	65	72	185	52	93	43	147	90	4x19	F07
90	80	63	200	58	100	51	168	108	8x19	F07
110	100	95	220	66	110	60	184	120	8x19	F07
125	110	95	250	73	125	69	184	120	8x23	F07
140	125	100	250	73	125	75	184	130	8x23	F07
160	150	100	285	76	142	86	204	140	8x24	F07
200	175	108	340	87	170	106	262	140	8x24	F07
225	200	108	340	87	170	120	262	153	8x24	F07
250	250	122	395	123	198	131	268	153	8x24	F10
280	250	122	395	119	198	146	268	153	8x24	F10
315	300	142	445	121	228	164	296	175	8x25	F10

BUTTERFLY VALVE INSTALLATION

It is essential that all screws of the flange used in butterfly valve installation must have been attached and tightened with proper torques. Torque rates table, specified for the screws, is as follows Flange installation must be carried out at least in 3 tours and in the given numbering order.

Recommended for U-PVC Butterfly valve installation.

Nominal Diameter	Screw	Specified Torque (Nm)
63-75-90-110-125y-140	M16	15-41
160-200-225-250y-315	M20	46-70
400y-500	M24	-



Butterfly valves are mounted with easy demounting flange connection.

Butterfly valves are required to be maintained at certain intervals based on usage conditions. During maintenance;

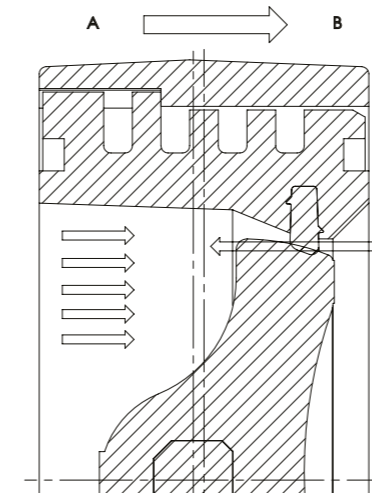
- Internal and external cleaning of butterfly valves,
- Control of butterfly valve disc and seal, replacement of the seal in case of deformation,
- stability control of fittings must definitely be performed.

In addition to these, it must be controlled if essential measures are taken in order to protect butterfly valve from external impacts and external corrosion.

1) DETERMINATION OF BUTTERFLY VALVE FLOW DIRECTION

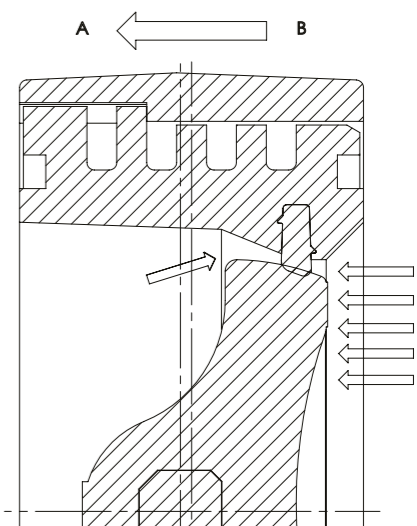
Butterfly valves are opened counterclockwise.

DN - side
PIMTAŞ Logo side



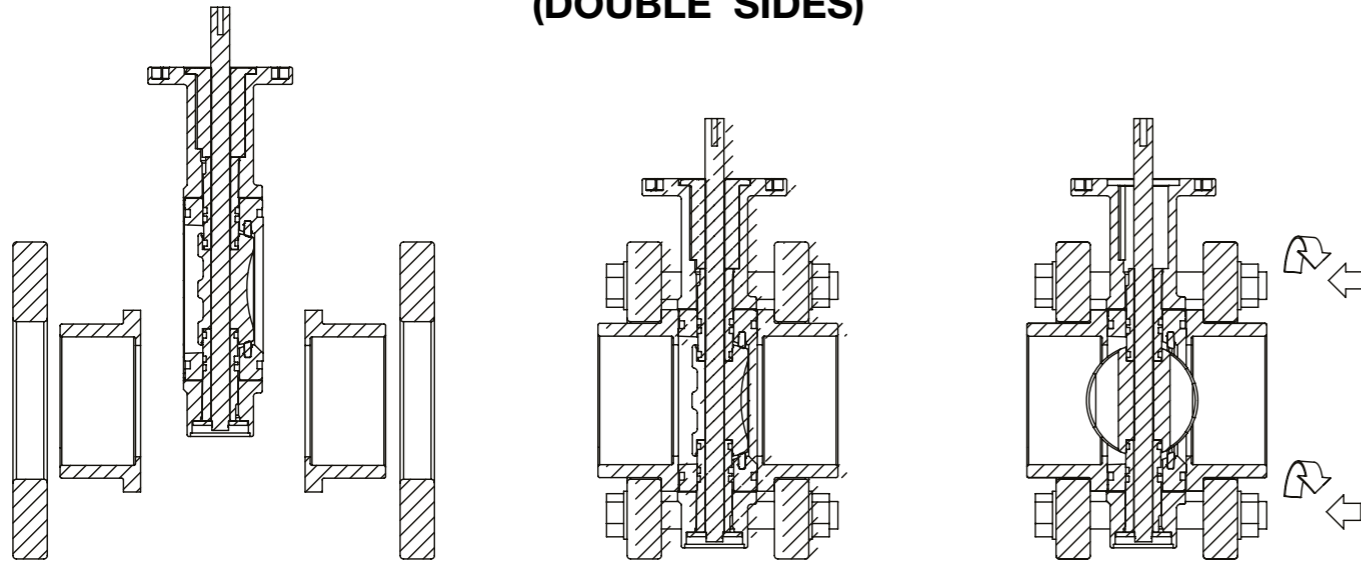
A>B flow direction is recommended when high sealing Safety is requested.

DN - side
PIMTAŞ Logo side



B>A flow direction enables opening - closing force (Torque) is less, connections in this direction are especially recommended for manual or actuator butterfly valves with high flow rate.

2)a) BUTTERFLY VALVE FLANGE AND FLANGE ADAPTOR ASSEMBLY (DOUBLE SIDES)

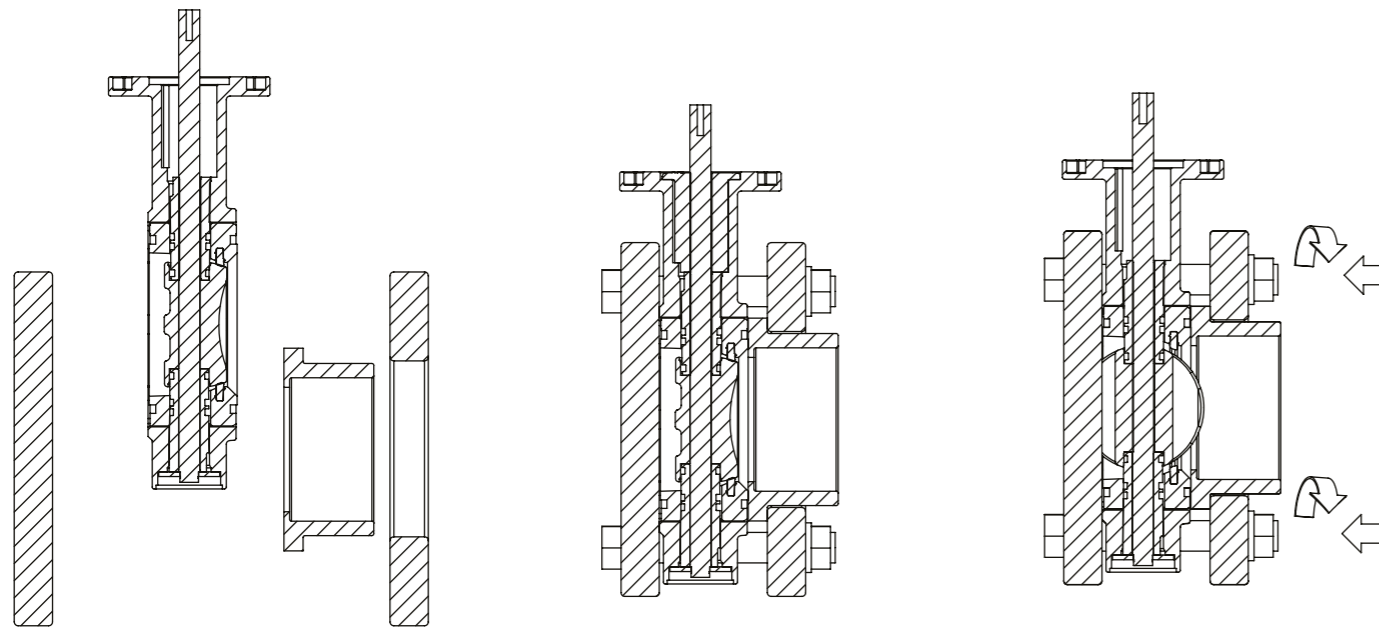


1st Set the butterfly valve in closed position. Check if there is adequate space between the two flanges.

2nd Place between the two flanges along with the seals on the valve.

3. Fix the valve and pipe line on the same axis. Make sure that disc is opened completely. Tighten the flange screw nut according to Table 1.

b) BUTTERFLY VALVE FLANGE AND FLANGE ADAPTOR ASSEMBLY (SINGLE SIDE)



1. Set the butterfly valve to closed position. Check if there is adequate space between the two flanges.

2nd Place between the two flanges along with the seals on the valve.

3. Fix the valve and pipe line on the same axis. Make sure that disc is opened completely. Tighten the flange screw nut according to Table 1.

Table 1: Butterfly valve flange screws maximum closing torque

DN	50	65	80	100	125	150	200	250	300
inch	2"	2 1/2"	3"	4"	5"	6"	8"	10"	12"
Nm	25	25	25	30	35	40	50	80	80
inch - lbs	222	222	222	266	310	355	443	708	708

Butterfly valve flange connection screw sizes

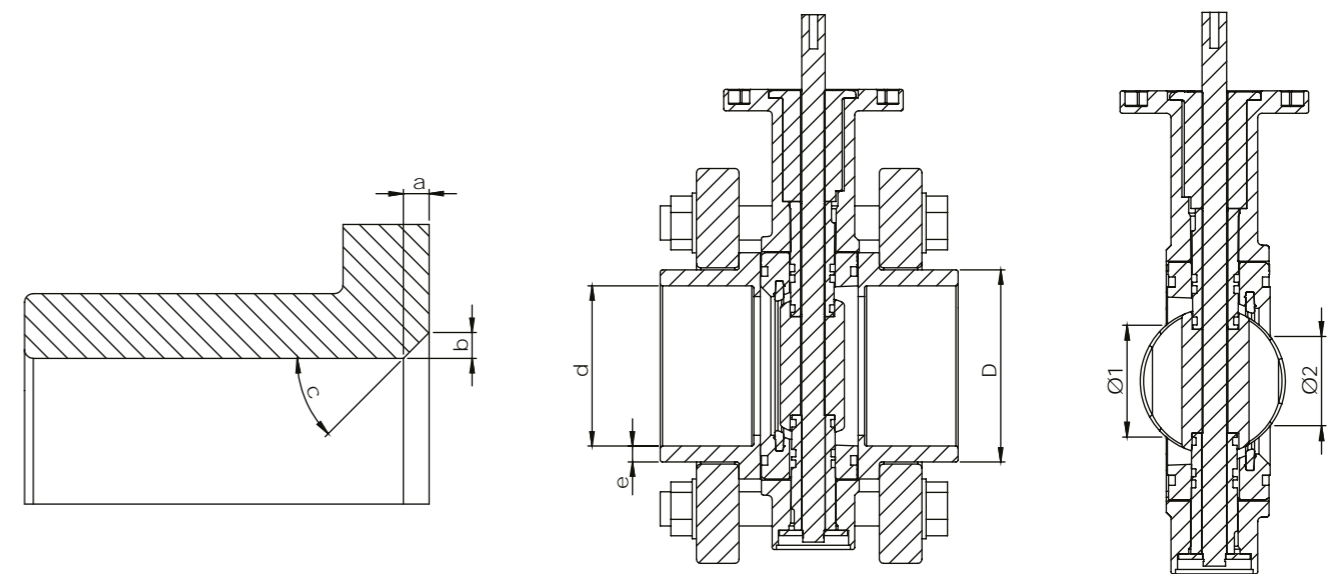
d	Inch	Total Screw Quantity
Ø 63	2"	4 x M16 x 120
Ø 75	2 1/2"	8 x M16 x 130
Ø 90	3"	8 x M16 x 130
Ø 110	4"	8 x M16 x 140
Ø 125	4 1/2"	8 x M16 x 170
Ø 140	5"	8 x M16 x 170
Ø 160	6"	8 x M16 x 180
Ø 200	7"	8 x M16 x 220
Ø 225	8"	8 x M16 x 220
Ø 250	9"	8 x M16 x 240
Ø 280	10"	8 x M16 x 240
Ø 315	12"	8 x M16 x 260

Butterfly valve flange connection thread sizes

d	Inch	Total Screw Quantity
Ø 63	2"	M4 x 10
Ø 75	2 1/2"	M4 x 10
Ø 90	3"	M4 x 10
Ø 110	4"	M4 x 10
Ø 125	4 1/2"	M4 x 10
Ø 140	5"	M4 x 10
Ø 160	6"	M4 x 10
Ø 200	7"	M4 x 10
Ø 225	8"	M4 x 10
Ø 225	9"	M4 x 10
Ø 250	10"	M4 x 10
Ø 315	12"	M4 x 10

c.) CHAMFERING TO FLANGE ADAPTORS:

Flange adaptors of several manufacturing firms may be used with PIMTAŞ butterfly valves. Please make sure that the internal diameter of the flange adaptor, you use is Ø1 bigger than the external diameter of the disc. In the contrary case, flange adaptors may be trimmed with the sizes, indicated in the following table.



DN Nominal diameter
d pipe internal diameter
Ø1 and Ø2 disc overflow diameter
e Wall thickness

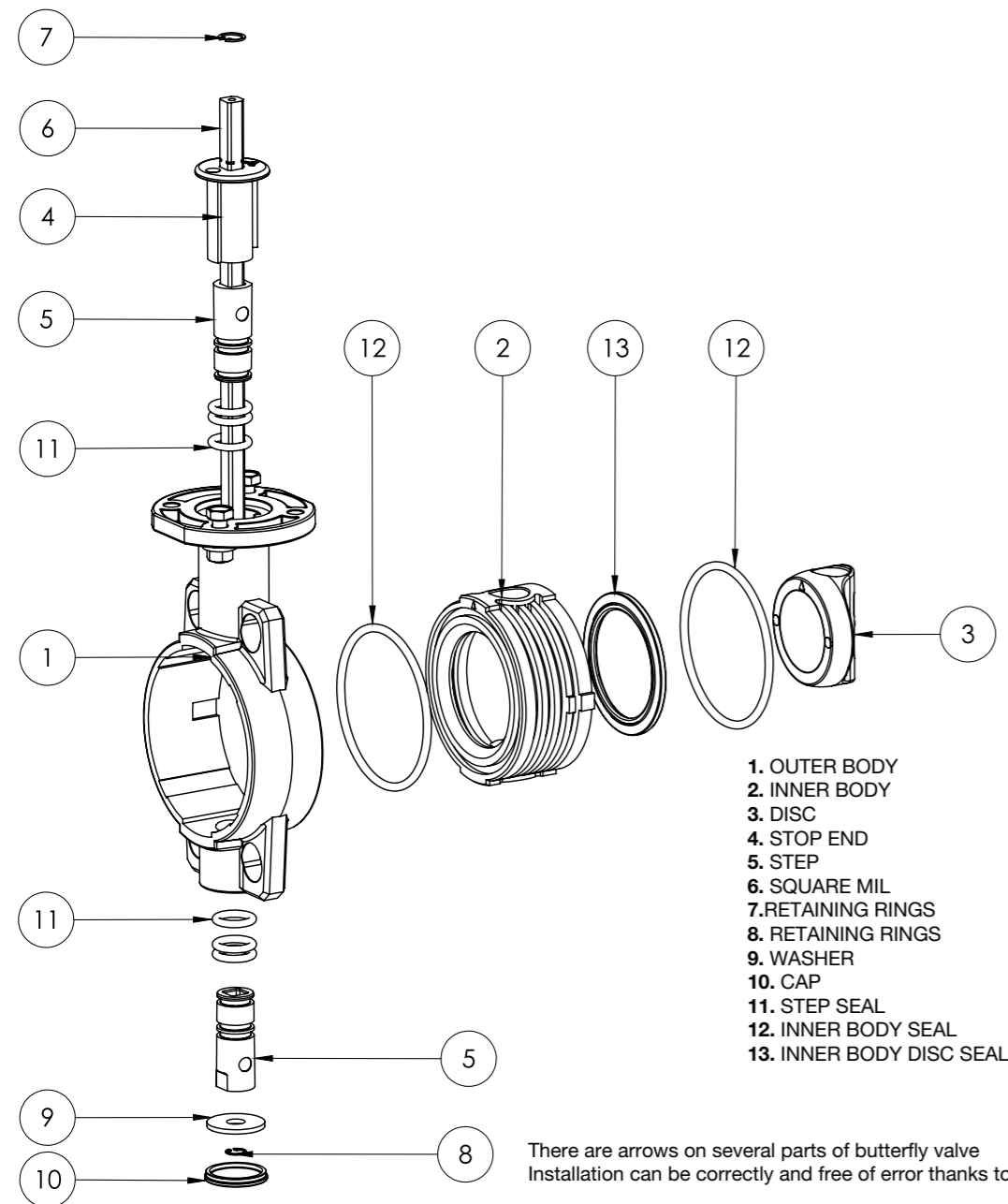
D Flange internal diameter
a Chamfering depth
b Chamfering width
C Chamfering angle

d	DN	Welded Flange Adaptor - Flange PP/PE		Flange Adaptor - Flange	Angle C
		SDR 17,4	SDR 11		
125	125	6 x 4	13 x 83	x 3	30
160	150	-	11 x 6	-	30
200	200	8 x 3	25 x 96	x 6	20
250	250	-	9 x 5	-	30

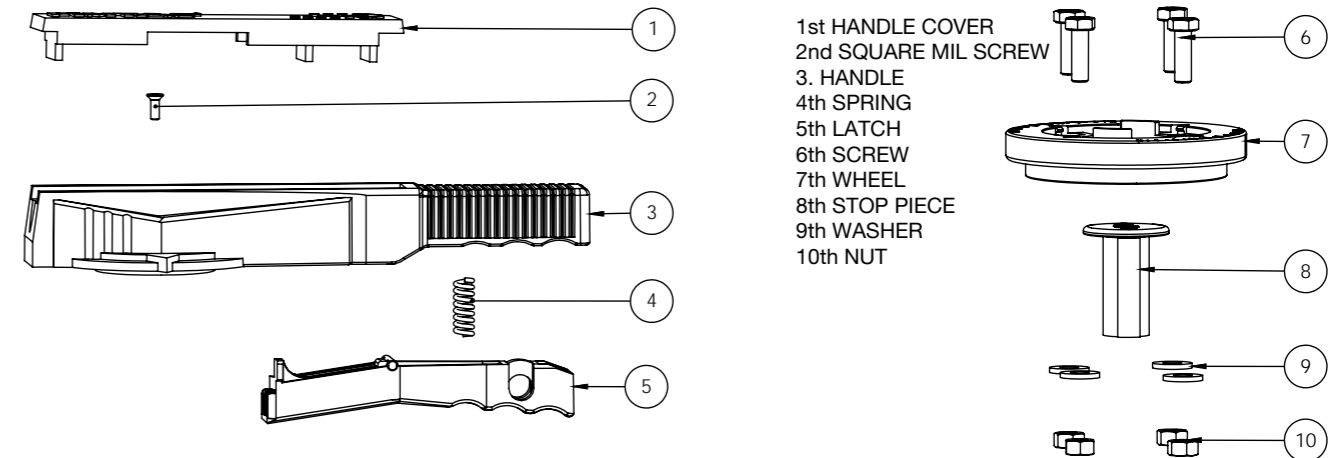
3. NORMAL OPERATION & MAINTENANCE

- Under normal operating conditions, butterfly valve is maintenance free, control at regular intervals is sufficient. (If there is no leakage with the fluid material)
- If there is leakage in the flange connections, flange screws - nuts must be tightened more. As in Table 1,
- If the butterfly valves remained in the same position for 1- 2 years, it is recommended to control the functions.
- Based on the operating conditions, disc seal must be lubricated periodically with a silicon-based lubricant.

4) a) BUTTERFLY VALVE SPARE PARTS LIST

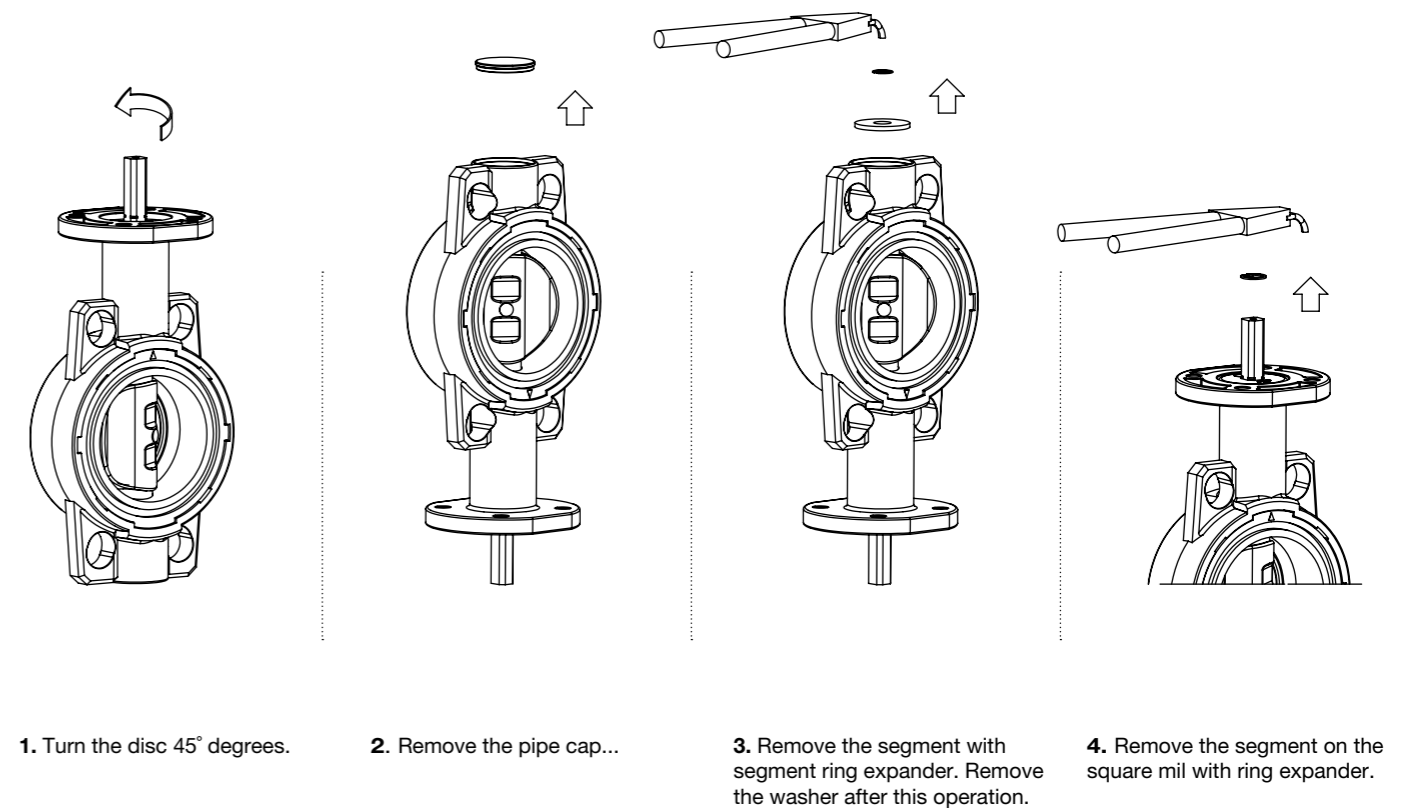


4)b) OPTIONAL PARTS LIST



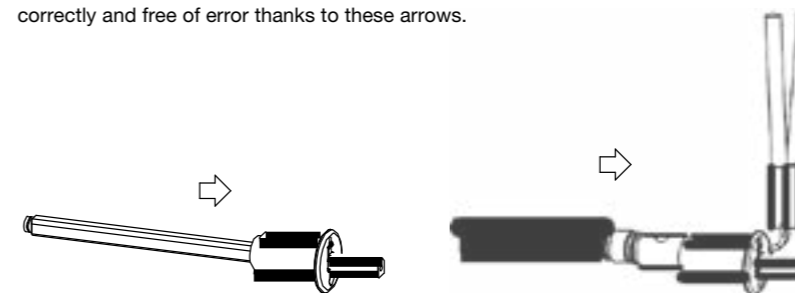
5) DISASSEMBLY OF BUTTERFLY VALVE

- Never disassemble the valve under pressure.
- Discharge the fluid in the piping system completely.



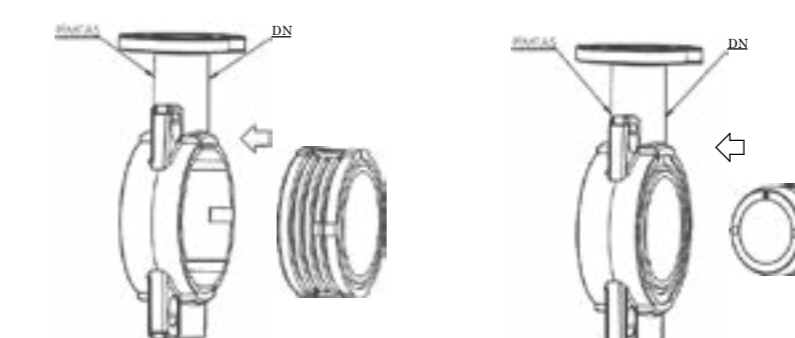
6) BUTTERFLY VALVE INSTALLATION

Follow the steps below for the installation of main parts. There are arrows on several parts of butterfly valve. Installation can be correctly and free of error thanks to these arrows.



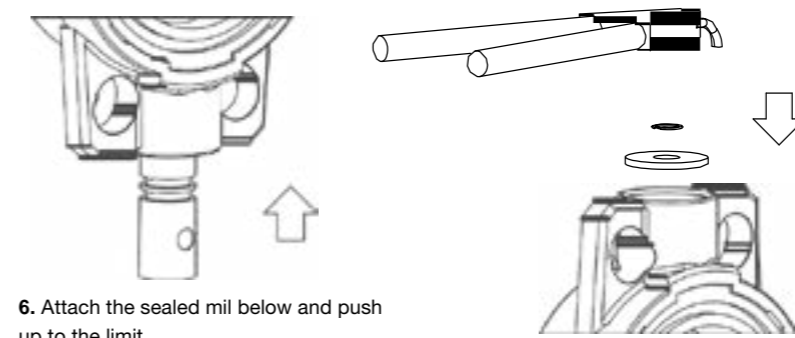
1. Place a stop lamp on the square mil.

2. Once the stop end is replaced install the retaining rings and attach the sealed step to the square mil.



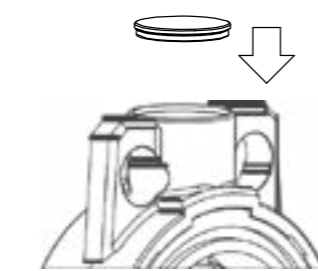
3. Place the inner body inside the outer body. (Pay attention to arrow directions.)

4. Place the disc in an open position to be 90° to the inner body (Pay attention to arrow directions.)



6. Attach the sealed mil below and push up to the limit.

7. Attach the retaining rings and washer on the square mil.



8. After the installation of retaining rings and washer is completed, insert the cap and flange o-rings.

5. Place the square mil and push up to the limit. Pay attention to square mil cross section. Make sure that notches on the square mil are in the same position with that of the disc hole. Two of the notches are bigger than the others to prevent incorrect installation.

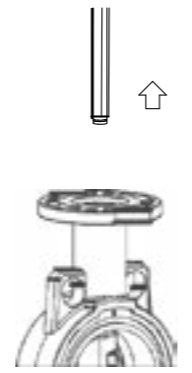
INSTALLATION COMPLETED



5. End stop is on the square mil, remove end stop.



6. Pull back the square mil up to the level of the sealed step above. In order to remove the sealed step above before taking out the square mil, Turn the top step up to 30° degrees.



7. Turn the square mil and disc 30°. Remove the square mil from the valve completely.



8. Turning square mil 15°, insert it inside through the bottom part of the valve and remove the sealed step above by pushing.



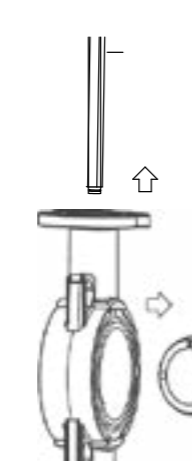
9. After removing the sealed step, take out the square mil from the bottom. Pull back the square mil to the level of sealed step.



10. Turn the square mil up to 30° degrees to remove the square mil. Turn the square mil and disc 30°, remove the square mil from the valve completely.



11. Inserting the square mill over the butterfly valve with an angle of 45° remove out the sealed step below by pushing.



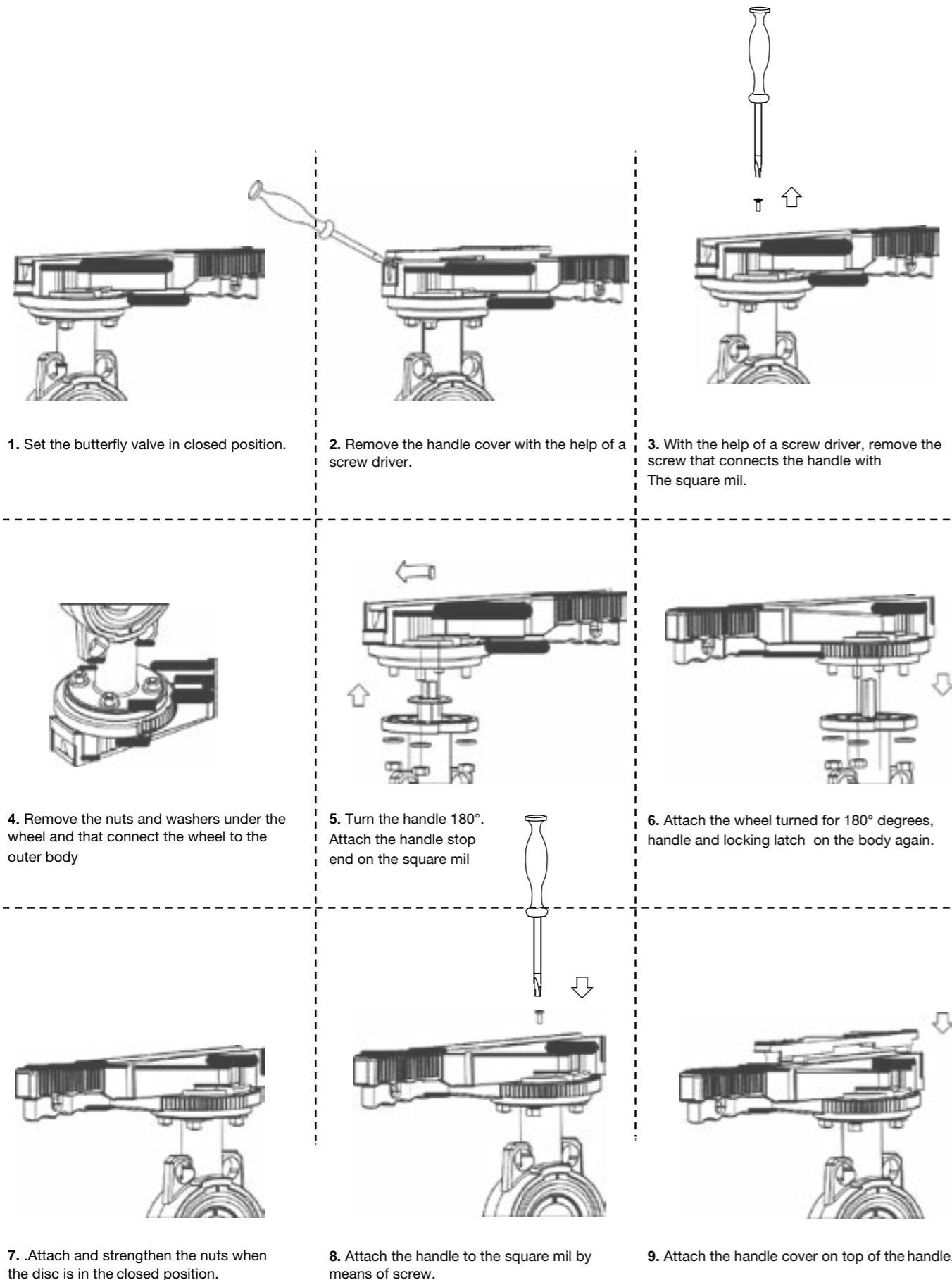
12. Remove the disc after the square mill is taken out.



13. Remove the inner body from unnotched side of the outer body.

VALVE DISASSEMBLY OPERATION IS COMPLETED

7) BUTTERFLY VALVE DISASSEMBLY (CHANGING HANDLE DIRECTION)



1. Set the butterfly valve in closed position.

2. Remove the handle cover with the help of a screw driver.

3. With the help of a screw driver, remove the screw that connects the handle with the square mil.

4. Remove the nuts and washers under the wheel and that connect the wheel to the outer body

5. Turn the handle 180°. Attach the handle stop end on the square mil

6. Attach the wheel turned for 180° degrees, handle and locking latch on the body again.

7. Attach and strengthen the nuts when the disc is in the closed position.

8. Attach the handle to the square mil by means of screw.

9. Attach the handle cover on top of the handle.

8B) PP BUTTERFLY VALVES

PIMTAŞ BUTTERFLY VALVES INNOVATION CHARACTERISTICS

1) Modular part in the design is one of the most important innovative designs. Thus, it becomes possible to manufacture the butterfly valves from the same plastic material of the pipeline in which it will be used. Plastic material of the pipeline may be selected as PVC-U, PVC, ABS, PP, or PVDF based on the characteristics of the fluid that will flow through it, usage conditions (temperature, pressure...), and the surfaces of butterfly valve to contact with the fluid are in the form of replaceable (modular design) parts. Thus, it becomes possible to manufacture the butterfly valves from the same plastic material of the pipeline. Such an opportunity is not available with the current valves in the market.

2) Double eccentric operation principle; disc has no connection with the seal when the valve disc is in ON position thanks to the disc and body, designed based on double eccentric operation principle. And this prevents wear and tear of the seal. Due to decrease of frictional force rotating force of disc decreases 50-70. Thus operating conditions are facilitated, and smaller and more economic actuators can be used. Moreover, this operation principle also protects the butterfly valves against increase or decrease to take place in fluid pressure, i.e., pressure fluctuations. Thus, longer service life and less maintenance is required in butterfly valves.

3) Ease of use, increase in efficiency and safety; valve disc and body are not contaminated by mud, dirt or solid substances etc., thanks to smooth, bright surfaces of modular parts in PIMTAŞ butterfly valves. Efficiency of valves increases, maintenance need decreases. When the disc is in open or closed position in current butterfly valves, rubber seals cover 70-80 of material flow surface in valve body. As is known, materials such as mud, dirt, solid particles etc., adhere to rubber materials and leads to narrowing of flow surface of the valve in time as well as blocking of the same. As the rubber surfaces of the seals in PIMTAŞ design do not contact with the fluid, they do not cause obstruction.

Compliance with the standards; PIMTAŞ butterfly valves are in compliance with the following international standards.

- Metric system; DIN, EN, ISO
- Inch system; BS, ASTM
- Industrial valves, manufactured from pr EN ISO 16136 Thermoplastic material, Butterfly valves.
- ISO 9393 Thermoplastic valves-pressure test methods and specification
- En 558
- Standard connection plate for electric or pneumatic actuator is available in compliance with ISO 5211.
- For precise controller control, a handle mechanism, which can be opened under control with 5 degree angles, was designed. Besides, there is lockability opportunity for handle safety and controller convenience.
- Based on the material of pipeline, it is possible to use different seal materials. EPDM, FPM, or optional special seal materials may be used. Double seal system is used for tightness control.
- As plastic valves are lighter, they are easier to handle, mount therefore, they have a lower cost. Thanks to rich diversity, it is possible to select the product that best fits the requirements of the client and the project.

USAGE AREAS OF PIMTAŞ BUTTERFLY VALVES

- Industrial water treatment plants
- Drinking water installations
- Swimming pool installations
- Aqua parks, aquariums
- Domestic water, waste water treatment plants
- Chemical substances transport facilities
- Electro-coating installations
- Energy production plants

ADVANTAGES OF PLASTIC VALVES IN COMPARISON TO METAL VALVES

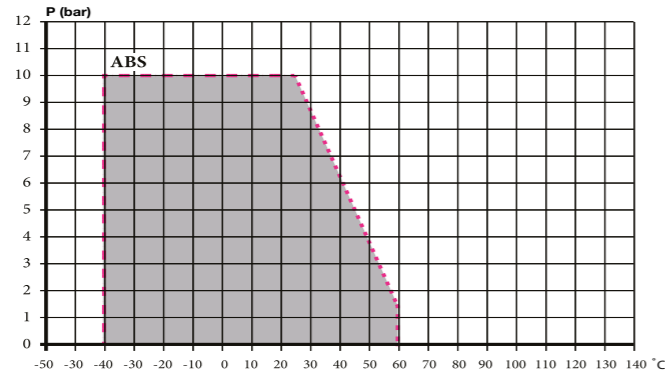
- High resistance to chemical substances
- High resistance to marks likely to arise out of abrasion and friction
- Smooth, bright surface
- As plastic valves are lighter, they are easier to handle, mount therefore, they have a lower cost.

Valve pressure loss diagram is as follows.

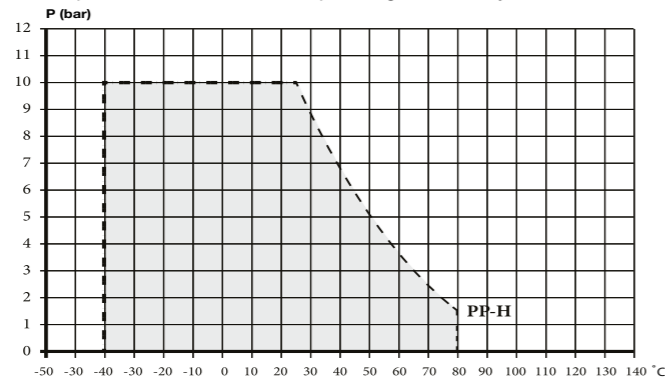
It is possible to calculate how many bars of pressure reduction will be experienced thanks to the data regarding % opening status of the valve, flow rate of passing water and valve nominal diameter.

For instance; When a handle of a butterfly valve with a nominal diameter of 125 is in 50% open position at a water flow rate of 10m³/hour, pressure reduction in the water will be 0,01 bar.

PRESSURE - TEMPERATURE DIAGRAM



Pressure -temperature table indicates operating life for 25 years for water or a similar fluid.



Pressure -temperature table indicates operating life for 25 years for water or a similar fluid.

Note - For the applications with service lives different than 25 years and / or with fluids which have an impact on physical and/ or chemical characteristics of valve body material, ratio factor fr is included in the following table pursuant to TS EN ISO 161354-2012

TEMPERATURE °C	MINIMUM RATE FACTOR FOR BODY MATERIAL					
	ABS	PE	PP	PVC-C	PVC-U	PVDF
-40	1.0	1.0	-	-	-	a
-30	1.0	1.0	-	-	-	a
-20	1.0	1.0	-	-	-	1.0
-10	1.0	1.0	-	-	-	1.0
0	1.0	1.0	-	-	-	1.0
+5	1.0	1.0	1.0	-	-	1.0
10	1.0	1.0	1.0	1.0	1.0	1.0
20	1.0	1.0	1.0	1.0	1.0	1.0
25	1.0	1.0	1.0	1.0	1.0	1.0
30	0.8	0.76	0.85	0.85	0.80	0.9
40	0.6	0.53	0.70	0.65	0.60	0.8
50	0.4	0.33	0.55	0.50	0.35	0.71
60	0.2	0.24	0.40	0.35	0.15	0.63
70	-	-	0.27	0.25	-	0.54
80	-	-	0.15	0.15	-	0.47
90	-	-	-	-	-	0.36
100	-	-	-	-	-	0.25
110	-	-	-	-	-	0.17
120	-	-	-	-	-	0.12
130	-	-	-	-	-	a
140	-	-	-	-	-	a

Pressure Loss

For hydraulic dimensioning of a piping system, pressure loss to emerge with middle flow with a valve is required. For individual valve types, with completely opened position, applicable pressure loss according to desired flow volume is included in pressure loss diagrams.

Flow Characteristics

Flow characteristics of individual valve types in percentages are provided as a diagram. Percentage of kV rate may be determined from the diagram based on a space angle in percentage (% 0= valve closed, % 100= valve completely open).

kv 100 Rates

kV value is a characteristic value/rate for a valve flow volume at a certain level of pressure loss in the valve. 100 kV rates for applicable nominal diameters of valves are stated in tabular form. This is also applicable to a completely open valve. These are included in the following units:

- kV 100 rate as l/m at 1 bar pressure loss
- kV 100 rate as mVh at 1 bar pressure loss
- Cv 100 rate as US gal / min at 1 psi pressure loss

Flow volume of valve at an interim position is determined based on 100 kV value by multiplying the flow volume with the percentage of kV value from flow characteristics diagram.

Conversion Factors

kv - Cv

In Europe, kV rate is related to a flow rate at a temperature of 16°C between 1 m³ / hour as well as a pressure loss of 1 bar. In USA, it is called as CV and it is related to a pressure loss of 1 psi at a temperature of 60° F at a flow rate of 1 US gal / min. This means as follows:

$$Cv = \frac{264.1722 \cdot \sqrt{1}}{60} \cdot kv = 1.1561 \cdot kv$$

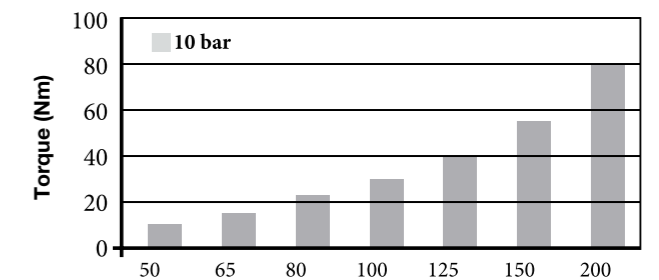
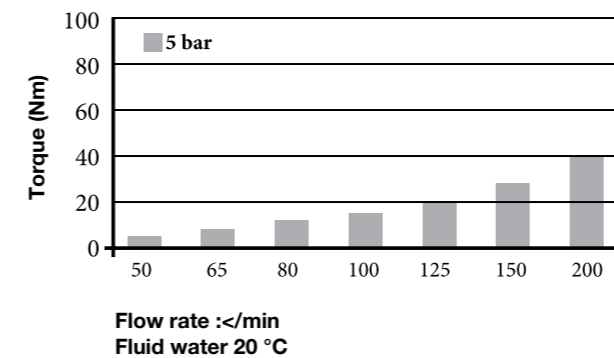
C: Cv rate at US gal / min

Kv: Refers to kv rate in Europe as m³/hour

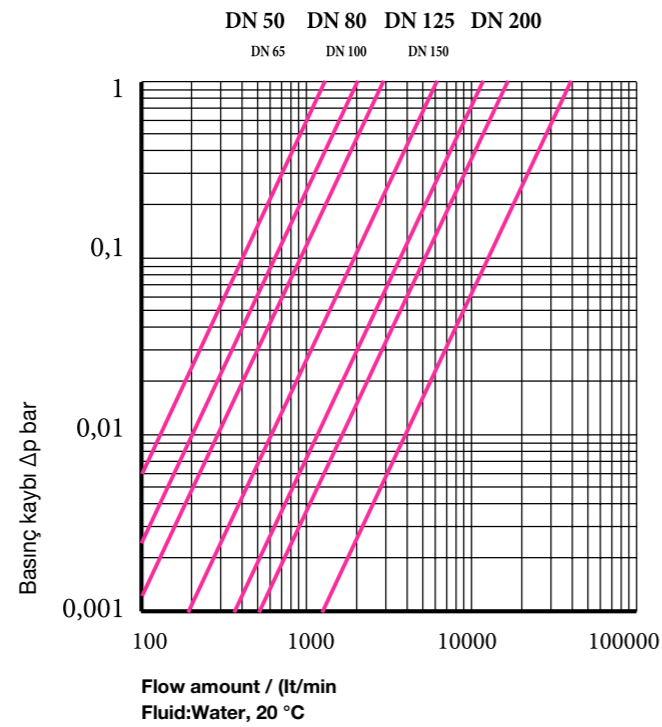
1m³: 264.1722

1 bar: 14.50377 psi

	kv	kv	Cv
kv	1m ³ /h	16.67 l/min	1 1561 US gal/min
kv	0.06 m ³ /h	1 l/min	0,069 US gal/min
Cv	0,865 m ³ /h	14.42 l/min	1 US gal/min



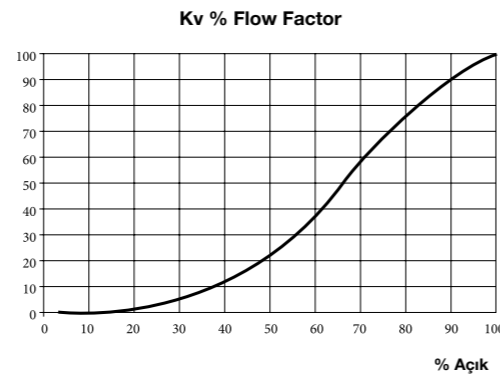
FRICITION PRESSURE LOSS



Kv % Flow Factor

DN mm	DN Inch	d mm	kv 100 L/min Δp=1 bar	kv 100 m³/h Δp=1 bar
50	2"	63	2050	123
65	2 1/2"	75	2800	168
80	3"	90	4100	246
100	4"	110	6800	408
140	5"	125-140	11500	690
150	6"	160	16500	990
200	7-8"	200-225	38500	2310
250	9-10"	250-280	53500	3210
300	12"	315	78600	4716

Flow amount / (lt/min)
Fluid: Water, 20 °C

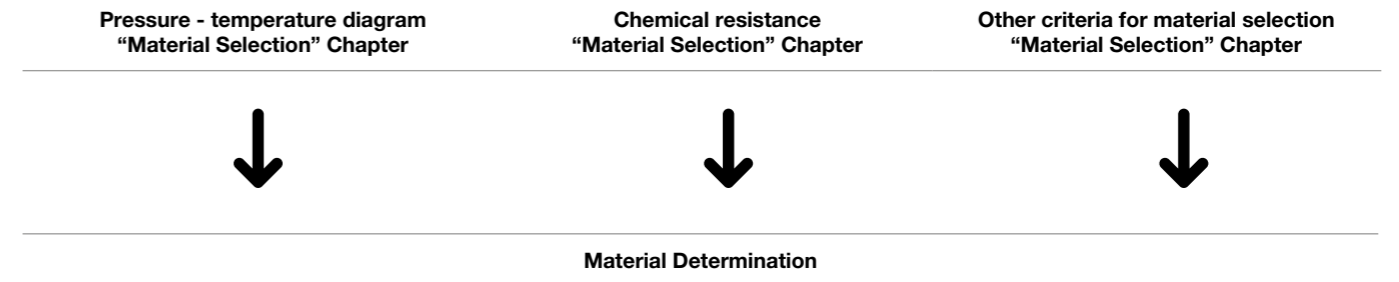


Kv % Flow Factor

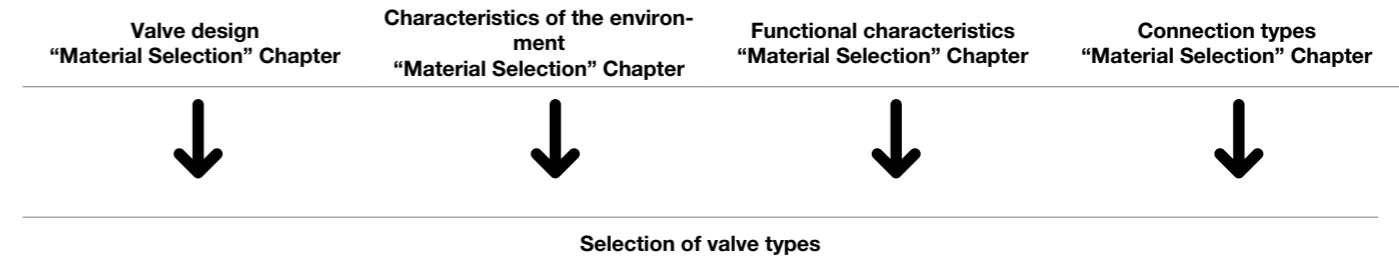
% Açık

III.) Material Selection

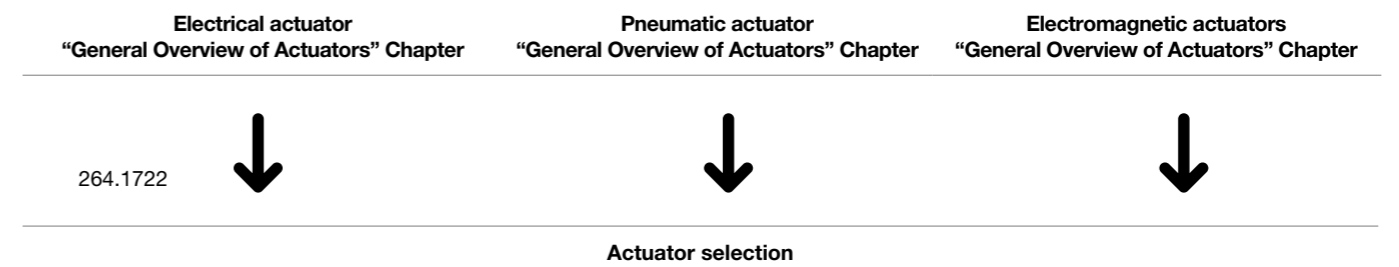
Several factors are important to carry out the correct selection for the valve. Following table is helpful for correct calve and valve type selection.



IV.) Product selection criteria



V.) Selection criteria for actuators



BALL VALVE CONFIGURATION TABLE

Malzeme / Material			
PVC-U	PVC-C	PP-H	↓
Dimensions			
DN 10 3/8"	DN 15 1/2"	DN 20 1/4"	DN 25 1"
DN 32 1 1/4"	DN 40 1 1/2"	DN 50 2 1/2"	DN 80 3"
DN 100 4"			↓
Seals			
EPDM	FPM		↓
Ball Seal			
PTFE			↓
Connections			
FLANGE ADAPTOR	PUSH - FIT	THREADED FLANGE ADAPTOR	FLANGE
PVC-U Flange Adaptor - Metric	Compression Outlet	PVC-U Female thread flange adaptor	PVC-U Flange - Metric
PVC-U Flange Adaptor - Inch ASTM	Latch pipe socket	PP Female thread Flange Adaptor with Fiber Glass	PVC-U Flange - ANSI/ASTM
PVC-U Flange Adaptor - Inch BS		Brass Female thread Flange Adaptor	PP Fiber Glass Flange - Metric
PP-H Flange Adaptor Welded - Metric		Brass male thread Brass Flange Adaptor	PP Flange - ANSI
PP-H Flange Adaptor Welded - Inch ASTM			
PE 100 - Flange Adaptor Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric	With Coupling		PVC-U Flange - Metric
	With Latch Socket	PVC-U Female Threaded Flange Adaptor	PVC-U Flange - ANSI/ASTM
PVC-U Flange Adaptor - Metric		PP - Glass Fibre Female Threaded Flange Adaptor	PP-Glass Fibre Flange - Metric
PVC-U Flange Adaptor - Inch ASTM		Brass Female Threaded Flange Adaptor	PP Flange - ANSI
PVC-U Flange Adaptor - Inch BS		Brass Male Threaded Flange Adaptor	
PP - H - Flange Adaptor Metric			
PP - H Flange Adaptor - Inch ASTM			
PE 100 - Flange Adaptor - Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			
Handle			
Blue for water	Magenta for acid	With lockable handle for valve	↓
		Ø63 / Ø75 / Ø90 / Ø110	
Electric Actuator			
24 V AC / DC	110 - 260 V AC / DC		↓
Pneumatic Actuator			
Single acting open safe.		Çift Etkili. / Double Acting	↓
Tek Etkili Kapama Emniyetli. / Single acting close safe.			

PP BUTTERFLY VALVE (WITHOUT FLANGE)



Diameter	EPDM - PTFE Code	Pressure
63	420 00 063 2	10
75	420 00 075 2	10
90	420 00 090 2	10
110	420 00 110 2	10
140	420 00 140 2	10
160	420 00 160 2	10
200	420 00 200 2	10
225	420 00 225 2	10

PP -SET



PP-STAINLESS 304



PP-STAINLESS 316



PP-REDUCTOR THREAD WITHOUT FLANGE



PP-REDUCTOR THREAD-SET



PP-REDUCTOR THREAD SET 304 STAINLESS



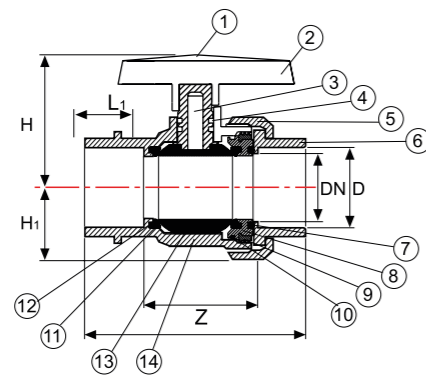
PP-REDUCTOR THREAD-SET 316 STAINLESS



UNILATERAL VALVE

9) SINGLE SIDE VALVE

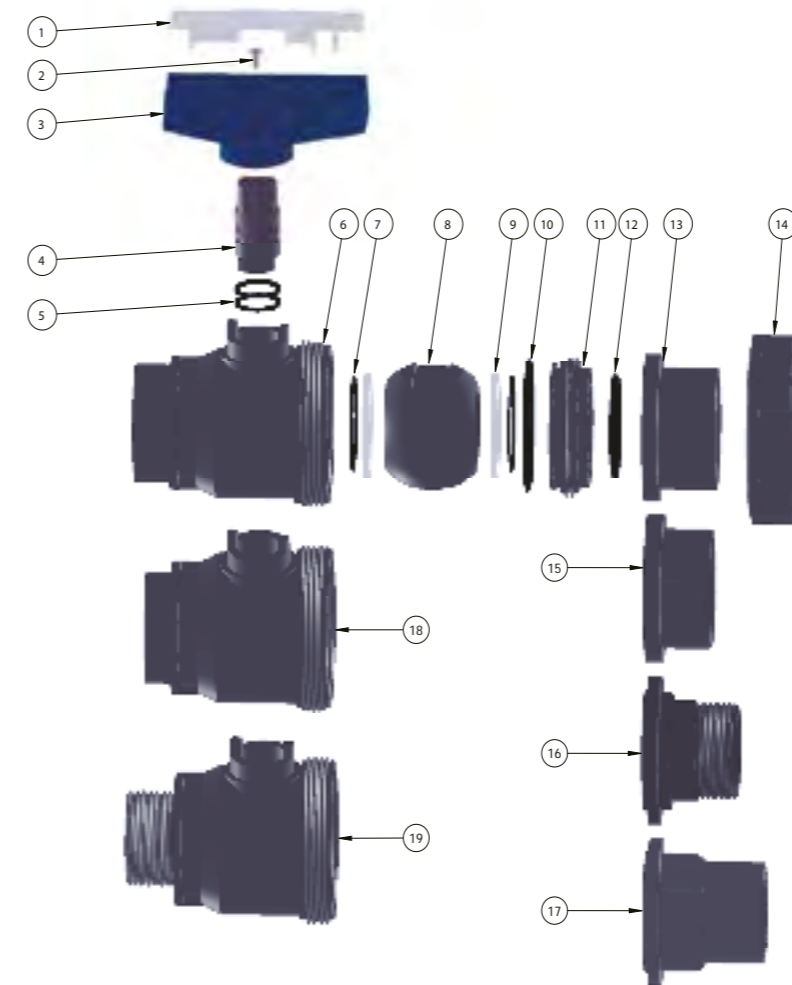
U-PVC Y.M. Ball Single Side Valve (Both Sides solvent Cement Socketed)



No	Part	Material	Number
1	Handle Cover	U-PVC	1
2	Handle	ABS	1
3	Step	U-PVC	1
4	Step O-Ring	EPDM-FPM	2
5	Union Nut	U-PVC	1
6	Fitting	U-PVC	1
7	Body O-Ring	EPDM-FPM	1
8	Tightening Piece	U-PVC	1
9	Ball Bush	U-PVC	1
10	Tightening Piece	EPDM-FPM	1
11	Ball Seal	HDPE-FPM	2
12	Backing Seals O-Ring	EPDM-FPM	2
13	Ball	U-PVC	1
14	Body	U-PVC	1

Diameter	BSP (Inch)	PN	DN (mm)	z (mm)	L1 (mm)	L (mm)	H (mm)	H1 (mm)	Kg / Pieces	Parcel / Pieces
20	1/2"	16	15	38	16	78	47	27	0.106	55
25	3/4"	16	20	42	19	87	52	31	0.141	56
32	1"	16	25	50	22	100	63	33	0.193	60
40	1 1/4"	16	32	63	25	114	67	42	0.308	30
50	1 1/2"	16	40	71	31	136	86	46	0.508	24
63	2"	16	50	86	38.5	166	101	58	0.910	12
75	2 1/2"	16	65	97	47	195	110	73	1.124	9
90	3"	16	80	121	51	229	137	89		4
110	4"	16	100	117.5	61	270	150	105		2

Injection Product



No.	Part	Material	Price / Pcs.
1	Handle Cover	U-PVC	
2	Screw	INOX	
3	Handle	ABS	
4	Step	U-PVC	
5	Step O-Ring	EPDM	
6	Body	U-PVC	
7	Backing Seals	EPDM	
8	Ball	U-PVC	
9	Ball Gasket	HDPE	
10	Bush O-Ring	EPDM	
11	Union Bush	U-PVC	
12	Body O-Ring	EPDM	
13	Adaptor	U-PVC	
14	Union Nut	U-PVC	
15	Internal Threaded Adaptor	U-PVC	
16	Male Thread Adaptor	U-PVC	
17	Female Male Cement Socketed Adaptor	U-PVC	
18	İç Diş Gövde / Body	U-PVC	
19	Diş Diş Gövde / Body	U-PVC	

BALL VALVE CONFIGURATION TABLE

BALL VALVE CONFIGURATION TABLE			
Malzeme / Material ↓			
PVC-U	PVC-C	PP-H	
Dimensions ↓			
DN 10 3/8" DN 15 1/2" DN 20 1/4" DN 25 1" DN 32 1 1/4" DN 40 1 1/2" DN 50 2 1/2" DN 80 3" DN 1000 4"			
Seals ↓			
EPDM		FPM	
Ball Seal ↓			
PTFE			
FLANGE ADAPTOR	PUSH - FIT	THREADED FLANGE ADAPTOR	FLANGE Connections ↓
PVC-U Flange Adaptor - Metric	Compression Outlet	PVC-U Female thread flange adaptor	PVC-U Flange - Metric
PVC-U Flange Adaptor - Inch ASTM	Latch pipe socket	PP Female thread Flange Adaptor with Fiber Glass	PVC-U Flange - ANSI/ASTM PP Fiber Glass Flange - Metric
PVC-U Flange Adaptor - Inch BS		Brass Female thread Flange Adaptor	PP Flange - ANSI
PP-H Flange Adaptor Welded - Metric		Brass male thread Brass Flange Adaptor	
PP-H Flange Adaptor Welded - Inch ASTM			
PE 100 - Flange Adaptor Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			
	With Coupling	PVC-U Female Threaded Flange Adaptor	PVC-U Flange - Metric
PVC-U Flange Adaptor - Metric	With Latch Socket	PP - Glass Fibre Female Threaded Flange Adaptor	PVC-U Flange - ANSI/ASTM PP-Glass Fibre Flange - Metric
PVC-U Flange Adaptor - Inch ASTM		Brass Female Threaded Flange Adaptor	PP Flange - ANSI
PVC-U Flange Adaptor - Inch BS		Brass Male Threaded Flange Adaptor	
PP - H - Flange Adaptor Metric			
PP - H Flange Adaptor - Inch AST			
PE 100 - Flange Adaptor - Metric			
PVC-C Flange Adaptor - Inch ASTM			
ABS Flange Adaptor - Metric			
Handle ↓			
Blue for water	Magenta for acid	With lockable handle for valve Ø63 / Ø75 / Ø90 / Ø110	
Electric Actuator ↓			
24 V AC / DC	110 - 260 V AC / DC		
Pneumatic Actuator ↓			
Tek Etkili Açma Emniyetli. Single acting open safe.		Çift Etkili. / Double Acting	
Tek Etkili Kapama Emniyetli. / Single acting close safe.			

U-PVC SINGLE UNION BALL VALVE BOTH SIDES SOLVENT CEMENT SOCKETED



BOTH SIDES SOLVENT CEMENT SOCKETED



BOTH SIDES FEMALE THREADED



SINGLE SIDE MALE THREADED



SINGLE SIDE FLANGED SINGLE SIDE MALE THREADED



DOUBLE SIDE COUPLING



SINGLE SIDE COUPLING SINGLE SIDE SOLVENT CEMENT SOCKETED



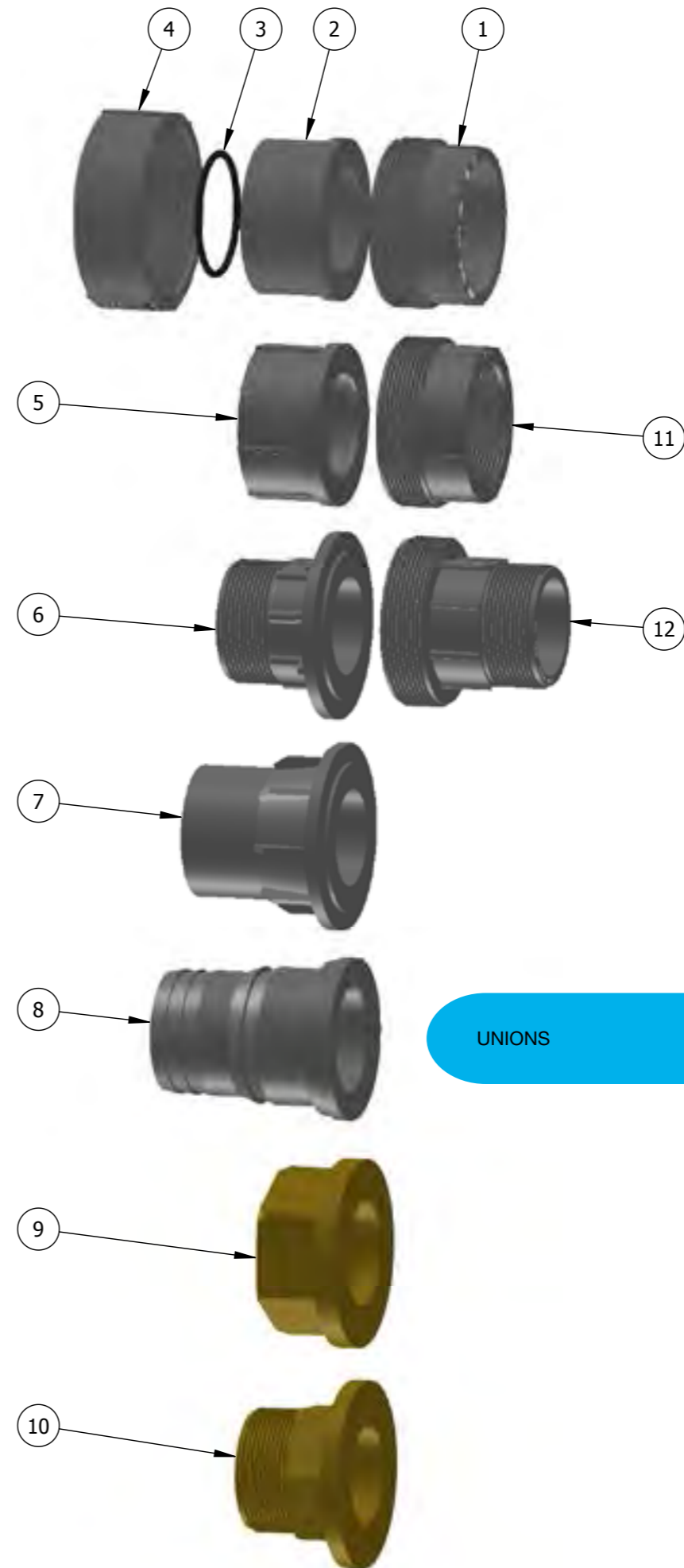
SINGLE SIDE COUPLING SINGLE SIDE FEMALE THREADED



SINGLE SIDE COUPLING SINGLE SIDE MALE THREADED



SINGLE SIDE FLANGE-SINGLE SIDE COUPLING



UNIONS

10) PIPE UNIONS

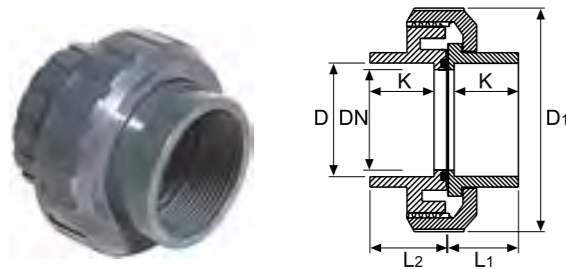
Adaptor unions to couple plastic pipe components

Where available, pipe unions are preferred option for plastic pipe connections rather than flange adapters. Without metal parts, corrosion is beyond the question and weight is also decreased. In addition, smaller external diameter indicates that distance from pipe axis to pipe axis is smaller in comparison to a flange connection.

Pipe unions are made of several materials:

10A) PVC-U

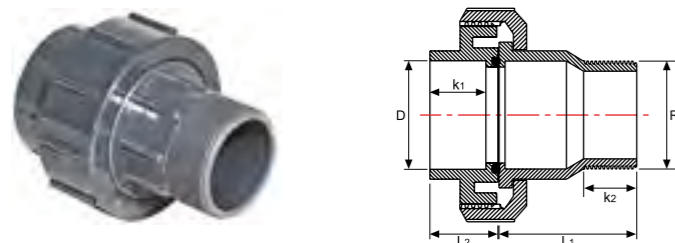
U-PVC Solvent Cement Socketed Pipe Union



Diameter	DN (mm)	D1 (mm)	L1 (mm)	L2 (mm)	K (mm)	Kg / Pieces	PN
16	12	53	17	24	14	0.065	16
20	15	54	19	24	16	0.051	16
25	20	62	22	27	19	0.074	16
32	25	65	25	30	22	0.086	16
40	32	83	28	36	26	0.158	16
50	40	93	34	42	31	0.206	16
63	50	116	41	52	38	0.380	8
75	65	129	47	54	44	1.586	9
90	80	155	56	61	51	1.340	10
110	100	178	66	71	61	2.020	10

Injection Product

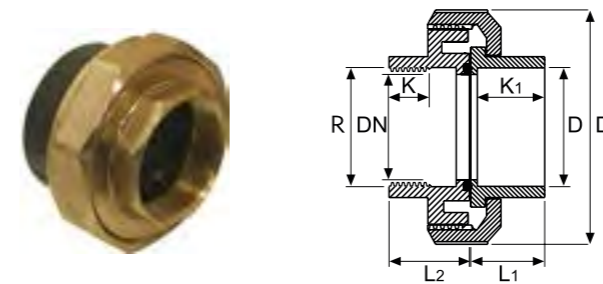
U-PVC Pump Pipe Union (Male Threaded)



Diameter	R	DN (mm)	D (mm)	L1 (mm)	L2 (mm)	K1 (mm)	K2 (mm)	Kg / Pieces	PN
50	1 1/2"	40	50	81	45	31	22	0.236	16
63 x 50	1 1/2"	50	63	61	55	38	22	0.376	16
63	2"	50	63	72	55	38	27	0.390	16

Injection Product

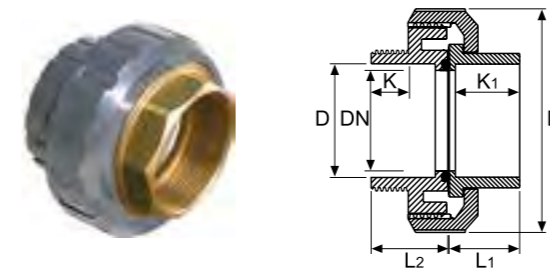
U-PVC Y.M. Outlet Brass Female Thread Pipe Union



Diameter	R	DN (mm)	D1 (mm)	L1 (mm)	L2 (mm)	K (mm)	K1 (mm)
20	1/2"	15	36	19	14	16	16
25	3/4"	20	45	22	15	18	19
32	1"	25	51	25	17	21	22
40	1 1/4"	32	64	28	24	23	26
50	1 1/2"	40	80	34	22	31	31
63	2"	50	98	41	23	31	38

Injection Product

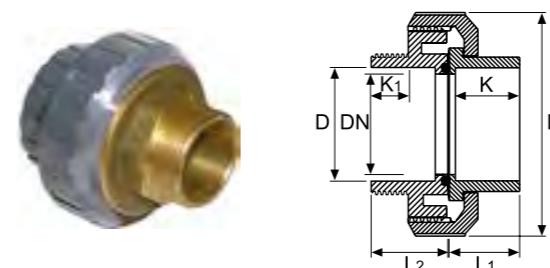
U-PVC Y.M. Pipe Union Brass Female Thread Port



Diameter	R	DN (mm)	D1 (mm)	L1 (mm)	L2 (mm)	K (mm)	K1 (mm)
20	1/2"	15	36	19	14	16	16
25	3/4"	20	45	22	15	18	19
32	1"	25	51	25	17	21	22
40	1 1/4"	32	64	28	24	23	26
50	1 1/2"	40	80	34	22	31	31
63	2"	50	98	41	23	31	38

Injection Product

U-PVC Y.M. Pipe Union Brass Male Thread Port



Diameter	R	DN (mm)	D1 (mm)	L1 (mm)	L2 (mm)	K (mm)	K1 (mm)
20	1/2"	15	15	19	25	16	16
25	3/4"	20	20	22	29	18	19
32	1"	25	25	25	32	21	22
40	1 1/4"	32	32	28	39	23	26
50	1 1/2"	40	40	34	45	31	31
63	2"	50	50	41	55	31	38

Injection Product

10B) PP PIPE UNIONS



GRAY



WHITE



GREEN



FEMALE THREADED



PP BRASS FEMALE THREADED PIPE UNION



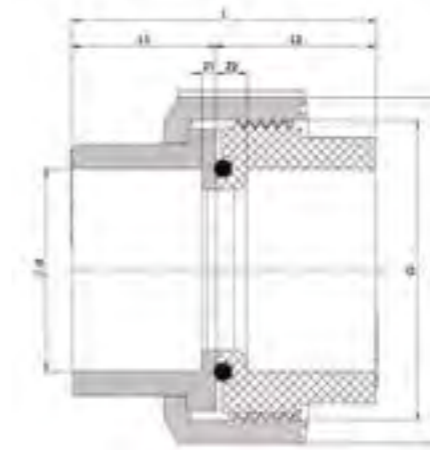
PP BRASS MALE THREADED PIPE UNION



BRASS FEMALE THREAD



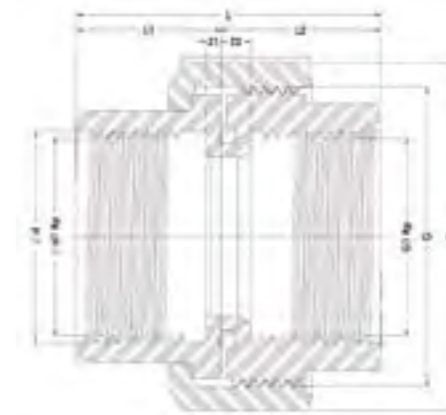
SPECIAL PIPE UNION BOTH SIDES SEALED



Ød	G	D	L	L1	L2	Z1	Z2
20	1"	40	41.5	20	21.5	3	5.5
25	1 ¼"	49	46.5	21.5	25	3	5.5
32	1 ½"	55	54	25	29	3	6
40	2"	69	62	29	33	3	6
50	2 ¼"	76	72	34	38	3	6
63	2 ¾"	94	86	41	45	3	7
75	3 ½"	118				3	
90	4"	132				5	
110	5"	161				5	

"D" size refers to pipe nail bottom size.

SPECIAL PIPE UNION BOTH SIDES FEMALE THREADED



Ød	G	D	L	L1	L2	Z1	Z2	G1	d1
20	1"	40	40.5	19	21.5	3	5.5	Rp ½"	Rp ½"
25	1 ¼"	49	45.5	21.5	24	3	5.5	Rp ¾"	Rp ¾"
32	1 ½"	55	53	25	28	3	6	Rp 1"	Rp 1"
40	2"	69	61	29	32	3	6	Rp 1 ¼"	Rp 1 ¼"
50	2 ¼"	76	71	34	37	3	6	Rp 1 ½"	Rp 1 ½"
63	2 ¾"	94	86	41	45	3	7	Rp 2"	Rp 2"
75	3 ½"	118		46.5		3		Rp 2 ½"	Rp 2 ½"
90	4"	132		56		5		Rp 3"	Rp 3"
110	5"	161		66		5		Rp 4"	Rp 4"

"D" size refers to pipe nail bottom size.

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ

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General Remarks for Installation

In order to prevent unknown stress during installation, unions with sealing rings must be used where applicable. Do not tight union nut manually. Generally wrenches used in steel pipe production are not allowed. For large-sized ones, a pipe wrench with belt may be used. Pay attention to perform the installation with low-stress while using the unions. As bending load will result in leakages within the area where there are flexible sections and/or expansion joints, flange joints will not be used.



Tip: Dampen the union nut in order to facilitate the installation of the union

Installation tips for PP, PE pipe unions in sizes of d 75, d90 and d110

The most recent generation of plastic pipe unions, manufactured from foregoing materials and with sizes is equipped with modern, plastic weighted buttress thread. And this means that you now have a product with safety reserves and nominal pressure of which has been significantly increased. At the same time butt fusion models are also new. In this respect, some issues must be taken into consideration.

Thread on coupling nut and pipe union bush, made of Polypropylene and polyethylene was reprocessed!

When used as a single piece, please check if the thread of pipe union body and coupling nut is screwed to each other before mounting. We recommend;

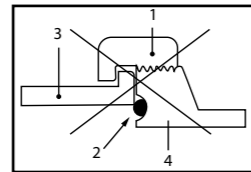
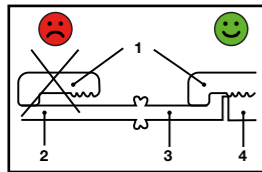
- Trapezoidal threaded pipe union body on trapezoidal threaded coupling nut or
- Buttress threaded pipe union body on buttress threaded coupling nut

Welding invoice in the pipe unions for butt fusion

Fusion application to entire pipe union if possible for d90 and d110 sizes as it will not be possible to slide pipe union nut on fusion welding lip after fusion process (or sliding pipe union nut to the ring of pipe union flange adaptor).

Only use pipe union flange adaptors or pipe union bodies with the same nominal diameter.

As indicated in the figure, it is not allowed to couple a pipe union body with butt fusion in sizes of d75 with A pipe union flange adaptor with butt fusion in sizes of d90 as it may result in leakage.



1. Union nut
2. Pipe
3. Union flange adaptor
4. Pipe union body

1. Union nut, d75
2. Inadequate gasket
3. Butt fusion pipe union flange adaptor, d90
4. Butt fusion pipe union body, d75

Pipe unions for adaptor connections made from different plastics

Component parts of butt fusion union pipe, made of PE, PP, (d20 – d63) materials may be sealed with each other as well as PVC pipe union.

This is not applicable to larger sizes (d75-d110).

Pipe union body and pipe union nut must be made of the same material. Valve flange adaptor may be manufactured from a different material.



Adaptor pipe unions between plastic and metal pipes (malleable iron pipe union flange adaptor)

Fittings include several adaptor and threaded fittings. In order to connect plastic pipe components with metal pipes, fittings or valves with threaded joints, adaptor unions with metal connections are preferred.

Insulation in metal thread may be performed with hemp or a PTFE band.

For the following plastics, these adaptor unions with EPDM or FPM o-rings are available: Other material combinations are supplied upon request.

Remark: In order to avoid electrochemical corrosion, preferably malleable iron fittings must be used in steel transitions, and brass fittings must be preferably used in non-ferrous metal transitions.

In the following industries, adaptor pipe unions, made of several materials from stainless steel to PVC-U plastics (additional plastics may be coupled from standard single parts) can be used.

- Chemical industry
- Food industry
- Automotive industry
- Swimming pool construction
- Metal surface finishing technology
- Cooling and air-conditioning

Product Specifications

Sealing of transition specific to plastic is ensured through o-ring seals, made of EPDM or FPM materials. Stainless steel, which is the material that the pipe union flange adaptors are made of, (also the cover edges in fusion models) is an austenite steel with molybden mixture (V4A) that provides high resistance to abrasion. This alloy is also resistant to rust and acid. Therefore, it is very suitable for use in industrial applications and hard environments. Low carbon content and good fusion characteristic obtained accordingly are the other advantages of this material. Plastic or stainless steel union adaptor is available in three alternative connections, namely female thread, male thread and fusion edge connection. In any case, it is d 16-3/8" - d63-2" in size.

Adaptor unions between plastic and non-ferrous pipes (brass union edge)

Preferably brass adaptor pipe unions must be used in order to connect plastic pipe to the pipes, made of non-ferrous metals, fittings or valves with threaded connections.

Insulation in brass thread may be performed with hemp or a PTFE band.

For the following plastics, these adaptor pipe unions with EPDM or FPM o-rings are available;

Other plastics are supplied upon demand.

Remark: In order to avoid electrochemical corrosion, preferably malleable iron fittings must be used in steel transitions, and brass fittings must be preferably used in non-ferrous metal transitions.

R tapered male pipe threaded adaptor fittings

R tapered male pipe threaded adaptor fittings enables to connect both plastic and metal pipes each other as well as plastic pipes.



See detailed information provided for some products in respective products range.

Threaded fittings with Rp parallel female thread

Threaded fittings with Rp parallel female thread, and made of PVC-U materials enable to connect plastic pipes each other. Some models of such threaded fittings are indicated below:



Installation tips regarding adaptor and threaded fittings

It is particularly important that pipe installation should be low-voltage. Avoid using adaptor or threaded fittings at the points that are exposed to bending stress in pipe systems.

In major circular temperature changes, adaptor unions are a preferable option.



Attention: In order to avoid the damages in plastic fittings Remove any flanges (if any) in the area where metal thread is located.

Adaptor and threaded fittings are mostly tightened manually. Never apply force when plastic fittings are installed. Using a proper tool, fittings are tightened until one or several thread pitches are seen.

It is recommended to use PTFE band in plastic and threaded fittings in order to ensure sealing. Alternatively, it is also possible to use Henkel Tangit Uni-Lock or Loctite 55 thread tightness gel and/or Loctite 5331 thread tightness cement. Please, comply with proper installation regulations of the manufacturer.

In case of use of other sealing/tightness materials, first check if such are in compliance with the plastics to be used.



Attention: Never use hemp! When hemp is used, over load to plastic fittings or damage risk to thread is possible. At the same time hemp is not resistant to chemical substances based on the utilized material.

Adaptor fittings to join plastic piping systems and metal threads

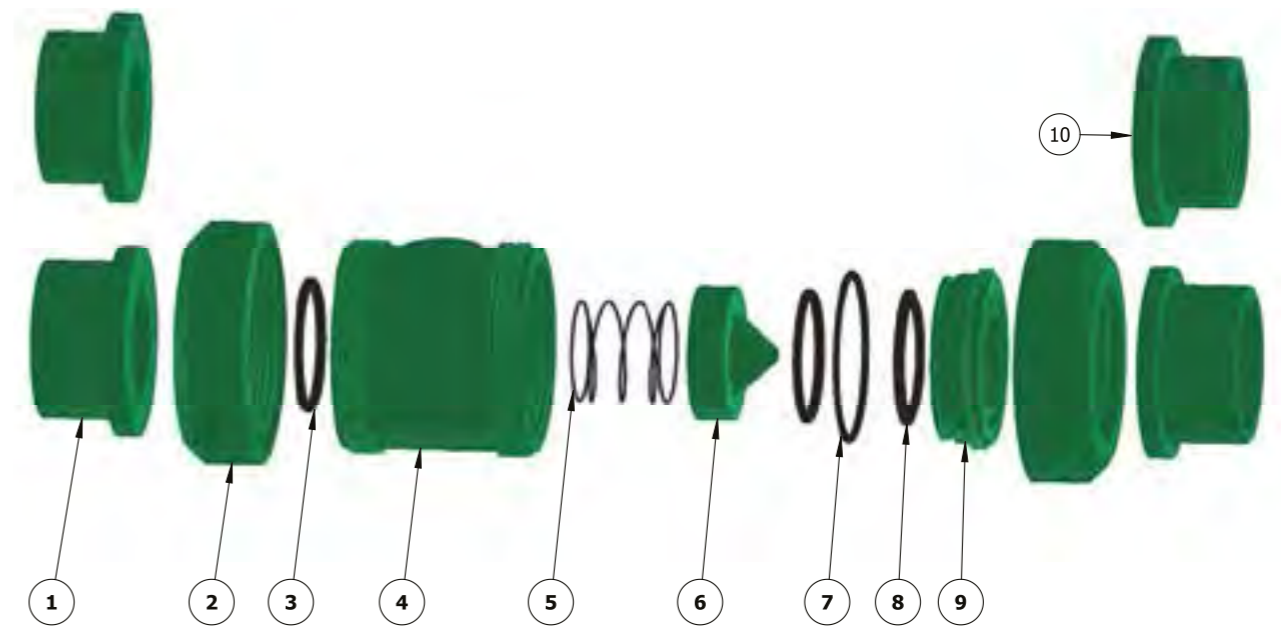
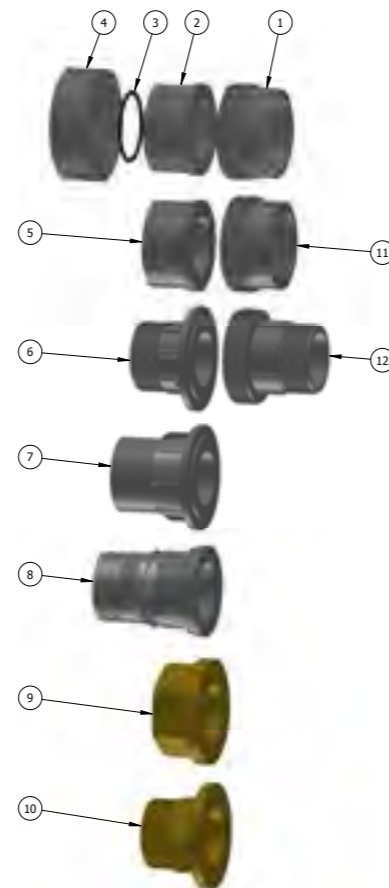
Adaptor fittings, used to combine plastic piping systems and metal threads offers the biggest possible flexibility to mount with union or socket, sealed in plastic end.

An EPDM O-ring is used for adaptor fittings. It also functions as a protector against deformation to prevent damage to plastic during installation. In comparison to normal adaptor unions, special connection technology with a safety segment also guarantees increased sealing while temperature changes or during quakes.

These fittings are also used to attach pressure gauges to metal pipes in addition to passage to metal pipes.

U-PVC Union Spare Parts List

No.	Part	Material
1	Pipe Union Body	U-PVC
2	Adaptor	U-PVC
3	Gövde O-Ring / Body O-Ring	EPDM / FPM
4	Somun / Nut	U-PVC
5	Female Thread Adaptor	U-PVC
6	Male Thread Adaptor	U-PVC
7	External Sealing Adaptor	U-PVC
8	Hose Adaptor	U-PVC
9	Female Thread Adaptor	BRASS
10	Male Thread Adaptor	BRASS
11	Female Thread Pipe Union Body	U-PVC
12	Male Thread Pipe Union Body	U-PVC



CHECK VALVES

11)CHECK VALVES

11A) SPRING CHECK VALVES

11-A-1) U-PVC Solvent Cement Socketed Spring Check Valve



Principles for check valves

General overview

Product Description

Everything is under control with recent check valve by PIMTAŞ Piping Systems. Combines increased safety and efficiency with new design and ease of use. Check Valves paved the way for new generation valves thanks to safety, simplicity and efficiency. A milestone for valve technology. Broad product range of check valves is compatible with all piping systems. For water treatment, chemical process industry or cooling operations, PIMTAŞ valves are available almost anywhere where confidence and performance is required. Multiple material selection and resistance to high pressure level make check valves fulfill the requirements of many shared applications. Self-close function of valve and silent operation defines its safety and comfort.

Versions

All types have dimensions between DN10 and DM100.

Product Specifications

Everything is under control with recent check valve by PIMTAŞ piping systems. Combines increased safety and efficiency with new design and ease of use.

Safety

- When the valve is in standby mode, spring inside the valve guarantees 10% tightness in a horizontally assembled manner and without ambient pressure
- It is 100% leak proof in (spring) 2m water column.
- Double bearing prevents compression of control cone.
- Seal remains in the same position in a way to have been fixed with a support ring. This avoids sliding, bending or wear of seals.
- Corrosion resistance

Simplicity

- Check valves are self-close. An energy supply different than current ambient pressure is required in order to open or close the valve at any time.
- Same installation length with that of ball valve

Efficiency

- Thanks to aerodynamic design of control cone, valve enables much higher flow rate in comparison to standard ball check valves.

Thanks to wide range of options, you can be confident to have the perfect check valve that fits your requirement:

- All coupling methods can be used and nothing desired is left without being fulfilled.
- Based on your application area, it is possible to make a choice between several types of valve body, cone and spring materials.
- In new-generation check valves, ISO, BS, ASTM, ANJS VE JIS connection standards are available.

PIMTAŞ Piping Systems ensure that check valves are safe, efficient and that material is easily transported

WARNING

Arrows

Arrow inside the valve hose indicated the direction of the flow For application with vertical flow, only upward flow is allowed, in other words, the arrow must indicate upwards. If installed in the reverse direction, closing function is not guaranteed and severe injuries may take place ultimately.

- In compliance with arrow information and description

WARNING

Connection Methods

In welded or sealed connections only identical materials can be connected. Failure to comply with these issues may result in severe injuries.

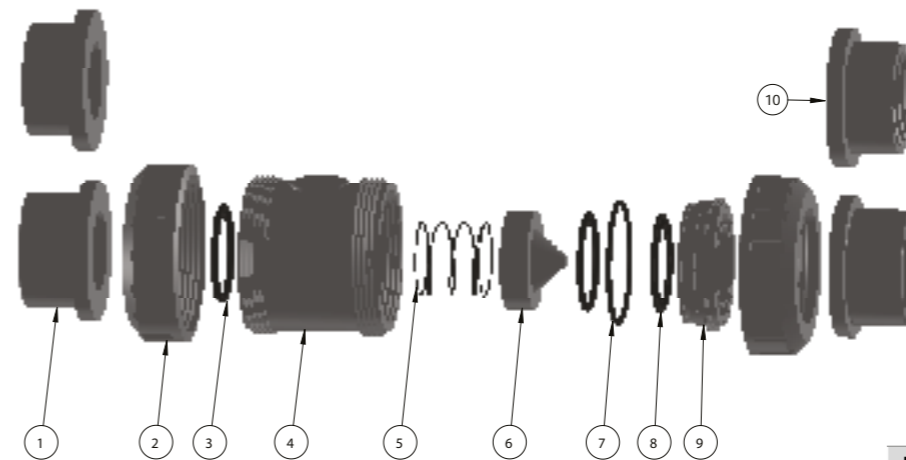
- Pipe parts with adhesive joints must be filled with unpressurized water as soon as possible once their connections are completed
- Linkage nuts on the valve "must be tightened up to a tightness" of manual tightening.

ATTENTION

Opening Closing Conditions

- Information in the table is applicable to an water with a density of around 1g/cm³ or a similar environment If an ambient with a higher density is used, make sure that cone may float based on the utilized material and that cone has no function
- Values for opening requirements are applicable to vertical installation (-> suggested installation position). For horizontal installation, valve is opened at a much lower differential pressure.

Dismantled View

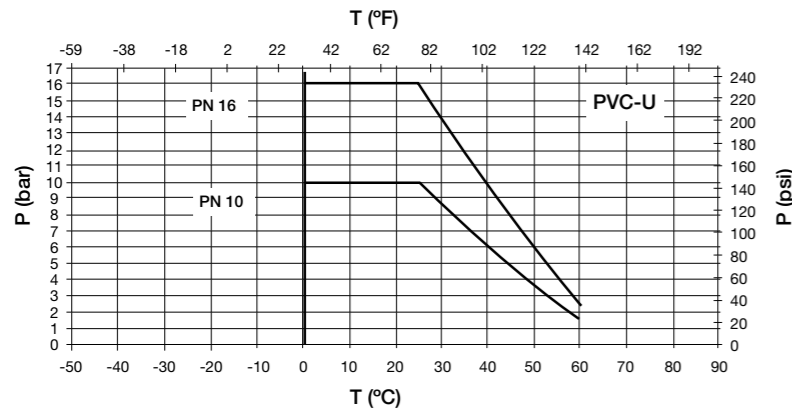


No.	Part	Material
1	Flange Adaptor	U-PVC
2	Somun / Union Nut	U-PVC
3	Body O-Ring	EPDM
4	Gövde / Body	U-PVC
5	Yay / Spring	Stainless Stell 316
6	Klapa / Valve disc	U-PVC
7	Bush O-Ring	EPDM
8	Klapa O-Ringi / Valve disc O-Ring	EPDM
9	Küre Dayama / Union Bush	U-PVC
10	Female Thread Flange Adaptor	U-PVC

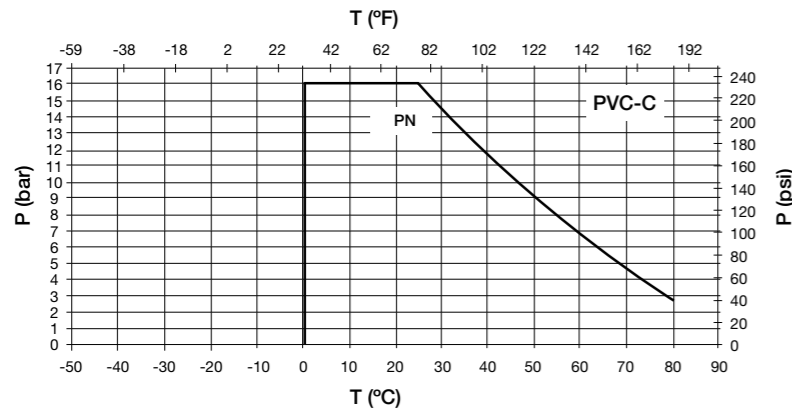
Technical Data

Pressure Temperature Diagram

Following pressure-temperature diagrams are based on water or similar material according to a service life for 25 years

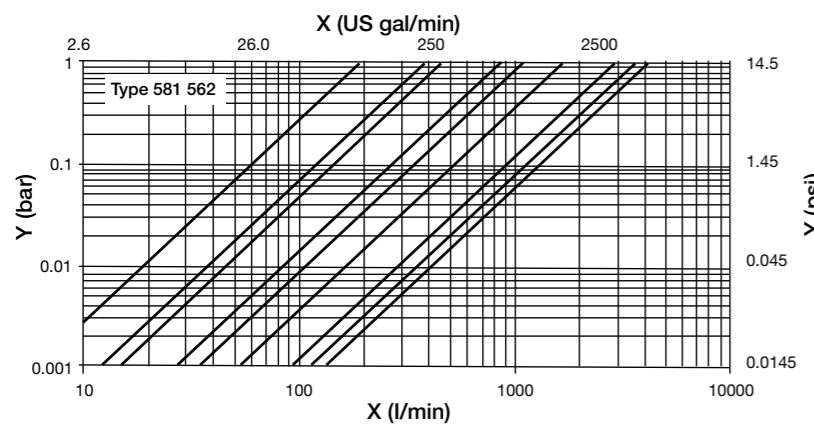


P Allowed pressure, as psi
T Temperature °C, °F



P Allowed pressure as bar, psi
T Temperature °C, °

PRESSURE LOSS



X Flow Rate (l/min, US gal/min)
Y Pressure Loss Δp (bar, psi)

Opening and Closing Conditions

DN	Open (Vertical Installation)				Closing*	
	Differential pressure for cone beginning (bar)	Differential pressure for Cone full impact (bar)	Min flow for Cone full impact (l/dk)	Min flow rate for cone full impact (m/sn)	Tightening (bar)	Tightening (bar)
10	0,003	0.01	8	0.7	0.2	0.1
15	0,003	0.01	9	0.7	0.2	0.1
20	0,003	0.01	13	0.7	0.2	0.1
25	0,005	0.01	18	0.8	0.2	0.1
32	0,005	0.01	35	0.8	0.2	0.1
40	0,010	0.01	70	0.8	0.2	0.1
50	0,020	0.01	100	0.8	0.2	0.1
65	0,025	0.01	120	0.9	0.2	0.1
80	0,030	0.01	170	0.9	0.2	0.1
100	0,030	0.08	250	10	0.2	0.1

* Vertical and Horizontal Installation

Material
ABS
PP-TV 20 (Corine: PP-)
PP-H
PVC-U
PVC-C
PVDF

References for screw tightening torques

d	DN	Inch	Total number of screws	Torque flat gasket		Torque profile gasket *	
				(Nm)	(lbft)	(Nm)	(lbft)
20	15	1/2	4 x M 12x50	10	7.4	10	7.4
25	20	3/4	4 x M 12x55	10	7.4	10	7.4
32	25	1	4 x M 12x60	15	11	10	7.4
40	32	1 1/2	4 x M 16x65	20	15	15	11
50	40	1 1/4	4 x M 16x70	25	18	15	11
83	50	2	4 x M 16x75	35	26	20	15
75	65	2 1/2	4 x M 16x90	50	37	25	18
90	80	3	8 x M 16x100	30	22	15	11
110	100	4	8 x M 16x130	35	26	20	15

kv 100 values

DN mm	DN Inch	d mm	kv 100 L/min (Δp=1 psi)	kv 100 m³/h (Δp=1 bar)
10	3/8"	16	190	11
15	1/2"	20	190	11
20	3/4"	25	380	23
25	1"	32	460	28
32	1 1/4"	40	850	51
40	1 1/2"	50	1080	65
50	2"	63	1670	100
65	2 1/2"	75	2950	177
80	3"	90	3600	216
100	4"	110	4150	249

Chemical Resistance of Springs

Chemical resistance at 20 °C (Applications may change based on concentration.)		Springs		
	Chemicals	Steel 1.4301 V2A	Steel / Halar® coated 1 4301 V2A	Nimonic 90 2.4632
Acids	Oxidant (HNO ₃ , H ₂ CrO ₄ , vb.)	o	+	o
	Inorganic (HCl, H ₂ SO ₄ , vb.)	-	+	o
	Organic (formic acid, acetic acid, citric acid, etc.)	-	+	o
Bases	Inorganic (NaOH, KOH, vb.)	+	+	+
Salts	NaCl, FeCl ₂ , FeCl ₃ , CaCl ₂ , vb.	o	+	o
Halogens	Chlorine, bromine, iodine, (no fluorine)	-	+	o
Fuels/Oils	Aliphatic hydrocarbons	+	+	+
	Aromatic hydrocarbons	+	+	+
Solvents	Chlorinated hydrocarbons	o	o	+
	Ketones	+	+	+
	Alcohols	+	+	+
	Esters	+	+	+
	Aldehyde	+	+	+
Phenols		o	+	+
Oxidizing agents	NaOCl, ozone, etc.	o	+	+
Glycol		+	+	+

+ Good

o resistant upon conditions please consult us

- having low resistance

Foregoing list was designed as a guide only and it doesn't stand for a close examination of financial regularity for a certain application.

Information is based on experience and cutting edge-technology. These data are only the general indicators of the application. Other factors such as concentration, pressure and coupling must also be considered. Technical data are binding and they do not explicitly guarantee the product characteristics. We are glad to help you with material selection.

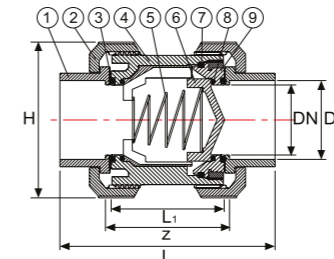
Usage Instructions

Maintenance

Check valves are maintenance-free under normal operating conditions. It is enough to control periodically if there are no leaks. In case of leaks or other malfunctions, Follow the instructions under <<Safety Information>> . A function test is recommended for the check valves, which are permanent in the same position for 1-2 years for the ease of service.

DN	Differential pressure to lift up the cone
mm	(Bar)
10	0,028
15	0,028
20	0.03
25	0.03
32	0,035
40	0.04
50	0.05
65	0.06
80	0.06
100	0.06

11A-1) U-PVC Y.M. Socketed Spring Check Valve



No.	Part	Material	Number
1	Pipe Connection	U-PVC	2
2	Union Nut	U-PVC	2
3	Body	EPDM	2
4	Body O-Ring	U-PVC	1
5	Spring	Stainless Steel 316	1
6	Disc	U-PVC	1
7	Tightening Piece O-Ring	EPDM	1
8	Disc-Ring	EPDM	1
9	Tightening Piece	U-PVC	1

Diameter	DN (mm)	BSP (Inch)	H (mm)	L (mm)	L1 (mm)	z (mm)	Kg / Pieces	PN
16	12	3/8"	54	80	42	50	0.123	16
20	16	1/2"	54	83	45	52	0.108	16
25	20	3/4"	62	96	50	56	0.150	16
32	25	1"	66	106	54	60	0.192	16
40	32	1 1/4"	84	125	65	71	0.356	16
50	40	1 1/2"	92	145	75	82	0.548	16
63	50	2"	116	172	90	95	0.918	16
75	65	2 1/2"	128	205	111	118	1.266	16
90	80	3"	180	240	127	137	3.146	16
110	100	4"	212	284	152	162	4.578	16

Injection Product

SINGLE SIDE FEMALE THREADED



DOUBLE SIDES FEMALE THREADED



DOUBLE SIDES COUPLING



SINGLE SIDE COUPLING-SINGLE SIDE THREADED



DOUBLE SIDES FLANGES



11A-2) PP SPRING CHECK VALVE-(WHITE-BLUE-BEIGE-GREEN)

SOLVENT CEMENT SOCKET



SINGLE SIDE FEMALE THREAD



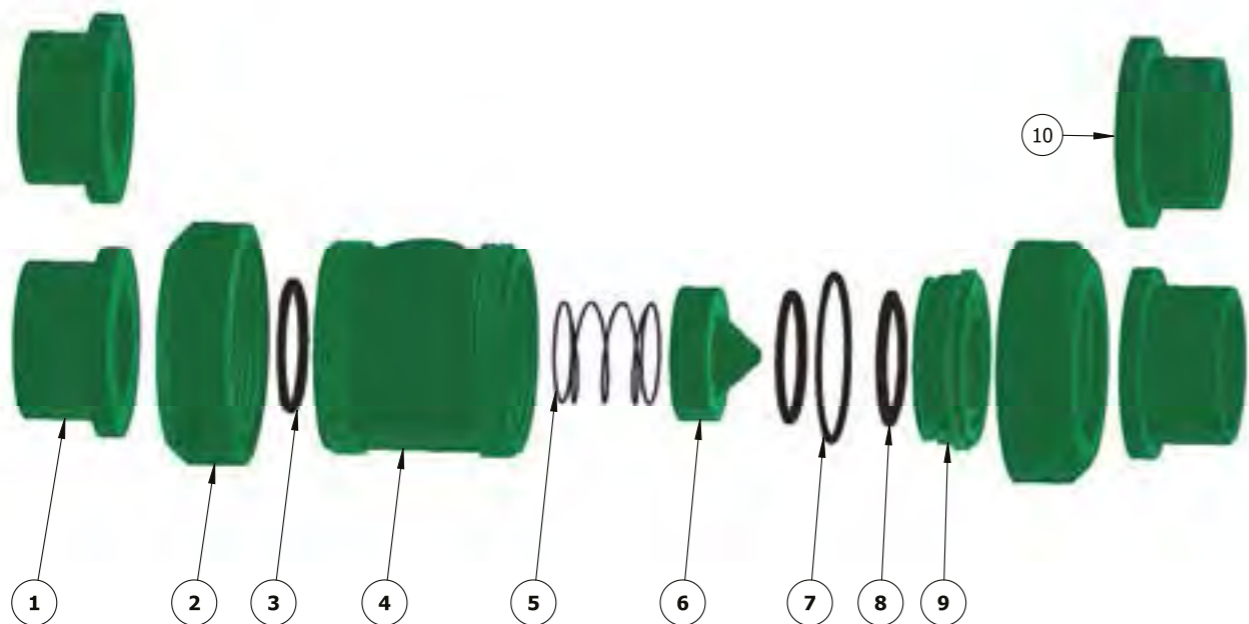
DOUBLE SIDES FEMALE THREAD



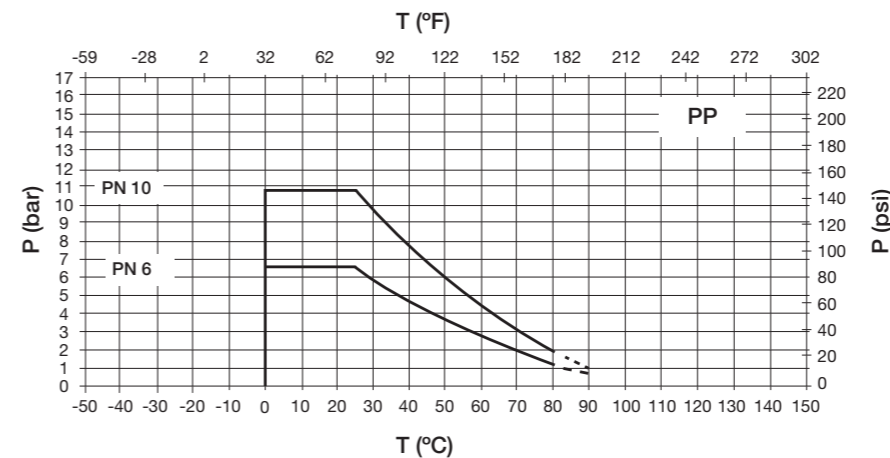
FLANGE CONNECTION



PP SPRING CHECK VALVE (WHITE-BLUE-BEIGE-GREEN)



No.	Part	Material
1	Somun / Union Nut	PPRC
2	Bağl. Parçası / End Connector	PPRC
3	Bağl. Parçası / End Connector Thr.	PPRC
4	Gövde O-Ringi / Body O-Ring	EPDM
5	Gövde / Body	PPRC
6	Yay / Spring	INOX
7	Subap / Valve	PPRC
8	Subap O-Ringi / Carrier O-Ring	EPDM
9	Subap Dayama / Valve Bush	PPRC
10	Sıkıtırma O-Ringi / Carrier O-Ring	EPDM



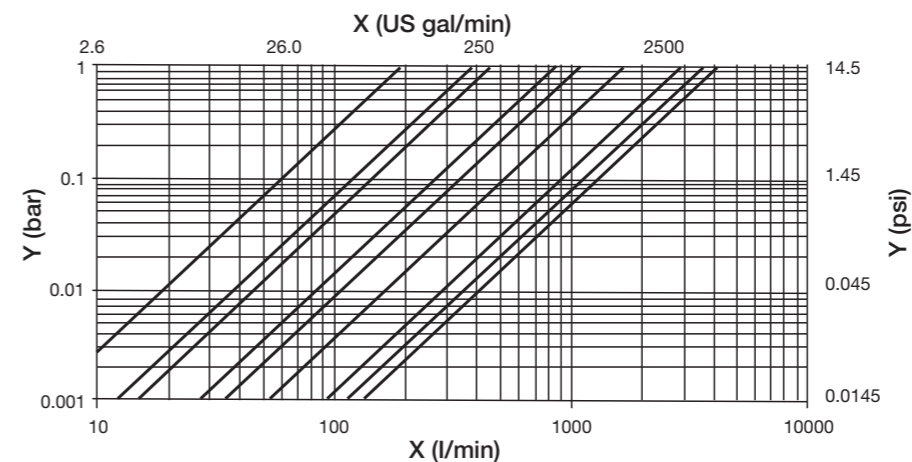
P Allowed pressure as bar, psi

T Temperature °C, °F

1.) E.g., Check valves with PP or PE 100 SDR17 cap

In temperatures, applications within the range of dotted-lines, contact your PIMTAŞ representative.

Pressure Loss



X Flow Rate (l/min, US gal/min)

Y Pressure Loss Δp (bar, psi)

Opening and Closing Conditions

DN	Open (Vertical Installation)				Closing*	
	Differential pressure for cone beginning (bar)	Differential pressure for Cone full impact (bar)	Min flow for Cone full impact (l/dk)	Min flow rate for cone full impact (m/sn)	Tightening (bar)	Tightening (bar)
10	0,003	0.01	8	0.7	0.2	0.1
15	0,003	0.01	9	0.7	0.2	0.1
20	0,003	0.01	13	0.7	0.2	0.1
25	0,005	0.01	18	0.8	0.2	0.1
32	0,005	0.01	35	0.8	0.2	0.1
40	0,010	0.01	70	0.8	0.2	0.1
50	0,020	0.01	100	0.8	0.2	0.1
65	0,025	0.01	120	0.9	0.2	0.1
80	0,030	0.01	170	0.9	0.2	0.1
100	0,030	0.08	250	10	0.2	0.1

*Vertical and Horizontal Installation

Material
ABS
PP-TV 20 (Corine: PP-)
PP-H
PVC-U
PVC-C
PVDF

References for screw tightening torques

d	DN	Inch	Total number of screws	Torque flat gasket		Torque profile gasket *	
				(Nm)	(lbft)	(Nm)	(lbft)
20	15	1/2	4 x M 12x50	10	7.4	10	7.4
25	20	3/4	4 x M 12x55	10	7.4	10	7.4
32	25	1	4 x M 12x60	15	11	10	7.4
40	32	1 1/2	4 x M 16x65	20	15	15	11
50	40	1 1/4	4 x M 16x70	25	18	15	11
83	50	2	4 x M 16x75	35	26	20	15
75	65	2 1/2	4 x M 16x90	50	37	25	18
90	80	3	8 x M 16x100	30	22	15	11
110	100	4	8 x M 16x130	35	26	20	15

kv 100 values

DN mm	DN Inch	d mm	kv 100 l/min (Δp=1 bar)	kv 100 US gal/min (Δp=1 psi)	kv 100 m³/h (Δp=1 bar)
10	3/8"	16	190	13	11
15	1/2"	20	190	13	11
20	3/4"	25	380	26	23
25	1"	32	460	32	28
32	1 1/4"	40	850	59	51
40	1 1/2"	50	1080	75	65
50	2"	63	1670	115	100
65	2 1/2"	75	2950	204	177
80	3"	90	3600	248	216
100	4"	110	4150	286	249

Chemical Resistance of Springs

Chemical resistance at 20 °C (Applications may change based on concentration.)		Springs		
	Chemicals	Steel 1.4301 V2A	Steel / Halar® coated 1 4301 V2A	Nimonic 90 2.4632
Acids	Oxidant (HNO ₃ , H ₂ CrO ₄ , vb.)	o	+	o
	Inorganic (HCl, H ₂ SO ₄ , vb.)	-	+	o
	Organic (formic acid, acetic acid, citric acid, etc.)	-	+	o
Bases	Inorganic (NaOH, KOH, vb.)	+	+	+
Salts	NaCl, FeCl ₂ , FeCl ₃ , CaCl ₂ , vb.	o	+	o
Halogen	Chlorine, bromine, iodine, (no fluorine)	-	+	o
Fuels/Oils	Aliphatic hydrocarbons	+	+	+
	Aromatic hydrocarbons	+	+	+
Solvents	Chlorinated hydrocarbons	o	o	+
	Ketones	+	+	+
	Alcohols	+	+	+
	Esters	+	+	+
	Aldehyde	+	+	+
Phenols		o	+	+
Oxidizing agents	NaOCl, ozone, etc.	o	+	+
Glycol		+	+	+

+ good

o resistant upon conditions please consult us

- having low resistance

Foregoing list was designed as a guide only and it doesn't stand for a close examination of financial regularity for a certain application.

Information is based on experience and cutting edge-technology. These data are only the general indicators of the application. Other factors such as concentration, pressure and coupling must also be considered. Technical data are binding and they do not explicitly guarantee the product characteristics. We would be glad to help you in material selection.

Usage Instructions

Maintenance

Check valves are maintenance-free under normal operating conditions. It is enough to control periodically if there are no leaks. In case of leaks or other malfunctions, Follow the instructions under <<Safety Information>> . A function test is recommended for the check valves, which are permanent in the same position for 1-2 years for the ease of service.

11B) WAFER SWING CHECK VALVE

11B-1) PVC SWING CHECK VALVE

Wafer-Swing check valve

General Overview

Product Description

PIMTAŞ Piping Systems Check Valve is especially for broad installations, requires low service and effort and materially compact.

Design was optimized for ISO/DIN and ASTM connections. Gate check valves may be installed vertically or horizontally. If the substance flows in flow direction, the plate of the wafer check valve is opened thus flow becomes possible. If the ambient temperature is below a certain limit, plate is closed again.

Versions

Wafer Check Valve is compatible with a great deal of PIMTAŞ Valves. It prevents flow back of the material, available as (DN32-DN300) in PVC-U, PP and PVDF and at the same time they are compatible with V4A and for resetting the springs in Hasteloy They are durable and maintenance-free and compatible with 6 bar nominal pressure (PN).

PVC-U, PP-H, PVDF

Product Specifications

- Self closing check valve (water column / gravity / spring optional)
- Only high resistant materials
- Simple installation between standard flanges (see product range)
- Optimized surface seal (flange gasket)
- Stable and Maintenance-Free Design
- Easy installation screws centers check valve through outer diameters for ISO/DIN and flange adaptors. Integrated support eye ensures easy installation
- Proper for horizontal and vertical installation.
- All parts in contact with the ambient are made of high resistance plastic and sealing material
- Made of PVC-U, PP-H and PVDF in sizes of DN32 and DN300.
- Special EPDM or FPM seals are fit for flange adaptors.
- Disc seals are available as EPDM or FPM.
- PVC-U wafer check valves comply with ISO/DIN and ANSI flange adaptor at the same time thanks to their outer shapes.
- Wafer check valves with reset spring to vibrate the flow is available (other than stainless steel V4A or Hasteloy C). In this way noise is reduced.
- Supplementary energy / actuator is npt required for the operation of the valve.

GENERAL OVERVIEW

GENERAL OVERVIEW		
General	Type	
	Dimension DN	DN32-DN300
	Pressure Range PN	6
Materials for valve body	PVC-U	+
	PVC-H	+
	PVDF	+
Sealing materials	EPDM	+
	FPM	+
Connection types	Sockets	+
	Spigot	+
	Flanges	+
	Threaded Socket	+
Standards	ISO	+
	ANSI	+

Safety Information

PIMTAŞ check valves are intended to cover the setting on their own or limit the transition inside the pipe system where they are mounted to under allowed pressure and temperature. Maximum service life is 25 years.

ATTENTION

- Check valves are not suitable for the environments, containing solid substances. Cavitation must be prevented during control operation.
- Wafer check valve is only approved for PN6.
- Direct installation on the pump flange or bending is not allowed.

DANGER

Wafer check valve disassembly

Substance may flow our of the pipe or valve under or without pressure uncontrollably, substance may flow through the open valve and valve may contain wastes or the residuals of aggressive, dangerous, flammable or explosive materials. As a result this may lead to death or severe injuries.

- Remove all pressure from the pipe system.
- Completely drain the pipe system
- Flush the piping system if there are aggressive, dangerous, flammable materials within the system.

DANGER

Lubricants

Use of improper lubricants may result in damage to the material of wafer check valve and seals.

As a result this may lead to death or severe injuries.

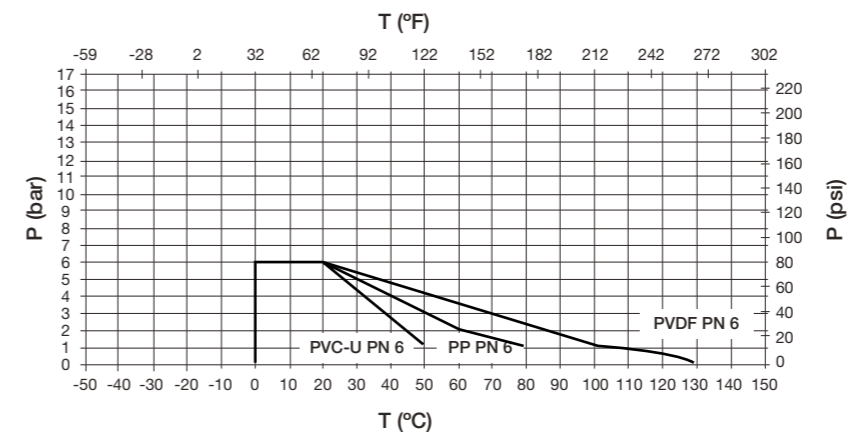
- Never use mineral-oil based Petrolatum!
- Lubricate all seals with grease lubricant, silicon or polycol.



TECHNICAL DATA

Pressure-temperature diagram PVC-U, PP

Following pressure-temperature diagrams are based on water or similar material according to a service life for 25 years



Diagram

P Allowed pressure as bar, psi

Temperature in °C, °F

ООО «ТИ-СИСТЕМС» ИНЖИНИРИНГ И ПОСТАВКА ТЕХНОЛОГИЧЕСКОГО ОБОРУДОВАНИЯ

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Pressure Loss PVC-U, pipe PN10

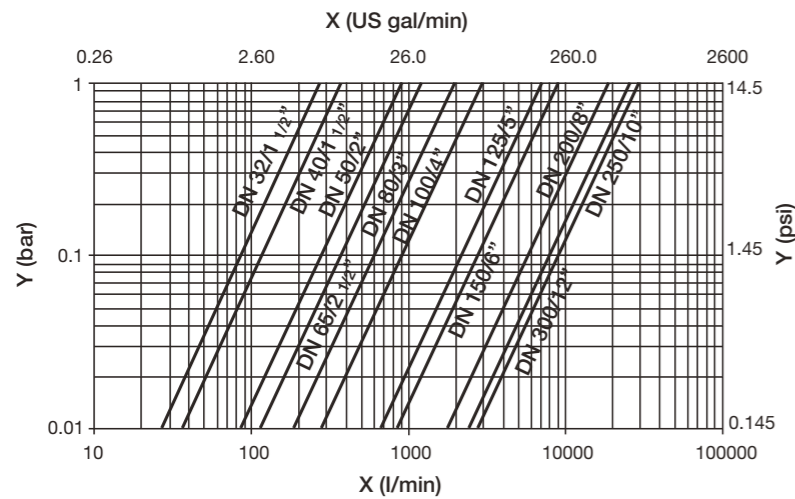


Diagram
Ambient: water 20 °C
X Flow rate (l/min, US gal/min)
Y Pressure loss Δp (bar, psi)

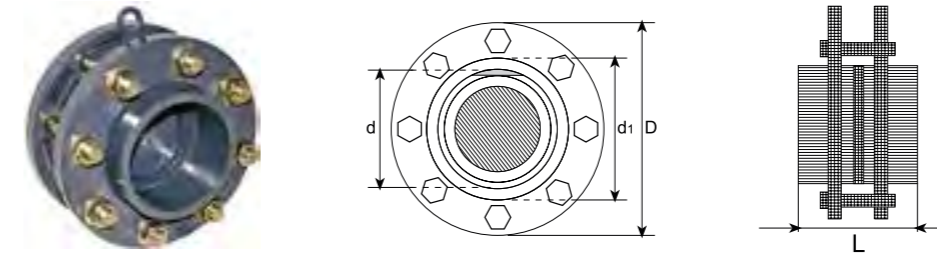
U-PVC Swing Check Valve (Without Flange)



Diameter	DN (mm)	D (mm)	D1 (mm)	D2 (mm)	L (mm)	Kg / Pieces	Parcel / Pieces	PN
90	80	125	115	54	16	0.170	25	6
110	100	184	135	70	19	0.274	20	6
125	100	213	160	92	21	0.400	15	6
140	125	213	160	92	21	0.400	15	6
160	150	251	175	105	23	0.650	15	6
200	200	280	235	155	27	0.825	10	6
225	200	280	235	155	27	1.410	10	6
250	250	330	285	330	40	3.500	2	6
280	250	330	285	330	40	3.500	2	6
315	300	380	325	380	45	5.300	2	6
400	400	575	446	380	50			

Injection Product

U-PVC Swing Check Valve (Without Flange)



Diame-ter	DN (mm)	D1 (mm)	D (mm)	L (mm)	nQe (mm)	Kg / Pieces	Parcel / Pieces	PN
90	80	107	200	126	8Q16	0.170		6
110	100	129	220	155	8Q16	0.274		6
125	100	147	250	173	8Q16	0.400		6
140	125	164	285	182	8Q16	0.400		6
160	150	188	340	209	8Q16	0.650		6
200	200	230	340	253	8Q16	0.825		6
225	200	245	340	285	8Q16	1.410		6
250	250	269	395	375	12Q20	3.500		6
280	250	304	395	375	12Q20	3.500		6
315	300	341	445	415	12Q20	5.300		6
400	400	450	565	482				

Injection Product

(Set - 304 Stainless Seal - Nut - Washer)



(Set - 316 Stainless Seal - Nut - Washer)



Reference values to tighten the screw torques
Metric flange adaptors

d	DN	Inch	Total number of screws	Torque Nm	Torque lb-ft
40	32	1 1/4	4 x M16 x 85	15	11
50	40	1 1/2	4 x M16 x 85	15	11
63	50	2	4 x M16 x 95	20	15
75	65	2 1/2	4 x M16 x 100	25	18
90	80	3	8 x M16 x 110	25	18
110	100	4	8 x M16 x 130	30	22
140	125	5	8 x M16 x 130	35	26
160	150	6	8 x M20 x 180	40	30
225	200	8	8 x M20 x 180	50	37
280	250	10	12 x M20 x 180	55	41
315	300	12	12 x M20 x 180	60	47

ANSI flange adaptors

d	DN	Inch	Total number of screws	Torque Nm	Torque lb-ft
50	40	2	4 x UNC5/8" x 3 1/2 "	15	11
63	50	2 1/4	4 x UNC5/8" x 4"	20	15
75	65	3	4 x UNC5/8" x 4"	25	18
90	80	4	8 x UNC5/8" x 4 1/2 "	25	18
110	100	4	8 x UNC5/8" x 4 1/2 "	30	22
160	150	6	8 x UNC3/4" x 5 "	40	30
225	200	8	8 x UNC3/4" x 6 "	50	37
280	250	10	12 x UNC7/8" x 6 1/2 "	55	41
315	300	12	12 x UNC7/8" x 7 "	60	47

Maintenance Instructions

Normally, wafer check valves are maintenance free. It is enough to control periodically if there are no leaks. If there is any leak with the flange connections, this must be tightened according to "Screwed equipment standard values" table or replace the flange gaskets if required.

11B-2) PP SWINF CHECK VALVE



Diameter	Pressure	Parcel / Pieces
63	10	40
75	10	30
90	10	25
110	10	20
125	10	15
160	10	10
225	10	10
250	10	2
280	10	1
315	10	1
400	10	1

FLANGE CONNECTION

STAINLESS STEEL 316 (SCREW, NUT, WASHER)



11-C TEE CHECK VALVE

SOLVENT CEMENT



SINGLE SIDE THREADED



BOTH SIDES THREADED



WELL CHECK VALVE



11-D SINGLE SIDE CHECK VALVES

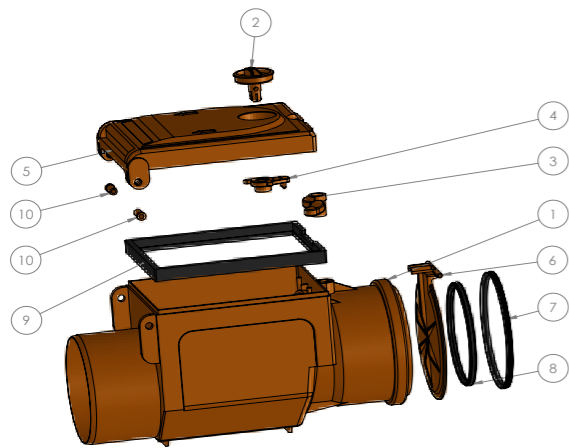
SOLVENT CEMENT SOCKETED



FEMALE THREADED



11-E) U-PVC Waste Water Check Valve Anti-Flooding Valve



No.	Part	Material	Number
1	Body	U-PVC	1
2	Disc Setting Button	U-PVC	1
3	Cover Locking Handle	U-PVC	1
4	Disc Setting Lever	U-PVC	1
5	Cover	U-PVC	1
6	Disc	U-PVC	1
7	Waste Water Seal	EPDM	1
8	Disc Seal	EPDM	1
9	Cover Seal	EPDM	1
10	Cover Pin	U-PVC	2



HANDLING, STORAGE

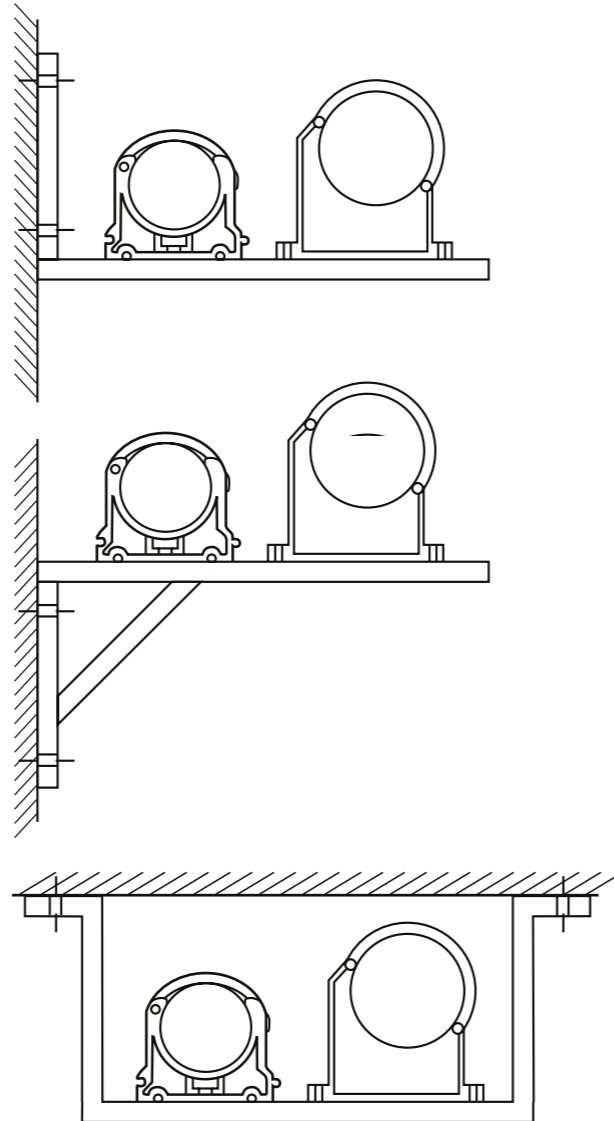
HANDLING
STORAGE

12-HANDLING-STORAGE

12-A) U-PVC PIPE LINES

U-PVC PROPER PIPE BRACKET RANGES TO BE USED IN PIPE LINES

BRACKET RANGE TABLE PROPER FOR U-PVC 10 BAR PIPES;



d	DN	Pipe bracket intervals L for SDR 21 / S 10 / PN 10 Pipes in mm at pipe wall temperature:				
		≤20 °C	30 °C	40 °C	50 °C	60 °C
16	3/8"	950	900	850	750	600
20	1/2"	1100	1050	1000	900	700
25	3/4"	1200	1150	1050	950	750
32	1"	1350	1300	1250	1100	900
40	1 1/4"	1450	1400	1350	1250	1000
50	1 1/2"	1600	1550	1500	1400	1150
63	2"	1800	1750	1700	1550	1300
75	2 1/2"	2000	1900	1850	1700	1450
90	3"	2200	2100	2000	1850	1550
110	4"	2400	2300	2250	2050	1750
125	-	2550	2450	2400	2200	1850
140	5"	2700	2600	2500	2300	1950
160	6"	2900	2800	2700	2500	2100
180	-	3100	2950	2850	2650	2200
200	-	3250	3150	3000	2800	2350
225	8"	3450	3300	3200	2950	2500
250	-	3650	3500	3350	3100	2600
280	10"	3750	3700	3550	3300	2750
315	12"	4100	3900	3750	3500	2950
355	14"	4300	4200	4000	3700	3100
400	16"	4600	4450	4250	3950	3300

Pipe diameter (mm)	Amount of cement for 100 Couplings (kg)	Pipe diameter (mm)	Amount of cement for 100 Couplings (kg)
50	1.5	160	19.0
63	1.7	200	24.0
75	2.2	225	26.0
90	4.0	250	31.0
110	8.0	280	38.0
140	13.0	315	52.0

Laying U-PVC Pipes

Attaching U-PVC Pipes each other;

a) Adding solvent cement socketed pipes each other;



1. Primarily joining sections of the parts to be joined each other are cleaned from all dust, oil, dirt and burrs using a cleaning liquid.



2. Sealing area is marked according to socket length.



3. Sealing sections on both of the parts to be joined are properly rubbed with emery. Following the sanding operation, sealing sections are cleaned with cleaning liquid again and dried.



4. Adhesive/cement is applied with a clean brush alongside the joining area on both of the parts to be sealed. If cement/adhesive more than required is applied on the parts, this excessive amount is taken back into the container.



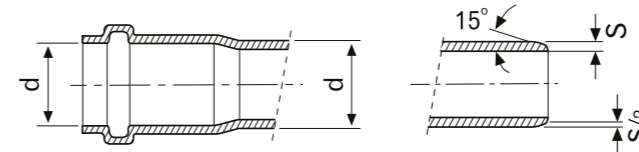
5. After the adhesive is applied properly, parts are inserted into each other quickly and without turning immediately.



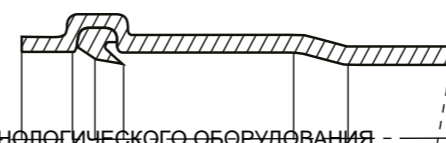
6. When the parts are pushed into each other, if any adhesive flows out, this is cleaned.

b) Adding Drift (Sealed) Socketed Pipes;

Socket sections of PIMTAŞ U-PVC Seal socketed pipes are manufactured to be inserted outside the pipe with the same diameter easily. In socketed section, there is a seal housing where 'Z' seal will be placed. The other end of the pipe is manufactured at a conic structure that is half of the wall thickness and that make a 15-degree angle.



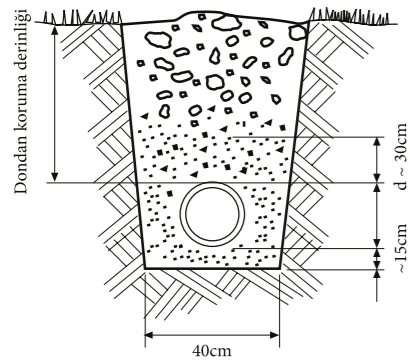
While jointing is performed 'Z' seal is placed into the socket so that lips of the seal completely seat into seal housing.



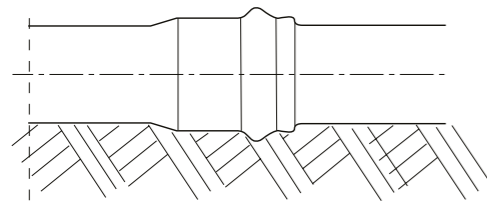
A sliding agent is applied on the pipe end (i.e., soap, machine grease etc.) and the male end of the pipe is inserted in to the socket so as not to displace the seal. Pushing process is carried out with different sizes for each diameter based on the depth of the socket.

PREPARING THE TRENCHES WHERE PVC PIPES WILL BE LAID

It is essential to prepare the trenches where the pipes will be laid, in compliance with the PVC pipes and lay the pipes carefully so that the service life of the pipes is long and without any problem. It is essential that trench bed is smooth and free of stones. Although the width of the trench must be arranged by adding 70 cm to the pipe diameter pursuant to DIN 4124 standard, it may be enough to open the trench width 40 cm wider than the pipe diameter if the trench will be made with a very quality bedding and filling material. Laying process of PVC Pipes must be carried out in compliance with DIN 4033 standard. It is very essential to lay the pipes deeper than the area where frost is effective.



If the pipe will be directly laid on the base, it must be ensured that joining sections will remain inside the soil, that is to say, pipe body be contacted with the soil so that there wouldn't be any variations in pipe sockets when earth load is applied on the pipe.



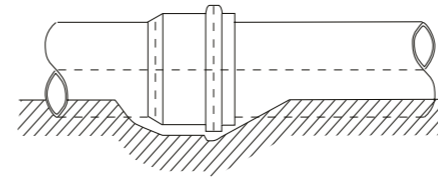
If the base of the trench is stony not smooth, then a bedding is made under the pipe from fine sand 15 cm in height and the pipes are laid on this bedding so that socket sections remain within the sand that is to say, the body of the pipe will contact with earth. Bedding sand must be compacted. Then the pipe is covered with rockless surface layer 30 cm in height. Attachments are not covered with sand as pressure test hasn't been performed yet. Once pressure test is performed, areas where there are attachments are also covered in the same way.



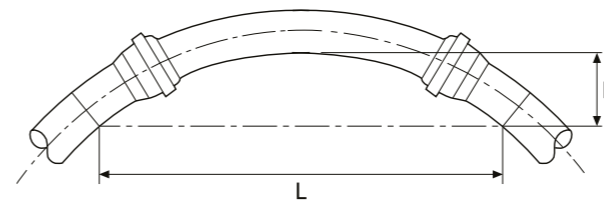
While filling is carried out in very cold weather conditions, it is recommended not to lay frozen earth on the pipe. After 30 cm filling earth is filled in, the space remaining on the trench is filled with the sand from the trench based on climate conditions and type of the soil between 1-1,5 meters and compression to the extend no damage is given to pipe, is made if desired.

Preparing the trenches where PVC pipes will be laid;

Pipe inside must be cleaned from dirt before the pipes are laid. It is very important that any measures are taken so that objects such as rocks, sand etc. wouldn't enter inside the pipes during pipe laying process. If desired, are connected one after the other and then covered with soil (fittings are not covered with soil if pressure test is not performed yet) or the pipes are coupled with each other outside the trench beforehand and then placed on the wood beams, prepared transverse and gradually inside the trench if desired. By removing the wood beams of one level at each round, pipe line, which was connected outside the trench, is taken into the trench slowly. Pipes must be laid in a stress free form and in a way joints will be inside the earth that is to say pipe body completely seat inside the soil.



Strictly avoid bending the U-PVC pipes very much while laying them inside the trench. Maximum amount of bending to be carried out on the U-PVC pipes, which are produced in compliance with standards, i.e., having not much calcite amount, is indicated in the next pages.



While making extensive turns by bending U-PVC pipes, it must be avoided both to bend the pipe and result in level drop or increase. This will be a vital mistake and the installation would have definitely been laid incorrectly due to the buckling to take

BENDING AMOUNTS OF U-PVC PIPES

BENDING AMOUNT OF U-PVC PIPES																				
Outer Dia	6 m		12 m		18 m		24 m		30 m		36 m		42 m		48 m		54 m		60 m	
	cm	L	cm	L	cm	L	cm	L	cm	L	cm	L	cm	L	cm	L	cm	L	cm	L
63	0.24	4.5	0.95	9.0	2.14	13.4	3.51	17.5	5.95	21.7	8.57	25.5	11.74	29.2	15.24	32.4	19.29	35.6	23.81	38.5
75	0.20	3.8	0.80	7.6	1.80	11.4	3.20	15.0	5.00	18.5	2.20	21.8	9.87	25.3	12.80	28.2	16.20	31.0	20.00	33.7
90	0.17	3.2	0.68	6.2	1.50	9.5	2.66	11.4	4.17	15.5	6.00	18.5	8.22	21.4	10.67	24.0	13.56	26.6	16.67	29.2
110	0.14	2.6	0.55	5.2	1.23	7.5	2.18	10.3	3.41	12.8	4.91	15.3	6.73	17.8	6.73	20.0	11.05	22.3	13.64	24.5
140	0.11	2.0	0.43	4.0	0.56	6.2	1.71	8.1	2.88	10.2	3.55	12.1	5.29	14.2	6.86	16.0	5.55	17.8	10.71	19.7
160	0.09	1.8	0.38	3.6	0.84	5.4	1.50	7.2	2.34	8.9	3.38	10.8	4.63	12.5	6.00	14.2	7.59	15.7	9.38	17.4
225	0.07	1.3	0.27	2.5	0.60	3.5	1.07	5.2	1.57	6.5	2.4	7.7	3.27	9.0	4.27	10.3	5.40	11.5	6.67	12.8
250	0.05	1.0	0.21	2.0	0.48	3.05	0.88	4.1	1.34	5.1	1.92	6.1	2.62	7.1	3.41	8.1	4.32	9.1	5.35	10.1
315	0.04	0.9	0.19	1.8	0.43	2.7	0.76	3.6	1.19	4.5	1.71	5.4	2.33	6.3	3.06	7.2	3.65	8.1	4.76	9.0
400	0.03	0.6	0.13	1.0	0.30	2.0	0.53	2.5	0.83	3.0	1.20	3.8	1.63	4.5	2.14	5.0	2.70	5.8	3.34	6.3

Laying U-PVC Pipes above the ground

While coupling the pipes in U-PVC pipe lines to be used above the ground or without covering thereon, insertion lengths, included in the following table are marked on the pipe ends in consideration of elongation and shrinkage due to temperature change.

Pipe Diameter 63 75 90 110 140 160 225 280 315 450 mm

Pushing Amount 119 123 129 136 147 155 178 197 213 249 mm

Then the pipe end is inserted into the socket completely until this marking disappears. And then, the pipe is pulled back by slightly rotating until the marking point is aligned with the outer side of the socket (muff). In case of elongation and shrinkage in pipe length due to temperature, pipe may move forward and backward inside the space/gap obtained in this way and thus it is prevented that line is damaged.

Laying U-PVC Pipes in Mud or Marshlands

In the land where the ground is not stable, pipeline bottom part must be reinforced with rocks or wedges and fine gravel fill must be made in consideration of collapse risk of the pipe line in the areas of collapse risk before laying U-PVC pipes. Formation of point charges on the pipe line must be prevented. In the areas with collapse risk where bearing capacity of soil reduces, as an additional measure pipes can be sealed in addition to gaskets, and thus removal of pipes from joint areas would have been prevented if the pipe line settles down. It is reminded that pipes will not respond to elongation or shrinkage due to temperature change if the pipes are sealed. Therefore, bonding process shouldn't be chosen in the areas lacking high temperature differences.

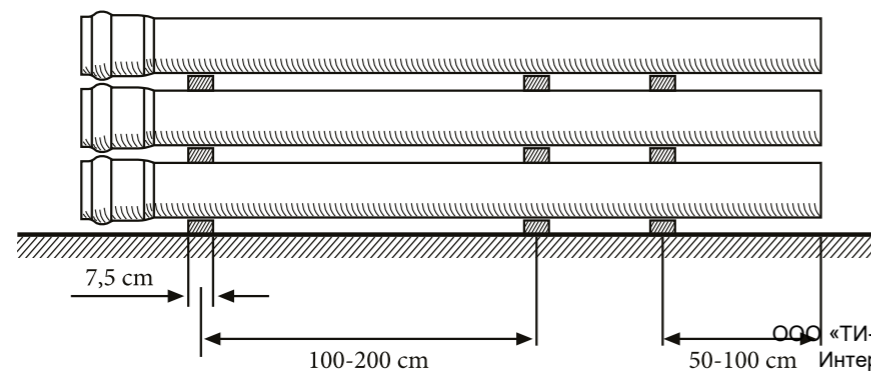
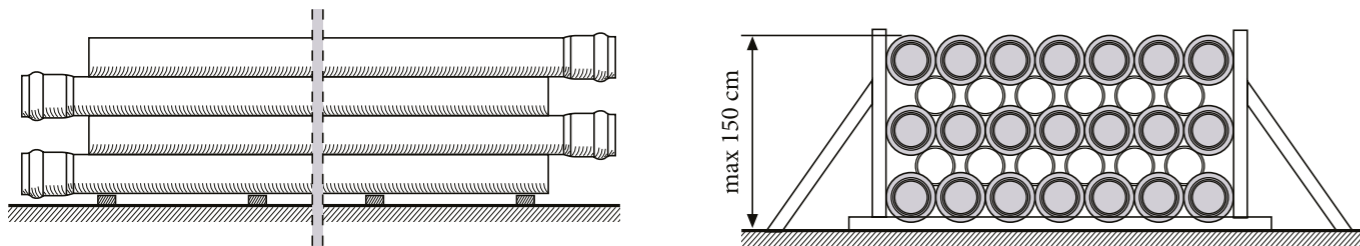


As the pipes, manufactured from U-PVC have a more brittle structure in comparison to some plastic pipes such as polyethylene pipes, we recommend to perform street passages with polyethylene pipes, which are more flexible, if possible. If it is definitely requested to use U-PVC pipes at street passages as well, then it is essential to insert U-PVC pipes to pass from the street inside another protective against traffic load.



PROPER HANDLING AND STORAGE OF U-PVC PIPES

Pipe sockets shouldn't be broken while U-PVC pipes are handled and deformation of pipes must be prevented. Supports must be placed under the pipe bodies so that socketed parts of the pipes wouldn't contact with the ground during handling and storage. Pipes must be covered properly so as to prevent penetration of dirt and foreign substances inside the pipes during handling and storage. If the pipes will be placed on each other directly, contact of socketed sections of the pipes with each other must be prevented. In order to ensure this, pipes must be placed side by side in reverse position, in other words, it is required to place muff-free side of a pipe next to a muff.



12-B) PE PIPE LINES

PE Pipe Laying Rules

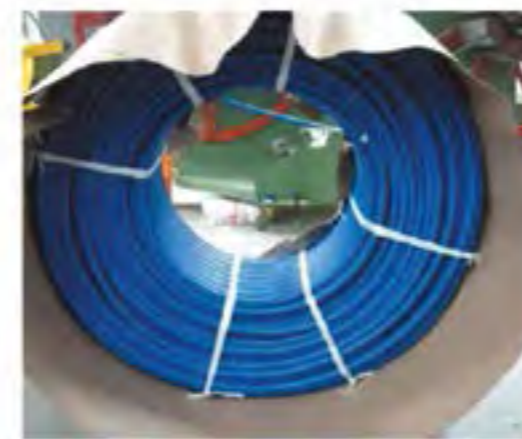
Laying Rules of PE pipes are specified in ATV-A 127 and EN 805 standards. Pipes can be placed into the channels after they are welded outside the channel. Here it is important to keep channel excavation narrow.

- By no means should the pipes be smashed.
- Strictly avoid the use of pipes, damaged during transport or storage (damaged due to pointed instruments or materials similar to stone).
- There must be no underground water or rain water accumulation inside the channel. (If there is water accumulation inside the channel, water must be drained by means of a pump.)
- In-cohesive sand, pebble, particulate composites and pebble are proper to be used as a channel filling material.
- The depth of the channel must be minimum 70-80 cm.
- If the excavation soil is available for filling, pipe can directly be laid down the bottom of the channel without a need for bedding. If the excavation is not suitable for filling (stony, watery etc.) channel depth must be increased and bedding must be performed with dry filling materials (e.g., Sand).
- Thickness of the bedding to be made must be minimum $A1 = 100 \text{ mm} + 1/10 \text{ DN}$. Bedding material must be compacted with the help of a compactor working slightly thereon until 95% compaction is obtained.
- Poring pipe side fillings at A2, 30 cm thickness, they must be once again compacted at the rate of 95% by means of compactor. This process must be continued once in every 30 cm until such passes the top of pipe 30 cm.
- When it passes the top of the pipe A3 = 30 cm, filling process must be completed upon compaction by a compactor with middle power.

Packaging and Labeling Pipes

PE pipes between $\varnothing 20 - \varnothing 125 \text{ mm}$ are packaged in the form of tubes. Pipes above $\varnothing 140 \text{ mm}$ are produced 12-13.5 in length. In tube amount, if desired, it is possible to perform packaging above 100 m.

Information required to ensure retrospective traceability is written on the pipes at 1 m spaces: Manufacturer's Name, Standard Number, Standard Logo, Pipe Raw Material, Pipe Diameter, Pipe Wall Thickness, SDR Group, Operating Pressure, Machine No and Day of Manufacture.



Packaging information for PE Pipes				
Diameter	Inner Diameter	Outer Diameter	Height	Length
$\varnothing 20$	40	70	20	100
$\varnothing 25$	50	85	22	100
$\varnothing 32$	65	100	34	100
$\varnothing 40$	80	120	38	100
$\varnothing 50$	100	140	40	100
$\varnothing 63$	130	160	50	100
$\varnothing 75$	150	200	55	100
$\varnothing 90$	180	230	60	100
$\varnothing 110$	220	280	85	100
$\varnothing 125$	250	300	105	100

Transport and Piling Principles

Transport and Operation Rules

Transport vehicle shouldn't have nail, hard objects stone etc., on the body likely to damage the pipes.

Pipes mustn't be placed inside the vehicles dispersedly. Pipes should never be thrown during loading and unloading.

Stock site ground must also be cleaned from materials likely to damage the pipes.

In piling of pipes in the form of tubes, height of the tubes to be piled mustn't exceed 1.5 m. Flat pipes can be piled in two ways.

1. Pyramid piling
2. Grid piling



HANDLING AND STORAGE

In any kind of installation, handling and storage of polyethylene pipes and fittings as well as the pipes is important. Handling and storage suggestions are the same for PE pipe types as they are different in terms of hardness. Although polyethylene is unresistant sharp objects, it is a light, easy to handle, durable and flexible material. Therefore, it is required to pay attention to sharp objects during transportation. Letters and markers to be written on the outer surface of the pipe mustn't exceed %10 of maximum pipe wall thickness. Pipes which are clearly seen to be damaged or those with letters or markers, written deeper than %10 must be considered as unsuitable products.

In consideration of general characteristics, polyethylene is not affected by low air temperatures, but the pipes and fittings become slippery in humid or freezing whether as they have a smooth surface. Products must be kept as a whole until they are used with their protective packages. If the products will be stored for a long time in open air, they must be covered with a canvas or black polyethylene cover to protect from ultraviolet lights. In order to storage under hygienic conditions, exposed ends of the pipes must be covered in order to protect from dirty water, foreign substances (earth, stone etc.).

DELIVERY

- If the load to be transported is bulky, it must be considered that the part of the transport vehicle on which load will be loaded should be adequately smooth and clean, and kept away from pointed or sharp objects.
- During the placement of pipes and pipe fittings, it is considered that products wouldn't be placed near or next to exothermic or heat-releasing sources, and they must be kept away from

Materials such as oil, which are likely to contaminate dirt.

- During the handling of the products, it must be considered that metal chains or metal parts mustn't contact with the products directly. Stands/hangers made of polypropylene or nylon are recommended.
- For handling pipe fittings in small sizes, it must be paid attention that pipe fitting ends must be transported in a way not to be worn out following friction to each other.
- Although special regulations are required in case of flat delivery, delivery of pipes in linked form can be delivered both vertically or horizontally.

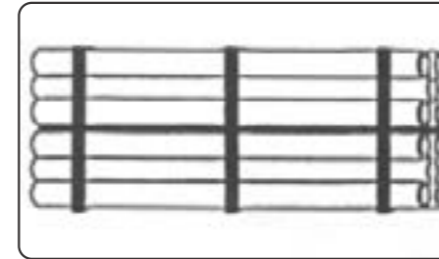
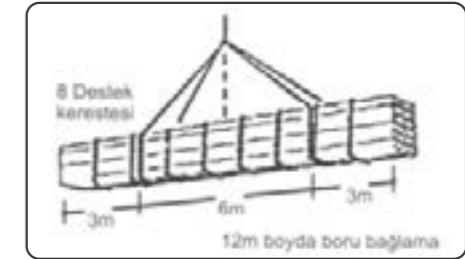


Figure 1: Package of PE pipes in the form of frame Figure



2. Carrying the packages in the form of frames by means of a crane

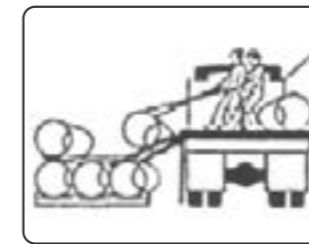


Figure 3: Unloading by using packing timbers



Figure 5-4: Inappropriate discharge

Hook or hanger mustn't be used during the transportation of pipe fittings, packaged in general in carton or polyethylene bag.

STORAGE IN WAREHOUSE

All materials must be inspected carefully during transportation and all defective materials must be set aside before the delivery is accepted to the warehouse. Suppliers must be informed about any failures with the materials before storage approval is made.

If the same products are supplied from different suppliers, these products must be kept individually and in a way they can be clearly distinguished from each other. Pipes and pipe fittings must be used according to obtained order of delivery for verifying stock rotations. Polyethylene pipes, on which date of manufacture was written by the manufacturer, must be purchased and in the usage, pipes with older manufacturing date must be used primarily so as to verify stock rotations.

Blue polyethylene pipes must preferably stored under protector and they must be protected from direct sunlight once it is required to be used. If the protection conditions require the pipes to be stored in an outdoor area, it is essential to cover the pipes with light-proof (nontransparent) covers.

For healthy piling of piled pipes, the company must ensure a flat ground to bear the weights of the pipes, keep required handling equipment, minimize piling height, and an area, allocated to them, in which transport machines can freely maneuver so as not to cause accidents. For the compatibility and safety of transportation, the height of pipe clusters in pipe piling shouldn't be more than 3 meters.

If the pipes are piled in the form of a pyramid in which all pipes come together one by one to form a pyramid, pipes in the bottom of the pyramid may expose to deformation in humid environments. Therefore, the height of this type of pipe cluster shouldn't exceed 1,2 meters.



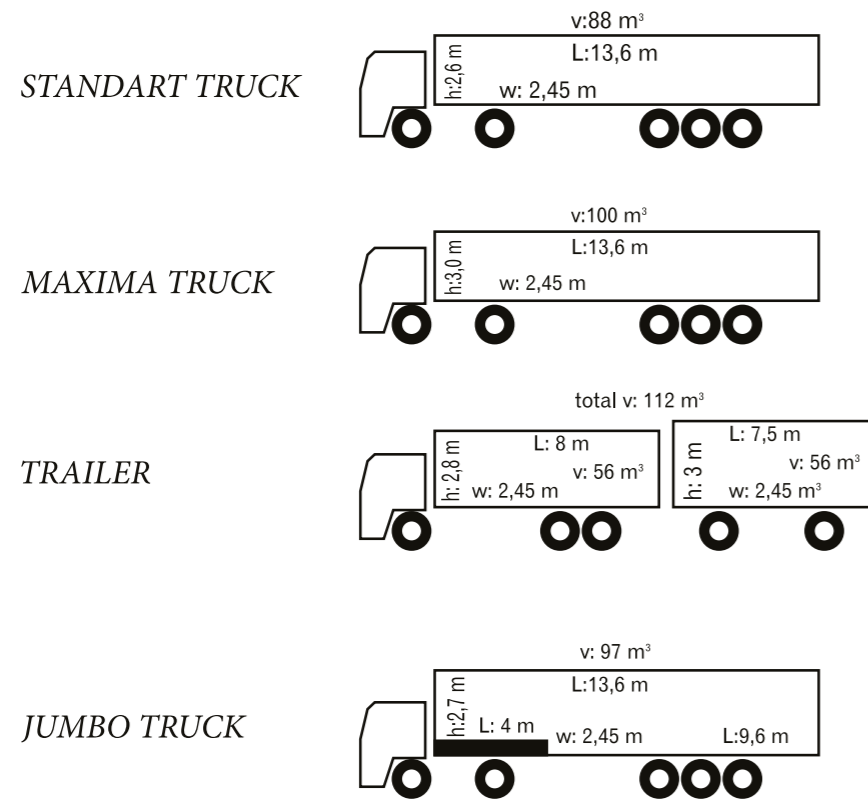
Polyethylene pipe fittings must be kept under a cover on a shelf. Protective package or cartons used by the manufacturing company must be completely kept until the product is required to be used. Polyethylene pipes and pipe fittings must always be stored away from exhaust outlets and all other sources releasing high temperatures .

Contact of polyethylene pipes and pipe fittings with the materials operating with oil, hydraulic oil, gases, solvents and other spreadable chemicals must be prevented.

All special tools and equipment regarding the attachment of polyethylene pipes and pipe fittings to each other must be kept in a safe area individually until they are needed to be used Heating parts of welding machines must be kept so as not be scratched and damaged.

If the pipes and pipe fittings will be stored out in the open for a long time, they must be covered with canvas or black polyethylene covers so that they would be protected against sunlights (ultraviolet)

INTERNATIONAL DIMENSIONS OF TRANSPORT VEHICLES



İÇ EBATLAR / INTERNAL DIMENSIONS

	Uzunluk Length	Genişlik Width	Yükseklik Height	Maximum Yükseklik Max. Load	Net Hacim Net Volume
Container	5,89 m	2,34 m	2,37 m	24,850 kg	33 m ³
Container	11,90 m	2,34 m	2,38 m	28,800 kg	67 m ³
40 FT High Cube	11,90 m	2,34 m	2,67 m	30,200 kg	76 m ³
45 FT High Cube	13,00 m	2,34 m	2,67 m	27,820 kg	86 m ³



STANDARD / DIMENSIONS / TABLE

13-STANDARD SIZES, TABLES

Imperial sizes-metric size comparison

For those unfamiliar with the difference between metric and inch sizes the following note may be helpful. In imperial systems, the sizes of pipes, fittings and other components such as valves are identified by reference to the nominal size of the bore of the pipe expressed in inches and fractions of an inch.

In metric systems, however, sizes are identified by references to the outside diameter of the pipe expressed in millimeters.

The table below shows the metric sizes which are regarded for practical purposes as being generally equivalent to imperial sizes. It should, however, be understood that metric sizes are not simply inch sizes which have been converted into millimeters and called metric; their actual dimensions are slightly different and they are with the exception of 75) " 1/2 mm) and 140) "5 mm) not interchangeable.

Imperial Sizes		Metric Sizes	
Nominal bore DN (inch)	Pipe outside diameter d (mm)	Pipe outside diameter d (mm)	Nominal bore DN (mm)
1/8	10.2	10	6
1/4	13.5	12	8
3/8	17.2	16	10
1/2	21.3	20	15
3/4	26.9	25	20
1	33.7	32	25
1 1/4	42.4	40	32
1 1/2	48.3	50	40
2	60.3	63	50
2 1/2	75.3	75	65
3	88.9	90	80
3 1/2	101.6	-	-
4	114.3	110	100
-	-	125	100
-	-	125	125
5	140.3	140	125
6	168.3	160	150
-	-	180	150

1) Only cementing socket systems

2) Only cementing socket systems

Imperial Sizes		Metric Sizes	
Nominal bore DN (inch)	Pipe outside diameter d (mm)	Pipe outside diameter d (mm)	Nominal bore DN (mm)
8	219.1	200	200
8	219.1	225	200
9	244.5	250	250
10	273.0	280	250
12	323.9	315	300
14	355.6	355	350
16	406.4	400	400
18	457.2	450	450
20	508.0	450	500
20	508.0	500	500
22	558.2	560	600
24	609.6	630	600
26	660.4	-	-
28	711.2	710	700
30	762.0	-	-
32	812.8	800	800
34	863.6	-	-
36	914.4	900	900
40	1016.0	1000	1000

STANDARD SIZES (TS EN 1555-3, TS EN 12201-3)

NOMINAL DIAMETER (mm)	OUTER DIAMETER		DEVIATION FROM ROUNDNESS (OVALITY) (mm)	WALL THICKNESSES				SMALLEST SLEEVE LENGTH (EF LENGTH) (mm)	NOMINAL DIAMETER (mm)
	MINIMUM (mm)	MAXIMUM (mm)		SDR17 (PN 10) MINIMUM (mm)	SDR17 (PN 10) MAXIMUM (mm)	SDR11 (PN 16) MINIMUM (mm)	SDR11 (PN 16) MAXIMUM (mm)		
16.0	16.0	16.3	0.3	2.3	2.7	3.0	3.4	41.0	16.0
20.0	20.0	20.3	0.3	2.3	2.7	3.0	3.4	41.0	20.0
25.0	25.0	25.3	0.4	2.3	2.7	3.0	3.4	41.0	25.0
32.0	32.0	32.3	0.5	2.3	2.7	3.0	3.4	44.0	32.0
40.0	40.0	40.4	0.6	2.4	2.8	3.7	4.2	49.0	40.0
50.0	50.0	50.4	0.8	3.0	3.4	4.6	5.2	55.0	50.0
63.0	63.0	63.4	0.9	3.8	4.3	5.8	6.5	63.0	63.0
75.0	75.0	75.5	1.2	4.5	5.1	6.8	7.6	70.0	75.0
90.0	90.0	90.6	1.4	5.4	6.1	8.2	9.2	79.0	90.0
110.0	110.0	110.7	1.7	6.6	7.4	10.0	11.1	82.0	110.0
125.0	125.0	125.8	1.9	7.4	8.3	11.4	12.7	87.0	125.0
140.0	140.0	140.9	2.1	8.3	9.3	12.7	14.1	92.0	140.0
160.0	160.0	161.0	2.4	9.5	10.6	14.6	16.2	98.0	160.0
180.0	180.0	181.0	2.7	10.7	11.9	16.4	18.2	105.0	180.0
200.0	200.0	201.2	3.0	11.9	13.2	18.2	20.2	112.0	200.0
225.0	225.0	226.4	3.4	13.4	14.9	20.5	22.7	120.0	225.0
250.0	250.0	251.5	3.8	14.8	16.4	22.7	25.1	129.0	250.0
280.0	280.0	281.7	4.2	16.6	18.4	25.4	28.1	139.0	280.0
315.0	315.0	316.9	4.8	18.7	20.7	28.6	31.6	150.0	315.0
355.0	355.0	357.2	5.4	21.1	23.4	32.3	35.6	164.0	355.0
400.0	400.0	402.4	6.0	23.1	26.2	36.4	40.1	179.0	400.0
450.0	450.0	452.7	6.8	26.7	29.5	40.9	45.1	195.0	450.0
500.0	500.0	503.0	7.5	29.7	32.8	45.5	50.1	212.0	500.0
560.0	560.0	563.4	8.4	33.2	36.7	50.9	56.0	235.0	560.0
630.0	630.0	633.8	9.5	37.4	41.3	57.3	63.1	255.0	630.0

PE 100 Pipe Unit Weight

MRS= 10 Mpa C=1,25 ó=8,0 Mpa

PN	4		5		6		8		10	
SDR	41		33		26		21		17	
SDR	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)
16										
20										
25									2.0	0.140
32									2.0	0.190
40							2.0	0.240	2.4	0.280
50					2.0	0.300	2.4	0.360	3.0	0.440
63			2.0	0.380	2.5	0.470	3.0	0.570	3.8	0.710
75	2.0	0.460	2.3	0.530	2.9	0.660	3.6	0.810	4.5	1.000
90	2.3	0.640	2.8	0.770	3.5	0.950	4.3	1.160	5.4	1.440
110	2.7	0.910	3.4	1.140	4.2	1.400	5.3	1.750	6.6	2.150
125	3.1	1.190	3.9	1.490	4.8	1.810	6.0	2.250	7.4	2.740
140	3.5	1.510	4.3	1.840	5.4	2.280	6.7	2.810	8.3	3.440
160	4.0	1.970	4.9	2.390	6.2	2.990	7.7	3.690	9.5	4.500
180	4.4	2.430	5.5	3.020	6.9	3.750	8.6	4.640	10.7	5.710
200	4.9	3.010	6.2	3.790	7.7	4.650	9.6	5.760	11.9	7.050
225.0	5.5	3.800	6.9	4.740	8.6	5.840	10.8	7.290	13.4	8.930
250	6.2	4.760	7.7	5.880	9.6	7.250	11.9	8.930	14.8	10.970
280	6.9	5.940	8.6	7.350	10.7	9.050	13.4	11.250	16.6	13.770
315	7.7	7.450	9.7	9.330	12.1	11.510	15.0	14.180	18.7	17.450
355	8.7	9.490	10.9	11.820	13.6	14.580	16.9	18.000	21.1	22.190
400	9.8	12.050	12.3	15.020	15.3	18.480	19.1	22.920	23.7	28.090
450	11.0	15.210	13.8	18.960	17.2	23.370	21.5	29.020	26.7	35.600
500	12.3	18.900	15.3	23.360	19.1	28.840	23.9	35.850	29.7	44.000
560	13.7	23.580	17.2	29.410	21.4	36.190	26.7	44.860	33.2	55.100
630	15.4	29.820	19.3	37.130	24.1	45.850	30.0	56.700	37.4	69.820
710	17.4	37.960	21.8	47.260	27.2	59.320	33.9	72.200	42.1	88.580
800	19.6	48.190	24.5	59.850	30.6	73.930	38.1	91.450	47.4	112.380
900	22.0	60.850	27.6	75.850	34.4	93.500	42.9	115.830	53.3	142.170
1000	24.5	75.290	30.6	93.450	38.2	115.370	47.7	143.100	59.3	175.730
1200	29.4	108.420	36.7	134.490	45.9	166.340	57.2	205.930	70.6	251.190
1400	34.3	147.570	42.9	183.410	53.5	226.200	66.7	280.150	82.4	342.020
1600	39.2	192.740	49.0	239.420	61.2	295.710	76.2	365.790	94.1	446.410

s= Wall Thickness (mm)

M= Unit Weight

C= Safety stress

MRS= Minimum required Strength (MPa)

Ó= Design stress

MRS= Minimum required Strength (MPa)

Ó= Design stress

PE 100 Pipe Unit Weight

MRS= 10 Mpa C=1,25 ó=8,0 Mpa

PN	12.5		16		20		25		32	
SDR	13.6		11		9		7.4		6	
Diameter (mm)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)	5 (mm)	m (kg/m)
16					2.0	0.090	2.3	0.100	3.0	0.120
20			2.0	0.110	2.3	0.130	3.0	0.160	3.4	0.180
25	2.0	0.150	2.5	0.170	3.0	0.210	3.5	0.240	4.2	0.280
32	2.4	0.220	3.0	0.270	3.6	0.320	4.4	0.380	5.4	0.450
40	3.0	0.350	3.7	0.420	4.5	0.500	5.5	0.600	6.7	0.700
50	3.7	0.540	4.6	0.660	5.6	0.780	6.9	0.940	8.3	1.090
63	4.7	0.860	5.8	1.050	7.1	1.250	8.6	1.470	10.5	1.740
75	5.6	1.220	6.8	1.460	8.4	1.760	10.3	2.100	12.5	2.460
90	6.7	1.760	8.2	2.110	10.1	2.540	12.3	3.010	15.0	3.540
110	8.1	2.600	10.0	3.150	12.3	3.790	15.1	4.510	19.3	5.290
125	9.2	3.360	11.4	4.080	14.0	4.900	17.1	5.810	20.8	6.830
140	10.3	4.210	12.7	5.090	15.7	6.150	19.2	7.310	23.3	8.570
160	11.8	5.510	14.6	6.690	17.9	8.010	21.9	9.530	26.6	11.180
180	13.3	6.980	16.4	8.450	20.1	10.120	24.6	12.040	29.9	14.140
200	14.7	8.580	18.2	10.420	22.4	12.530	27.4	14.900	33.2	17.450
225	16.6	10.900	20.5	13.210	25.2	15.860	30.8	18.840	37.4	22.100
250	18.4	13.420	22.7	16.250	27.9	19.520	34.2	23.250	41.5	27.260
280	20.6	16.830	25.4	20.370	31.3	24.520	38.3	29.160	46.5	34.200
315	23.2	21.330	28.6	25.800	35.2	31.030	43.1	36.920	52.3	43.280
355	26.1	27.040	32.2	32.740	39.7	39.430	48.5	46.830	59.0	55.020
400	29.4	34.320	36.3	41.590	44.7	50.030	54.7	59.500	66.7	70.030
450	33.1	43.470	40.9	52.710	50.3	63.340	61.5	75.270		
500	36.8	53.700	45.4	65.020	55.8	78.080				
560	41.2	67.330	50.8	81.490	62.2	97.540				
630	46.3	85.140	57.2	103.160						
710	52.2	108.170	64.5	131.160						
800	58.8	137.300	72.8	166.770						
900	66.2	173.890								
1000	73.5	214.520								
1200										
1400										
1600										

s= Wall Thickness (mm)

M= Unit Weight

C= Safety stress

MRS= Minimum required Strength (MPa)

Ó= Design stress

MRS= Minimum required Strength (MPa)

Ó= Design stress

PE 100 PIPES

SDR								
41	33	21	17	13.6	11	9	7.4	6
PIPE SERIES S								
20	16	10	8	6.3	5	4	3.2	2.5
PN								
4	5	8	10	12.5	16	20	25	32

PE 80 PIPES

SDR								
41	26	22	17	13.6	11	9	7.4	6
PIPE SERIES S								
20	12.5	10.5	8	6.3	5	4	3.2	2.5
PN								
3.2	5	6	8	10	12.5	16	20	25

PE 63 PIPES

SDR								
41	33	26	17.6	13.6	11	9	7.4	6
PIPE SERIES S								
20	16	12.5	8.3	6.3	5	4	3.2	2.5
PN								
3.3	3.2	4	6	8	10	12.5	16	20

Bending Radius of PE Pipes according to SDR: (20 °C)

SDR	Acceptable Bending Radius R d= Pipe Outside Diameter
41	50 d
33	40 d
26	30 d
17	30 d
11	20 d
7.4	20 d

For acceptable bending radius at operating temperatures below 0°C, add 2.5 to the rates, specified in the foregoing table. Acceptable bending radius at operating temperatures between 0°- 20°C is calculated via interim value (rate) calculation method.



14) POOL CHEMICALS

Use of Pool Chemicals

Product	Function	Usage Amount
56% Granular chlorine	For disinfection	To 100 m ³ pool water, 0,5 kg / day (in public pools)
		To 100 m ³ pool water 0,5 kg / week (domestic pools)
	For quick freezing	To 100 m ³ pool water 0,6 - 1 kg / 15 days (in public pools)
		To 100 m ³ pool water 0,6 1 kg / month (Domestic pools)
90% Granular chlorine	For disinfection	To 100 m ³ pool water, 0,35 kg / day (in public pools)
		To 100 m ³ pool water 0,35 kg / week (domestic pools)
90% Tablet chlorine	For disinfection	To 100 m ³ pool water 1 Tablet / day (once in 10 - 12 days)
70% Calcium Hypochlorite	For disinfection	To 100 m ³ pool water 0,2 kg / day
PH (-) Dust	PH Reducer	To 100 m ³ pool water, to reduce 1 kg pH rate for 0,1 degree
PH (+) Dust	PH Increaser	To 100 m ³ pool water, to increase 1 kg pH rate for 0,1 degree
PH (-) Liquid	PH Reducer	To 100 m ³ pool water, to reduce 1 lt pH rate 0,1 degree
PH (+) Liquid	PH Increaser	To 100 m ³ pool water, to increase 1 lt pH rate 0,1 degree
Algaecide	Prevents formation of algae	To 100 m ³ pool water 1,5 lt first dose Following dose, is 0,5 lt / week (outdoor pools)
		To 100 m ³ pool water 1,5 lt first dose Following dose is 0,3 lt / week (indoor pools)
Precipitant	Flocculant	To 100 m ³ Pool water, 0,03 - 0,2 lt / day
Polisher	Clarifier	To 100 m ³ Pool water, 0,03 - 0,2 lt / day
Foot disinfectant	Fungicide disinfectant	Used by watering 0,5%
Surface Cleaner	Surface disinfection	Used by watering 1%
Winter Maintenance	In winter, against algae growth and frost	Repeat once in 2 months as 3-5 lt to 100 m ³ pool water (based on the hardness of the water)

WARNINGS

- Read the label carefully and follow the instructions while using chemical products.
- Never mix the products each other, throw the into the pool one after the other.
- Use a glove while handling chemicals, wash with plenty of water and consult your doctor in case of eye contact.
- Keep the chemical products in a dry, closed and good ventilated area out of reach of children. Keep fire away.

Problems and Solutions (for 100 m³)

PROBLEM	REASON	SOLUTION
Turbid Water	1) high pH 2) Excessively decomposed solids 3) Bad filtering 4) Excessive organic solutions	1) Set pH between 7,2 - 7,6 2) Change some part of pool water with fresh water 3) Clean the filter with reverse washing Carry out settling process with liquid precipitator by pouring 21 precipitant to 100 m ³ e (quick-freeze application) 4) Quick-freeze with 90% granular chloride
Green water	Formation of Algae	Apply flash chlorination with 90% granule. Add 2,5 lt algaecide to 100 m ³ pool, after the surfaces are brushed and swept.
Brown water	Presence of iron or manganese	Apply flash chlorination and add lt. precipitant to 100 m ³ .
Eye and skin irritation, bad odors	1) Unadjusted pH 2) Combined chlorine is much	1) Control pH, set between 7,2 - 7,6 2) Perform quick-freezing by adding 1 kg 90% chlorine to 100 m ³ . 3) Don't use the pool for 2 days

ENGAGING SWIMMING POOL IN THE BEGINNING OF THE SEASON

Following procedures must be followed to prevent the problems likely to occur during the season.

- Review all equipment, call a service if need be.
- Drain the pool, if required and clean the bottom side walls with watered algae solvent.
- Fill in with water if the pool is empty, operate the filtration system if it is full.
- Precipitate 100 m³ water with 2 lt precipitator. Stop filtration process after 3-4 hours once the precipitator is added into the water. Carry out sweeping operation after waiting for one night. Operate the filtration system again.
- Set the pH and alkalinity values to ideal rates
- Measure all measurement rates again (ph), Alkalinity, Chlorine, Compound Chlorine, hardness
- Quick-freeze the pool with 90% granule chlorine Proceed with routine application
Once the pool is engaged and the controls are completed.

