

PolyPure Polypropylene Natural Piping

PART 1 GENERAL

1.1 Summary

Furnish a complete high purity natural PP piping system to include pipe, fittings, anchors, specialty fittings and valves.

1.2 References

The following standards apply to products used within this section.

ÖNORM B5174	CE0036
DIN 8077/8078	DIN16962
ASTM D 1598	ASTM D 1599
ASTM D 2122	ASTM D 2657
ASTM D 2837-85	ASTM D 4101
DVS 2207-11	DVS 2207-6
EN ISO 15494	

The system design shall meet the requirements of EN ISO 15494 for design criteria where temperature and pressure fall within the limits of the code.

1.3 Definitions

PolyPure
Polypropylene natural
PP-natural

1.4 System Description and Pressure Rating

System shall be a PolyPure system made of uniform pipe fitting and valve resin. System pressure ratings shall be based on continuous use of 50 years. PolyPure Pipe, Fittings and valves shall be based on a Standard Dimensional Ratio (SDR) of 11, 20-110mm (½" through 4"). Pressure rating for pipe and fittings, unless otherwise noted, shall be 10 bar (150 psi) for all SDR11 material and 10 bar for all applied valves.

1.5 System Performance Requirements

System performance requirements shall handle the following:

Operating Pressure: (TBD by Engineer/Project Owner)
Operating Temp: (TBD by Engineer/Project Owner)
Test Pressure: (TBD by Engineer/Project Owner)
Media: Deionized Water, CMP slurries

1.6 Submittals

Submit the Following:

A. Product data for the system specified; relative to materials, dimensions of individual components, profiles and finishes.

B. Product certificates signed by manufacturer of PolyPure piping product, stating compliance to stated requirements.

C. Welder certificates, certifying that welders comply with the installation procedures as outlined by DVS 2207-11/DVS2207-6 & ASTM D-2657. All required training should be scheduled and completed at to job start-up.

D. Qualification of firms supplying PolyPure: Firms must have a minimum of five years experience in HP design, installation and operation of thermoplastic high-purity piping systems.

1.7 Quality Assurance

Obtain components from a single source having responsibility and accountability to answer and resolve problems regarding proper installation, compatibility, performance, and acceptance.

1.8 Delivery, Storage and Handling

A. Deliver all PolyPure pipe to arrive on-site inside protected for shipment.

B. Deliver all PolyPure fittings to arrive on-site single bagged in boxes layered with bubble packing to prevent damage.

C. Store products on elevated platforms in a dry location with protection from the environment.

D. Lift, support and transport PolyPure piping per manufacturers' recommendations.

1.9 Extra Material

Turn over to owner at end of construction necessary welding equipment as suggested by manufacturer for repair, additions and maintenance of PolyPure piping system.

PART 2 PRODUCTS

2.1 Manufacturers

Subject to compliance with requirements products which may be incorporated in the work include: The PolyPure System as supplied and produced by AGRU Kunststofftechnik GmbH • A - 4540 Bad Hall • Ing.-Pesendorfer-Str. 31.

2.2 Material

Pipe, valves and fittings shall be made from resin produced by one supplier. The resin shall meet or exceed the requirements outlined for a random copolymer resin according to ASTM D 4101-96a and DIN 16774. Melt Flow Range of resin shall be 1.25 g/10min per 230/5. Resin is approved for contact with foodstuff as per the FDA CFR, Title 21 (2001) 177.1520.

In addition, manufacturer shall test all lots to ensure the melt flow index is within allowable range.

2.3 Product Identification

Each Product must be clearly marked with manufacturers name, Dimension and SDR rating, Material identification and product batch number.

2.4 Pipe

A. Production

All pipe shall be produced on dedicated extruders completely within a dedicated clean area. Surface finish smoothness is as follows:

Dimension	Ra
OD 20 – 40 mm	≤ 1.0µm
OD 50 – 110 mm	≤ 0.8µm

B. Packaging

All pipes shall have ends sealed with PE bags and then capped. Pipe shall be sleeved in full length PE bag (qty dependent). The following chart designates quantities of pipe per PE bag:

Size mm	Size inches	Quantity Per Tube
20	1/2"	Five
25	3/4"	Four
32	1"	Three
40	1 1/4"	One
50	1 1/2"	One
63	2"	One
90	3"	One
110	4"	One

C. Pressure Rating

All pipes shall meet the requirements of Section 1.4.

2.5 Fittings

A. Production

All standard fittings through 110mm (4") shall be injected molded. All fittings are to be molded with equipment in a clean environment. After gating removal all fittings shall be cleaned for a minimum of 1 hour in an automated Hot DI rinse. The DI Rinse water shall be 70°C with resistivity above 18MΩ and TOC ≤10ppb.

B. Packaging

All fittings are to be packaged in a class 100 (acc. Fed Std 209E ISO Class 5 acc. ISO 14644-1) cleanroom immediately after the cleaning process. Fittings are to be single bagged in clean diffusion resistant PE (composite) bags. Bag is purged with nitrogen. Bags are to be silicone free.

C. Specialty Fittings

Specialty fittings are to include restraint fittings, butt fusion instrumentation fittings, instrumentation donuts, etc. Specialty fittings shall be machined or molded of the same PP resin as the pipe and fittings. Any manufacturing process no mold release agents to be used. All special fittings must be cleaned and packed as molded fittings (see 2.4 A and B)

D. Pressure Rating

All fittings, unless otherwise noted, shall meet the requirements of Section 1.4.

2.6 Valves

All valves shall be produced in the same manner as High Purity Fittings

Type 342 Spigot Diaphragm Valves:

20mm –63mm (1/2"-2") shall be the type 342 of the PURAD system. The Valves shall have a PolyPure body and a diaphragm of PTFE with EPDM backing or EPDM. Valves will be spigot single body design. Top Works must include integral lockout device on the handle and position indicator.

Type 343 Reduced Dead Leg Valve:

20mm x 20mm through 63mm x 32mm (1/2" x 1/2" through 2" x 1") reduced dead leg (zero dead leg) valves shall be Type 343 Style from the PolyPure System. Valves shall be made of PolyPure resin. Valve bodies are to be unibody, molded design with a full 10bar rating at 20°C. All metal nuts and bolts must be capped or covered to reduce metal exposure. Top Works must include integral lockout device on the handle and position indicator. (Consult Factory for Availability of Molded T-343)

Check Valves:

PolyPure with FPM or EPDM seat and seals. 10 bar at 23°C for sizes 20mm – 75mm.

Pressure Rating-Valves

Pressure rating of valves shall be per manufacturer's recommendations based on materials, valve type and size.

2.7 Joining Equipment

PolyPure installation shall be performed by factory certified and trained installers in accordance with manufacturer's

ISO procedures, ASTM D 2657 and DVS 2207-11/DVS2207-6. Date of certification or re-certification shall not exceed two years from the beginning of project. Each welder must have a certification from the manufacturer or recognized representative of the system. For identification each welder must hold identification card which is providing the following information:

- Name of company
- Name of welder
- Certification date
- further recommended information
- picture of welder

The identification card (welder card) can be either PCMC card or plastic identification card. The card must be used as a key to operate the welding equipment.

Available joining techniques are as follows:

A. Non-Contact Butt-Fusion (IR-Fusion)

Proper equipment selection should be based on installation requirements and line sizes. Tool shall be fully automatic (SP series).

SP Series:

Tool shall be made available in 20mm – 110mm (½” – 4”) and 75mm – 280(315)mm (2½” – 11”(12”)) size ranges. Tools shall possess electronic planer and infrared heating element. Tools will utilize and measure the welding pressures to join material and not mechanical stops. To avoid improper welded joints, tool shall automatically operate clamps and control joining force and joining speed. Tools shall possess the following features:

1. Computer control and automatic fusion.
2. Touch screen for tool operation and parameter selection.
3. Restricted access through use of welder cards .
4. Automatic label printouts after each weld.
5. Ability to display and graph weld processes weld is proceeding.
6. Memory storage of welds
7. Magnetic clamps to reduce change out time from one size to another.
8. Vertical and Horizontal Adjustment for pipe alignment.

B. Butt-Fusion

Proper equipment (non hydraulic machines) selection should be based on pipe size and site conditions. Butt fusion equipment should be designed and tested to provide reliable welds. All equipment should utilize electronically controlled heating elements for accurate welding temperatures. Tools should also incorporate planing units to face ends prior to heating. Butt-fusion equipment supplied shall weld joints based on force or pressure and not mechanical stops. Butt fusion should only be applied where IR fusion cannot be used. Only welding parameters recommended by the manufacturer should be applied.

PART 3 EXECUTION

3.1 Installation

A. Facilities

Subassembly and fabrication work should be conducted in a separate, temporary clean room located within the building. Cleanroom should be equipped with the following to provide a clean installation:

1. Provide Laminar flow Hepa filters in room ceiling to reach a level of class 10000.
2. The quantity of filters should be determined by providing a minimum of 60 room air changes per hour.
3. Ideal set up is to place welding equipment directly beside the filter. In addition nitrogen should be available for purging the pipelines with a positive pressure if the assemblies expand beyond the bounds of the room.

B. Tools

All fusion tools utilized are to be dedicated for clean build only, and should be kept separate. Special attention should be given to the fusion tools to prevent the possibility of contaminating a weld. The contractor shall lease or purchase all necessary welding equipment from the manufacturer. At the end of the installation, any necessary equipment needed on-site should be sold to the owner. Contractor is responsible for proper maintenance and care of the fusion tools during construction. All welds must be executed using welding equipments. Manually performed joints are not acceptable.

C. Weld Execution

Only components which have the same SDR rating in the welding area can be joined together. From the welding equipment manufacturer recommended parameters must be used. Each weld must be carefully visually checked by the operator acc. to manufacturers recommendation.

D. Certification

Installers shall be pre-qualified as per section 2.6. Manufacturer shall provide on-site training in the assembly and installation of the PolyPure piping system as needed.

3.2 Piping assembly

A. Installation

For the installation of the piping the following requirements must be evaluated and recognized:

1. support distances.
2. expansion loops (changes in direction for expansion compensation)
3. correct setup of pipe supports to ensure pipe expansion in axial and radial direction.
4. apply only suitable pipe supports for plastic piping as recommended by the manufacturer.
5. Installer only ready qualified pre-assemblies.

B. Flange connections

For each flange connection only expanded PTFE (e-PTFE) gaskets Type seal clean should be used. Ensure that each gasket is centered acc. to manufacturers recommendation.

Apply the recommended backing rings and torques. Ensure correct support of piping in the area of flange connection.

3.3 Testing

A. Inspection

Prior to pressure testing, the system shall be examined for the following items:

1. Pipe shall be completed per drawing layout with all pipe and valve supports in place.
2. Pipe, valves, and equipment shall be supported as specified, without any concentrated loads on the system.
3. Pipe shall be in good conditions, void of any cracks, gouges or deformation.
4. Pipe flanges shall be properly aligned. All flange bolts should be checked for correct torques.
5. All diaphragm valve bonnet bolts shall be checked for correct torques.
6. All joints should be reviewed for appropriate welding technique:

Non-Contact: Identity labels shall identify weld certification by the print "welding parameters OK". Joints should have two beads 360° around the joint.

Butt: To have two beads, 360° around the joint.

Manufacturer to supply inspection procedures beyond the above recommendations. If any deficiencies appear, the quality control manager shall provide directions for repair.

B. Pressure Test

1. Test fluid should be deionized water, with quality level set by Quality Control Engineer. In all cases test must be done hydrostatically. Air test is not allowed
2. Filling the system--Open all valves and vents to purge the system of air. Slowly inject the water into the system, making sure that air does not become trapped in the system.
3. Test sequences should be performed acc. DVS 2210-1 (DIN 4279).
4. Test is to be witnessed by Quality Control Engineer and certified by the contractor.

3.4 Cleaning of PolyPure Piping System

System shall be cleaned at completion of project according to requirements set by owner.

Appendix A: Static Leach Out Data

In the international market different test methods for leach out behavior are being used. The different test methods provide different test results, which are not comparable. For better identification and qualification all Agru high purity systems have been tested according to the valid international standard.

Static leach tests provide valuable information on a material's purity. Static tests provide a worst case scenario since the test water is stagnant during the entire test. These tests are useful in comparing materials, but do not simulate an actual installation. When comparing this data to other materials, ensure the test methods and result units are identical. Results will vary based on the test method.

Measurement Types:

Ion chromatography (IC) According to SEMI draft doc. 2840 (rev 05/14/98)

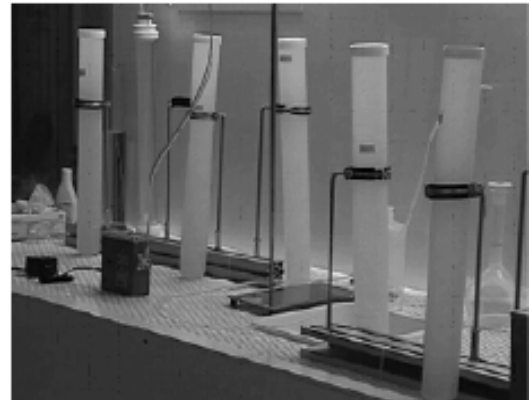
Total organic carbon Analyses (TOC) According to SEMI2840B STD (7d;850C)

Test Procedure acc. SEMI F057:

- Sample preparation in class 10000 environment
- Test was performed in class 1
- Precleaning of the sample with UPW
- Soak time 7 days at 85°C
- Anion analyses by IC with suppressed conductivity and preconcentration unit (Release values are notified)
- Transition metals + Cation analyses by IC with suppressed conductivity and postcolumn derivation with PAR. (Release values are notified)
- TOC analyses by TAC-502P system



Analytical Equipment



Test Samples

**Static Leach Out Test Results:
Temperature 85°C**

	PolyPure µg/m ² February 2002 OD 63		<i>SEMI</i> <i>Specification</i>
Fluoride*	<	3.93	60000
Chloride		348.3	3000
Nitrite*	<	6.74	100
Bromide*	<	3.9	100
Nitrate*	<	9.9	100
Phosphate*	<	12.7	300
Sulphate		56.8	300
Oxalate		38.2	No Specification
Lithium*	<	0.6	2
Sodium*	>	87.7	15
Ammonium*	>	82.3	No Specification
Potassium*	<	4.1	15
Magnesium		27.4	5
Calcium		22.2	30
Iron		1.5	5
Copper*	<	0.3	15
Nickel		0	1
Zinc		13.7	10
Cobalt*	<	0.1	No Specification
Manganese		4.9	5
Aluminum		43.8	10
Barium		0.7	15
Boron*	<	2.2	10
Chromium		0.8	1
Lead*	<	0.2	1
Strontium*	<	0.2	0,5
TOC		88841	60000

* critical values below detection limit