

TA 1117 HD

Cross-linkable High Density Polyethylene Compound

TA 1117 HD is for use in industrial applications. Crosslinked TA 1117 HD has a beneficial combination of high density and high gel content which result in excellent chemical, abrasion and heat resistance. The properties of TA 1117 HD make it a preferred choice for oil and gas production, mining, and other aggressive industrial applications. TA 1117 HD is suitable for continuous service at operating temperatures of 95°C (203°F).

Description:

TA 1117 HD PEX-b compound, sometimes referred to as graft, is a silane grafted ethylene copolymer. The graft and a masterbatch containing a crosslinking catalyst and various stabilizers are required together to produce crosslinked pipes and other profiles.

This two component system allows crosslinked polyethylene products to be extruded as normal thermoplastic polymers and then after the two components are extruded together in the proper proportions, the resulting product is crosslinked by immersion in hot water at 95°C or by exposure to low pressure steam. The catalyst compounded into the TA 1117 HD during production of pipes is used to provide the crosslinked pipe with weathering resistance and protection from thermal degradation to a desired level.

Due to the ability of pipe producers to add antioxidants and other stabilizers in any amount required without negatively affecting the degree of crosslinking of the final product, crosslinking using the silane grafting method is judged to be superior to other methods of producing crosslinks in polyethylene.

Physical Properties:

Property	Typical Values	Method and Comments	Inch-Pounds Units
Density	0.948 g/cm ³	ASTM D792 (Natural, not crosslinked)	59.2 lbs/ft ³
Gel Content	75 %	ASTM D2765 as per ASTM F 876	75 %
Tensile Strength at Yield	22 MPa	ASTM D638 (50 mm/min)	3,050 psi
Tensile Elongation at Break	>300 %	ASTM D638 (50 mm/min)	>300 %
Flexural Modulus	800 MPa	ASTM D790 (2% secant, Method 1)	116,000 psi
Vicat Softening Point	128 °C	ASTM D1525	262°F
Brittleness Temperature	< -60°C	ASTM D746	< -76°F

Properties (cont.)	Typical Values	Method and Comments	US / Other Units
Hydrostatic Design Basis (HDB) (crosslinked)	1600 psi at 73°F 800 psi at 200°F	ASTM D2837 E10 level	11.03 MPa at 23°C 5.51 MPa at 93°C
Hardness, Shore D	68	ASTM D2240	68
Low Temperature Squeeze Off	-50°C	Does not rupture during 1000 hours at 95°C and 3.7 MPa hoop stress according to ASTM D1598 after -50°C squeeze off according to ASTM D2513	-58°F
Melt Flow Index	0.9 g/10 min	ASTM D1238 (190°C/5.0kg) (non-crosslinked graft)	0.9 g/10 min
Melt Flow Index	21 g/10 min	ASTM D1238, (190°C/21.6 kg)	21 g/10 min
Volatiles Total	< 0.10 %	Kafrit method 4.3 (as packaged)	< 0.10 %
Moisture	< 0.02 %	Kafrit method 4.4 (as packaged)	< 0.02 %
Bulk Density	0.54 g/cm ³	ASTM D1895 (ISO R 60)(as packaged)	33.7 lbs/ft ³

Processing TA 1117 HD:

TA 1117 HD may be processed on most modern thermoplastic extruders. High quality products may be expected when TA 1117 HD is processed with an extruder designed for polyethylene. Adequate blending of the catalyst masterbatch and the TA 1117 HD is important to the final properties of the product, so use of a barrier flight or other mixing type screw is preferred.

It is important to accurately blend the graft and catalyst masterbatch in the ratio of 95.0% TA 1117 HD and 5.0% catalyst masterbatch by weight. Use of a gravimetric feeding system is recommended for optimum results.

Catalyst Masterbatches:

A variety of catalyst masterbatches are available in different colors and with different stabilization additives. Please contact your Kafrit NA sales representative for more information about selecting Kafrit NA catalyst masterbatches.

Screw Parameters:

- Length to diameter ratio (L/D) : 25 to 1
- Compression ratio : between 3.0 to 1 and 2.5 to 1

Extrusion Temperature Profile:

The following temperature profile is intended as a starting point. When extruding PEX compound it is important to assure adequate mixing of the catalyst masterbatch with the TA 1117 HD. Poor mixing as a result of low back pressure and low temperature may result in poor surface finish and a lack of homogenous distribution of the catalyst additives through the wall of the pipe. Excessive shear and temperature may result in degradation of the material and the performance of the pipe.

Extruder Zone	Temperature (Fahrenheit)	Temperature (Celsius)
Zone 1	310 – 350	154 - 177
Zone 2	330 – 370	165 - 188
Zone 3	350 – 390	177 - 200
Zone 4	370– 390	188 - 200
Head	390 – 410	200 - 210
Die	375 – 420	190 - 215
Screw*	160 – 195	70 - 90

* Control of the screw temperature may improve processing results.

To Optimize Extrusion Performance:

- Pre-dry (warm) the catalyst masterbatch for 2 hours at 140°F - 175°F (60°C -80°C).
- Allow the raw material to warm up to ambient factory temperature before opening packaging to avoid moisture condensing on the material.
- The extruder, head and die tooling should be constructed to streamline the flow of the melt and to avoid stagnation of the material anywhere in the system.
- Use of screen packs and breaker plates may be required to provide sufficient back pressure to optimize mixing of catalyst and TA 1117 HD.
- In case of a pause in extrusion longer than 10 or 15 minutes, purge the extruder with HDPE that has a MFI ≤ 2.0 before extruding TA 1117 HD again.

Crosslinking (Curing):

Crosslinking of TA 1117 HD extruded with catalyst may be completed by immersion in or flushing with hot water at 160°F - 195°F (70°C - 90°C) or exposure to low pressure steam to heat the pipes to similar temperatures.

In some cases in situ crosslinking is very advantageous, for example if fusion welding of the pipe during installation is desired. In situ crosslinking may be undertaken on TA 1117 HD pipes with appropriate engineering control of the maximum pressure and temperature that the pipe is subjected to during crosslinking. Please consult with Kafrit NA regarding in situ crosslinking.

The time required to obtain the desired degree of crosslinking (gel content) depends on the pipe wall thickness, relative humidity, and the temperature. The rate of crosslinking is predominantly influenced by temperature.

Storage:

Unopened packages of TA 1117 HD have a shelf life of 9 months from the production date. Packages of TA 1117 HD should only be opened immediately before processing. Exposure of TA 1117 HD to direct sunlight, moisture, or atmosphere must be avoided.

Shelf life of opened packages is up to 5 or 6 weeks, provided packages are resealed completely airtight using a tape with strong adhesive and barrier properties (i.e. aluminum tape).

Packaging:

TA 1117 HD is available in cardboard gaylords of 1322 pound (600 kg). The material is preserved by a moisture resistant multi-layer lining inside the box which is sealed under vacuum. By special request TA 1117 HD may be provided in 55 pound (25 kg) moisture resistant multi-layer bags.

Catalyst masterbatch is available in 55 pound (25 kg) moisture resistant multi-layer bags. By special request catalyst masterbatch may also be provided in cardboard gaylords.

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