aquatechnik®

iso-technik system

System with pre-insulated pipes
for district heating & cooling (DHC)

sistema iso-technik

System with pre-insulated pipes for district heating & cooling (DHC)

Introduction 2

Easy installation 3

Energy saving 4

Components of the system 5
Pre-insulated internal service pipes for DHW (Domestic Hot Water) systems
Pre-insulated internal service pipes for mechanical-thermal systems

Allowed working pressures 6
Domestic water systems
Closed-circuit, heating, air-conditioning, and remote heating systems

Comparison table 7

Features of PUR insulation 8

Features of external PEHD casing pipe 8

Insulation dimensional features of pipes and fittings 9

Instructions to process the single- and double-seal restoration joint 10

Instructions regarding the flame relevant to weather conditions 13

General recommendations about the installation inside a ditch (burial) 14
Typical heights in an excavation 14

General recommendations about overhead installations with bracket-type collars 15
Table about clamping units for overhead installations 15

Item list 1.1

Introduction

The iso-technik system, which is designed and manufactured by Aquatechnik Group S.P.A., includes a complete range of pre-insulated fittings and single pipes made with PUR (stiff polyurethane) foam protected by a casing pipe made with PEHD.
The iso-technik system is used to remotely distribute energy, both directly and indirectly, by means of the carrying fluid - water.
The range of diameters provides for the sizes included between Ø 32 and 250 mm, made with SDR 7.4 and SDR 11, which are available in the following versions:
.

- **iso fiber-T** (for domestic water uses)
- **iso fiber-COND** (for mechanical uses)

The products are guaranteed with integrated cycle and comply with the standards that regulate the industry: EN 253, EN 488, EN 489, DIN 8075, and UNI EN ISO 15874.

Internal service pipes and fittings, which form the iso-technik system, are made with completely synthetic material, with a state-of-the-art polypropylene-based technopolymer Super PP-R 80 with compounding fibre-reinforced matrix (GFRP).
(Polypropylene random tested MRS 100 + compounding fibre-reinforced)



The remote transfer of energy between thermal power stations for the production of heat, chillers/heat pumps, geothermal systems, thermal-bath systems, etc. and the utilities of the users provides for networks of pre-insulated buried pipes that assure maximum safety and design/application reliability.

Thanks to Aquatechnik's well-established know-how, compliance with the standards in force about this matter and strict in-house disciplinary measures attested by the corporate certification, the pre-insulated pipes of the iso-technik system were conceived with specific burial installation and self-compensating expansion features. The high quality standards of the system are obtained thanks to the high quality of the materials being used and to the most advanced integrated production technologies, which mainly refer to service pipes with high mechanical stabilization and reduced expansion (made with PP-R 80 super, tested MRS 100) together with the "bonded" type system, which restrains the high-quality PUR heat insulator until obtaining a compact system between the external PEHD 80 casing pipe (treated with hot corona discharge) and the service pipes.

Easy installation

The iso-technik system is characterised by several advantages:

- Easy installation, quick application and safe system junctions by means of hot-melt sealing M/F from Ø 32 to 125 mm, pressure welding (butt type) from Ø 160 to 250 mm and electric sleeve.
- Dedicated welding equipment, with welding machines that mechanically self-align the pipes (from Ø 50 to 250 mm). No crane hoists and/or similar devices are needed to handle the items during the welding operation.
- Reduced linear mass with respect to metal pipes, so it is easier to manoeuvre the materials on the spot. It is not necessary to perform crosswise weld cutting.
- Selection of single- and/or double-seal restoration joints to be carried out by means of on-site foaming by using a PUR bicomponent material (isocyanate and polyol).
- Facilitated operation both to cut the service pipe and to remove the heat insulator and the casing pipe, in order to remove the shell from the pipe for customised installation.
- Opportunity to assembly the line out of the ditch and re-positioning into the ditch afterwards; it is very useful in case of very bad weather conditions that make the ditch unusable.
- In case there are no direction changes by means of “cold” installation, the iso-technik system offers excellent self-compensation in the expansion (only in case of buried installations). So, it is not necessary to provide for loops, omegas, disposable mechanical compensators, thrust bearings, and all the solutions that increase work costs.
- The very low thrust force, expansion axial stress (s) of the system (Kgf /N) allows, the possible installation in "pre-tension" with open ditch, which consists in preheating the lines with temperatures that reach at least 50% of the max. design temperature before being buried to close the excavation.
- The tensions caused by residual thermal expansions will be absorbed and compensated in a natural way by the material, and the plastic features of the same material will allow finding a new outline of the pipe. According to what is said above, the exercised thrust forces (s) are calculated according to the features of the modulus of elasticity of the materials.

Modulus of elasticity (σ= Sigma)		Expansion coefficient (K^{-1})
PP-R	**900 N/mm² = Kgf·m 81.6**	α 0,035 mm/m°C
Steel	**210.000 N/mm² = Kgf·m 21.400**	α 0,0115 mm/m°C

As for the above-mentioned values, we can infer a higher stress in steel compared with fibre-reinforced PP-R, where it is remarkably lower. For more information, please contact our Technical Dep.

Energy saving

The iso-technik system is characterised by several energy saving advantages, as well:

- It is considered "energy saving" thanks to its intrinsic features of very low thermal conductivity. Its thermal performance can be compared with series 1 of metal pre-insulated pipes, which provide for an increased heat insulator thickness category.

- Minimum linear heat loss thanks to the low thermal conductivity coefficient U (W/m°C) values, also in the presence of high heat gradients (ΔT); this factor is mainly characterised by the very low thermal conductivity of the service pipe equalling only 0.24 W/mK. Together with an excellent and uniform insulation by means of stiff polyurethane foam (PUR) injected into the interspace with annular cross-section between the service pipe and the external casing pipe (PEHD), it makes the pipes highly efficient from the energy saving point of view (conductivity reference value for steel equalling 45 W/mK).

- So, thanks to the use of our iso-technik system, we can certify that energy savings reach values included between 8% and 10% compared with the use of pre-insulated metal pipes of the normal range.

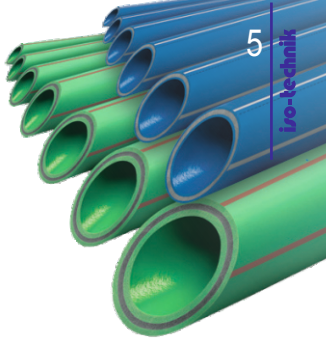
- The low internal friction of the pipe allows the laminar flow of the fluid thanks to the mirror-like surface, whose roughness equals 0.070µ, with subsequent low distributed pressure drops. This way, the energy consumption of circulation pumps is only proportioned to the hydrostatic pressure head (h/m) as regards the design flow-rate (Q), thus assuring minimum speeds of heat-carrying fluids, without creating turbulences.

- Increased system cleanliness: the iso-technik system does not create sludge, rust, and remarkably reduces scale deposits; the aforesaid factors lead to a poor performance of the system with possible clogging problems concerning exchangers, filters, shut-off valves and other devices that form the plant-engineering of the users, and the need for frequent maintenance interventions.

- The iso-technik system does not need corrosion-resistant film-forming treatments; in addition, it is compatible with antifreeze products, ethylene glycol and propylene glycol types, and resists the main chemical components

- No corrosion phenomena caused by:
  Stress corrosion due to bimetallic couplings between different metal alloys.
  Leakage, direct and alternating currents, so it is not necessary to provide for any cathode-anodic protection because the fibre-reinforced PP-R pipe is characterised by a low electrical conductivity equalling >OhmΩ 10 cm.
  External corrosion of the service pipe caused by watering as the dew point has been reached.
  For thermal water and fluids that contain sulphide, bromine, etc.
  Oxygenation in the system, ex. water restoration in thermal systems

low thermal conductivity
excellent and homogeneous insulation
8%-10% energy savings
excellent fluid flow
increased system cleanliness
no corrosion phenomena



Components of the iso-technik system

Internal pre-insulated service pipes for DHW (Domestic Hot Water) systems

faser FIBER-T SDR 7.4 pipe for 70°C/9.3 bar domestic water systems, made with polypropylene with fibre-reinforced matrix and reduced expansion, whose stratigraphy includes PP-R + FVR + PP-R, with strengthening compounding matrix with special fibre placed in the median annular layer of pipe thickness, which is characterised by expansion coefficient α = 0.035 mm/m°C and thermal conductivity λ = 0.24W/mK, specularity of internal walls equals 0.070µ

This product complies with the standards: DIN 8077 and 8078 with reference to UNI EN ISO 15874-2 and 15874-5 about the sizes and the pressure ranges for polypropylene pipes. The pipe is suitable to be used according to the following classes: Classes 1/8bar-2/6bar-4/10bar-5/6bar (opaque) for a duration of 50 years.

Compliant with the Italian Ministerial Decree D.M. 174/2004 concerning the transport of drinkable water intended for human consumption.

IQNet: manufacturing process managed and assured by the corporate quality system UNI EN ISO 9001:2008.

***faser* FIBER-TSDR 7.4**
FROM Ø 32 TO 125 mm
SDR 11 FROM Ø 160 TO 250 mm

Pipe size faser FIBER-T	ø outside mm	Wall thickn. mm	ø internal mm
32 x 4,4	32	4,4	23,2
40 x 5,5	40	5,5	29,0
50 x 6,9	50	6,9	36,2
63 x 8,6	63	8,6	45,8
75 x 10,3	75	10,3	54,4
90 x 12,3	90	12,3	65,4
110 x 15,1	110	15,1	79,8
125 x 17,1	125	17,1	90,8
160 x 14,6	160	14,6	130,8
200 x 18,2	200	18,2	163,6
250 x 22,7	250	22,7	204,6

Internal pre-insulated service pipes for mechanical-thermal systems

Faser FIBER-COND SDR 11 pipe for heating, conditioning, air-conditioning and cooling systems, made with polypropylene with fibre-reinforced matrix and reduced expansion, whose stratigraphy includes PP-R + FVR + PP-R, with strengthening compounding matrix with special fibre placed in the median annular layer of pipe thickness, which is characterised by expansion coefficient α 0.035 = mm/m°C and thermal conductivity λ= 0.24W/mK, specularity of internal walls equals 0.070µ.

This product complies with the standards: DIN 8077 and 8078 with reference to UNI EN ISO 15874-2 and 15874-5 about the size and the pressure ranges for polypropylene pipes.

The pipe system must operate according to the temperature/pressure working classes that are specified by the manufacturer, with T max. 90°C, and it will be only intended to transport water for engineering heating, air-conditioning and cooling systems (excluding the transport of hot and cold domestic water intended for human consumption).

IQNet manufacturing process managed and assured by the corporate quality system UNI EN ISO 9001:2008.

***faser* FIBER-COND**
SDR 11 FROM Ø 32 TO 250 mm

Pipe size faser FIBER-COND	ø outside mm	Wall thickn. mm	ø internal mm
32 x 2,9	32	2,9	26,2
40 x 3,7	40	3,7	32,6
50 x 4,6	50	4,6	40,8
63 x 5,8	63	5,8	51,4
75 x 6,8	75	6,8	61,4
90 x 8,2	90	8,2	73,6
110 x 10,0	110	10,0	90,0
125 x 11,4	125	11,4	102,2
160 x 14,6	160	14,6	130,8
200 x 18,2	200	18,2	163,6
250 x 22,7	250	22,7	204,6

Allowed working pressures

Domestic water systems

Temp. °C	Working years	Working pressure in bars faser FIBER-T SDR 7,4	Working pressure in bars faser FIBER-T SDR 11
20°C	1	28.6	16.5
	5	26.8	15.2
	10	26.1	15.1
	25	25.3	14.6
	50	24.4	14.2
30°C	1	24.3	14.1
	5	22.8	13.2
	10	22.0	12.7
	25	21.3	12.3
	50	20.7	12.0
40°C	1	20.5	11.7
	5	19.2	10.9
	10	18.7	10.6
	25	18.0	10.1
	50	17.5	9.9
50°C	1	17.5	9.8
	5	16.2	9.0
	10	15.7	8.7
	25	15.2	8.5
	50	14.7	8.2
60°C	1	14.7	8.0
	5	13.7	7.5
	10	13.2	7.2
	25	12.6	7.0
	50	12.1	6.7
65°C	1	13.9	7.3
	5	12.9	6.7
	10	12.5	6.5
	25	12.0	5.6
	50	10.6	4.9
70°C	1	12.4	6.8
	5	11.4	6.2
	10	11.1	6.1
	25	9.6	5.3
	50	8.1	4.5
75°C	1	11.7	5.6
	5	10.8	4.9
	10	10.0	4.1
	25	8.0	3.2

Closed-circuit, heating, air-conditioning, and remote heating systems

Temp. °C	Working years	Working pressure in bars faser FIBER-T - FIBER-COND SDR 7,4	Working pressure in bars faser FIBER-COND SDR 11
10°C	1	30.2	27.8
	5	28.2	26.2
	10	27.7	25.6
	25	26.9	24.7
	50	26.1	24.1
15°C	1	29.4	25.7
	5	27.4	24.2
	10	26.9	23.6
	25	26.1	22.8
	50	25.3	22.2
20°C	1	28.6	23.8
	5	26.8	22.3
	10	26.1	21.7
	25	25.3	21.0
	50	24.5	20.4
30°C	1	24.3	20.2
	5	22.8	18.9
	10	22.0	18.4
	25	21.3	17.8
	50	20.7	17.3
40°C	1	20.5	17.1
	5	19.2	16.0
	10	18.7	15.6
	25	18.0	15.0
	50	17.5	14.6
50°C	1	17.5	14.5
	5	16.2	13.5
	10	15.7	13.1
	25	15.2	12.6
	50	14.7	12.2
60°C	1	14.7	12.2
	5	13.7	11.4
	10	13.2	11.0
	25	12.6	10.6
	50	12.1	10.3
70°C	1	13.9	10.3
	5	12.9	9.6
	10	12.5	9.2
	25	12.0	8.0
	50	10.6	6.8
75°C	1	12.4	9.4
	5	11.4	8.7
	10	11.1	8.0
	25	9.6	6.4
	50	8.1	5.4
80°C	1	10.4	8.6
	5	9.2	7.7
	10	7.8	6.5
	25	6.2	5.2
90°C	1	8.7	7.2
	5	6.0	5.1
	10	5.1	4.3

Comparison table

Iron comparison reference table
Normal series UNI 3824-68 up to Ø 4" / Medium series Ø 5" Uni 4148/Uni 4991 Ø 8" - 10"

Iron	DN10	DN15	DN20	DN25	DN32	DN40	DN50	DN65	DN80	DN100	DN125	DN150	DN200
Inches	3/8	½	¾	1	1 ¼	1 ½	2	2 ½	3	4	5	6	8
Di (mm)	13.2	18.6	22.2	27.9	36.6	42.5	53.8	69.6	81.6	106.2	129.9	155.2	207.0
Content H2O/l	0.136	0.271	0.386	0.611	1.051	1.418	2.272	3.802	5.226	8.853	13.246	18.908	33.636
Weight Kg/m naked	0.82	1.20	1.52	2.37	3.05	3.50	4.90	6.28	8.20	11.80	17.40	20.60	31.00

PP-R SDR 7,4	DN15	DN15/20	DN20/25	DN25/32	DN32/40	DN40/50	DN50	DN65	DN80	DN80/100
De Ø mm	20.0	25.0	32.0	40.0	50.0	63.0	75.0	90.0	110.0	125.0
Di (mm)	14.4	18.0	23.2	29.0	36.2	45.8	54.4	65.4	79.8	90.8
Content H2O/l	0.163	0.254	0.422	0.660	1.029	1.647	2.323	3.358	4.999	6.472
Weight Kg/m naked	0.151	0.232	0.380	0.578	0.865	1.380	1.965	2.826	4.322	5.243
Weight Kg/m pre-insulated	N.D.	N.D.	1.70	2.30	2.60	3.30	4.20	5.50	7.90	10.00

PP-R SDR 11	DN15	DN20	DN25	DN32	DN40	DN50	DN50/65	DN65/80	DN80/100	DN100	DN125	DN150	DN200
De Ø mm	20.0	25.0	32.0	40.0	50.0	63.0	75.0	90.0	110.0	125.0	160.0	200.0	250.0
Di (mm)	16.2	20.4	26.2	32.6	40.8	51.4	61.4	73.6	90.0	102.2	130.8	163.6	204.6
Content H2O/l	0.200	0.320	0.530	0.834	1.307	2.074	2.959	4.250	6.358	8.200	13.430	21.010	32.861
Weight Kg/m naked	0.107	0.164	0.267	0.412	0.638	1.010	1.420	2.068	3.010	3.750	6.755	10.640	15.780
Weight Kg/m pre-insulated	N.D.	N.D.	1.600	2.100	2.300	2.900	3.600	4.600	6.600	8.300	11.500	18.000	28.600

Example of installation (building yard at Arino –VE, Italy)

Features of PUR insulation

The process to inject PUR foaming complies with the UNI EN 253 standard and is carried out by a computer-controlled machine; the aforesaid computer controls, in real time, the proportioning (polyaddition) of the two components forming it: polyol and isocyanate (PUR).

The foam for the pipes and for the special items is obtained with the additivation of the expanding agent "cyclopentane", thus creating an exothermic reaction that gives better heat insulation and reduced heat loss to the foam. In addition, the PUR component is equipped with specific stabilizers, which assure the same initial thermal insulation features in the long term. Polyurethane moulding procedure is carried out by using a discontinuous technology, which is suitable to mould a stiff PUR block. Coaxiality of the service pipes is assured during the construction procedure by means of particular plastic spacers, which are specifically spaced out and suitable to resist the expanding forces of PUR during the injection foaming procedure, assuring high eccentricity of the PEHD casing pipe.

Physical and technical features	Results
Total density	80 Kg/m³
Core density	60 Kg/m³
Closed-cell content	> 88%
Compression strength with 10% deformation	> 30 N/m²
Thermal conductivity coefficient at 50°C	< 0,027 W/mK
Resistance to axial cutting at 23°C	0,12 N/m²
Resistance to tangential cutting at 23°C	0,20 N/m²
Absorption in water at 100°C after 90 min.	< 10% Vol.

Features of the external PEHD casing pipe

The external casing pipe made with PEHD material is used to protect the PUR insulator to lay pre-insulated systems in buried conditions. PE is the material being specified by all standards and directives in case of burial, as it is really resistant to weathering agents, it is UV-ray-proof, by specifically proportioning stabilizing agents and carbon-black, as well as resistant to all chemical and electro-chemical interactions that occur in the soil. The PEHD pipe is manufactured in compliance with the requirements that are established in UNI EN 253, DIN 8075, UNI EN 12201, and UNI EN ISO 15494 standards.

To obtain an optimal result concerning the adhesion between the PEHD casing and the PUR insulator, the internal surface of the casing is hot-treated to increase its “wettability”, and so PE adhesion. Hot-treatment is applied to reduce the surface tension of PE, thus leading it to levels that are lower than solid state, and increasing the surface adhesion coefficient, which is suitable to achieve an excellent polyurethane-casing pipe adherence

Features of the PEHD casing pipe	
Thermal conductivity	0,40 W/mK
Density	0,950 g/cm³
Thermal expansion coefficient	α 0,18
Modulus of elasticity	800 MPa
Pressure strength	21 N/mm²

Dimensions of the PEHD casing pipe			
Ø out. (De)	Wall thickness	Ø ext. (De)	Wall thickness
90	3 mm	200	3,2 mm
100	3 mm	225	3,5 mm
125	3 mm	250	3,9 mm
140	3 mm	315	4,9 mm
160	3 mm	400	6,4 mm

Diameters and thicknesses comply with the EN 253 standard, with excellent mechanical strengths, which are suitable to bear the stresses that are caused by buried installation, friction and pressure of the soil.

Dimensional features of pipes and fittings

Supply: Ø 32-250 mm

Bar length (L): standard 5.80 m, upon demand 11.60 m

(De) = Outside diameter of the external casing pipe

(d) = Outside diameter of the service pipe

NOTE: the ends of the pre-insulated pipe are insulation-free for a distance equalling 220 mm and are ready to be welded, protected with an intrusion-resistant plug.

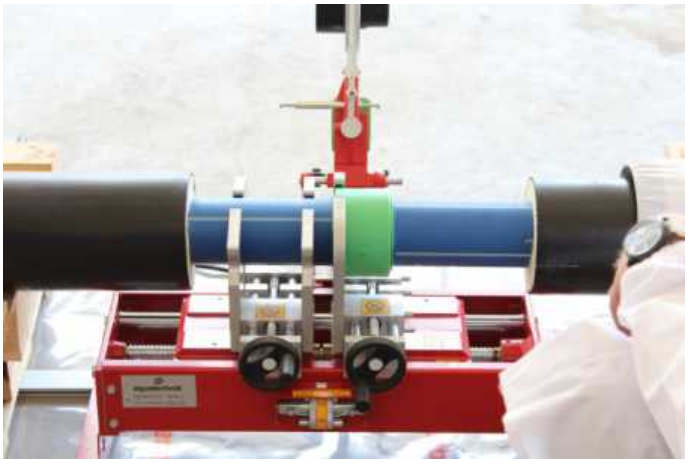
Internal service pipe	PUR insulation thickness	External PEHD casing pipe	Thickness of the external PEHD casing pipe
Dimensions Ø (d)	(mm)	(De)	(mm)
32 mm	26	90 mm	3,0
40 mm	32	110 mm	3,0
50 mm	27	110 mm	3,0
63 mm	28	125 mm	3,0
75 mm	29,5	140 mm	3,0
90 mm	32	160 mm	3,0
110 mm	41,8	200 mm	3,2
125 mm	46,5	225 mm	3,5
160 mm	41,1	250 mm	3,9
200 mm	52,6	315 mm	4,9
250 mm	68,7	400 mm	6,3

Instructions to process the single- and double-seal restoration joint

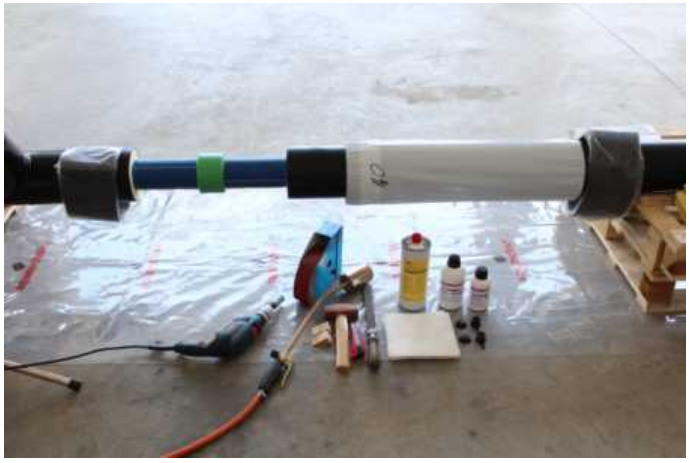
To process the restoration joint on site, you must have the complete equipment at disposal and follow the specified working steps.

Basic processing material:
- welding machine on site, equipped with matrices
- torch with LPG cylinder or gas propane-butane gas burner
- restoration joint kit, including:
  - 1 pre-holed heat-shrinking casing pipe with pre-applied sealant bands inside
  - 1 bicomponent dose (1 bottle polyol + 1 bottle isocyanate)
  - 2 seasoning plugs
  - 2 hole welding plugs
  - 1 PP-R sleeve included up to Ø 125 mm
  - 2 heat-shrinking bands (only for double-seal joint)

Additional processing material:
- emery cloth, grain 50÷70
- cleaning liquid item 50330
- cleaning cloths
- rasp
- hammer
- wooden or aluminium wedges (spacers)
- cutter
- whiteout or marker



1 - Perform the welding operation by following the instructions that are described in the technical catalogue. Before welding the second end, make sure that you introduced the heat-shrinking casing pipe still covered with the supplied film and, in case of double-seal restoration joint, the two heat-shrinking casings.



2 - Make sure you have the necessary material at disposal before the processing operation.

3 - Measure the length of the casing pipe and subtract the length of the non-insulated pipe from the detected measure. Divide the result by two: the obtained measure must be measured from the end of the pre-insulated pipe and marked with a white marker so that the position of heat-shrinking casing pipe ends will be clear.

4 - By using emery cloth (sandpaper), abrade the pre-insulated pipe by about 0.1 ÷ 0.25 mm by rubbing its end: start from the drawn line towards the inside to remove impurities and the oxidized layer of the insulator. Repeat the operation on both sides.

Instructions to process the single- and double-seal restoration joint

5 - Clean the ends, which were previously ground with the cleaning liquid item 50330, and then perform a preheating operation by using the torch up to about 40° in the area to be coated.

6 - Remove the packaging of the heat-shrinking casing pipe by using a cutter. Then, remove the protective paper inside.
WARNING! : the sealant bands are already pre-applied inside the the heat-shrinking casing pipe.
Place the heat-shrinking casing pipe by paying attention that its ends overlap on the sealants bands.

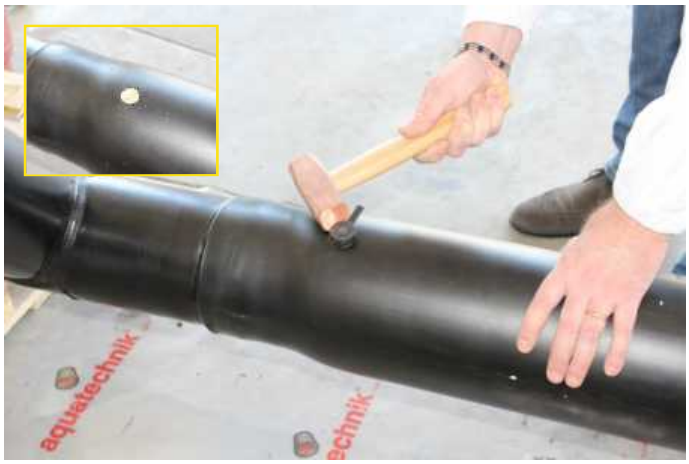
7 - Place the spacer wedges under the casing pipe so that it keeps centred and slightly lifted.

8 - Homogeneously heat the heat-shrinking casing pipe by using a torch with low regulation. The wooden wedge will be automatically ejected and the sealant band below will start working as a bonding agent between the pre-insulated pipe and the heat-shrinking casing pipe. At the end of the operation, you will notice a slight leakage of sealant material (see the yellow box) at welding level. Repeat the operation on the other side

Instructions to process the single- and double-seal restoration joint

9 - Mix the bicomponent products by pouring the polyol content into the isocyanate container: after that, shake for maximum 2 seconds, and then pour the content into one of the two holes.
WARNING! This operation must be carried out in very short times because the chemical reaction of the mixture is immediate

10 - Place the two supplied seasoning plugs by paying attention that the vent opening is not pushed inside the hole. After that, wait for about 20 minutes so that the introduced mixture becomes foam.



11 - With a light hammer blow, pop the drilled seasoning plugs. The hardened foam will look like the picture in the yellow box.

12 - With a rasp, slightly scrape the material to remove foam residues; after that, wipe with a cloth soaked in the cleaning liquid (item 50330) to finish the cleaning operation.

13 - Weld the supplied closing plugs by polyfusion, and then comply with melting and cooling times.

14 - Now, the installation of the single-seal restoration joint has been completed.

Instructions to process the single- and double-seal restoration joint

If you need to install a double-seal joint, the processing steps are similar. Remember that, to perform the double seal, you need to introduce the two heat-shrinking bands, as it is specified in processing step number 1.
After that, weld the two heat-shrinking bands as follows:

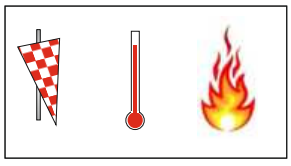
15 - After performing the cleaning operation with the cleaning liquid item 50330, remove the packaging film from the heat-shrinking band, and then place it on the casing pipe weld by paying attention that the middle line of the band correspond to the welding line.

16 - Perform the welding operation, heat the band by using the torch in all directions until it has completely shrunk. Repeat the operation for both bands.

17 - The double-seal joint assures maximum sealing and insulation by preventing any seepage risk.

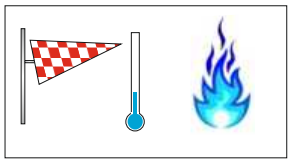
Instructions regarding the flame relevant to weather conditions

To correctly perform the welding operation, it is important that the flame adapts to the weather conditions of the building yard.



In case of external and heat-shrinking thin-walled pipes, without wind, high external temperatures and reduced space in the ditch

WEAK YELLOW FLAME



In case of external and heat-shrinking thick-walled pipes, strong wind, and low external temperatures

STRONG BLUE FLAME

Furthermore, remember that you need to perform the welding operations always by means of circular and homogeneous movements.

General recommendations about the installation inside a ditch (burial)

For an optimal installation, the buried iso-technik pipes must be placed in a trapezium-shaped excavation in order to obtain a slope-shaped ditch. The aforesaid shape allows considerably limiting the base width of ditch bottom, thus obtaining a lower load of the soil onto the pipes and also allowing the distribution of the loads.

The base width of ditch bottom is established according to the calculation that depends on the centre distance (A1+ De), which is the minimum recommended space that allows working inside the ditch with the areas occupied by our polyfusion welding equipment/machinery. Furthermore, the aforesaid installation distance allows operating in completely safe conditions while restoring the joint.

In case of excavations in the presence of water, you must provide for mechanical drains, in particular if you use electrical equipment and/or appliances.

It is advisable to level and manually tamp the sand layer around the pipes (h2, h3), while the filling up (h1) between the height flush with the sand layer and the soil level can be completed with the help of mechanical vibrators for tamping purposes. Make sure that the minimum height of the soil equals total 40-50 cm above the pipes.

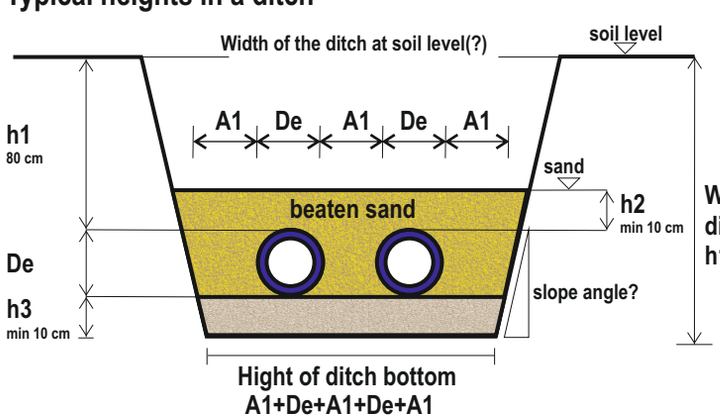
During the filling-up operation, you must install a suitable signalling tape.

As for the areas of the ditch that are involved in heavy vehicle traffic (>35 q.), you must provide for the creation of suitable reinforced-concrete slabs.

Table about installation centre distance

Dimensions	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
De Casing PE	90	110	125	140	160	200	225	250	315	400
A1 Installation centre distance	150	200	250	250	250	250	250	350	350	350

Typical heights in a ditch



Legend:

h1 = minimum height of the filling-up with riddled material from excavation debris, the 80cm height is the minimum value to prevent soil freezing, mechanical tamping with a vibrator with max. pressure 100Kpa

h2 = minimum height of sand layer above the pipes with mixed medium 0-4mm granulometry, manually tamped

h3 = minimum height of sand layer on the bottom of the excavation with mixed medium 0-4mm grain size, manually tamped

A1 = minimum distance to install the pipes for processing operations

De = outside diameter of the pipes

NOTE: the width of the ditch at soil level(?) and the slope inclination angle (?) depend on the type of soil; by starting from the calculation of the ditch bottom, according to the quality of soil, the slope inclination will be selected to prevent landslides.

General recommendations about overhead installations with bracket-type collars

As for overhead installations out of ditches, use the table about the centre distance for horizontally installed iso-technik pipes.
As for iso-technik pipes installed in vertical direction, increase the centre distance by 20%.

All fastening bracket-type collars must be hovering type; provide for 2 bracket-type collars for each hover point.

The specific bracket-type collar must take into consideration the outside diameters of the pipe. The size of the bracket flat has always to be minimum L 40mm x 3mm thickn.; the profile of the flat for the bracket-type collar is naked, so rubber-free.

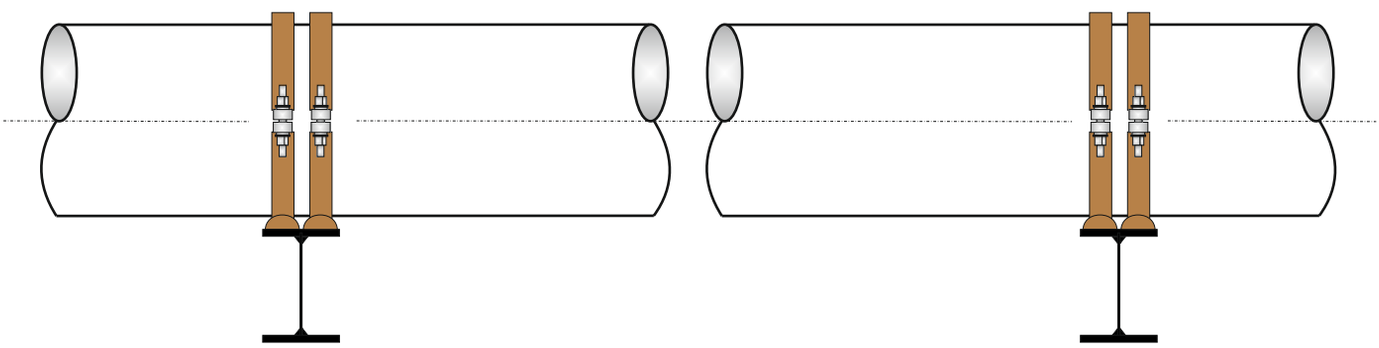


Table about clamping units for overhead installations

Temperature difference Δ T [K]	d (mm) Internal service pipe										
	32	40	50	63	75	90	110	125	160	200	250
	Correspondence (mm) Diameter of the external PE casing pipe										
	90	110	110	125	140	160	200	225	250	315	400
	Distance between clamping units (cm)										
0	165	195	195	235	250	265	260	295	335	340	350
20	125	145	145	180	190	200	195	220	245	280	265
30	125	145	145	180	190	200	195	215	235	245	250
40	115	135	135	170	180	190	185	205	225	235	245
50	115	135	135	170	180	190	185	195	210	225	235
60	110	125	125	160	170	165	180	185	200	210	220
70	100	120	120	150	170	165	170	175	190	200	205

NOTE: as for the installations of iso-technik pipes in vertical direction, increase the centre distance by 20%.

aquatechnik®

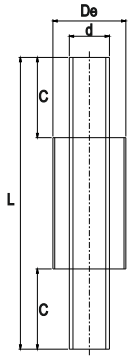
Item List

iso-technik System

COMPLETE RANGE OF PRE-INSULATED FITTINGS AND PIPES, MADE WITH PUR (STIFF POLYURETHANE) FOAM AND PROTECTED WITH PEHD CASING PIPE, TO REMOTELY DISTRIBUTE ENERGY, BOTH DIRECTLY AND INDIRECTLY, BY MEANS OF CARRYING FLUID - WATER

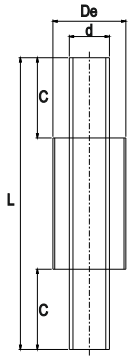
To know the conditions, please contact the Sales Departments.

Pipe
5,8 metres bars



d Int. pipe diameter	De Ext. pipe diameter	C Cut back	L Total length	iso fiber-T	iso fiber-COND
mm	mm	mm	m	Item	Item
32	90	190	5,8	61362PC	61462PC
40	110	190	5,8	61364PC	61464PC
50	110	190	5,8	61366PC	61466PC
63	125	190	5,8	61368PC	61468PC
75	140	190	5,8	61370PC	61470PC
90	160	190	5,8	61372PC	61472PC
110	200	190	5,8	61374PC	61474PC
125	225	190	5,8	61376PC	61476PC
160	250	190	5,8	61378PC	61478PC
200	315	190	5,8	61380PC	61480PC
250	400	190	5,8	61382PC	61482PC

Pipe
11,6 metres bars
Transport not included!



d Int. pipe diameter	De Ext. pipe diameter	C Cut back	L Total length	iso fiber-T	iso fiber-COND
mm	mm	mm	m	Item	Item
32	90	190	11,6	61362PL	61462PL
40	110	190	11,6	61364PL	61464PL
50	110	190	11,6	61366PL	61466PL
63	125	190	11,6	61368PL	61468PL
75	140	190	11,6	61370PL	61470PL
90	160	190	11,6	61372PL	61472PL
110	200	190	11,6	61374PL	61474PL
125	225	190	11,6	61376PL	61476PL
160	250	190	11,6	61378PL	61478PL
200	315	190	11,6	61380PL	61480PL
250	400	190	11,6	61382PL	61482PL

Iso-fiber-T: fiber-T pipe, SDR 7,4 from 32 to 125 mm - SDR11 from 160 to 250 mm
Iso fiber-COND: fiber-COND pipe, SDR11 from 32 to 250 mm

Restoration joint kit

double-sealing for PUR foaming on-site, including:
- 1 heat-shrinking casing pipe with pre-applied sealing bands inside
- 2 heat-shrinking bands
- 1 bicomponent dose (1 bottle polyol + 1 bottle isocyanate)
- 2 drilled plugs for seasoning
- 2 plugs to close and weld the hole
- PP-R pipe coupling to Ø 125 mm included

d Int. pipe diameter	De Ext. pipe diameter	Y Restoration casing pipe length	Z Restoration casing pipe diameter		Item
mm	mm	mm	EXT1 mm	EXT2	
32	90	650	95	105	62012PCX
40	110	650	118	128	62014PCX
50	110	650	118	128	62016PCX
63	125	650	132	142	62018PCX
75	140	650	146	156	62020PCX
90	160	650	168	180	62022PCX
110	200	650	208	220	62024PCX
125	225	650	236	250	62026PCX
160	250	650	262	278	62028PCX
200	315	650	324	340	62030PCX
250	400	650	415	430	62032PCX

Reduced restoration joint kit

double-sealing for PUR foaming on-site, including:
- 1 heat-shrinking casing pipe with pre-applied sealing bands inside
- 2 heat-shrinking bands
- 1 bicomponent dose (1 bottle polyol + 1 bottle isocyanate)
- 2 drilled plugs for seasoning
- 2 plugs to close the hole by welding
- PP-R pipe coupling up to Ø 125 mm included
-PP-R reducer up to Ø 160 mm included

d Int. pipe diameter	De Ext. pipe diameter	Y Restoration casing pipe length	Z Restoration casing pipe diameter	Item
mm	mm	mm	EXT mm	
40 - 32	110 - 90	650	125 - 100	62122PCX
50 - 32	110 - 90	650	125 - 100	62128PCX
50 - 40	110 - 110	700	125 - 125	62130PCX
63 - 40	125 - 110	700	140 - 125	62136PCX
63 - 50	125 - 110	700	140 - 125	62138PCX
75 - 50	140 - 110	700	160 - 125	62140PCX
75 - 63	140 - 125	700	160 - 140	62142PCX
90 - 63	160 - 125	700	180 - 140	62152PCX
90 - 75	160 - 140	700	180 - 160	62153PCX
110 - 75	200 - 140	700	220 - 160	62157PCX
110 - 90	200 - 160	700	220 - 180	62159PCX
125 - 90	225 - 160	700	245 - 180	62170PCX
125 - 110	225 - 200	700	245 - 220	62172PCX
160 - 110	250 - 200	700	270 - 220	62174PCX
160 - 125	250 - 225	700	270 - 245	62176PCX
200 - 160	315 - 250	700	335 - 270	62182PCX
250 - 160	400 - 250	700	420 - 270	62184PCX
250 - 200	400 - 315	700	420 - 335	62186PCX

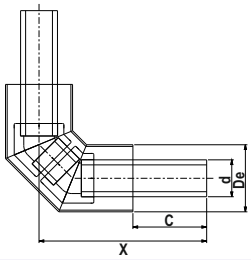
Single-sealing restoration joint kit

single-sealing for PUR foaming on-site, including:
- 1 heat-shrinking casing pipe with pre-applied sealing bands inside
- 1 bicomponent dose (1 bottle polyol + 1 bottle isocyanate)
- 2 drilled plugs for seasoning
- 2 plugs to close and weld the hole
- PP-R pipe coupling up to Ø 125 mm included

d Int. pipe diameter	De Ext. pipe diameter	Y Restoration casing pipe length	Z Restoration casing pipe diameter		Item
mm	mm	mm	EXT1 mm	EXT2	
32	90	650	95	105	62012PCZ
40	110	650	118	128	62014PCZ
50	110	650	118	128	62016PCZ
63	125	650	132	142	62018PCZ
75	140	650	146	156	62020PCZ
90	160	650	168	180	62022PCZ
110	200	650	208	220	62024PCZ
125	225	650	236	250	62026PCZ
160	250	650	262	278	62028PCZ
200	315	650	324	340	62030PCZ
250	400	650	415	430	62032PCZ

Elbow 90°

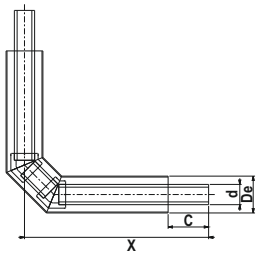
with stiff foam insulator made with PUR and PEHD coating



d Int. pipe diameter	De Ext. pipe diameter	C Cut back	X Branch length	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	Item	Item
32	90	190	500	63112PCT	63112PCC
40	110	190	500	63114PCT	63114PCC
50	110	190	500	63116PCT	63116PCC
63	125	190	500	63118PCT	63118PCC
75	140	190	500	63120PCT	63120PCC
90	160	190	500	63122PCT	63122PCC
110	200	190	500	63124PCT	63124PCC
125	225	190	500	63126PCT	63126PCC

Elbow 90°

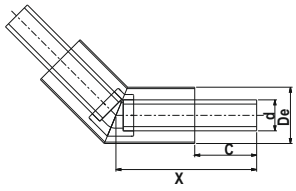
with stiff foam insulator made with PUR and PEHD coating



d Int. pipe diameter	De Ext. pipe diameter	C Cut back	X Branch length	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	Item	Item
32	90	190	1000	63112PLT	63112PLC
40	110	200	1000	63114PLT	63114PLC
50	110	190	1000	63116PLT	63116PLC
63	125	190	1000	63118PLT	63118PLC
75	140	190	1000	63120PLT	63120PLC
90	160	190	1000	63122PLT	63122PLC
110	200	190	1000	63124PLT	63124PLC
125	225	190	1000	63126PLT	63126PLC
160	250	190	1000	63128PLT	63128PLC
200	315	190	1000	63130PLT	63130PLC
250	400	190	1000	63132PLT	63132PLC

Elbow 45°

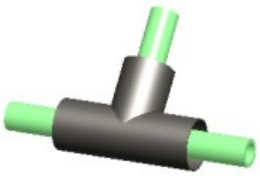
with stiff foam insulator made with PUR and PEHD coating

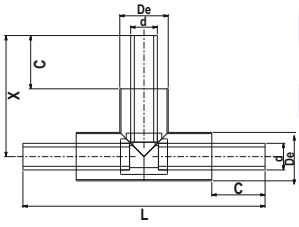


d Int. pipe diameter	De Ext. pipe diameter	C Cut back	X Branch length	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	Item	Item
32	90	190	500	63512PCT	63512PCC
40	110	190	500	63514PCT	63514PCC
50	110	190	500	63516PCT	63516PCC
63	125	190	500	63518PCT	63518PCC
75	140	190	500	63520PCT	63520PCC
90	160	190	500	63522PCT	63522PCC
110	200	190	500	63524PCT	63524PCC
125	225	190	500	63526PCT	63526PCC
160	250	190	500	63528PCT	63528PCC
200	315	190	500	63530PCT	63530PCC
250	400	190	500	63532PCT	63532PCC

Tee

with stiff foam insulator made with PUR and PEHD coating

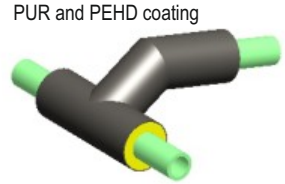


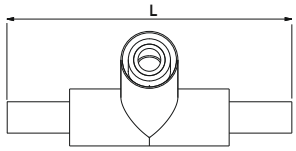


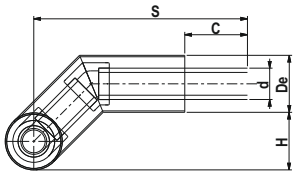
d Int. pipe diameter	De Ext. pipe diameter	C Cut back	X Branch length	L Total length	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	mm	Item	Item
32	90	190	500	1000	64112PCT	64112PCC
40	110	190	500	1000	64114PCT	64114PCC
50	110	190	500	1000	64116PCT	64116PCC
63	125	190	500	1000	64118PCT	64118PCC
75	140	190	500	1000	64120PCT	64120PCC
90	160	190	500	1000	64122PCT	64122PCC
110	200	190	500	1000	64124PCT	64124PCC
125	225	190	500	1000	64126PCT	64126PCC
160	250	190	500	1000	64128PCT	64128PCC
200	315	190	750	1500	64130PCT	64130PCC
250	400	190	750	1500	64132PCT	64132PCC

Tee with bridging conductor

with stiff foam insulator made with PUR and PEHD coating



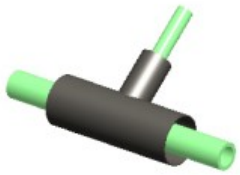


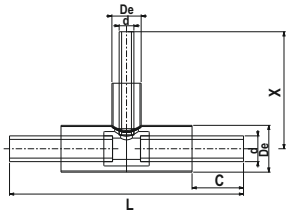


d Int. pipe diameter	De Ext. pipe diameter	C Cut back	L Total length	S Bridging conductor length	H Bridging conductor height	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	mm	mm	Item	Item
32	90	190	1000	750	100	64112PST	64112PSC
40	110	190	1000	750	120	64114PST	64114PSC
50	110	190	1000	750	120	64116PST	64116PSC
63	125	190	1000	750	135	64118PST	64118PSC
75	140	190	1000	750	150	64120PST	64120PSC
90	160	190	1000	750	170	64122PST	64122PSC
110	200	190	1000	750	210	64124PST	64124PSC
125	225	190	1000	750	235	64126PST	64126PSC
160	250	190	1000	750	260	64128PST	64128PSC
200	315	190	1500	1000	325	64130PST	64130PSC
250	400	190	1500	1000	410	64132PST	64132PSC

Reduced tee

with stiff foam insulator made with PUR and PEHD coating

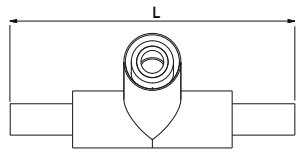


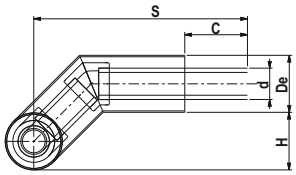


d Int. pipe diameter	De Ext. pipe diameter	C Cut back	X Branch length	L Total length	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	mm	Item	Item
40-32-40	110-90-110	190	500	1000	64246PCT	64246PCC
50-32-50	110-90-110	190	500	1000	64250PCT	64250PCC
50-40-50	110-110-110	190	500	1000	64251PCT	64251PCC
63-32-63	125-90-125	190	500	1000	64256PCT	64256PCC
63-40-63	125-110-125	190	500	1000	64258PCT	64258PCC
63-50-63	125-110-125	190	500	1000	64260PCT	64260PCC
75-32-75	140-90-140	190	500	1000	64264PCT	64264PCC
75-40-75	140-110-140	190	500	1000	64266PCT	64266PCC
75-50-75	140-110-140	190	500	1000	64268PCT	64268PCC
75-63-75	140-125-140	190	500	1000	64270PCT	64270PCC
90-50-90	160-110-160	190	500	1000	64280PCT	64280PCC
90-63-90	160-125-160	190	500	1000	64282PCT	64282PCC
90-75-90	160-140-160	190	500	1000	64284PCT	64284PCC
110-63-110	200-125-200	190	500	1000	64286PCT	64286PCC
110-75-110	200-140-200	190	500	1000	64288PCT	64288PCC
110-90-110	200-160-200	190	500	1000	64290PCT	64290PCC
125-90-125	225-160-225	190	500	1000	64294PCT	64294PCC
125-110-125	225-200-225	190	500	1000	64296PCT	64296PCC
160-90-160	250-160-250	190	500	1000	64298PCT	64298PCC
160-110-160	250-200-250	190	500	1000	64299PCT	64299PCC
160-125-160	250-225-250	190	500	1000	64300PCT	64300PCC
200-160-200	315-250-315	190	750	1500	64302PCT	64302PCC

Reduced Tee with bridging conductor

with stiff foam insulator made with PUR and PEHD coating





d Int. pipe diameter	De Ext. pipe diameter	C Cut back	L Total length	S Bridging conductor length	H Bridging conductor height	iso fiber-T	iso fiber-COND
mm	mm	mm	mm	mm	mm	Item	Item
40-32-40	110-90-110	190	1000	750	120	64246PST	64246PSC
50-32-50	110-90-110	190	1000	750	120	64250PST	64250PSC
50-40-50	110-110-110	190	1000	750	120	64251PST	64251PSC
63-32-63	125-90-125	190	1000	750	135	64256PST	64256PSC
63-40-63	125-110-125	190	1000	750	135	64258PST	64258PSC
63-50-63	125-110-125	190	1000	750	135	64260PST	64260PSC
75-32-75	140-90-140	190	1000	750	150	64264PST	64264PSC
75-40-75	140-110-140	190	1000	750	150	64266PST	64266PSC
75-50-75	140-110-140	190	1000	750	150	64268PST	64268PSC
75-63-75	140-125-140	190	1000	750	150	64270PST	64270PSC
90-50-90	160-110-160	190	1000	750	170	64280PST	64280PSC
90-63-90	160-125-160	190	1000	750	170	64282PST	64282PSC
90-75-90	160-140-160	190	1000	750	170	64284PST	64284PSC
110-63-110	200-125-200	190	1000	750	210	64286PST	64286PSC
110-75-110	200-140-200	190	1000	750	210	64288PST	64288PSC
110-90-110	200-160-200	190	1000	750	210	64290PST	64290PSC
125-90-125	225-160-225	190	1000	750	235	64294PST	64294PSC
125-110-125	225-200-225	190	1000	750	235	64296PST	64296PSC
160-90-160	250-160-250	190	1000	750	260	64298PST	64298PSC
160-110-160	250-200-250	190	1000	750	260	64299PST	64299PSC
160-125-160	250-225-250	190	1000	1000	260	64300PST	64300PSC
200-160-200	315-250-315	190	1500	1000	325	64302PST	64302PSC

Closing collar

d Int. pipe diameter	De Ext. pipe diameter	Item
mm	mm	
32	90	**69612PC**
40	110	**69614PC**
50	110	**69616PC**
63	125	**69618PC**
75	140	**69620PC**
90	160	**69622PC**
110	200	**69624PC**
125	225	**69626PC**
160	250	**69628PC**
200	315	**69630PC**
250	400	**69632PC**

Sealing ring
for wall passage

d Int. pipe diameter	De Ext. pipe diameter	Item
mm	mm	
32	90	**69662PC**
40	110	**69664PC**
50	110	**69666PC**
63	125	**69668PC**
75	140	**69670PC**
90	160	**69672PC**
110	200	**69674PC**
125	225	**69676PC**
160	250	**69678PC**
200	315	**69680PC**
250	400	**69682PC**

Cutter for PE drilling
to drill the restoration joint

Dimensions	Item
mm	
20	**52160**

Tapered matrix
to weld the PE closing plug for restoration joint

Dimensions	Item
mm	
25	**52120**

Cleaning liquid

for all cleaning operations

Dimensions	Item
weight	
g. 1000	**50330**

Seasoning plug

made with PE, with vent
spare part for restoration joint
package with 10 items

Dimensions	Item
mm	
25	**52150**

Closing plug

made with PE, to be welded
spare part for restoration joint
package with 10 items

Dimensions	Item
mm	
25	**52152**

Versione 01, Maggio 2014

aquatechnik®

ADMINISTRATIVE SEAT - PRODUCTION - WAREHOUSE
20020 Magnago (MI) - ITALY - Via P.F. Calvi, 40
Tel. +39 0331 307015 - Fax +39 0331 306923
E-mail: aquatechnikexp@aquatechnik.it

TRAINING CENTER IN BUSTO ARSIZIO
21052 Busto Arsizio (VA) - ITALY - Via Bonsignora,53

www.aquatechnik.it