Corzan Ducting Systems

With increasing regulation of air emissions, the need for reliable fume handling systems, especially in corrosive environments, is growing rapidly. To meet this demand Corzan Industrial Systems offer the same outstanding balance of properties in round duct, fabricated duct fittings, industrial sheet, and welding rod. As a result, these properties can be designed and fabricated into entire fume handling systems.

Round duct and fittings are available in sizes up to 24". For larger size systems, Corzan industrial sheet can be fabricated into square or round duct using techniques described in greater detail in the fabrication section of this manual. Corzan ducting systems can also be connected with fume scrubbers or other emission control equipment made of Corzan CPVC to ensure excellent corrosion resistance throughout the entire system.

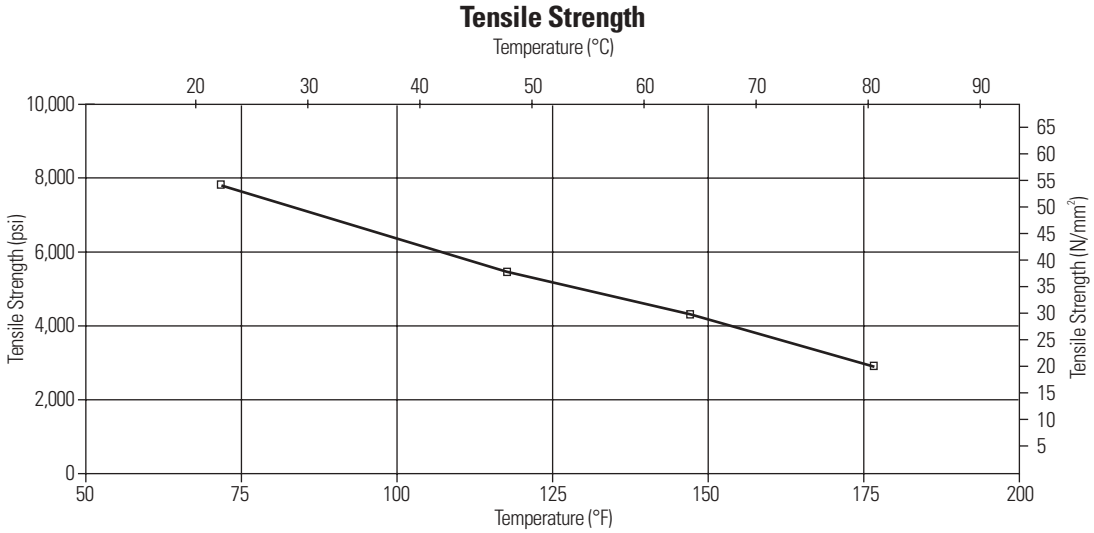
Property	Test	Condition	English Units	SI Units
GENERAL				
Density (Specific Gravity = 1.53)	ASTM D792	73°F/23°C	95.4 lb/ft^3	1.53 g/cm^3
Specific Volume		73°F/23°C	0.0105 ft^3/lb	0.654 cm^3/g
Water Absorption	ASTM D570	73°F/23°C	+0.03%	+0.03%
		212°F/100°C	+0.55%	+0.55%
Rockwell Hardness	ASTM D785	73°F/23°C	118	
Cell Class	ASTM D1784		23437	
MECHANICAL				
*Notched Izod Impact	ASTM D256	73°F/23°C	2.0 ft lb$_f$/in	107 J/m
*Tensile Strength	ASTM D638	73°F/23°C	7960 psi	55 N/mm^2
*Tensile Modulus	ASTM D638	73°F/23°C	373,000 psi	2572 N/mm^2
*Flexural Strength	ASTM D790	73°F/23°C	13,300 psi	92 N/mm^2
*Flexural Modulus	ASTM D790	73°F/23°C	348,000 psi	2399 N/mm^2
Compressive Strength	ASTM D695	73°F/23°C	10,100 psi	70 N/mm^2
Compressive Modulus	ASTM D695	73°F/23°C	186,000 psi	1282 N/mm^2
THERMAL				
Coefficient of Thermal Expansion	ASTM D696		3.9x10^{-5} in/in/°F	2.1x10^{-5} m/m/K
Thermal Conductivity	ASTM C177		0.95 BTU in/hr/ft^2/°F	0.137 W/m/K
Heat Distortion Temperature	ASTM D648		225°F	108°C
*Specific Heat (Heat Capacity/mass)	DSC	73°F/23°C	0.21 BTU/lb$_m$°F	0.88 J/gK
		212°F/100°C	0.26 BTU/lb$_m$°F	1.09 J/gK
FLAMMABILITY				
Flammability Rating	UL 94		V-O, 5VB, 5VA	
Flame Spread[§]	ULC		5	
Smoke Developed[§]	ULC		15 - 25	
Fire Propagation Index (FPI)	FM 4910		1.9	
Smoke Damage Index (SDI)	FM 4910		0.03	
Limiting Oxygen Index	ASTM D2863		55%	
ELECTRICAL				
Dielectric Strength	ASTM D149		1250 V/mil	492,000 V/cm
Dielectric Constant	ASTM D150	60 Hz, 30°F/-1°C	3.40	
Power Factor	ASTM D150	1000 Hz	0.007%	
Volume Resistivity	ASTM D257	73°F/23°C		3.4x10^{15} ohm-cm

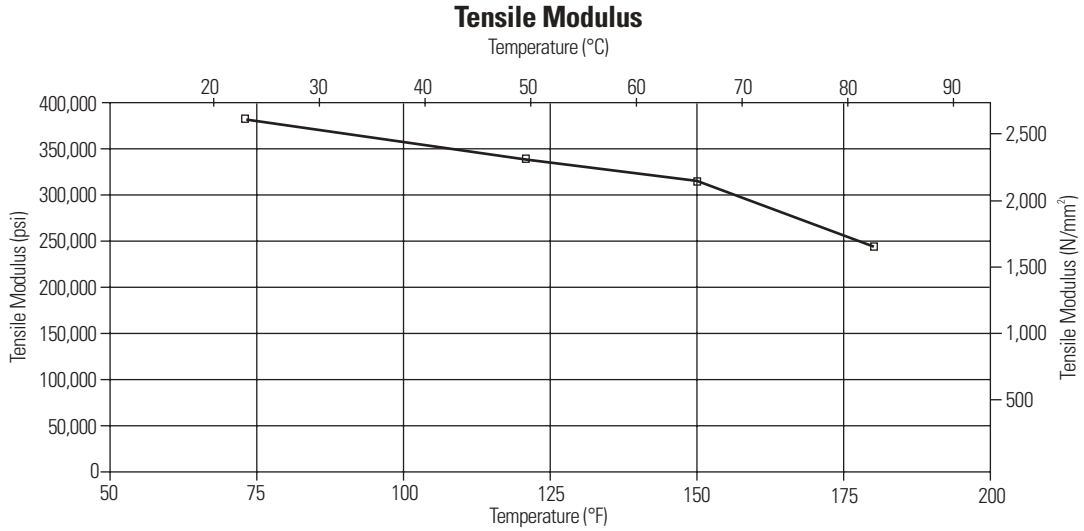
*Plots of these properties versus temperature follow this table.

Data presented are typical values.

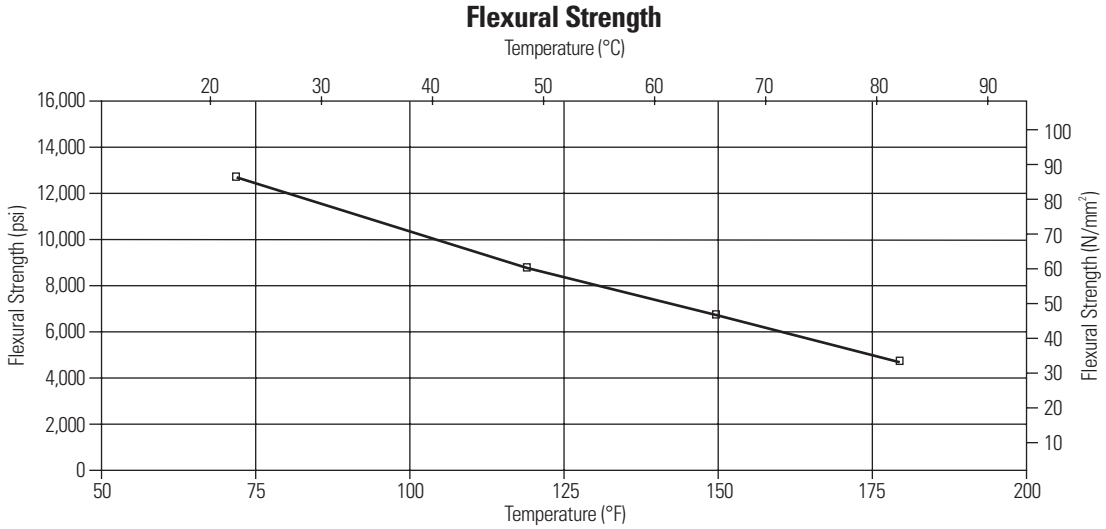
[§]Seamless extruded round duct as produced by Harvel® Plastics, Inc. Data courtesy of Harvel® Plastics, Inc., printed by permission.

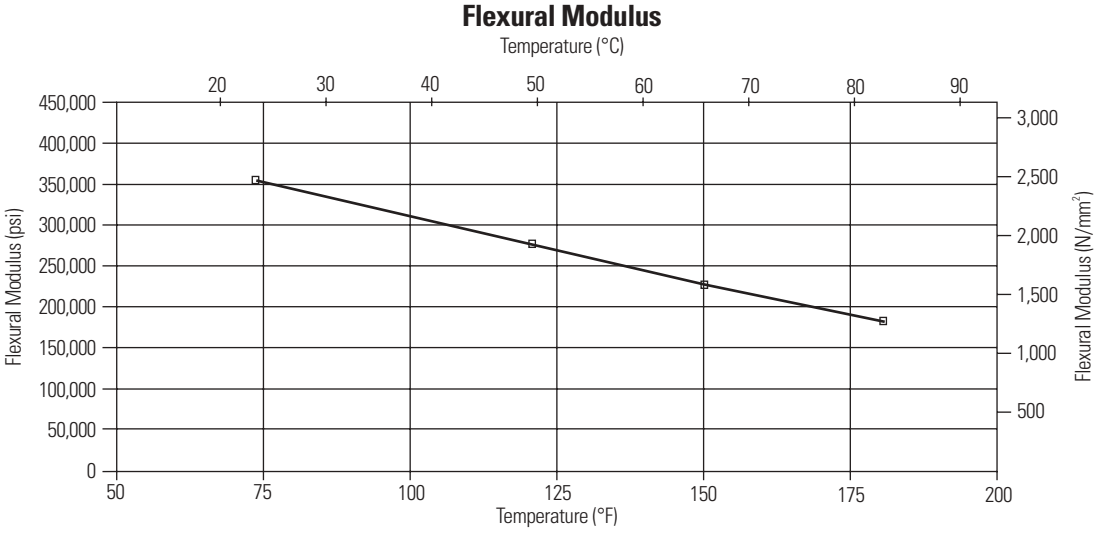
Basic Physical Properties





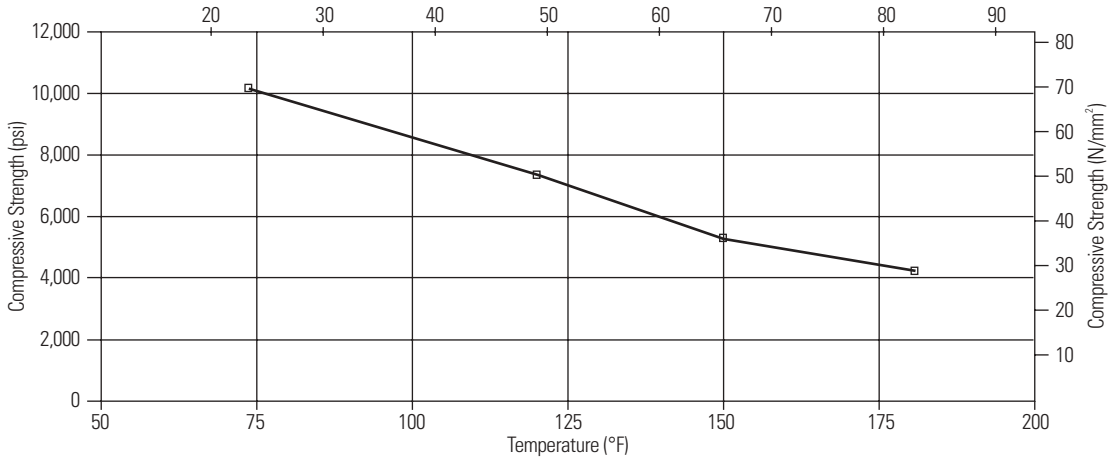
Basic Physical Properties (cont.)



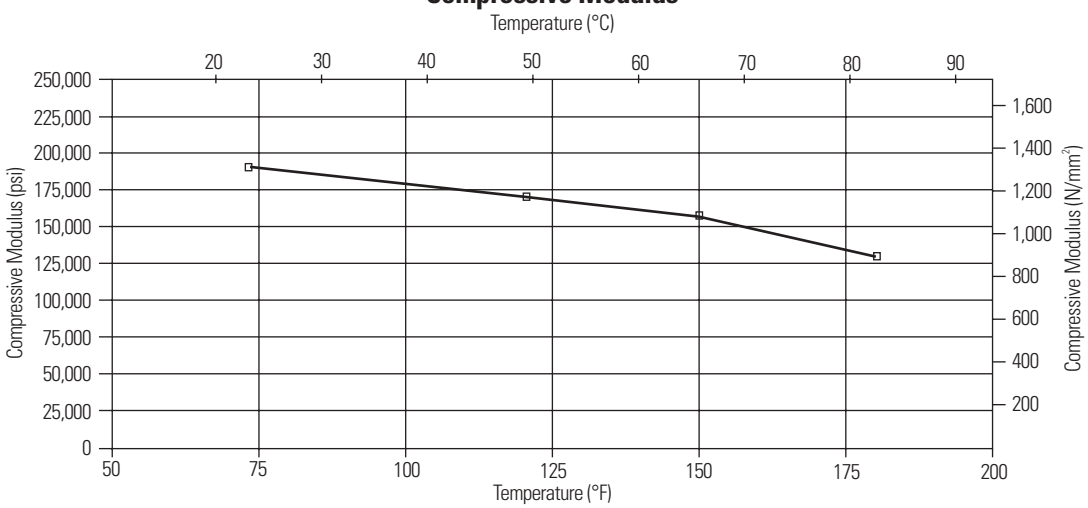


Basic Physical Properties (cont.)

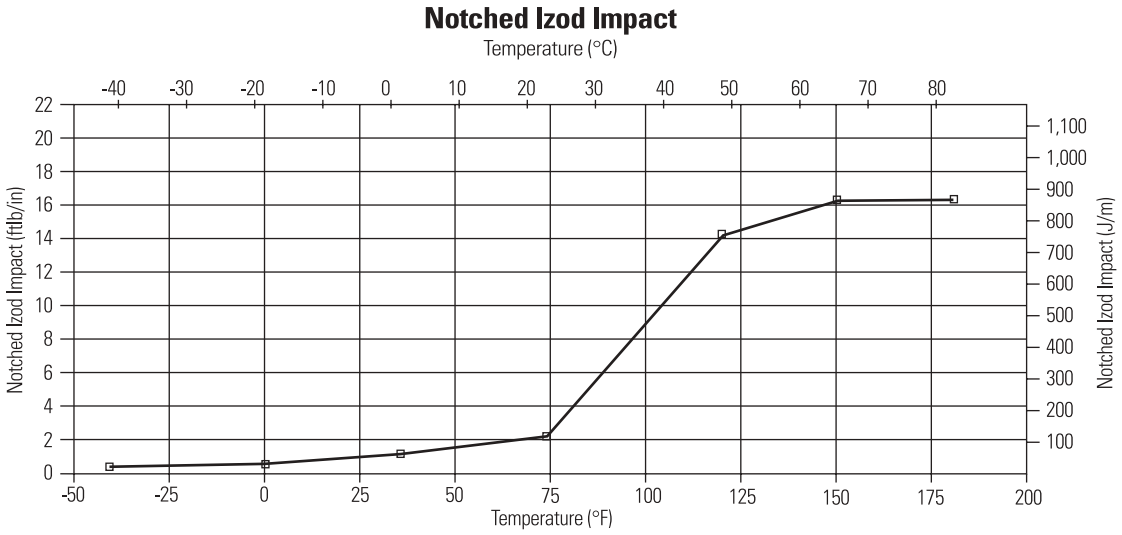
Compressive Strength

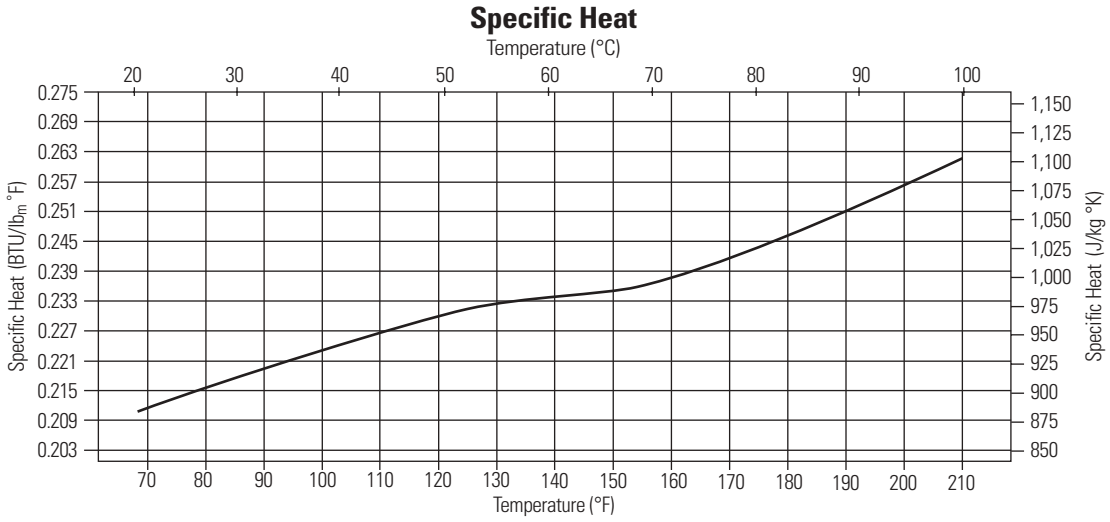


Compressive Modulus



Basic Physical Properties (cont.)





Joining Methods

Corzan CPVC Duct can be easily assembled in the field using standard thermoplastic-pipe joining techniques. The most common methods involve thermal hot-air welding or the solvent-cementing process. Both of these methods provide reliable, cost-effective joints. Other methods of joining and fabricating Corzan CPVC Duct and system accessories include thermoforming, extrusion welding, and hot-plate welding.

Solvent Cementing

Belled-end duct, couplings, flanges and other socket-style fittings can be joined using the solvent-cementing process. This process involves the application of a primer and solvent cement to join system components. This joining method has been used successfully for over 30 years in tough corrosive pressure applications. When properly conducted, this method provides a strong, homogenous joining area in which the mating surfaces are chemically fused together, producing a strong, leak-tight seal when cured. Detailed solvent-cementing procedures are available and should be referenced for proper installation techniques. Adequate surface-to-surface contact of the parts being joined is necessary for reliable solvent-cemented joints. Generally, a minimum socket depth of 3" (all sizes) will provide sufficient joint strength for most systems. Since duct dimensional tolerances can appreciable when compared to heavy wall pipe, the use of extra-heavy-bodied CPVC cement (such as IPS 3461 or equivalent) is recommended due to the cement's excellent gap-filling properties. Care should be used when solvent-cementing duct diameters 18" and larger to ensure tightness of fit of matting components. The solvent-cementing method is not recommended for any type of end-joining.

Thermal Welding

The hot-air welding technique utilizes clean hot air to preheat the duct material and CPVC welding rod, while pressure is applied to the weld area as the rod is guided. This joining method results in the surface molecules of the parts being joined to fuse together at the weld seam. Only welding rod produced from Corzan CPVC material is recommended for this joining process to ensure the highest system integrity. All welding should be conducted by personnel adequately trained in the art of hot-air welding thermoplastics. Detailed information concerning Corzan CPVC welding and fabrication is available.

Seamless extruded round duct as produced by Harvel® Plastics, Inc.
Data courtesy of Harvel® Plastics, Inc. Printed by permission.

Corzan CPVC Duct requires fewer supports at elevated temperatures than other thermoplastic duct systems due to its exceptional heat resistance, a significant cost-savings advantage. Proper support spacing is dependent on the duct diameter, the temperature parameters of the system, the location of concentrated stress loads, and the possibility of process solids accumulation within the system. As with all piping systems, proper support spacing is critical to ensure that the deflection and sagging are kept to a minimum. This prevents unnecessary stress on the system, and reduces the possibility of creating fluid condensation/collection areas. Drains must be installed where accumulation of moisture is expected and at low points in the system; these locations shall be specified on the drawings. The values stated in Table 1 are based on actual testing of air-filled duct at various temperatures, and incorporate a reasonable safety factor. Depending on the type of system service, consideration must be given to the possibility of solids accumulation within the line, particularly where two separate process lines intersect. (Solids can be created within a system as the result of a chemical reaction of the fumes being extracted.) Stress loads can be generated by the additional weight of accumulated solids, and this fact should be addressed with adequate system support where required. Proper system inspection, cleaning and maintenance should be enforced to prevent the formation of additional weight loads. Refer to Table 1 for maximum support spacing of horizontal air-filled duct at various temperatures.

As with any system, Corzan CPVC Duct must be independently supported at fans, flexible connections, hoods, scrubbers, tanks, and other system components to ensure the highest system integrity. In the case where flexible connections are installed as expansion joints, a suitable support or hanger shall be provided at each end of the flexible connection. Other heavy system components such as dampers, filters, etc. must also be independently supported to prevent high stress concentration areas. Hangers and supports shall be securely fastened to the building structure to avoid vibration, and should be installed in such a manner as to prevent conditions of stress on the system (properly aligned). Seismic design and construction practices for hangers and supports shall be followed where applicable.

Hangers selected shall have an adequate load-bearing surface free of rough or sharp edges, and shall not cause damage to the duct during use. The hangers and hanger hardware shall be of a corrosive-resistant material suitable for use in the system environment. Hangers are to be of a type that will not restrict linear movement of the system due to expansion and contraction. Overtightening must be avoided to prevent duct deformation and restriction of movement.

Seamless extruded round duct as produced by Harvel® Plastics, Inc.
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Hangers and Supports (cont.)

Thermal Expansion and Contraction

The coefficient of linear expansion (y) for Corzan CPVC Duct is 3.9 x 10^{-5} in/in/°F, the lowest thermal expansion rate of commonly used thermoplastics. As with all piping products, thermal expansion and contraction of the system must be considered and properly addressed during the design and installation of the system. The expansion or contraction rate of Corzan CPVC Duct can be calculated as follows:

$\Delta L = 12 L_d C \Delta T$

where: ΔL = expansion or contraction of duct in inches
L_d = Length of duct run in feet
C = 3.9 x 10^{-5} in/in/°F (coefficient of thermal expansion)
ΔT = Temperature change °F (T max. - T in.)
T max. = maximum change in operating temperature (°F)
T in. = temperature at time of installation (°F)

The most common means to compensate for changes in length is with the installation of in-line expansion joints, either flexible sleeve type or o-ring piston type being the most common. The effects of thermal expansion and contraction can also be compensated by using the inherent line flexibility of the system to construct expansion loops and offsets where required. Additional detailed information concerning the effects and control of thermal expansion and contraction, and other information pertaining to the design and installation of CPVC piping products, is available from Noveon, Inc.

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