PVC Bar: Solid Round

Application:

Corrosion resistant solid round bar, sizes 1/4" through 12", for use at temperatures up to and including 140˚F. Generally resistant to most acids, bases, salts, aliphatic solutions, oxidants, and halogens. Chemical resistance data is available and should be referenced for proper material selection. Extruded bar exhibits excellent physical properties and flammability characteristics. Provides consistent machining stock for the production of corrosion resistant: valve and valve components, pump components, bushings, spacers, nuts, bolts, and many other custom components and subassemblies for use in corrosive environments. Standard methods for machining, joining, and fabricating PVC thermoplastics are applicable to this product including: drilling, threading, turning, solvent cementing, and thermal welding techniques. General machining recommendations stated on page 2 of this specification should be referenced as guidelines.

Scope:

This specification outlines minimum manufacturing requirements for Polyvinyl Chloride (PVC) solid round bar. This product is manufactured as machining stock for use to produce components for end use in systems where temperatures do not exceed 140˚F.

PVC Materials:

The material used in the manufacture of the solid bar shall be domestically produced rigid, unfilled, general-purpose-grade polyvinyl chloride (PVC) compound, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784 as provided by the PolyOne Corporation. (Callout Designation S-PVC0111 per ASTM D6263). This compound shall be gray in color, and shall be approved by NSF International for use with potable water. This material shall not contain lead stabilizers.

Quality Assurance:

PVC solid round bar is manufactured in strict compliance with ASTM D6263, Standard Specification for Extruded Rods and Bars. This includes requirements for classification and material, physical properties, degree of fusion, dimensions, dimensional stability, voids, lengthwise camber, workmanship, finish and appearance. Each production run of solid bar shall be subjected to, and meet, the following test requirements established for material, workmanship, extrusion quality, and internal stress. All finished product shall be homogenous throughout, and shall be free of voids and foreign contamination.

Product Traceability:

- A record of each material lot, which contains physical analysis and conformance records of that lot, shall be maintained for material identification and tracking.
- Each standard length of product shall be traceable to the raw material lot and batch from which it was produced.

Physical Performance Testing:

- Finished product dimensions shall be monitored continuously for compliance to standards and tolerances.
- Physical samples shall be taken at start-up, and periodically from each production run, and subjected to destructive testing for:
- Degree of fusion by Acetone Immersion per Section 12.6 of ASTM D6263
- Voids - all product shall be porosity free, and shall not contain foreign inclusions or contamination per Section 8 of ASTM D6263.
- Stress - Internal stress levels throughout the product profile shall be measured, monitored, and kept to a minimum. This product shall also meet the dimensional stability requirements as published in Table S-PVC-II of ASTM D6263 when tested in accordance with Section 12.2 of that Standard.

Marking:

Each standard length of solid bar, sizes 1" and larger shall be permanently marked on each end with the production date and shift for tracking purposes.

Sample Specification:

All PVC Solid Round Bar shall be manufactured from a unfilled, general purpose grade PVC material with a Cell Classification of 12454 per ASTM D1784 (Callout Designation S-PVC0111 per ASTM D6263). The bar shall be manufactured in strict compliance to ASTM D6263 consistently meeting or exceeding the quality assurance test requirements of this standard with regard to material, physical properties, degree of fusion, dimensions, dimensional stability, lengthwise camber, workmanship, finish and appearance. All PVC solid bar shall be porosity free, and shall be tested for internal stress levels. The solid bar shall be manufactured in the USA, using domestic materials, by an ISO 9001 certified manufacturer. All solid round bar shall be stored indoors after production at the manufacturing site until shipped from factory. This product shall be produced from materials Listed by the National Sanitation Foundation (NSF) as approved for potable water applications. All PVC solid rod shall be manufactured by Georg Fischer Harvel LLC.

Solid Round Bar

Size (in.)	O.D.	Tol. -0; +	Camber & Bow	Nom. Weight (Lbs./ft.)
1/4	0.250	0.008	N/A	0.029
3/8	0.375	0.015	N/A	0.066
1/2	0.500	0.015	1-1/2	0.117
5/8	0.625	0.020	1-1/2	0.183
3/4	0.750	0.022	1-1/2	0.265
7/8	0.875	0.025	1-1/2	0.358
1	1.000	0.030	1-1/2	0.471
1-1/8	1.125	0.035	1-1/4	0.594
1-1/4	1.250	0.035	1-1/4	0.736
1-3/8	1.375	0.040	1-1/4	0.891
1-1/2	1.500	0.040	1-1/4	1.060
1-5/8	1.625	0.045	1-1/4	1.244
1-3/4	1.750	0.050	1	1.440
1-7/8	1.875	0.055	1	1.657
2	2.000	0.060	1	1.890
2-1/8	2.125	0.060	1/2	2.128
2-1/4	2.250	0.068	1/2	2.384
2-3/8	2.375	0.071	1/2	2.658
2-1/2	2.500	0.075	1/2	2.950
2-3/4	2.750	0.080	1/2	3.560
3	3.000	0.090	1/4	4.240
3-1/4	3.250	0.100	1/4	4.975
3-1/2	3.500	0.105	1/4	5.770
4	4.000	0.120	1/4	7.550
4-1/2	4.500	0.135	1/4	9.555
5	5.000	0.150	1/4	11.700
5-1/2	5.500	0.165	1/4	14.300
6	6.000	0.180	1/4	17.100
7	7.000	0.210	1/8	24.010
8	8.000	0.240	1/8	31.360
9	9.000	0.270	1/8	39.690
10	10.000	0.300	1/8	49.000
11	11.000	0.330	1/16	59.290
12	12.000	0.360	1/16	74.000

1/4" thru 2" stocked in 10 ft lengths; 2 1/8" thru 5 1/2" stocked in 5 ft and 10 ft lengths; 6" thru 10" stocked in 5 ft lengths; 11" and 12" stocked in 2 ft lengths. Tolerance on lengths = ±1". Custom lengths available on all sizes as requested.

ASTM STANDARD D1784 MATERIAL EQUIVALENTS:
Cell Classification 12454 = PVC Type I Grade I = PVC1120

Refer to Georg Fischer Harvel LLC Machining Shapes Bulletin (HPB-111) for additional information pertaining to materials, physical properties, machining recommendations and other technical data.

NOTE The machining characteristics of different plastics vary somewhat. The recommendations given are general and may require modification to obtain the best results. The data furnished herein is provided as a courtesy and is based on past experience, limited testing, and other information believed to be reliable. This information may be considered as a basis for recommendation only, and not as a guarantee for its accuracy, suitability for particular applications, or the results to be obtained there from. Materials should be machined and tested under actual use conditions to determine suitability for a particular purpose.

Recommended Machining Practices

Residual stresses are inherent in all extruded profiles due to the nature of the extrusion process. The amount of inherent stress will affect the product's long term stability, toughness, and machineability. Certain machining practices, regardless of the material being machined, can generate excessive stress. When induced stresses caused by the effects of machining are added to the existing residual stress, product failure can result.

Georg Fischer Harvel LLC has addressed this phenomena by refining its extrusion processes to reduce and continually monitor internal stress levels present within extruded bar to ensure consistent machine stock. The following machining recommendations will help minimize the amount of stress being induced during the machining process.

1. **Heat Generation** should be kept to a minimum during all machining processes.

   a. Actual testing should be conducted to determine the maximum speed a particular tool can be used without generating excessive heat.

   b. Cutting solutions of water, soapy water, a suitable lubricant, or cool air jet should be considered for cooling during the machining process. CAUTION: Certain oils and lubricants typically used for machining of metallics contain stress-cracking agents that are not compatible with PVC or CPVC materials. Contact the lubricant manufacturer for compatibility prior to use.

2. **Turning and Boring -** High-speed steel and carbide tools are typically used for most plastics. A common practice is to follow the feed and speed rates that are typically used for machining brass. Speed rates for high speed steel tools commonly vary between 250-500 ft./min.; rates for carbide tools can vary from 500 to 1500 ft./min. Tools used should have less clearance and more rake than those used for steel or other metals.

3. **Drilling -** Carbide tipped bits are recommended for high volume production. Extra clearance at the back edges of the flutes is desirable to reduce heat generation caused by friction. Drill speeds can be as high as 12,000 to 15,000 Rpm's with carbide tipped bits. Bit points should have an included angle of 55° to 60° for thin sections and 90° for thicker sections; with a clearance angle of 15°. Lubrication or an air jet should be provided for to avoid excessive heating and aid in chip removal. Commercial high speed steel drills specifically designed for use with plastics are available which have large flutes for easy chip removal.

4. **Tapping and Threading -** A high speed, steel nitride, chromium plated tap with a rake from 0 to -5° is recommended for tapping small holes. Tapping speeds usually vary from 40 to 55 ft./min. The size of the hole should allow for approx. 3/4 of the standard thread depth. When cutting a 60° thread (such as ANSI B1.2.1) the tool used should be ground to cut on one side only, and fed in at an angle of 30° by setting the compound rest at this angle.