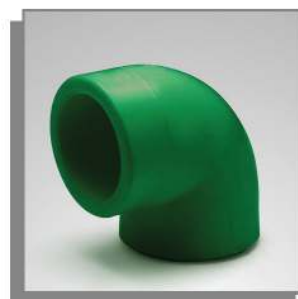


PP-R HOT AND COLD WATER SYSTEMS





ARCON HANDELS GmbH

Arcon Handels GmbH was established in 1982 in Munich and joined Kar Group of Companies in 1987. Being the engineering arm of VESBO PP-R pipes and fittings, Arcon is responsible for the research and product development of VESBO products as well as the supply of machineries and raw materials from Germany.

NOVAPLAST Plastik Sanayi ve Ticaret A.Ş.

Established in Istanbul in 1992, Novaplast joined Kar Group of Companies in the year of 1994, in which, it merges its operation with Çamlıca Yapı Ltd. Şti. to streamline its operations and take advantage of the economies of scale to manufacture VESBO Polypropylene Random Co-polymer (PP-R) pipes and fittings. Among various things, Novaplast also manufactures other types of thermoplastic products in extrusion and injection moulding.

VESBO export department is responsible for European, Mediterranean and Middle East markets.

VESBO ASIA Pte. Ltd.

VESBO was introduced to the Far East Markets in 1994. At present, VESBO Asia Pte. Ltd. a subsidiary of Kar Group of Companies, is the Asian marketing arm of VESBO, with its head office in Singapore. It is established to further introduce, market and assign distributors to spread its networks in the Asia Pacific region.

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1. CHARACTERISTICS

1.1 General

Raw Material

VESBO PP-R pipes and fittings are manufactured from high quality, Polypropylene Random Co-polymer resins (PP-R Type 3). Its physical and chemical properties make VESBO a versatile piping system in a wide range of applications in different industries. Its advantages over PP types 1 or 2 and other thermoplastic pipes in the potable water industries are its high impact strength and resistance to high temperatures.

1.2 Mechanical & Thermal Properties

| Property | Test Method | Unit | Value |
|------------------------------------|---------------------------------|--------------------|-----------|
| Resin Type | Polypropylene, Random Copolymer | | |
| Density at 23° C | ISO 1183 | g/cm ³ | 0.9 |
| Viscosity number | ISO 1628 T3 | cm ³ /g | 420 ml/g |
| Melt Flow Rate | | | |
| MFR 190° C / 5 kg | ISO 1133 | g /10 min | 0.5 - 0.7 |
| MFR 230° C / 2.16 kg | ISO 1133 | g /10 min | 0.3 - 0.5 |
| MFR 230° C / 5 kg | ISO 1133 | g /10 min | 1.3 - 1.5 |
| Melting temperature | ASTM 3418 | °C | 141 |
| Softening point (vicat) | ASTM D1525 | °C | 133 |
| Crystalline melting temp. | ASTM E794 | °C | 150 - 154 |
| Tensile Properties | | | |
| Tensile Stress at Yield | ISO 527 | MPa | 25 |
| Tensile Strength at Break | ISO 527 | MPa | 40 |
| Elongation at Break | ISO 527 | % | >600 |
| Tensile Modulus (23 °C) | ISO 527 | | 850 MPa |
| Tensile Creep Modulus 1h | ISO 527 | MPa | 650 |
| Tensile Creep Modulus 1000h | ISO 527 | MPa | 350 |
| Flexural modulus (23 °C) | ISO 178 | MPa | 850 |
| Flexural stress at 3,5% deflection | ISO 178 | MPa | 20 |
| Ball indentation hardness | ISO 2039 T1 (132N) | MPa | 45 |
| Shear Modulus | | | |
| -10 °C | ISO 537 Method A | N/mm ² | 1100 |
| 0 °C | ISO 537 Method A | N/mm ² | 770 |
| 10 °C | ISO 537 Method A | N/mm ² | 500 |
| 20 °C | ISO 537 Method A | N/mm ² | 370 |
| 30 °C | ISO 537 Method A | N/mm ² | 300 |
| 40 °C | ISO 537 Method A | N/mm ² | 240 |
| 50 °C | ISO 537 Method A | N/mm ² | 180 |
| 60 °C | ISO 537 Method A | N/mm ² | 140 |

| Mechanical Strength Properties | | | |
|---|-----------------------|-------------------|------------------------|
| Determined by Impact Strength at 0°C | DIN 8078 | | no failure |
| Impact Strength (Charpy) | ISO 179/1eU | | |
| 23°C | | kJ/m ² | no failure |
| 0°C | | kJ/m ² | no failure |
| -10°C | | kJ/m ² | no failure |
| Notched Impact Strength (Charpy) | ISO 179/1eA | | |
| 23°C | | kJ/m ² | 20 |
| 0°C | | kJ/m ² | 4 |
| -10 B44 | | kJ/m ² | 3 |
| Coefficient of Linear Thermal Expansion | DIN 53752 | K ⁻¹ | 1.5x10 ⁻⁴ |
| Thermal Conductivity at 20°C | DIN 52612 | W/mK | 0.24 |
| Specific Heat at 20°C | Adiabatic Calorimeter | kJ/kg K | 2.0 |
| Specific Surface Resistivity | ASTM D257 | Ohm | > 10 ¹⁴ Ohm |

1.3 Application Areas

- Potable water, hot & cold water, chemical, irrigation
- Residential apartments, condominiums, public housing
- Industrial plants dealing with chemicals, food processing, semi conductors
- Hospitals
- Schools, laboratories and chemical sewerage
- Hotels & Resorts

1.4 Behavior of VESBO According to DIN 8078 Under Long Term Hoop Stress

The service life of VESBO depends on the internal hoop stress over time subject to the temperature

Hoop stress is given as follows:

$$\delta = \frac{P \times (d-s)}{20 \times s}$$

where

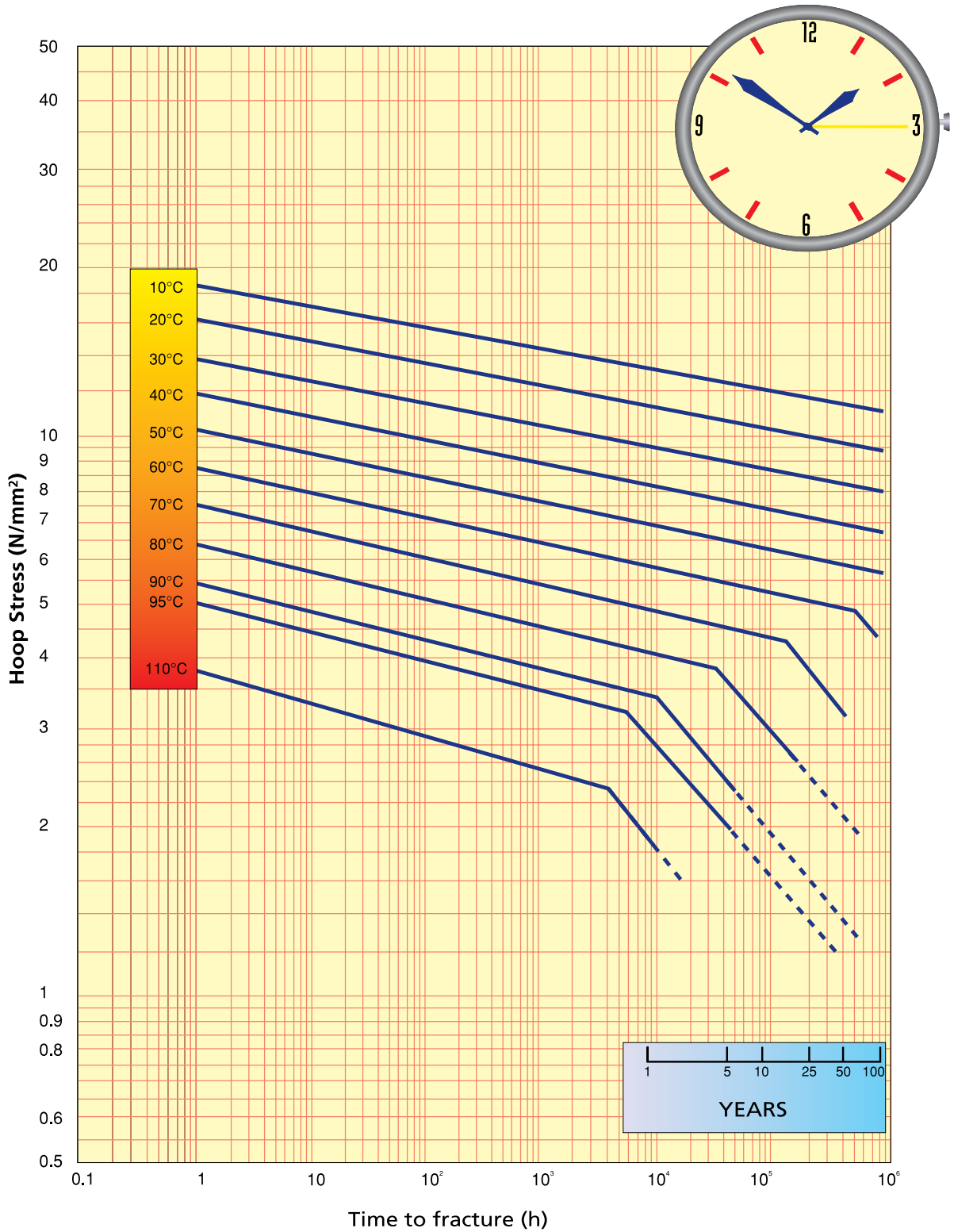
δ = Hoop stress (N/mm² or MPa)

P = Internal pressure (bar)

d = Outer diameter of pipe (mm)

s = Wall thickness of pipe (mm)

Time-Hoop Stress Graph



1.5 Permissible Operation Pressure

Allowable operating pressures for PP-R pipes conveying water, safety factor (SF) = 1,5

The following table provides more detailed information with regards to the permissible pressure of various pipe pressure rating at various temperatures. These values are derived from the hoop stress chart and formula.

Under normal working pressures and conditions the average service life of VESBO pipes is projected to be 50 years or more.

Examples:

A PN 10 cold water pipe, transporting water at a temperature of 30°C can last for more than 50 years under normal conditions with an operating pressure of 10.9 bars or 158 psi.

A PN 20 hot water pipe, transporting water at temperature of 70°C can last for more than 50 years under normal conditions with an operating pressure of 8.5 bars or 123 psi.

SDR= Standart Dimension Ratio
(Diameter/Wall Thickness Ratio)
SDR= d/s
(s= Pipes series index from ISO 4065)

| Temperature | Service Life, Years | For Water Installations, According to DIN 8077:2208 Safety-Factor of 1.5 | | | | |
|---|---------------------|---|-------------------------|-------------------------|----------------------------------|-------------------------|
| | | VESBO Pipe SDR 11 | VESBO Pipe SDR 7.4 | VESBO Pipe SDR 6 | VESBO Composite Faser Pipe SDR 6 | VESBO Stable Pipe |
| | | Nominal Pressure in Bars | | | | |
| | | PN 10 Cold Water | PN 16, Hot & Cold Water | PN 20, Hot & Cold Water | PN 20, Hot & Cold Water | PN 25, Hot & Cold Water |
| Permissible Working Pressure at Various Temperatures (bars) | | | | | | |
| 20°C | 1 | 15,0 | 23,7 | 29,9 | 29,9 | 37,7 |
| | 5 | 14,1 | 22,3 | 28,1 | 28,1 | 35,4 |
| | 10 | 13,7 | 21,7 | 27,4 | 27,4 | 34,5 |
| | 25 | 13,2 | 21,0 | 26,4 | 26,4 | 33,3 |
| | 50 | 12,9 | 20,4 | 25,7 | 25,7 | 32,4 |
| | 100 | 12,5 | 19,9 | 25,0 | 25,0 | 31,5 |
| 30°C | 1 | 12,7 | 20,2 | 25,4 | 25,4 | 32,0 |
| | 5 | 11,9 | 18,9 | 23,8 | 23,8 | 30,0 |
| | 10 | 11,6 | 18,4 | 23,2 | 23,2 | 29,2 |
| | 25 | 11,2 | 17,7 | 22,3 | 22,3 | 28,1 |
| | 50 | 10,9 | 17,2 | 21,7 | 21,7 | 27,4 |
| | 100 | 10,6 | 16,8 | 21,1 | 21,1 | 26,6 |
| 40°C | 1 | 10,8 | 17,1 | 21,6 | 21,6 | 27,2 |
| | 5 | 10,1 | 16,0 | 20,2 | 20,2 | 25,4 |
| | 10 | 9,8 | 15,5 | 19,6 | 19,6 | 24,7 |
| | 25 | 9,4 | 15,0 | 18,8 | 18,8 | 23,7 |
| | 50 | 9,2 | 14,5 | 18,3 | 18,3 | 23,1 |
| | 100 | 8,9 | 14,1 | 17,8 | 17,8 | 22,4 |
| 50°C | 1 | 9,1 | 14,5 | 18,2 | 18,2 | 23,1 |
| | 5 | 8,5 | 13,5 | 17,0 | 17,0 | 21,4 |
| | 10 | 8,2 | 13,1 | 16,5 | 16,5 | 20,8 |
| | 25 | 7,9 | 12,6 | 15,9 | 15,9 | 20,0 |
| | 50 | 7,7 | 12,2 | 15,4 | 15,4 | 19,4 |
| | 100 | 7,5 | 11,8 | 14,9 | 14,9 | 18,8 |
| 60°C | 1 | 7,7 | 12,2 | 15,4 | 15,4 | 19,4 |
| | 5 | 7,1 | 11,3 | 14,3 | 14,3 | 18,0 |
| | 10 | 6,9 | 11,0 | 13,9 | 13,9 | 17,5 |
| | 25 | 6,6 | 10,5 | 13,3 | 13,3 | 16,7 |
| | 50 | 6,4 | 10,2 | 12,9 | 12,9 | 16,2 |
| 70°C | 1 | 6,5 | 10,3 | 12,9 | 12,9 | 16,3 |
| | 5 | 6,0 | 9,5 | 12,0 | 12,0 | 15,1 |
| | 10 | 5,8 | 9,2 | 11,6 | 11,6 | 14,6 |
| | 25 | 5,0 | 8,0 | 10,0 | 10,0 | 12,7 |
| | 50 | 4,2 | 6,7 | 8,5 | 8,5 | 10,7 |
| 80°C | 1 | 5,4 | 8,6 | 10,8 | 10,8 | 13,7 |
| | 5 | 4,8 | 7,6 | 9,6 | 9,6 | 12,1 |
| | 10 | 4,0 | 6,4 | 8,1 | 8,1 | 10,2 |
| | 25 | 3,2 | 5,1 | 6,5 | 6,5 | 8,1 |
| 95°C | 1 | 3,8 | 6,1 | 7,6 | 7,6 | 9,6 |
| | 5 | 2,6 | 4,1 | 5,2 | 5,2 | 6,5 |
| | (10) ^a | (2,2) | (3,4) | (4,3) | (4,3) | (5,5) |

1.6 Hygiene & Health Concerns

Health is taken as a major concern during production of VESBO pipes and fittings. Connection of pipes does not require additives such as cement solvent, fluxes or solder. To ensure the safety of VESBO pipes and fittings for usage relating to human contact and consumption with potable water the following are strictly adhered to:

- **DIN 1988 Part 2**

- Drinking Water Supply Systems, Materials, Components, Appliances, Design and Installation

- **SKZ - Hygiene Enstitute**

- Test Certificate Based on Hygiene Enstitute recommendations for Materials in Contact with Drinking Water

- **WRc**

- Test Certificate

- Water Bylaws Scheme/WRc, Tests of Effect on Water Quality based on BS 6920

1.7 UV Resistance

VESBO Products are produced with UV stabilisers. However, like all other piping systems including metals pipe works should not be left exposed under direct sunlight without insulating or protection from direct sunlight or UV radiation.

1.8 Fire Classification

VESBO pipes and fittings comply and are classified under the requirements of the fire classification, B2 (Normally inflammable) according to DIN 4102. In case of a fire outbreak of temperature $>800^{\circ}\text{C}$, under ideal conditions, with sufficient oxygen, only carbon dioxide and water vapour are produced as the raw material of Polypropylene Random Co-polymer is a hydrocarbon chain. Toxic fumes or dioxin will not be emitted.

1.9 Sound Insulation

Compared to metallic pipes, VESBO does not need further insulation to decrease the decibel level when water flows at relatively high speeds. The reason is simply that metals transmit noises quicker and louder, whereas, plastics dampen the noises. Hence "whistling" and noises resulting from water hammer effect are largely reduced to non-existence.

1.10 Advantages of Using VESBO

From the above properties of VESBO systems and application areas, compared to other conventional metal or plastic piping systems VESBO has the following advantages.

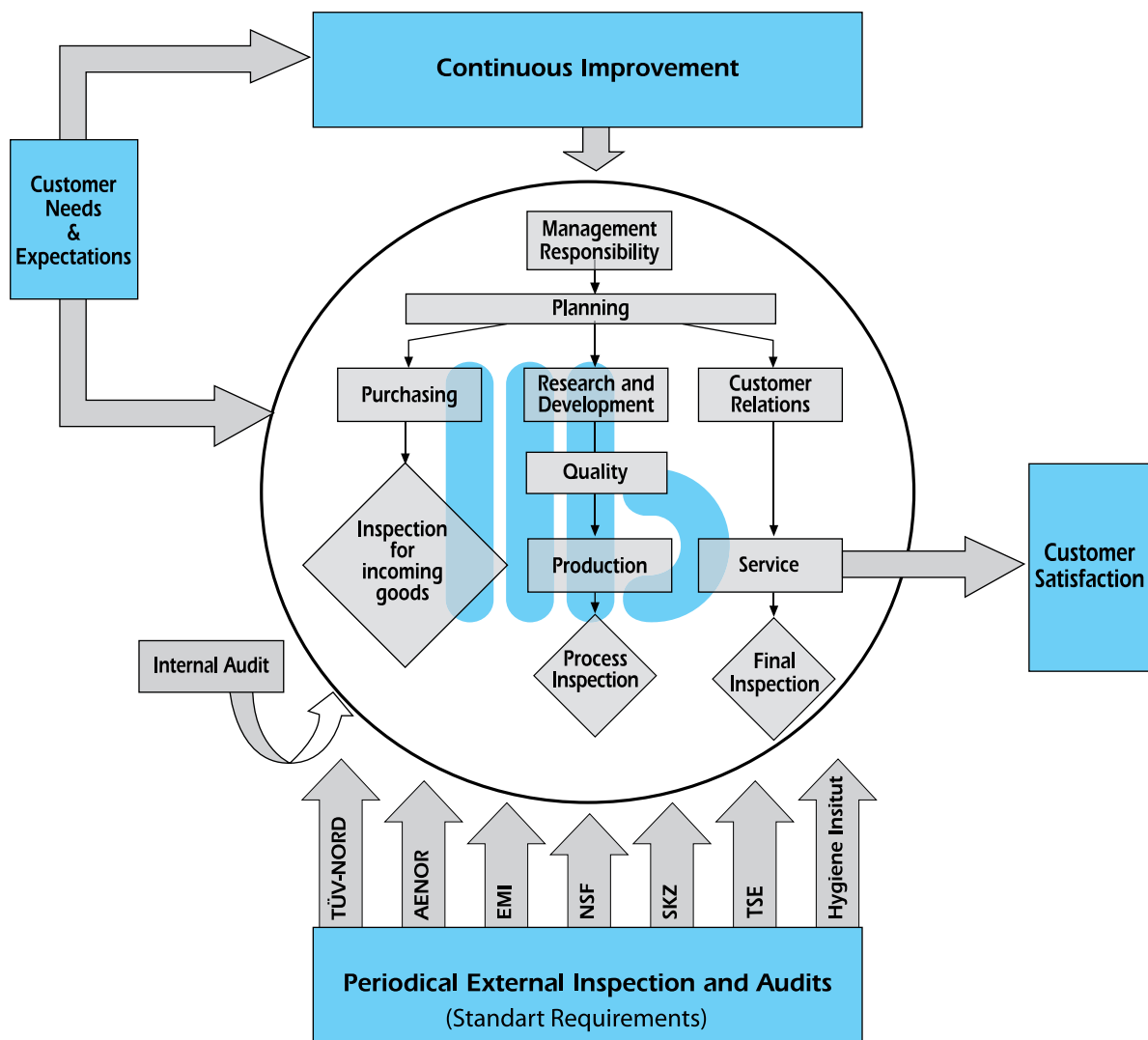
- Not detrimental to human health
- Rust and corrosion free
- Rupture free
- No scalling
- High resistance to acids and chlorides
- Noise free at high flow rates
- High pressure tolerances and rating
- Insulation is not necessary for interior applications
- Light weight
- Speed and ease of fusion technology
- Extensive savings in time and labour

2. QUALITY ASSURANCE

2.1 Quality as the Strategic Focus

Quality process is an integral part of everything VESBO does. Quality action teams of VESBO throughout the world are continually working to improve products, processes and procedures to better meet customer requirements.

We have learned and adapted many of the best practices of successful better quality management systems to create our own VESBO Quality System. There is no end for quality. VESBO Quality System is designed to be a cycle:



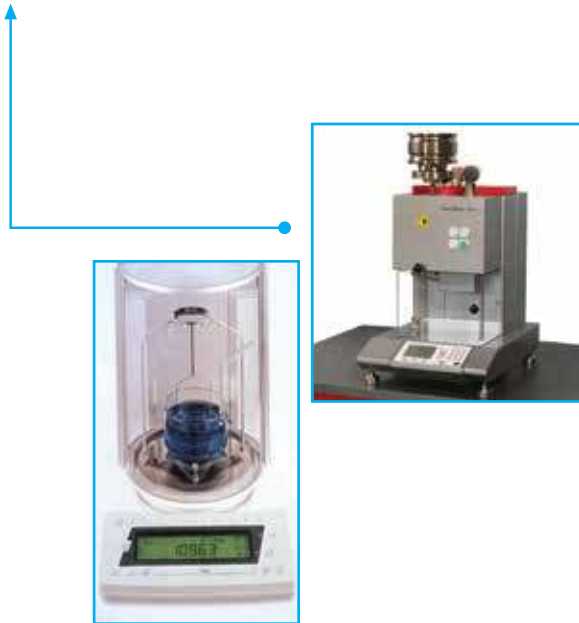
Quality is engineered into VESBO products during the entire manufacturing process. The three phases of quality control involve the incoming raw material, the pipe production and the finished product. The combination of all three areas ensures that the final product will fulfill the requirements and meet the desired specifications.

2.2 Internal Control

VESBO pipes and fittings are periodically subjected to the following extensive test program according to the standards.

Material Characterization Tests

Testing the incoming resin is the first step in the quality control program. It is usually checked for contamination, melt index, density, DSC and OIT. Any resin that does not meet the raw material specifications is not used for the production.



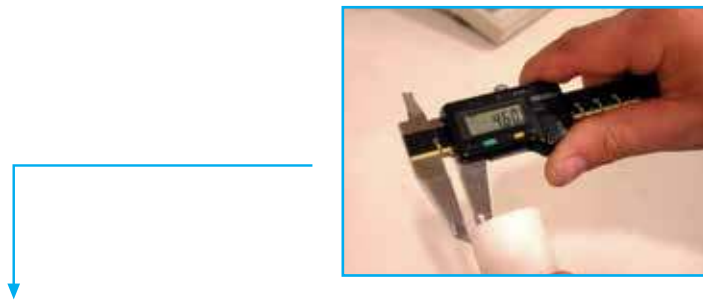
Thermal Reversion Properties

Thermal properties of plastic materials are equally important as mechanical properties. Unlike metals, plastics are extremely sensitive to changes in temperature. This difference in the coefficient of thermal expansion develops internal stresses and stress concentrations in the polymer. Pipes are subjected to thermal stresses inside a thermostatic chamber with a continuous air circulation to observe shrinkage in accordance with DIN 8078, EN ISO 15874.



Color Measurement Test with Spectrophotometry

Numeric color measurement means everyone involved in the supply chain speaks a universal color language. This new language lets you compare a measured color to a pre-established specification. And that enables you to control the color - maintain it within acceptable tolerances - at every step in your production process or supply chain.



Dimensional Tests

Pipe diameter, wall thickness, ovality and length of pipe are measured on a regular basis to insure compliance with standard requirements. The outside diameter wall thickness shall comply with the DIN 8077 and EN ISO 15874 specifications.

Mechanical Tests

The mechanical properties, among all the properties of plastic materials, are often the most important properties because virtually all service conditions and majority of end-use applications involve some degree of mechanical loading.

Thermocycling Test

Thermocycling Testing determines the ability of parts to resist extremely low and extremely high temperatures, as well as their ability to withstand cyclical exposures to these temperature extremes.



Impact Strength

Impact resistance is the ability of a material to resist breaking under a shock loading. Standard test specimens prepared from VESBO pipes are subjected to a pendulum type impact type load in accordance with DIN 8078 and EN ISO 15874.



Creep Strength Test (Short Term)

VESBO Pipes are subjected to creep tests according to DIN 8078 that determines their service life and that provides the required information about the mechanical characteristics of the pipe. The long-term burst strength of pipes is determined by subjecting the pipes to constant internal pressure and observing time-to-failure.



Thermal Stability Test (110 °C @ 8760 h)

A method for developing long-term hydrostatic design stresses, defined as the estimated tensile stress in the wall of the pipe in the circumferential orientation due to internal hydrostatic pressure that can be applied continuously with a high degree of certainty that failure of the pipe will not occur, for thermoplastic pipe materials is described.



The long-term performance of thermoplastic pipe materials is evaluated by stresses calculated for period 50 years.

Peeling Strength Test

Peeling strength is generally used to measure adhesive band strength of a material for VESBO Stable Pipes, Alpex, Alpert Multilayer Pipes.

2.3 External Control

Beside the internal controls which are planned and maintained by qualified VESBO technical departments, there are also periodic external controls carried out by independent international organizations like TÜV-NORD, SKZ, TSE, AENOR, NSF, EMI and Hygiene Institut. These controls include both product testing according to relevant standards and whole quality system controls. Therefore external controls are the main tools for us to ensure the highest quality products hence satisfying our customers expectations.

2.4 Locate & Trace Tools

Locate and Trace Tools make easier handling (H), loading (L), storing (S) and tracing (T) processes with visual locating and comprehensive feedback data.

Packaging



Barcode Packaging Box Label For Fittings (H, L, S, T)

On each Vesbo fittings box you will find a labelling tag on which the article's dimensions, code, quantity and KBT (to trace if contents are genuinely produced by VESBO®) are mentioned.

The article's name in different languages are also printed.



Barcode Packaging Box Label For Pipes (H,L,S,T)

Package or bundle of pipes is strapped with a barcode tag containing the article dimension, code, size, KBT and SN (serial numbers). Possible quality problems, shortage of goods during the packaging or dispatching process can be eliminated.

2.5 Standards

Pipes & Fittings

| | |
|----------------------------|---|
| EN ISO 15874 | : Plastic Piping Systems for Hot and Cold Water Installations-Polypropylene(PP) |
| EN ISO 15874-2:2013 | : Plastic Piping Systems for Hot and Cold Water Installations - Polypropylene pp - part 2: Pipes |
| EN ISO 15874-3:2013 | : Plastic Piping Systems for Hot and Cold Water Installations - Polypropylene pp - part 3: Fittings |
| DIN 8077:2008 | : Polypropylene (PP) Pipes – PP-H, PP-B, PP-R, PP-RCT – Dimensions |
| DIN 8078:2008 | : Polypropylene (PP) Pipes – PP-H, PP-B, PP-R, PP-RCT – General Quality Requirements and Testing |
| DIN 16962 | : Pipe Joints and Elements for Polypropylene Pressure Pipes |
| DIN 16928 | : Pipe Joints, Elements for Pipes, Laying-General Conditions |
| DIN 1988 | : Drinking Water Supply Systems, Materials, Components, Appliances, Design and Installation |
| DIN 2999 | : Threads for Pipes and Fittings |
| KWT Requirements | : Plastics Used for Drinking Water |
| DVS 2207 | : Welding of Thermoplastic Materials |
| DVS 2208 | : Machines and Instruments for Welding of thermoplastic Materials |
| ASTM F2389 | : Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems |
| CSA B 137:11 | : Polypropylene (PP-R) Pipe and Fittings for Pressure Applications |

2.6 Quality & Health Certificates

Production Quality Certificates

- DIN EN ISO 9001: 2008 Design, Production, Marketing and Sales of Vesbo Plastic Pipes and Fittings and Miscellaneous Parts
- BS OHSAS 18001: 2007 Occupational Health and Safety Management Systems
- EN ISO 14001: 2005 Environmental Management Systems

Product Quality & Health Certificates



GERMANY

- SKZ German Plastic Institute
- KTW Federal Health Office



USA

- NSF The Public Health and Safety Organization



SPAIN

- AENOR The Spanish Association for Standardization and Certification



RUSSIAN FEDERATION

- GOST-R State Committee of the Russian Federation for Standardization and Metrology
- Russian federation Ministry of Health-Sewerage Department , Recommendations for materials in contact with drinking water



ROMANIA

- ICECON Test Approval Certificate



POLAND

- TIN Institute of Building Technique
- PZH National Institute of Hygiene



CANADA

- NSF The Public Health and Safety Organization

**TURKEY**

- TSE Turkish Standards Institute

**PHILIPPINES**

- Industrial Technology Development Institute Standards and Testing Division

**SINGAPORE**

- TUV SUD PSB
- PSB Productivity & Standards Board, Public Utilities Board, Singapore Ministry of Environment Sewerage Department (Project Basis), Test Effect on Water quality based on BS 6920

**MALAYSIA**

- SIRIM, SPAN

**CHINA**

- MA/Ministry of Health
- Building Material Quality Inspection Testing Bureau

**VIETNAM**

- Directorate for Standards and Quality Vietnam Metrology Institute

**PORTUGAL**

- CERTIF

**CHILE**

- CESMEC

**KUWAIT**

- Ministry of Public Works

**KAZAKHSTAN**

- TEKS

**UKRAINE**

- SEPROKIEVBUDPROEKT Certification Center of Construction, Materials, Wares and Structures

- 1 TÜV-CERT EN ISO 9001
- 2 SKZ / Germany
- 3 NSF / USA
- 4 HYGIENE INSTITUT / Germany
- 5 AENOR / Spain
- 6 KIWA / The Netherlands
- 7 GOST-R / Russian Federation
- 8 Ukraine
- 9 PSB / Singapore
- 10 Certif / Portugal



3. PRODUCT RANGE

3.1 VESBO® Composite Faser Pipe

VESBO® Faser Pipe is the latest addition to the PP-R pipe range.

It is a composite pipe consisting of 3 Layers, with 20% glass fiber/PP-R, sandwiched between PPR material in the inner layer and on the surface layer i.e. PP-R/GF/PP-R.

Faser pipes are used for chilled and hot water reticulation systems.

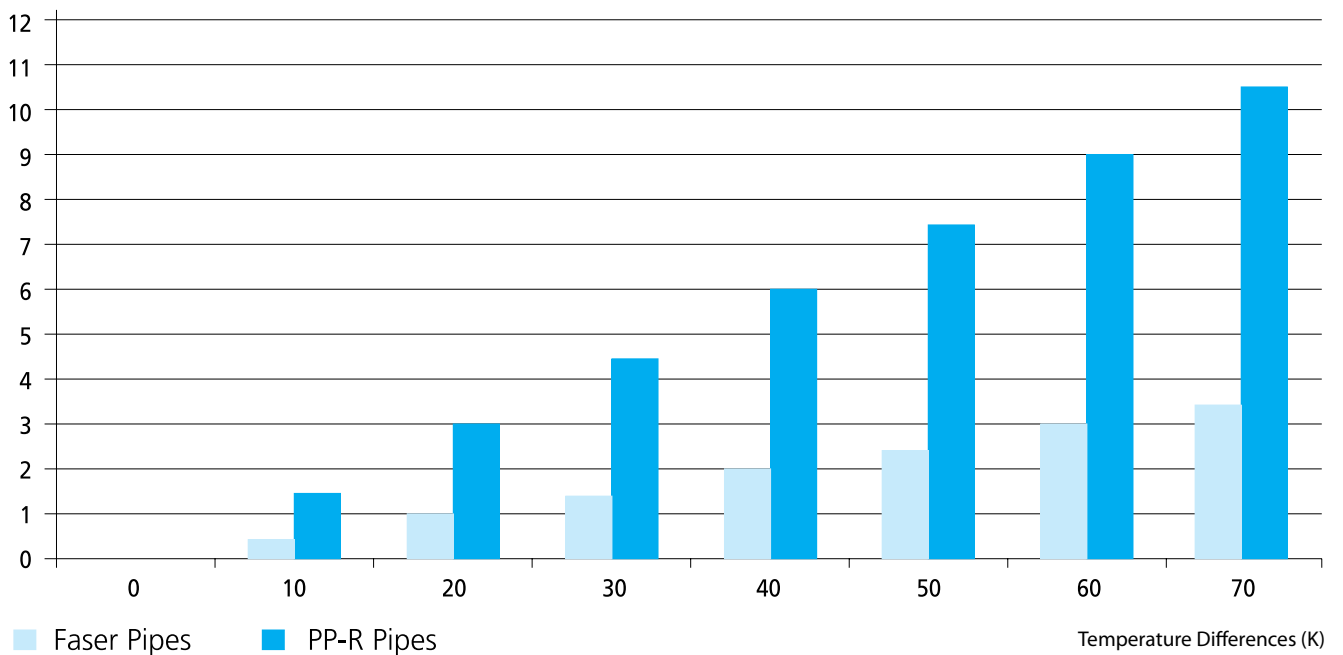
Linear Expansion

Compared to normal PP-R pipes, Faser pipes have a much lower extension when transporting hot water. As such, Faser pipes remain relatively straight at high temperatures. Pipe supports can be minimized.

Linear Expansion Comparison

Linear Expansion of PP-R and Faser Pipes

Linear Expansion Comparison (m/mm)



Coefficient of linear thermal expansion of VESBO faser pipes is 0.04 mm/mK.

Coefficient of linear thermal expansion of VESBO mono PP-R is 0.15 mm/mK.

Permissible Operating Pressure

Compared to normal PP-R pipes, Faser pipes has better and longer projected life span at higher temperatures and pressure.

Maximum operational pressures for pipes consisting of PP-R 80 for water with Safety Factor (SF) = 1.25 (acc. to DIN 8077: 2007-05)

| Heating Period | Temperature (°C) | Years of Operating | PN 16 SDR 7.4 (bar) | PN 20 SDR 6 (bar) | PN 25 SDR 5 (bar) |
|---|------------------|--------------------|---------------------|-------------------|-------------------|
| Continuously | 70 | 50 | 8.1 | 10.2 | 12.8 |
| Continuous working at 70 °C including 60 days per year with | 75 | 45 | 8.1 | 10.2 | 12.8 |
| | 80 | 40 | 7.8 | 9.8 | 11.6 |
| | 85 | 35 | 7.1 | 8.9 | 11.2 |
| | 90 | 30 | 6.3 | 7.6 | 8.4 |
| Continuous working at 70 °C including 90 days per year with | 75 | 45 | 7.3 | 9.9 | 12.2 |
| | 80 | 37.5 | 7.0 | 9.1 | 11.5 |
| | 85 | 32.5 | 6.2 | 8.0 | 10.4 |
| | 90 | 25 | 5.7 | 7.3 | 8.2 |

VESBO® PP-R + Glass Fiber=



Polypropylene Random Copolymer Pipe (PP-R) _____

Glass Fiber (GF) _____

Polypropylene Random Copolymer Pipe (PP-R) _____



3.2 Pipes



VESBO PN 10 (SDR 11) Pipes are suitable for cold water installations and low pressure systems.

PN 10 (SDR 11) COLD WATER PIPE

| CODE | OD x THICKNESS (mm) | m / PACK |
|-----------------|---------------------|----------|
| 111.1Y.E15.EC4T | 20 x 2.3 | 100 |
| 111.1Y.E15.FC4T | 25 x 2.3 | 100 |
| 111.1Y.E15.GC4T | 32 x 2.9 | 100 |
| 111.1Y.E15.HC4T | 40 x 3.7 | 60 |
| 111.1Y.E15.IC4T | 50 x 4.6 | 40 |
| 111.1Y.E15.JC4T | 63 x 5.8 | 28 |
| 111.1Y.E15.KC4T | 75 x 6.8 | 20 |
| 111.1Y.E15.LC4T | 90 x 8.2 | 12 |
| 111.1Y.E15.MC4T | 110 x 10.0 | 8 |
| 111.1Y.E15.NC4T | 125 x 11.4 | 4 |
| 111.1Y.E15.PC4T | 160 x 14.6 | 4 |



VESBO PN 16 (SDR 7.4) Pipes are used for both hot & cold water installations and higher pressure systems

PN 16 (SDR 7.4) HOT & COLD WATER PIPE

| CODE | OD x THICKNESS (mm) | m / PACK |
|-----------------|---------------------|----------|
| 111.1Y.E13.EC4T | 20 x 2.8 | 100 |
| 111.1Y.E13.FC4T | 25 x 3.5 | 100 |
| 111.1Y.E13.GC4T | 32 x 4.4 | 100 |
| 111.1Y.E13.HC4T | 40 x 5.5 | 60 |
| 111.1Y.E13.IC4T | 50 x 6.9 | 40 |
| 111.1Y.E13.JC4T | 63 x 8.6 | 28 |
| 111.1Y.E13.KC4T | 75 x 10.3 | 20 |
| 111.1Y.E13.LC4T | 90 x 12.3 | 12 |
| 111.1Y.E13.MC4T | 110 x 15.1 | 8 |
| 111.1Y.E13.NC4T | 125 x 17.1 | 4 |
| 111.1Y.E13.PC4T | 160 x 21.9 | 4 |

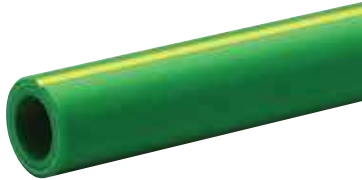


VESBO PN 20 (SDR 6) Pipes are used for both hot & cold water installations and higher pressure systems

PN 20 (SDR 6) HOT & COLD WATER PIPE

| CODE | OD x THICKNESS (mm) | m / PACK |
|-----------------|---------------------|----------|
| 111.1Y.E12.EC4T | 20 x 3.4 | 100 |
| 111.1Y.E12.FC4T | 25 x 4.2 | 100 |
| 111.1Y.E12.GC4T | 32 x 5.4 | 100 |
| 111.1Y.E12.HC4T | 40 x 6.7 | 60 |
| 111.1Y.E12.IC4T | 50 x 8.3 | 40 |
| 111.1Y.E12.JC4T | 63 x 12.5 | 28 |
| 111.1Y.E12.KC4T | 75 x 12.5 | 20 |
| 111.1Y.E12.LC4T | 90 x 15.0 | 12 |
| 111.1Y.E12.MC4T | 110 x 18.3 | 8 |
| 111.1Y.E12.NC4T | 125 x 20.8 | 4 |
| 111.1Y.E12.PC4T | 160 x 26.6 | 8 |

3.2 Pipes



VESBO Composite Faser Pipes are preferred mainly for exposed pipe installations thanks to the low linear expansion rate and reinforced structure.

SDR 6 COMPOSITE FASER PIPE FOR HOT & COLD WATER

| CODE | OD x THICKNESS (mm) | m / PACK |
|-----------------|---------------------|----------|
| 111.1Y.E62.EC4T | 20 x 3.4 | 100 |
| 111.1Y.E62.FC4T | 25 x 4.2 | 100 |
| 111.1Y.E62.GC4T | 32 x 5.4 | 60 |
| 111.1Y.E62.HC4T | 40 x 6.7 | 40 |
| 111.1Y.E62.IC4T | 50 x 8.3 | 20 |
| 111.1Y.E62.JC4T | 63 x 10.5 | 20 |
| 111.1Y.E62.KC4T | 75 x 12.5 | 12 |
| 111.1Y.E62.LC4T | 90 x 15.0 | 12 |
| 111.1Y.E62.MC4T | 110 x 18.3 | 8 |



VESBO Composite Faser Pipes are preferred mainly for exposed pipe installations thanks to the low linear expansion rate and reinforced structure.

SDR 7.4 COMPOSITE FASER PIPE FOR HOT & COLD WATER

| CODE | OD x THICKNESS (mm) | m / PACK |
|-----------------|---------------------|----------|
| 111.1Y.E63.EC4T | 20 x 2.8 | 100 |
| 111.1Y.E63.FC4T | 25 x 3.5 | 100 |
| 111.1Y.E63.GC4T | 32 x 4.4 | 60 |
| 111.1Y.E63.HC4T | 40 x 5.5 | 40 |
| 111.1Y.E63.IC4T | 50 x 6.9 | 20 |
| 111.1Y.E63.JC4T | 63 x 8.6 | 20 |
| 111.1Y.E63.KC4T | 75 x 10.3 | 12 |
| 111.1Y.E63.LC4T | 90 x 12.3 | 12 |
| 111.1Y.E63.MC4T | 110 x 15.1 | 8 |



VESBO Stable Pipes are preferred mainly for exposed pipe installations thanks to the low linear expansion rate and reinforced structure.

PN 25 (SDR 5) STABLE PIPE WITH ALUMINIUM FOR HOT & COLD WATER

| CODE | OD x THICKNESS + OUTER LAYER (mm) | m / PACK |
|-----------------|-----------------------------------|----------|
| 111.1Y.E21.E04T | 20 x 3.4 + 0.5 | 100 |
| 111.1Y.E21.F04T | 25 x 4.2 + 0.6 | 100 |
| 111.1Y.E21.G04T | 32 x 5.4 + 0.7 | 60 |
| 111.1Y.E21.H04T | 40 x 6.7 + 0.8 | 60 |
| 111.1Y.E21.I04T | 50 x 8.3 + 1.0 | 40 |
| 111.1Y.E21.J04T | 63 x 10.5 + 1.1 | 28 |
| 111.1Y.E21.K04T | 75 x 12.5 + 1.4 | 20 |
| 111.1Y.E21.L04T | 90 x 15.0 + 1.6 | 12 |
| 111.1Y.E21.M04T | 110 x 18.3 + 2.0 | 8 |

3.3 Fittings



VESBO Sockets are used to join two pipes.

SOCKET

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.A01.E00 | 20 | 280 |
| 112.1Y.A01.F00 | 25 | 180 |
| 112.1Y.A01.G00 | 32 | 119 |
| 112.1Y.A01.H00 | 40 | 75 |
| 112.1Y.A01.I00 | 50 | 36 |
| 112.1Y.A01.J00 | 63 | 16 |
| 112.1Y.A01.K00 | 75 | 16 |
| 112.1Y.A01.L00 | 90 | 7 |
| 112.1Y.A01.M00 | 110 | 4 |
| 212.9Y.A01.N00V * | 125 | 1 |
| 212.9Y.A01.P00V * | 160 | 1 |



VESBO Elbows are used where the pipeline makes a curve of 90°.

90° ELBOW

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.A02.E00 | 20 | 200 |
| 112.1Y.A02.F00 | 25 | 125 |
| 112.1Y.A02.G00 | 32 | 75 |
| 112.1Y.A02.H00 | 40 | 40 |
| 112.1Y.A02.I00 | 50 | 24 |
| 112.1Y.A02.J00 | 63 | 10 |
| 112.1Y.A02.K00 | 75 | 5 |
| 112.1Y.A02.L00 | 90 | 2 |
| 112.1Y.A02.M00 | 110 | 2 |
| 212.9Y.A02.N00V * | 125 | 1 |
| 212.9Y.A02.P00V * | 160 | 1 |



VESBO Elbows are used where the pipeline makes a curve of 45°.

45° ELBOW

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.A03.E00 | 20 | 200 |
| 112.1Y.A03.F00 | 25 | 120 |
| 112.1Y.A03.G00 | 32 | 75 |
| 112.1Y.A03.H00 | 40 | 48 |
| 112.1Y.A03.I00 | 50 | 25 |
| 112.1Y.A03.J00 | 63 | 12 |
| 112.1Y.A03.K00 | 75 | 5 |
| 112.1Y.A03.L00 | 90 | 3 |
| 112.1Y.A03.M00 | 110 | 2 |
| 212.9Y.A03.N00V * | 125 | 1 |
| 212.9Y.A03.P00V * | 160 | 1 |

* These products may be supplied by an outsource

3.3 Fittings



VESBO T Parts are used to join branches on the main pipeline.

T-PART

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.A04.E00 | 20 | 150 |
| 112.1Y.A04.F00 | 25 | 75 |
| 112.1Y.A04.G00 | 32 | 48 |
| 112.1Y.A04.H00 | 40 | 36 |
| 112.1Y.A04.I00 | 50 | 12 |
| 112.1Y.A04.J00 | 63 | 8 |
| 112.1Y.A04.K00 | 75 | 4 |
| 112.1Y.A04.L00 | 90 | 2 |
| 112.1Y.A04.M00 | 110 | 1 |
| 212.9Y.A04.N00V * | 125 | 1 |
| 212.9Y.A04.P00V * | 160 | 1 |



VESBO Reducers are used for joining bigger size pipelines to smaller size pipelines.

REDUCER

| CODE | SIZE (mm) | PCS / PACK | SOCKET SIZE TO BE USED (mm) |
|-------------------|-----------|------------|-----------------------------|
| 112.1Y.A06.FE0 | 25 / 20 | 250 | 25 |
| 112.1Y.A06.GE0 | 32 / 20 | 180 | 32 |
| 112.1Y.A06.GF0 | 32 / 25 | 120 | 32 |
| 112.1Y.A06.HE0 | 40 / 20 | 100 | 40 |
| 112.1Y.A06.HF0 | 40 / 25 | 100 | 40 |
| 112.1Y.A06.HG0 | 40 / 32 | 105 | 40 |
| 112.1Y.A06.IE0 | 50 / 20 | 60 | 50 |
| 112.1Y.A06.IF0 | 50 / 25 | 60 | 50 |
| 112.1Y.A06.IG0 | 50 / 32 | 60 | 50 |
| 112.1Y.A06.IH0 | 50 / 40 | 60 | 63 |
| 112.1Y.A06.JE0 | 63 / 20 | 48 | 63 |
| 112.1Y.A06.JF0 | 63 / 25 | 40 | 63 |
| 112.1Y.A06.JG0 | 63 / 32 | 40 | 63 |
| 112.1Y.A06.JH0 | 63 / 40 | 30 | 63 |
| 112.1Y.A06.JI0 | 63 / 50 | 36 | 63 |
| 112.1Y.A06.KH0 | 75 / 40 | 16 | 75 |
| 112.1Y.A06.KI0 | 75 / 50 | 16 | 75 |
| 112.1Y.A06.KJ0 | 75 / 63 | 16 | 75 |
| 112.1Y.A06.LI0 | 90 / 50 | 12 | 90 |
| 112.1Y.A06.LJ0 | 90 / 63 | 12 | 90 |
| 112.1Y.A06.LK0 | 90 / 75 | 12 | 90 |
| 112.1Y.A06.MK0 | 110 / 75 | 6 | 110 |
| 112.1Y.A06.ML0 | 110 / 90 | 6 | 110 |
| 212.9Y.A06.NM0V * | 125 / 110 | 1 | 125 |
| 212.9Y.A06.PM0V * | 160 / 110 | 1 | 160 |

* These products may be supplied by an outsource



VESBO Unequal T Parts used for both joining branches on pipelines and for transitions to different diameters like reducer parts.

UNEQUAL T

| CODE | SIZE (mm) | PCS / PACK |
|----------------|----------------|------------|
| 112.1Y.A05.EFE | 20 x 25 x 20 | 75 |
| 112.1Y.A05.FEE | 25 x 20 x 20 | 75 |
| 112.1Y.A05.FEF | 25 x 20 x 25 | 75 |
| 112.1Y.A05.FFE | 25 x 25 x 20 | 75 |
| 112.1Y.A05.GEE | 32 x 20 x 20 | 45 |
| 112.1Y.A05.GEF | 32 x 20 x 25 | 45 |
| 112.1Y.A05.GEG | 32 x 20 x 32 | 50 |
| 112.1Y.A05.GFE | 32 x 25 x 20 | 60 |
| 112.1Y.A05.GFG | 32 x 25 x 32 | 48 |
| 112.1Y.A05.HEH | 40 x 20 x 40 | 36 |
| 112.1Y.A05.HFG | 40 x 25 x 32 | 36 |
| 112.1Y.A05.HFH | 40 x 25 x 40 | 36 |
| 112.1Y.A05.HGF | 40 x 32 x 25 | 36 |
| 112.1Y.A05.HGH | 40 x 32 x 40 | 30 |
| 112.1Y.A05.IEI | 50 x 20 x 50 | 15 |
| 112.1Y.A05.IFI | 50 x 25 x 50 | 15 |
| 112.1Y.A05.JGI | 50 x 32 x 50 | 15 |
| 112.1Y.A05.IHI | 50 x 40 x 50 | 12 |
| 112.1Y.A05.JEJ | 63 x 20 x 63 | 8 |
| 112.1Y.A05.JFJ | 63 x 25 x 63 | 8 |
| 112.1Y.A05.JGJ | 63 x 32 x 63 | 8 |
| 112.1Y.A05.JHJ | 63 x 40 x 63 | 8 |
| 112.1Y.A05.JJJ | 63 x 50 x 63 | 8 |
| 112.1Y.A05.KEK | 75 x 20 x 75 | 5 |
| 112.1Y.A05.KFK | 75 x 25 x 75 | 5 |
| 112.1Y.A05.KGK | 75 x 32 x 75 | 5 |
| 112.1Y.A05.KHK | 75 x 40 x 75 | 5 |
| 112.1Y.A05.KIK | 75 x 50 x 75 | 4 |
| 112.1Y.A05.KJK | 75 x 63 x 75 | 4 |
| 112.1Y.A05.LHL | 90 x 40 x 90 | 3 |
| 112.1Y.A05.LIL | 90 x 50 x 90 | 3 |
| 112.1Y.A05.LJL | 90 x 63 x 90 | 2 |
| 112.1Y.A05.LKL | 90 x 75 x 90 | 2 |
| 112.1Y.A05.MIM | 110 x 50 x 110 | 2 |
| 112.1Y.A05.MJM | 110 x 63 x 110 | 2 |
| 112.1Y.A05.MKM | 110 x 75 x 110 | 2 |
| 112.1Y.A05.MLM | 110 x 90 x 110 | 2 |

CROSS

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.A13.E00 | 20 | 105 |
| 112.1Y.A13.F00 | 25 | 60 |
| 112.1Y.A13.G00 | 32 | 32 |
| 112.1Y.A13.H00 | 40 | 20 |



3.3 Fittings



VESBO Caps are used as a stopper at the pipeline ends.

CAP

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.A07.E00 | 20 | 350 |
| 112.1Y.A07.F00 | 25 | 270 |
| 112.1Y.A07.G00 | 32 | 150 |
| 112.1Y.A07.H00 | 40 | 90 |
| 112.1Y.A07.I00 | 50 | 50 |
| 112.1Y.A07.J00 | 63 | 24 |
| 112.1Y.A07.K00 | 75 | 16 |
| 112.1Y.A07.L00 | 90 | 9 |
| 112.1Y.A07.M00 | 110 | 4 |



VESBO Threaded Caps are for sealing the pipe ends during the pressure tests.

THREADED CAP

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.A08.E00 | 20 | 300 |
| 112.1Y.A08.F00 | 25 | 300 |
| 112.1Y.A08.G00 | 32 | 200 |



LONG THREADED CAP**

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.A08.E00V | 20 | 100 |
| 212.9Y.A08.F00V | 25 | 100 |



VESBO Collectors provide a direct installation of pipes to the consumption points and minimize number of the fittings used.

COLLECTOR

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.A09.GE0 | 20 | 30 |
| 112.1Y.A09.HE0 | 25 | 20 |



VESBO Flanges are used for joining big size pipes to each other and for transition of Vesbo pipelines to other Pipe systems (copper, steel, PVC, PB etc.) without any plastic or metal threaded parts. Moreover, the joint could be separated easily when required.

FLANGE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.A10.J00 | 63 | 24 |
| 112.1Y.A10.K00 | 75 | 20 |
| 112.1Y.A10.L00 | 90 | 10 |
| 112.1Y.A10.M00 | 110 | 8 |



VESBO Sleeves are used to fix the pipelines on ground or walls.

SLEEVE

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.A16.E00 | 20 | 400 |
| 112.1Y.A16.F00 | 25 | 300 |
| 112.1Y.A16.G00 | 32 | 200 |
| 212.9Y.A13.H00V * | 40 | 100 |
| 212.9Y.A13.I00V * | 50 | 50 |
| 212.9Y.A13.J00V * | 63 | 25 |
| 212.9Y.A13.K00V * | 75 | 20 |
| 212.9Y.A13.L00V * | 90 | 10 |
| 212.9Y.A13.M00V * | 110 | 10 |


DOUBLE SLEEVE

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.A14.E00 | 20 | 50 |
| 112.1Y.A14.F00 | 25 | 40 |
| 112.9Y.A14.G00V * | 32 | 25 |



VESBO Pipe Bridges are used where a pipeline has to pass over the other pipeline.

PIPE BRIDGE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 113.1Y.M12.E00 | 20 | 50 |
| 113.1Y.M12.F00 | 25 | 40 |
| 113.1Y.M12.G00 | 32 | 25 |

* These products may be supplied by an outsource

3.3 Fittings

OMEGA

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 113.1B.O12.E00 | 20 | 50 |
| 113.1B.O12.F00 | 25 | 40 |
| 113.1B.O12.G00 | 32 | 20 |


BRIDGE WITH SOCKET **

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 213.1Y.M12.E00 | 20 | 50 |
| 213.1Y.M12.F00 | 25 | 40 |
| 213.1Y.M12.G00 | 32 | 25 |


C BRIDGE **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 213.9Y.C12.E00V | 20 | 50 |
| 213.9Y.C12.F00V | 25 | 40 |


ELBOW WITH TAILED **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.A19.EQ0V | 20 x ½ | 100 |
| 212.9Y.A19.PQ0V | 25 x ½ | 75 |

** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.



VESBO Female Adaptors are used as transition parts between VESBO and metal pipelines. These fittings are preferred mostly for permanent joints.

ADAPTOR FEMALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.B11.EQ0 | 20 x ½ | 180 |
| 112.1Y.B11.ER0 | 20 x ¾ | 120 |
| 112.1Y.B11.FQ0 | 25 x ½ | 120 |
| 112.1Y.B11.FR0 | 25 x ¾ | 105 |
| 112.1Y.X15.GS0 | 32 x 1 | 48 |



VESBO Male Adaptors are used in transition of VESBO pipeline to metal threaded parts and pipelines. These fittings are preferred mostly for permanent joints.

ADAPTOR MALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.X21.EQ0 | 20 x ½ | 140 |
| 112.1Y.B21.ER0 | 20 x ¾ | 90 |
| 112.1Y.B21.FQ0 | 25 x ½ | 120 |
| 112.1Y.X21.FR0 | 25 x ¾ | 90 |
| 112.1Y.X25.GS0 | 32 x 1 | 54 |



VESBO Hexagonal Female Adaptors are used as transition parts between VESBO and metal pipelines. These fittings are preferred mostly for permanent joints.

HEX. FEMALE ADAPTOR

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.X11.GS0 | 32 x 1 | 40 |
| 112.1Y.B11.HT0 | 40 x 1 ¼ | 25 |
| 112.1Y.B11.IU0 | 50 x 1 ½ | 16 |
| 112.1Y.B11.JV0 | 63 x 2 | 12 |
| 112.1Y.B11.KW0 | 75 x 2 ½ | 6 |
| 212.9Y.B11.LX0V * | 90 x 3 | 1 |
| 212.9Y.B11.MY0V * | 110 x 3 ½ | 1 |

* These products may be supplied by an outsource

3.3 Fittings



VESBO Hexagonal Male Adaptors are used in transition of VESBO pipeline to metal threaded parts and pipelines. These fittings are preferred mostly for permanent joints.

HEX. MALE ADAPTOR

| CODE | SIZE (mm) | PCS / PACK |
|-------------------|-----------|------------|
| 112.1Y.X21.GS0 | 32 x 1 | 36 |
| 112.1Y.B21.HT0 | 40 x 1 ¼ | 24 |
| 112.1Y.B21.IU0 | 50 x 1 ½ | 16 |
| 112.1Y.B21.JV0 | 63 x 2 | 12 |
| 112.1Y.B21.KW0 | 75 x 2 ½ | 8 |
| 212.9Y.B21.LX0V * | 90 x 3 | 1 |
| 212.9Y.B21.MY0V * | 110 x 3 ½ | 1 |



VESBO Female Elbows are used in transition between VESBO pipeline and metal threaded parts (battery, tap, etc.)

ELBOW FEMALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.B12.EQ0 | 20 x ½ | 120 |
| 112.1Y.B12.FQ0 | 25 x ½ | 90 |
| 112.1Y.B12.FR0 | 25 x ¾ | 60 |
| 112.1Y.B12.GS0 | 32 x 1 | 30 |
| 112.1B.B12.GR0 | 32 x ¾ | 40 |



VESBO Male Elbows are used in transition between VESBO pipeline and metal threaded parts (battery, tap, etc.)

ELBOW MALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.B22.EQ0 | 20 x ½ | 105 |
| 112.1Y.B22.FQ0 | 25 x ½ | 80 |
| 112.1Y.B22.FR0 | 25 x ¾ | 60 |
| 112.1Y.B22.GS0 | 32 x 1 | 24 |

* These products may be supplied by an outsource



VESBO Female T parts are used in joints between VESBO pipelines and metal threaded parts

T-PART FEMALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-------------|------------|
| 112.1Y.B13.EQ0 | 20 x ½ x 20 | 90 |
| 112.1Y.B13.ER0 | 20 x ¾ x 20 | 60 |
| 112.1Y.B13.FQ0 | 25 x ½ x 25 | 60 |
| 112.1Y.B13.FR0 | 25 x ¾ x 25 | 50 |
| 112.1Y.B13.GR0 | 32 x ¾ x 33 | 32 |



VESBO Male T parts are used in joints between VESBO pipelines and metal threaded parts

T-PART MALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-------------|------------|
| 112.1Y.B23.EQ0 | 20 x ½ x 20 | 75 |
| 112.1Y.B23.FQ0 | 25 x ½ x 25 | 60 |
| 112.1Y.B23.FR0 | 25 x ¾ x 25 | 48 |
| 112.1Y.B23.GS0 | 32 x 1 x 32 | 28 |



VESBO Wall Connection Elbows with their additional back parts are used to fasten the pipelines to the wall.

WALL CONNECTION ELBOW

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.B14.EQ0 | 20 x ½ | 75 |
| 112.1Y.B14.FQ0 | 25 x ½ | 68 |

3.3 Fittings

ADJUSTABLE UNDER PLASTER ELBOW (NO NAME) **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.B44.EQ0V | 20 x ½ | 10 |
| 212.9Y.B44.FQ0V | 25 x ½ | 10 |


DOUBLE STABLE UNDER PLASTER ELBOW **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.B34.EQ0V | 20 x ½ | 20 |
| 212.9Y.B34.FQ0V | 25 x ½ | 20 |


UNION FEMALE

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 112.1Y.G12.EQ0 | 20 x ½ | 160 |
| 112.1Y.G12.FR0 | 25 x ¾ | 90 |
| 112.1Y.G12.GS0 | 32 x 1 | 60 |
| 112.1Y.G12.HT0 | 40 x 1 ¼ | 30 |
| 112.9Y.G12.IU0V | 50 x 1 ½ | 16 |
| 112.9Y.G12.JV0V | 63 x 2 | 10 |

VESBO Female Unions are used in transition between fixed VESBO and metal pipelines. These fittings are preferred mainly for the installations in which temporarily renovation of the intermediate parts (valves, batteries, etc.) is required.

** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.



VESBO Male Unions are used in transition between fixed VESBO and metal pipelines. These fittings are preferred mainly for the installations in which temporarily renovation of the intermediate parts (valves, batteries, etc.) is required.

UNION MALE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.G22.EQ0 | 20 x ½ | 120 |
| 112.1Y.G22.FR0 | 25 x ¾ | 80 |
| 112.1Y.G22.GS0 | 32 x 1 | 48 |
| 112.1Y.G22.HT0 | 40 x 1 ¼ | 24 |
| 112.9Y.G22.IU0 | 50 x 1 ½ | 12 |
| 112.9Y.G22.JV0 | 63 x 2 | 10 |


ADAPTOR WITH NUT (NO NAME) **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.K00.EQ0V | 20 x ½ | 120 |
| 212.9Y.K00.FR0V | 25 x ¾ | 120 |


ELBOW WITH NUT (NO NAME) **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.K02.EQ0V | 20 x ½ | 80 |
| 212.9Y.K02.FR0V | 25 x ¾ | 60 |

** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.

3.3 Fittings



VESBO Valves are used as turn on/off and flow regulating units in pipelines.

VALVE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.C10.EQ0 | 20 x ½ | 24 |
| 112.1Y.C10.FR0 | 25 x ¾ | 25 |
| 112.1Y.C10.GS0 | 32 x 1 | 16 |



VESBO Chromium Valves are ball valves that are preferred mostly for the locations where aesthetics is important.

CHROMIUM VALVE

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.C30.EQ0 | 20 x ½ | 30 |
| 112.1Y.C30.ER0 | 20 x ¾ | 20 |
| 112.1Y.C30.FR0 | 20 x ¾ | 30 |
| 112.1Y.C30.GS0 | 32 x 1 | 20 |



CHROMIUM VALVE-LONG

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 112.1Y.C40.EQ0 | 20 x ½ | 20 |
| 112.1Y.C40.FR0 | 25 x ¾ | 20 |
| 112.1Y.C40.GS0 | 32 x 1 | 16 |


VALVE T-PART

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 614.1Y.B01.EQ0 | 20 x ½ | 60 |
| 614.1Y.B01.FR0 | 25 x ¾ | 40 |
| 614.1Y.B01.GS0 | 32 x 1 | 32 |


PLASTIC BALL VALVE

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 112.1Y.C20.EQ0 | 20 x ½ | 40 |
| 112.1Y.C20.FR0 | 25 x ¾ | 32 |
| 112.1Y.C20.GS0 | 32 x 1 | 18 |
| 212.1Y.C20.HT0* | 40 x 1 ¼ | 6 |
| 212.1Y.C20.IU0* | 50 x 1 ½ | 4 |
| 212.1Y.C20.JV0* | 63 x 2 | 2 |
| 212.1Y.C20.KW0* | 75 x 2 ½ | 1 |

VESBO Ball Valves are preferred for a more practical usage with their handles to regulate the water flow.


PP-R BRASS UNION STOP VALVE **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.Q60.EQ0V | 20 x ½ | 20 |
| 212.9Y.Q60.FR0V | 25 x ¾ | 18 |
| 212.9Y.Q60.GS0V | 32 x 1 | 15 |
| 212.9Y.Q60.HT0V | 40 x 1 ¼ | 9 |

* These products may be supplied by an outsource

** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.

3.3 Fittings



VESBO Composite Faser Pipes are preferred mainly for exposed pipe installations thanks to the low linear expansion rate and reinforced structure.

PP-R BRASS UNION BALL VALVE **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.Q70.EQ0V | 20 x ½ | 45 |
| 212.9Y.Q70.FR0V | 25 x ¾ | 24 |
| 212.9Y.Q70.GS0V | 32 x 1 | 18 |



RADIATOR STRAIGHT VALVE **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.H01.E00V | 20 x ½" | 50 |



RADIATOR ELBOW VALVE **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.9Y.H02.EQ0V | 20 x ½" | 40 |

** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.


THERMOSTATIC RADIATOR VALVE - ELBOW **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.1B.H12.EQ0V | 20 x 1/2" | 50 |


THERMOSTATIC RADIATOR VALVE - STRAIGHT **

| CODE | SIZE (mm) | PCS / PACK |
|-----------------|-----------|------------|
| 212.1B.H11.EQ0V | 20 x 1/2" | 40 |


FUSION WELDING MACHINES **

| CODE | TYPE | PCS / PACK |
|-----------------|-----------------------------|------------|
| 214.CO.101.B22V | WELDING SET 1500w/220v | 1 |
| 114.CO.102.C22V | MAXI WELDING SET 2000w/220v | 1 |

Fusion Welding Machines are used for joining the pipes and fittings with socket fusion method. Desktop Welding Kits are recommended for the pipe sizes over 50 mm.



** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.

3.3 Fittings



Welding Adaptors are used for heating the pipe ends and fittings to be welded.

WELDING ADAPTOR **

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 214.1O.1A0.E00 | 20 | 50 |
| 214.1O.1A0.F00 | 25 | 50 |
| 214.1O.1A0.G00 | 32 | 50 |
| 214.1O.1A0.H00 | 40 | 40 |
| 214.1O.1A0.I00 | 50 | 30 |
| 214.1O.1A0.J00 | 63 | 20 |
| 214.1O.1A0.K00 | 75 | 10 |
| 214.1O.1A0.L00 | 90 | 4 |
| 214.1O.1A0.M00 | 110 | 2 |
| 214.1O.1A0.N00 | 125 | 1 |
| 214.1O.1A0.P00 | 160 | 1 |

ALUMINIUM FOIL SHAVER **



Aluminium Foil Shavers are used to remove the outer PP-R layer and aluminium foil of the VESBO Stable Pipes' tips to be welded.

| CODE | SIZE (mm) | PCS / PACK |
|----------------|-----------|------------|
| 214.1O.3B0.EF0 | 20-25 | 1 |
| 214.1O.3B0.GH0 | 32-40 | 1 |
| 214.1O.3B0.HI0 | 40-50 | 1 |
| 214.1O.3B0.IJ0 | 50-63 | 1 |
| 214.1O.3B0.JK0 | 63-75 | 1 |
| 214.1O.3B0.KL0 | 75-90 | 1 |
| 214.1O.3B0.LM0 | 90-110 | 1 |

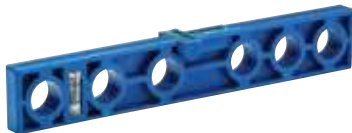
** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.



Cutters are used to shorten the pipes to the required length.

CUTTERS & BLADES **

| CODE | SIZE (mm) | PCS / PACK |
|----------------|--------------|------------|
| 214.1O.2A0.E00 | 20-40 | 1 |
| 214.1O.2A0.H00 | 40-63 | 1 |
| 214.1O.2A4.000 | CUTTER BLADE | 1 |

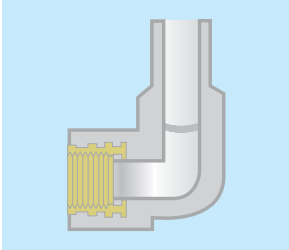
WATER LEVELLER **


| CODE | TYPE | PCS / PACK |
|----------------|------------------------------|------------|
| 214.1M.4A0.000 | WATER LEVELLER | 1 |
| 214.1M.4B0.000 | WATER LEVELLER STRAIGHT EDGE | 1 |
| 214.1M.4C0.000 | WATER LEVELLER SET BLUE | 1 |

** These accessories are not manufactured by VESBO; they are supplied from an outsource and can be subjected to modifications.

4. JOINTS, FUSSION & REPAIRS

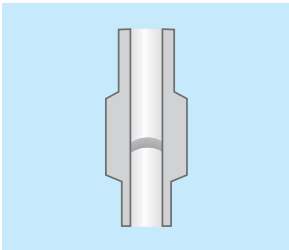
4.1 Homogeneous Joint



The result of a socket fusion or electrofusion joint is a homogeneous joint. This is one of the biggest advantages of using VESBO system:

- 100% leak-proof
- No maintenance
- Visual inspection possible
- Perfect for concealed installation that needs corrosion-free joining system.

4.2 Fusion Tools



- Socket Fusion Welding Tool
- Desktop Welding Machine
- Electrofusion Welding Kit

Please refer to the operating manuals of various welding tools.

4.3 Four-Step Fusion Process



Step 1

Cut pipe to the required length using a cutter, mark the welding depth on the pipe, ensure that the indicator light on the welding tool signals that the tool is hot enough (260 °C) for welding.



Step 2

The tip of the pipe to be welded is shaved by a special VESBO shaver to remove outside PP-R layer and aluminium foil. (This step is applicable only to Stable Pipes with aluminium foil.)



Step 3

Push the pipe and fitting into the welding adaptors, applying even strength at both ends. Do not twist or turn the pipe and fitting while pushing. Wait until heating time is reached. See the table on section 4.5 for necessary information).



Step 4

When the welding time is reached, remove both pipe and fittings together, again without twisting or turning while pulling out of the welding adaptors. Almost immediately, push both the pipe and fitting together until the depth is reached. It is possible to adjust the joints for more than 5 degrees during the time. Thus the fusion process is completed.

4.4 VESBO Desktop Welding Machine Operating Manual

VESBO desktop welding machine is designed for a efficient and operative fusion for specifically large diameter (50 mm to 110 mm) pipes. Because of its simple appliance, it is not necessary to use complicated equipments.



Step 1

To prevent formation of gaps inside the joint, check the pipe and the fitting which are placed into clamping jaws whether they fit well into each other before the welding process. Use a pipe support if the pipe is longer than 50 cm for a correct alignment.



Step 2

Operate the welding machine by turning the switch on and ensure that the indicator light on the welding machine signals that the welding sockets are hot enough (260 °C) for welding.



Step 3

Insert the pipe and fitting into the sockets of the adaptor plate slowly by using the handle and wait until heating time is reached. See the table on section 4.5 for necessary information.



Step 4

When the welding time is reached, separate the sockets from the pipe and fitting by using the handle and lift the adaptor plate up. Almost immediately, push both pipe and fitting together until the required depth is reached by using the handle.



Step 5

Keep the joint under stress for 1 minute without turning the handle back. Then wait until the cooling time is reached. Release the grips of the clamping jaws. Thus the fusion process is completed.



4.5 Welding Depth, Heating, Welding and Cooling Time

The table below provides the necessary information for a good welding joint for various VESBO pipe and fitting sizes. (It also applies to stable pipes.)

| Pipe Diameter (mm) | Welding Depth (mm) | Heating Time (sec.) | Welding Time (sec.) | Cooling Time (min.) |
|--------------------|--------------------|---------------------|---------------------|---------------------|
| 20 | 14.0 | 5 | 4 | 2 |
| 25 | 15.0 | 7 | 4 | 2 |
| 32 | 16.5 | 8 | 6 | 4 |
| 40 | 18.0 | 12 | 6 | 4 |
| 50 | 20.0 | 18 | 6 | 4 |
| 63 | 24.0 | 24 | 8 | 6 |
| 75 | 26.0 | 30 | 8 | 8 |
| 90 | 29.0 | 40 | 8 | 8 |
| 110 | 32.5 | 50 | 10 | 8 |

Note: Heating time starts when both pipe and fitting are pushed into correct depth. Welding time begins when joints are connected. Cooling time is the time taken for the joint completely cured. Never try to reduce cooling time by pouring water or by other means.

4.6 Pipe Repair

Pipe repair may be carried out by one of the following methods depending on the following:

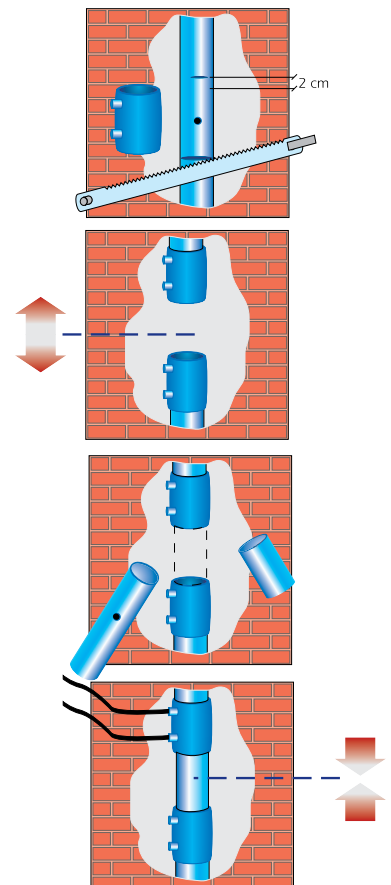
Pipe with nail holes (not concealed)

If the damaged part of the pipe is not concealed yet (before the pressure test is conducted) the recommended procedure is to cut out that part and replace it by a new part through normal welding for a socket.

Pipe concealed with two through holes

Using Electrofusion Fittings (see picture on the right)

- Cut the damaged pipe perpendicularly by a length equal to that of the corresponding electric socket plus 2 cm.
- Remove the section of the damaged pipe.
- Carefully clean the surfaces of the two pipe sections to be joined, using sanpaper and solvent liquid and wait until the parts of the pipe are perfectly dry.
- Remove the inner stops from 2 electric sockets.
- Fully insert the electric sockets into the pipe section.
- Cut a pipe section having the same diameter and length as the damaged one.
- Fit it into the place of the previous one. Make the 2 electric sockets slide towards the middle of the new pipe piece, by a section equal to the half the length of the socket.
- Weld the socket using an electrofusion welding kit.



Pipe with one nail hole (concealed)

With a pipe repairing kit you can easily repair holes (max. 10 mm diameter) on the surface of a pipe. This system makes the repairing process easier especially for the pipes installed into places where it is difficult to reach. Only a welding kit, a pipe repairing socket, a pipe repairing stick and a drill with a 6 mm or 10 mm tip is needed.



Insert the repairing socket into the welding tool.



Adjust the pipe clip on the socket according to the wall thickness of the pipe to be repaired. It is adjusted by adding a tolerance of +0.1 mm to the wall thickness and moving the rings on the socket. The related data are given in the table on the right.



If the hole diameter on the pipe surface is equal to or smaller than 5 mm expand it with a 6 mm tip. If it is equal to or smaller than 9 mm use a 10 mm tip.



Ensure that the welding tool is hot enough.



Insert the hole to be repaired into the male part of the socket to heat the plastic around the hole and insert the repairing stick to the female part of the socket to heat it.



Adhere to heating, welding and cooling periods for a good welding joint. Increase the periods by 50% when the air temperature is below +5°C



Insert the pipe repairing stick without exceeding the pipe's wall thickness.



Cut the remaining part after the stick cools down.



After an hour later, the pipe should be subjected to a pressure test with its normal operating pressure to see whether it will leak. If the pressure test is successful the repair is completed.

| VESBO Pipe | Outer Diameter (mm) | Wall Thickness (mm) | Depth of Socket Clip on the Socket (mm) |
|------------|---------------------|---------------------|---|
| SDR 11 | 20 | 2.3 | 2.4 |
| SDR 11 | 25 | 2.3 | 2.4 |
| SDR 11 | 32 | 2.9 | 3.0 |
| SDR 11 | 40 | 3.7 | 3.8 |
| SDR 11 | 50 | 4.6 | 4.7 |
| SDR 11 | 63 | 5.8 | 5.9 |
| SDR 11 | 75 | 6.8 | 6.9 |
| SDR 11 | 90 | 8.2 | 8.3 |
| SDR 11 | 110 | 10.0 | 10.1 |
| SDR 6 | 20 | 3.4 | 3.5 |
| SDR 6 | 25 | 4.2 | 4.3 |
| SDR 6 | 32 | 5.4 | 5.5 |
| SDR 6 | 40 | 6.7 | 6.8 |
| SDR 6 | 50 | 8.3 | 8.4 |
| SDR 6 | 63 | 10.5 | 10.6 |
| SDR 6 | 75 | 12.5 | 12.6 |
| SDR 6 | 90 | 15.0 | 15.1 |
| SDR 6 | 110 | 18.3 | 18.4 |
| SDR 7.4 | 20 | 2.8 | 2.9 |
| SDR 7.4 | 25 | 3.5 | 3.6 |
| SDR 7.4 | 32 | 4.4 | 4.5 |
| SDR 7.4 | 40 | 5.5 | 5.6 |
| SDR 7.4 | 50 | 6.9 | 7.0 |
| SDR 7.4 | 63 | 8.6 | 8.7 |
| SDR 7.4 | 75 | 10.3 | 10.4 |
| SDR 7.4 | 90 | 12.3 | 12.4 |
| SDR 7.4 | 110 | 15.1 | 15.2 |

5. CHEMICAL RESISTANCE

5.1 General

VESBO has high resistance to various acids and chlorides due to the chemical properties of polypropylene. As such, VESBO is highly suitable for transportation of hard or soft water or potable water with consumable amount of chlorine, fluids, DI water or industrial chemicals.

5.2 Chemical Resistance Chart

The following chart is given for our customers to have an idea for the chemical resistance of VESBO Pipes and Fittings. The customers are strictly recommended to consult our technical department (technical@vesbo.com) before the design stage of the project.

G : Good / S : Satisfactory / NS : Non Satisfactory

| Reagent | Concentration | Temperature °C | | |
|------------------------------|---------------|----------------|------|-------|
| | | 20°C | 60°C | 100°C |
| Acetic anhydride | 100 % | G | - | - |
| Acetic di-tri-chloroacetic | sol. | G | - | - |
| Acetic acid | up to 40 % | G | G | - |
| Acetic acid | 50 % | G | G | S |
| Acetic glacial acid | over 96 % | G | S | NS |
| Acetone | 100 % | G | S | - |
| Acetophenone anhydride | 100 % | G | S | - |
| Acrylonitrile | 100 % | G | - | - |
| Air | | G | G | G |
| Almond oil | | G | - | - |
| Alum | sol. | G | - | - |
| Ammonia (gas) | 100 % | G | - | - |
| Ammonia (saturated in water) | | G | G | - |
| Ammonia liquor | up to 30 % | G | G | - |
| Ammonium acetate | sat. sol. | G | G | - |
| Ammonium bicarbonate | sat. sol. | G | G | - |
| Ammonium chloride | sat. sol. | G | G | - |
| Ammonium fluoride | sol. | G | G | - |
| Ammonium hydroxide | sol. | G | - | - |
| Ammonium methaphosphate | sat. sol. | G | G | G |
| Ammonium nitrate | sat. sol. | G | G | G |
| Ammonium phosphate | sat. sol. | G | G | - |
| Ammonium sulphate | sat. sol. | G | G | G |
| Amyl acetate | 100 % | S | - | - |
| Amyl alcohol | 100 % | G | G | G |
| Aniline | 100 % | S | - | - |
| Anisole | 100 % | S | - | - |
| Apple juice | | G | G | - |
| Barium carbonate | sat. sol. | G | G | G |
| Barium chloride | sat. sol. | G | G | G |
| Barium hydroxide | sat. sol. | G | G | G |
| Barium sulphate | sat. sol. | G | G | G |
| Benzoic, acid | sat. sol. | G | - | - |
| Benzoyl acid | 100 % | G | G | - |
| Benzoil alcohol | 100 % | G | S | - |
| Borax sol. | | G | G | - |
| Boric acid | sat. sol. | G | G | - |
| Butane | 100 % | G | G | - |

G : Good / S : Satisfactory / NS : Non Satisfactory

| Reagent | Concentration | Temperature °C | | |
|--------------------------------|---------------|----------------|------|-------|
| | | 20°C | 60°C | 100°C |
| Butanol | 100 % | G | S | S |
| Butyglycol | 100 % | G | - | - |
| Butyphenol cold | sat. sol. | G | - | - |
| Butly phtalate | 100 % | G | S | S |
| Calcium carbonate | sat.sol. | G | G | G |
| Calcium chloride | sat. sol. | G | G | G |
| Calcium hydroxide | sat. sol. | G | G | - |
| Calcium nitrate | sat. sol. | G | G | - |
| Carbon dioxide, gaesus, dry | 100 % | G | G | - |
| Carbon dioxide, gaesus, wet | | G | G | - |
| Carbon di-sulphide | 100 % | NS | NS | NS |
| Carbon tetrachloride | 100 % | NS | NS | NS |
| Castor oil | 100 % | G | G | - |
| Chloroethanol (2-Chlorethanol) | 100 % | G | - | - |
| Chorome alum | sat. sol. | G | G | - |
| Chromic acid | up to 40 % | S | S | NS |
| Citric acid | 10 % | G | G | G |
| Coconut-oil | | G | - | - |
| Corn-oil | | G | S | - |
| Cotton-oil | | G | S | - |
| Cresol | over 90 % | G | - | - |
| Cupric chloride | sat. sol. | G | G | - |
| Cupric nitrate | 30 % | G | G | G |
| Cupric sulphate | sat. sol. | G | G | - |
| Cyclohexane | 100 % | G | - | - |
| Cyclohexanol | 100 % | G | S | - |
| Dextrin | sol. | G | G | - |
| Dextrose | sol | G | G | - |
| Di-butly phtalate | 100 % | G | S | NS |
| Di-chloroacetic acid | 100 % | S | - | - |
| Di-chloroethylene | 100 % | S | - | - |
| Di-ethanolamine | 100 % | G | - | - |
| Di-ethyl ether | 100 % | G | S | - |
| Di-ethylen glycol | 100 % | G | G | - |
| Di-glycolic acid | sat. sol. | G | - | - |
| Di-isooctyl phtalate | 100 % | G | S | - |
| Di-methylamine | 100 % | G | - | - |
| Di-methylformamide | 100 % | G | G | - |
| Di-octyl phtalate | 100 % | S | S | - |
| Dioxan | 100 % | S | S | - |
| Ethanolamine | 100 % | G | - | - |
| Ethylalcohol (ethanole) | up to 95 % | G | G | - |
| Ethylene chloride | 100 % | NS | NS | - |
| Athyleneglycole | 100 % | G | G | G |
| Formaldehyde | 40 % | G | - | - |
| Formic acid | 10 % | G | G | S |
| Formic acid | 85 % | S | NS | NS |
| Formic acid (anhydrous) | 100 % | S | S | S |

G : Good / S : Satisfactory / NS : Non Satisfactory

| Reagent | Concentration | Temperature °C | | |
|-----------------------------|---------------|----------------|------|-------|
| | | 20°C | 60°C | 100°C |
| Fructose | sol. | G | G | G |
| Fruit juice | | G | G | G |
| Glucose | 20 % | G | G | G |
| Glycerine | 100 % | G | G | G |
| Glycolic acid | 30 % | G | - | - |
| Hexane | 100 % | S | S | - |
| Hydrobromic, acid | up to 48 % | G | S | NS |
| Hydrocloryc acid | 2 % | G | G | G |
| Hydrocloryc acid | 10 % | G | G | - |
| Hydrocloryc acid | 30 % | G | S | S |
| Hydrocloryc acid | 35 % | G | - | - |
| Hydrocloryc acid, gas, dry | 100 % | G | G | - |
| Hydrofluoric acid | dil. sol. | G | - | - |
| Hydrofluoric acid | 40 % | G | - | - |
| Hydrogen | 100 % | G | - | - |
| Hydrogen peoxide | up to 10 % | G | - | - |
| Hydrogen peroxide | up to 30 % | G | - | - |
| Hydrogen sulphide, gas, dry | 100 % | G | G | - |
| Iodine (alcoholic solution) | | G | - | - |
| Isopropylalcohol | 100 % | G | G | G |
| Isopropylether | 100 % | S | - | - |
| Jelly | 100 % | G | G | - |
| Lactic acid | up to 90 % | G | G | - |
| Lanolin | | G | S | - |
| Linseed-oil | | G | G | - |
| Magnesium carbonate | sat. sol. | G | G | G |
| Magnesium chloride | sat. sol. | G | G | - |
| Mercurous nitrate | sol. | G | G | - |
| Mercury | 100 % | G | G | - |
| Melty acetate | 100 % | G | - | - |
| Melty alcohol | 5 % | G | S | S |
| Melty ethly ketone | 100 % | G | - | - |
| Metlylamine | up to 32 % | G | - | - |
| Milk | | G | G | G |
| Monochloracetic acid | over 85 % | G | G | - |
| Naphta | | G | NS | NS |
| Nickel chloride | sat. sol. | G | G | - |
| Nickel nitrate | sat. sol. | G | G | - |
| Nickel sulphate | sat. sol. | G | G | - |
| Nitric acid | 10 % | G | NS | NS |
| Nitric acid | 30 % | S | - | - |
| Nitric acid, fuming | | NS | NS | NS |
| Nitrobenzene | 100 % | G | S | - |
| Olive-oil | | G | G | S |
| Oxalic acid | sat. sol. | G | S | NS |
| Oxygen | 100 % | G | - | - |
| Peanut-oil | | G | G | - |
| Peppermint-oil | | G | - | - |

G : Good / S : Satisfactory / NS : Non Satisfactory

| Reagent | Concentration | Temperature °C | | |
|---------------------------|---------------|----------------|------|-------|
| | | 20°C | 60°C | 100°C |
| Perchloric acid | 2N | G | - | - |
| Petroleum-ether (ligroin) | | S | S | - |
| Phenol | 5 % | G | G | - |
| Phenol | 90 % | G | - | - |
| Phosphoric acid | up to 85 % | G | G | G |
| Phosphorus oxychloride | 100 % | S | - | - |
| Picric acid | sat. sol. | G | - | - |
| Potassium bicarbonate | sat. sol. | G | G | - |
| Potassium borate | sat. sol. | G | G | - |
| Potassium bromate | up to 10% | G | G | - |
| Potassium bromite | sat. sol. | G | G | - |
| Potassium carbonate | sat. sol. | G | G | - |
| Potassium chlorate | sat. sol. | G | G | - |
| Potassium chloride | sat. sol. | G | G | - |
| Potassium chromate | sat. sol. | G | G | - |
| Potassium cyanide | sol. | G | - | - |
| Potassium fluoride | sat. sol. | G | G | - |
| Potassium hydroxide | up to 50 % | G | G | G |
| Potassium iodite | sat. sol. | G | - | - |
| Potassium nitrate | sat. sol. | G | G | - |
| Potassium perchlorate | 10 % | G | G | - |
| Potassium permanganate | 2N | G | - | - |
| Potassium persulphate | V | G | G | - |
| Potassium sulphate | V | G | G | - |
| Propane | 100 % | G | - | - |
| Propionic acid | over 50 % | G | - | - |
| Pyridine | 100 % | S | - | - |
| Silicone-oil | | G | G | G |
| Silver | sat. sol. | G | G | G |
| Sodium acetate | sat. sol. | G | G | G |
| Sodium benzoate | 35 % | G | S | - |
| Sodium bicarbonate | sat. sol. | G | G | G |
| Sodium bisulfite | sol. | G | G | - |
| Sodium bisulphate | sat. sol. | G | G | - |
| Sodium carbonate | up to 50 % | G | G | s |
| Sodium chlorate | sat. sol. | G | - | - |
| Sodium chloride | 10 % | G | G | G |
| Sodium chlorite | 2 % | G | N | NS |
| Sodium chlorite | 20 % | G | S | NS |
| Sodium dchromate | sat. sol. | G | G | G |
| Sodium hydroxide | 1 % | G | G | G |
| Sodium hydroxide | up to 60 % | G | G | G |
| Sodium hypochlorite | 5 % | G | - | - |
| Sodium hypochlorite | 10 % | G | - | - |
| Sodium hypochlorite | 20 % | S | - | - |
| Sodium metaphosphate | sol. | G | - | - |
| Sodium nitrate | sat. sol. | G | G | - |

G : Good / S : Satisfactory / NS : Non Satisfactory

| Reagent | Concentration | Temperature °C | | |
|---------------------------|---------------|----------------|------|-------|
| | | 20°C | 60°C | 100°C |
| Sodium ortho-phosphate | sat. sol. | G | G | - |
| Sodium perborate | sat. sol. | G | - | - |
| Sodium silicate | sol. | G | G | - |
| Sodium sulfite | sat. sol. | G | - | - |
| Sodium sulfite | 40 % | G | G | G |
| Sodium sulphate | sat. sol. | G | G | - |
| Sodium thiosulphate | sat. sol. | G | - | - |
| Soybean-oil | | G | S | - |
| Stannic chloride | sat. sol. | G | G | - |
| Succinic acid | sat. sol. | G | G | - |
| Sulphur dioxide, dry, gas | 100 % | G | - | - |
| Sulphur dioxide, wet, gas | 100 % | G | - | - |
| Sulphuric acid | up to 10 % | G | G | G |
| Sulphuric acid | 100 % | G | G | - |
| Sulphuric acid | 50 % | G | S | G |
| Sulphuric acid | 96 % | G | S | NS |
| Sulphurous acid | sol. | G | - | - |
| Tartaric acid | 10 % | G | G | - |
| Thiophene | 100 % | G | S | - |
| Trichloroacetic acid | up to 50 % | G | G | - |
| Triethanolamine | sat. sol. | G | - | - |
| Urea | sat. sol. | G | - | - |
| Vinegar | | G | G | - |
| Water, brackish | | G | G | G |
| Water, distilled | 100 % | G | G | G |
| Water, drinkable | | G | G | G |
| Water mineral | | G | G | G |
| Water (sea water) | | G | G | G |

6. HANDLING

| | | | |
|---|---|--|---|
| <p style="text-align: center;">You must not</p> | | <p>1- subject the pipe ends to shock or impact</p>  | <p>2- use pipes that are damaged or cracked at the interfaces</p>  |
| | | <p>3- twist pipe or fittings after joining</p>  | <p>4- use conical threads</p>  |
| <p>7- subject VESBO to heavy shocks or falling stones</p>  | <p>8- use excessive amounts of hemp when sealing in fittings</p>  | <p>9- heat with a naked flame</p>  | <p>10- bind up contaminated pipes or fittings</p>  |
| <p style="text-align: center;">You must</p> | | <p>1- handle VESBO with care</p>  | <p>2- only use sharp tools to cut the pipe</p>  |
| | | <p>3- not correct by more than 5° after joining</p>  | <p>4- only use fittings with parallel threads, not tighten too firmly</p>  |
| <p>7- protect exposed pipes from damage</p>  | <p>8- only heat with hot air for bending, max bending temperature 140°C</p>  | <p>9- use sealing tape or sealing compound; apply hemp moderately</p>  | <p>10- only install clean material</p>  |

7. DISCLAIMER

VESBO accepts no responsibility or liability whatsoever with regard to the any failure, defect or damage caused by situations and events including, but not limited to, the following:

- Misuse, abuse, neglect or improper handling or storage.
- Improper installation or use of accessories not in strict adherence to VESBO's below mentioned written general instructions.
- Defects in other manufacturer's components incorporated during installation.
- Fire, earthquake, flood, lightning, hurricane, tornado or other casualty or acts of God.
- Exposure to chemicals and many other local influences over which VESBO has no control.
- Any other cause not involving inherent manufacturing defects in the pipes and fittings supplied by VESBO.

The pipes and fittings are not warranted against color discoloration or other damage caused by normal weathering resulting from exposure to the elements. Normal weathering is defined as exposure to sunlight and extremes of weather and atmosphere which will cause any colored surface to gradually fade or accumulate stains.

VESBO shall have sole discretion to determine whether the pipe and fittings are suffering from normal weathering, which conclusion shall be based on reasonable criteria. In the event the material weathers to a degree which is determined by VESBO to be beyond normal, then VESBO shall either repair or replace, at its option.

VESBO reserves the right to discontinue or modify any of its products.

8. GENERAL INSTRUCTIONS

8.1 Transport & Storage

- Store VESBO sheltered from sun and rain. Do not expose to UV radiation for a long period.
- Handle VESBO with care at low temperatures. Do not store at temperatures below 0°C. Impacts can form cracks on pipes.
- Protect exposed pipes from damage; do not subject the pipe to heavy shocks or falling Stones.

8.2 Installation

- Install the VESBO pipes and fittings according to the pressure, temperature and expansion limitations indicated in VESBO's Technical Catalogue or on www.vesbo.com.
- Do not use pipes that are damaged or cracked at the interfaces. Use only special pipe cutter to shorten the pipe.
- Install only clean material; do not bind up contaminated pipes and fittings. Before welding, be sure that both pipe and fitting surfaces should be removed from chemicals and paint. If it is required to paint the installation after welding, insulate VESBO surfaces should be removed from chemicals and paint. If it is required to paint the installation after welding, insulate VESBO pipeline to prevent the passage of chemicals inside the paint, which will cause contamination of water or affect the service life of the installation, through the pipe wall. VESBO does not warrant any responsibility regarding the exposure to chemicals and paints. The customers are strictly recommended to consult our technical department before the design stage of the project.
- Use only fittings with parallel threads, do not use conical threads and do not tighten too firmly.
- Do not use metal plugs as connectors, prefer using plastic plugs.
- While sealing in fittings use sealing tape or sealing compound. If you have to use hemp; apply hemp moderately; do not use excessive amounts of hemp.
- For hot bending of pipes, a hot air gun should be used, not an open flame. The hot air temperature meeting the PP-R pipe surface should not exceed 140°C.
- Do not twist pipe or fittings after joining; correct by not more than 5°.
- For exterior installation, it is necessary to insulate VESBO to prevent excessive heat loss and to protect from UV radiation.
- For a good welding joint, refer to the welding depths and periods that are indicated in VESBO's Technical Catalogue Part 4. Ensure that the indicator light on the welding tool signals that the tool is hot enough (260°C).
- It is recommended to cut the pipe ends by 4-5 cm before the welding process.
- Temperature of the welding adaptors should be high enough for welding process. After the indicator light on the welding machine switches off, adaptors temperature will be suitable for welding. Welding process should be carried out after this signal. Cold welding affects the stabilization of the raw material and service life of the product.
- Everyday usage of the machine may cause excess temperature of 300-320°C. Excessive heat causes excessive melting of the material. To prevent this, the operator should wait the 2nd signal of the indicator light since the adaptors temperature does not change and fixes at 260°C after the 2nd signal.
- VESBO Caps are used ONLY during the pressure tests which should be carried out after the installation of the piping system. Do not use as a permanent stopper at the pipeline ends. Prefer fittings with parallel threads.

8.3 Chemical Resistance

- Consult VESBO Technical Department for transportation of a chemical before installation.
- Remove the installation from chemicals that can affect the service life. VESBO does not warrant any responsibility for the contaminated water that has been affected by permeable chemicals.

Warning:

VESBO products are not to be used with compressed air or gases. VESBO does not recommend that piping systems that include its products or components be tested with compressed air or compressed gases.

What the Consumer Must Do

The original end user must immediately notify VESBO of any manufacturing defect and provide proof of the date of installation, as well as proof of property ownership, in order to provide VESBO an opportunity to investigate the claim and examine the material claimed to be defective. All notifications must be sent to Novaplast Co., ATTN: Quality & Control Dept. If requested, the original end user must submit a sample of the allegedly defective material to VESBO for analysis (shipping to be paid by VESBO). VESBO will then investigate the claim and examine the material claimed to be defective. If a defect covered by this warranty is confirmed, VESBO, within a reasonable amount of time after the inspection, will make the necessary repair or replacement, per the terms of this warranty.

VESBO is a registered trademark of Novaplast Co.

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