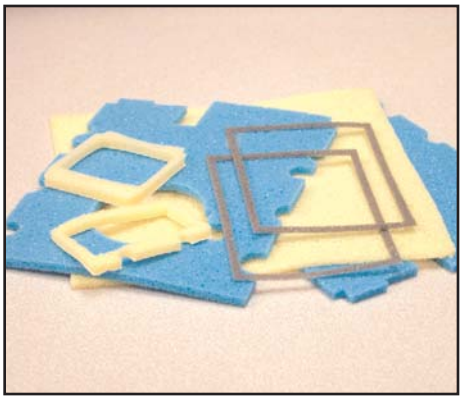
CONFOR® CF-EG grade environmentally friendly foams



- No metal oxides or halogens
- No silicone off-gassing
- Meet UL 94 HF-1
- Highly energy-absorbent
- Only available in die cut parts

CONFOR CF-EG urethane foams offer a unique combination of physical characteristics, high energy-absorption properties and temperature-softening behavior. Soft and flexible, the highly damped, slow-recovery materials contain no halogens or metal oxides, meeting most clean-room requirements. The foams exhibit no silicone off-gassing as well, making them ideal for shock protection and padding in electronics applications.

Environmentally friendly CONFOR CF-EG formulations are available in standard stiffnesses ranging from very soft to firm. The foams exhibit properties nearly identical to their CF (standard) counterparts. All CF-EG formulations meet HF-1 of Underwriters Laboratories UL 94 flame standards.

Even as thin as 2 mm, CONFOR CF-EG shock pads absorb and dissipate up to 97 percent of shock energy, without recoiling and amplifying the effect, and without bottoming out. In hard disk drives, they help protect against handling-related damage. In electronic devices, such as cell phones, laptop computers and digital handheld devices, they help prevent circuit boards from colliding, speakers from crashing into the shell and LCD screens from cracking. As microphone and speaker seals, they reduce audio distortion and background noise.

The newest CF-EG formulation—CF34-EG RCF4—is engineered specifically for circuit board applications, where it is used as a self-molding shock pad between the board and hard drive. The foam has a density of 4 pcf, rather than the standard EG density of 6 pcf, and exhibits very low compression force deflection values. Thus it exerts little return pressure that could bend the boards and interfere with performance. It also has low surface tack, making stacked die-cut parts easy to separate and install.

Product Applications

Disk drive shock pads

LCD frames and seals

Protective padding for electronics components

Snubbers, space fillers

Circuit board spacers

Microphone muffs

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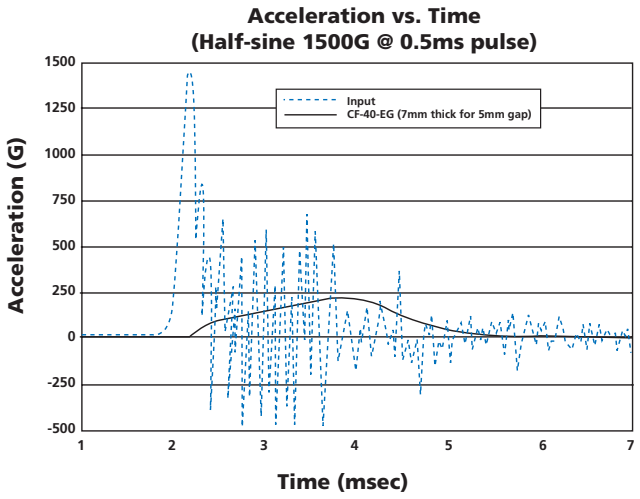
CONFOR CF-EG foams satisfy clean-room standards
CONFOR CF-EG grades contain no bromines, halogenated flame retardants or metal oxides, meeting most clean-room requirements. The materials do not release silicone vapor, making them ideal for shock protection and padding in electronics applications.

Materials meet electronics flame standard
All CONFOR CF-EG materials meet HF-1 of Underwriters Laboratories UL 94 flame standards, CF-34EG RCF4 at a thickness of 1mm, the other formulations at 2mm.

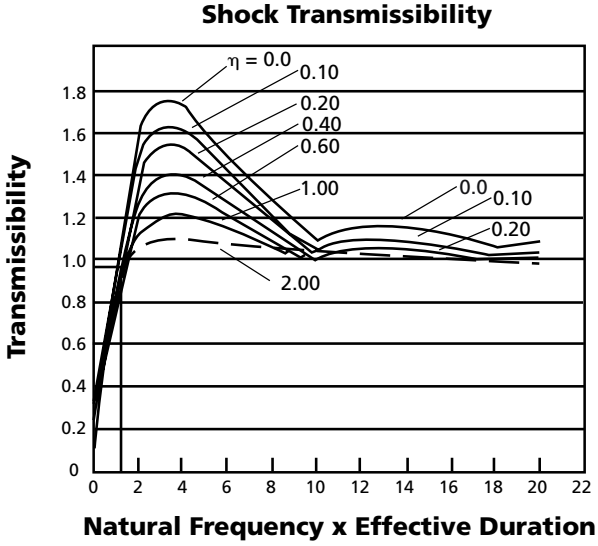
CONFOR CF-EG foams provide acoustic benefits
The porous semi-open-cell structure of CONFOR foams also provides excellent acoustical absorption when compared to typical acoustical absorbers. CONFOR foam is engineered to have peak absorption coefficients in the range of frequencies where human hearing is most sensitive. The damping in the material reduces noise by minimizing vibration of radiating surfaces and by absorbing airborne sound energy (such as spindle bearings and actuator systems), enabling components to pass stringent acoustic and vibration specifications. (See acoustical absorption graphs on following pages).

Damped foams exhibit excellent shock absorption
The key to CONFOR foams' shock absorption performance is in their damping and rate-sensitive stiffness behavior. Under high velocity shock loading, the materials will react with much more stiffness than under static loading. This strain rate-sensitive stiffness means that upon direct impact, CONFOR materials resist collapse and absorb the impact internally. CONFOR foam's unique chemistry provides dissipation—instead of storage and release—of shock energy. These properties provide the highest level of shock protection given the tight space constraints of today's electronic component designs, enabling a more rugged, robust design within existing form factor requirements.

The graph below illustrates a half-sine shock input of 1500G at 0.5ms into a 2.5-inch HDD. The response measured from the HDD, with 5mm space around it and treated with CONFOR CF-40EG material, was less than 250G. Damping in CONFOR material lowers the shock energy response by spreading it over a longer duration and dissipating the mechanical energy by converting it to heat energy.



With a loss factor over 1.0, CONFOR foams provide low amplification at resonance during shock (less than 1.2 transmissibility on the graph below). Lightly damped polyurethane foam with a loss factor of 0.1 could amplify the shock input 1.6 times or higher—often an unacceptable situation for sensitive equipment in the electronics industry.



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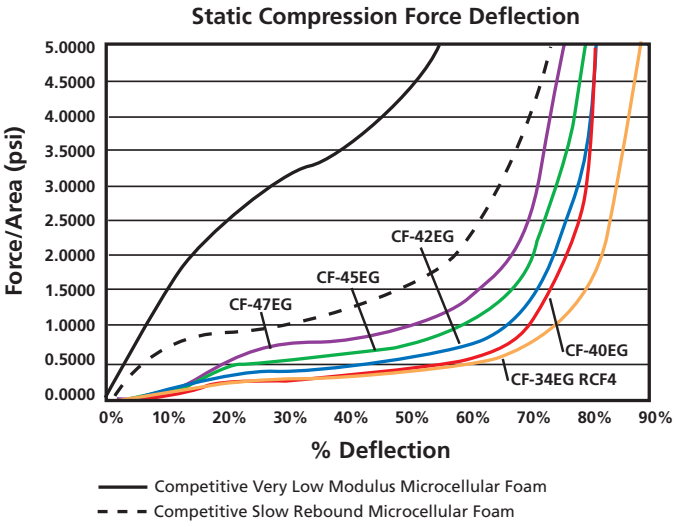
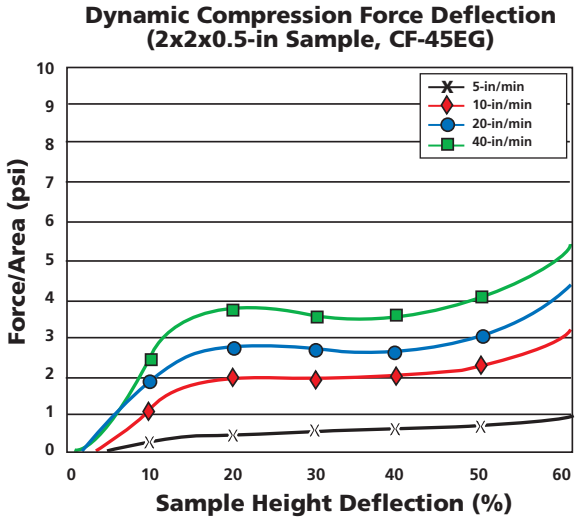
Compression Load Deflection

Most resilient foams exhibit compression force deflection (CFD) properties that follow Hooke's Law. That is, the further they are compressed, the harder they push back against whatever is compressing them. CONFOR foams, however, are internally damped, which causes them to exert even amounts of pressure across a wide range of deflections. This behavior is illustrated in the load vs. deflection graph below. CONFOR foams produce a very flat CFD curve, while most other microcellular foams generate a curve that increases at a slope dependent upon the modulus, until all of the cells are collapsed. At that point, foams become solids, and their stiffness increases dramatically.



CONFOR foams are engineered to compress and conform under sustained pressure and to slowly rebound when the weight is released. Thus they provide excellent snubbers, to securely fill the space and provide protection between closely installed components. As shown on the graph above, there is only a 0.3 psi maximum increase from 10 percent to 50 percent deflection of CONFOR foams. Competitive materials produce 4 to 12 times this value. A lower, more even pressure profile will induce less stress, warp and twisting on mating parts, such as circuit boards and LCDs.



The dynamic properties of CONFOR foams are dramatically stiffer when deformed at higher strain rates. Under high velocity shock loading, these materials exhibit higher levels of stiffness than they do under static loading. This strain rate-sensitive stiffness behavior is the primary reason that CONFOR foams provide the best possible shock protection with a minimal amount of sway space. This behavior keeps the foams from bottoming out and provides dissipation (instead of storage and release) of shock energy.

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CONFOR® CF-34EG RCF4 Foams

Typical Properties

Property	Test Reference or Apparatus	CF-34EG RCF4	Spec or Typical
Color	NA	Green	Spec
IFD (lbs/50 in²)	ASTM D3574(03) Test B1 (Modified)[1]	15-28	Spec
Flammability	UL 94[2]	Meets HF-1 @ 1.0 mm	Spec
Tear Resistance (lbf)	ASTM D3574(03)	3.0	Typical
Tensile Strength (psi)	ASTM D3574(03)	14.0	Typical
Elongation (%)	ASTM D3574(03)	125	Typical
Tg (Peak Loss Modulus)	From DMA @ 10 Hz and 0.3 amplitude[3]	~15C	Typical
Peak Tan Delta @ Temp (C)	From DMA @ 10 Hz and 0.3 amplitude[3]	1.1 @ 38C	Typical
Compression Set (%) After 1 hour	ASTM D3574(03) 22 hrs @ 22C Compressed 50%	<1.0	Typical
Compression Set (%) After 1 hour	ASTM D3574(03) 22 hrs @ 70C Compressed 50%	<4.0	Typical
Density (pcf)	ASTM D3574(03)	3.6-4.2	Spec
Surface Resistivity (ohms/square)	ASTM D257 Concentric Rings, 1-in thick	$>10^{14}$	Typical
Contains Volatile Silicones	Dynamic Headspace Analysis with GC/MS	No	Typical
Contains Poly-brominated Biphenyl Oxides[4]	NA	No	Typical
Contains Metal Oxides[4]	NA	No	Typical

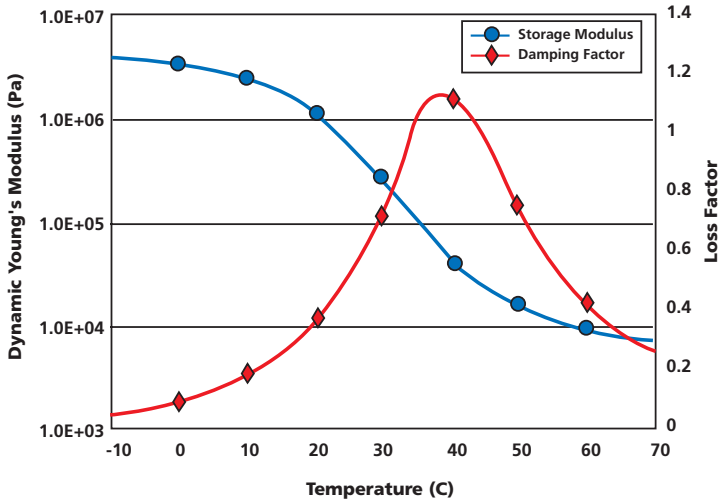
[1]Modified with no pre-flexing and smaller indentation foot with a constant multiplier of 10.24 to adjust for indentation foot size.

[2]UL File No. E90847

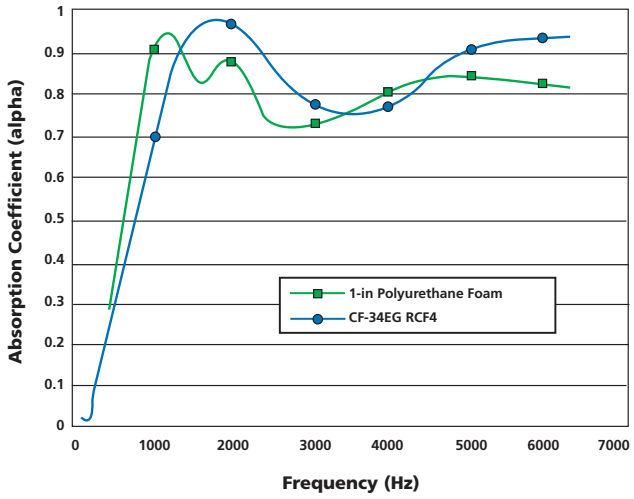
[3]Internal test based on ASTM D5279, modified for foam sample 1-in diameter, 7-mm thick, compressed 30%, in Torsional Mode at 10 Hz, 0.3% Amplitude, Heat ramp = 2C/min. PaarPhysica DMA.

[4]Verification possible via X-ray Fluorescence, FTIR or other test method.

Dynamic Young's Modulus and Loss Factor versus Temperature CF-34EG RCF4



Normal Incident Acoustical Absorption



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CONFOR® CF-40 and CF-40EG Foams

Typical Properties

Property	Test Reference or Apparatus	CF-40	CF-40-EG	Spec or Typical
Color	NA	Yellow	Yellow	Spec
IFD (lbs/50 in²)	ASTM D3574(95) Test B_1 (Modified)[1]	15-28	15-28	Spec
Flammability	UL 94[2]	Listed HBF @ min 6.0-mm	Listed HF-1 @ min 2.0-mm	Spec
Tear Resistance (lbf)	ASTM D3574(95)	1.6	2.1	Typical
Tensile Strength (psi)	ASTM D3574(95)	14.6	11.0	Typical
Elongation (%)	ASTM D3574(95)	135	135	Typical
Tg (Peak Loss Modulus)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	0C	2C	Typical
Peak Tan Delta @ Temp (C)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	1.2-1.3 @ 24C	1.3-1.4 @ 26C	Typical
Compression Set (%) (21C)	ASTM D3574(95) 22 hrs @ 21C Compressed 50%	<2.0	<1.0	Typical
Compression Set (%) (70C)	ASTM D3574(95) 22 hrs @ 70C Compressed 50%	<3.0	<2.0	Typical
Density (lb/ft³)	ASTM D3574(95)	5.6-6.0	5.6-6.0	Typical
Contains Volatile Silicones	Dynamic Headspace Analysis with GC/MS	Yes	No	Typical
Contains Poly-brominated Biphenyl Oxides[4]	NA	Yes	No	Typical
Contains Metal Oxides[4]	NA	Yes	No	Typical

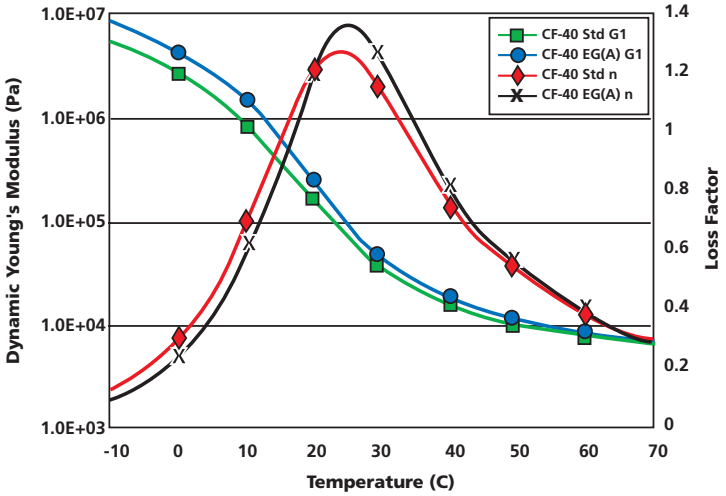
[1]Modified with no pre-flexing and smaller indentation foot with a constant multiplier of 10.24 to adjust for indentation foot size.

[2]UL File No. E90847

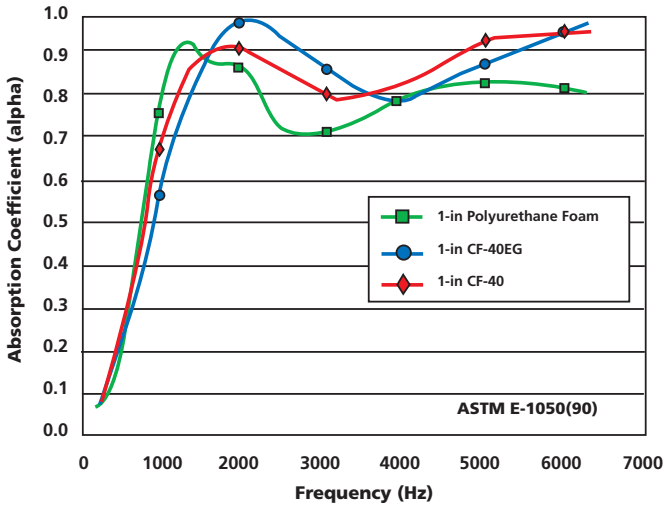
[3]Internal test based on ASTM D5279, modified for foam sample 1-in diameter, 7-mm thick, compressed 30%, in Torsional Mode at 10 Hz, 0.3% Amplitude, Heat ramp = 2C/min. PaarPhysica DMA.

[4]Verification possible via X-ray Fluorescence, FTIR or other test method.

Dynamic Young's Modulus and Loss Factor versus Temperature
CF-40, CF-40EG



Normal Incident Acoustical Absorption



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CONFOR® CF-42 and CF-42EG Foams

Typical Properties

Property	Test Reference or Apparatus	CF-42	CF-42-EG	Spec or Typical
Color	NA	Pink	Pink	Spec
IFD (lbs/50 in²)	ASTM D3574(95) Test B_1 (Modified)[1]	29-41	29-41	Spec
Flammability	UL 94[2]	Listed HBF @ min 6.0-mm	Meets HF-1 @ min 2.0-mm	Spec
Tear Resistance (lbf)	ASTM D3574(95)	3.4	3.4	Typical
Tensile Strength (psi)	ASTM D3574(95)	18.1	18.4	Typical
Elongation (%)	ASTM D3574(95)	109	135	Typical
Tg (Peak Loss Modulus)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	5C	8C	Typical
Peak Tan Delta @ Temp (C)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	1.2-1.3 @ 29C	1.3-1.4 @ 32C	Typical
Compression Set (%) (21C)	ASTM D3574(95) 22 hrs @ 21C Compressed 50%	<1.0	<1.0	Typical
Compression Set (%) (70C)	ASTM D3574(95) 22 hrs @ 70C Compressed 50%	<2.0	<2.0	Typical
Density (lb/ft³)	ASTM D3574(95)	5.6-6.0	5.6-6.0	Typical
Contains Volatile Silicones	Dynamic Headspace Analysis with GC/MS	Yes	No	Typical
Contains Poly-brominated Biphenyl Oxides[4]	NA	Yes	No	Typical
Contains Metal Oxides[4]	NA	Yes	No	Typical

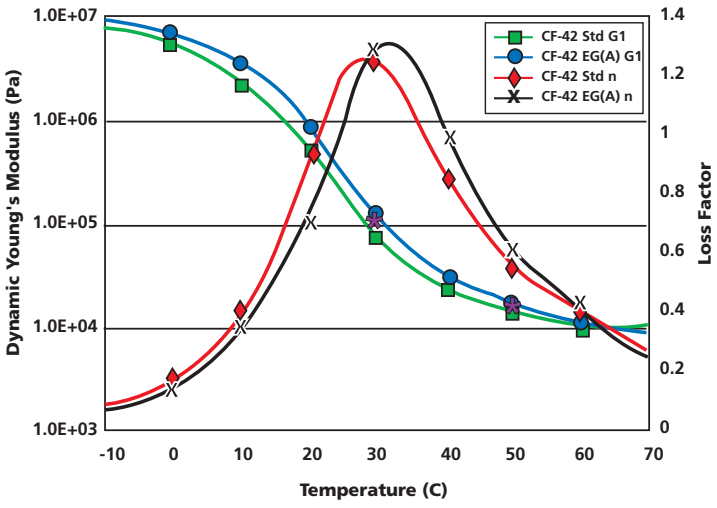
[1]Modified with no pre-flexing and smaller indentation foot with a constant multiplier of 10.24 to adjust for indentation foot size.

[2]UL File No. E90847

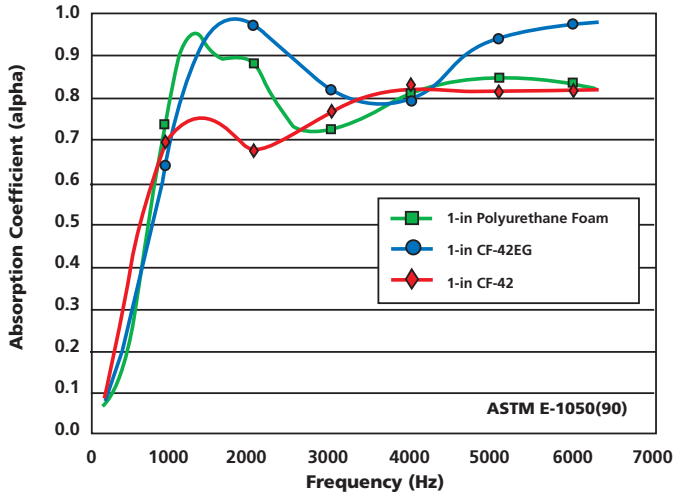
[3]Internal test based on ASTM D5279, modified for foam sample 1-in diameter, 7-mm thick, compressed 30%, in Torsional Mode at 10 Hz, 0.3% Amplitude, Heat ramp = 2C/min. PaarPhysica DMA.

[4]Verification possible via X-ray Fluorescence, FTIR or other test method.

Dynamic Young's Modulus and Loss Factor versus Temperature
CF-42, CF-42EG



Normal Incident Acoustical Absorption



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CONFOR® CF-45 and CF-45EG Foams

Typical Properties

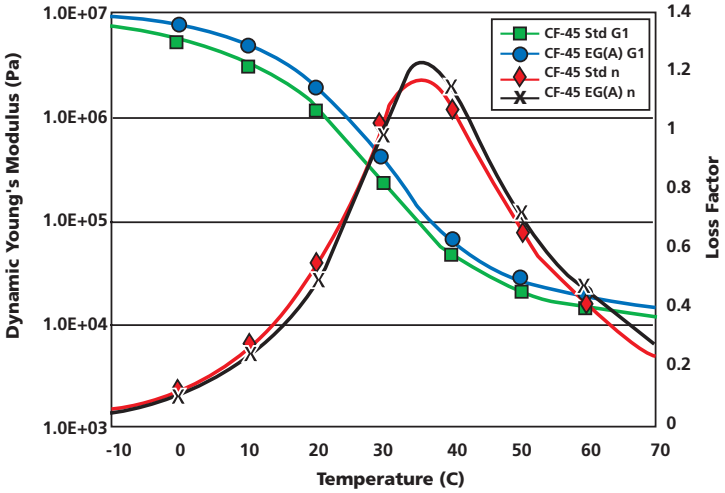
Property	Test Reference or Apparatus	CF-45	CF-45-EG	Spec or Typical
Color	NA	Blue	Blue	Spec
IFD (lbs/50 in²)	ASTM D3574(95) Test B_1 (Modified)[1]	42-55	42-55	Spec
Flammability	UL 94[2]	Listed HBF @ min 6.0-mm	Listed HF-1 @ min 2.0-mm	Spec
Tear Resistance (lbf)	ASTM D3574(95)	4.6	3.9	Typical
Tensile Strength (psi)	ASTM D3574(95)	22.3	20.1	Typical
Elongation (%)	ASTM D3574(95)	108	140	Typical
Tg (Peak Loss Modulus)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	17-20C	17-20C	Typical
Peak Tan Delta @ Temp (C)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	1.1-1.2 @ 35C	1.1-1.3 @ 36C	Typical
Compression Set (%) (21C)	ASTM D3574(95) 22 hrs @ 21C Compressed 50%	<1.0	<1.0	Typical
Compression Set (%) (70C)	ASTM D3574(95) 22 hrs @ 70C Compressed 50%	<1.0	<1.0	Typical
Density (lb/ft³)	ASTM D3574(95)	5.6-6.0	5.6-6.0	Typical
Contains Volatile Silicones	Dynamic Headspace Analysis with GC/MS	Yes	No	Typical
Contains Poly-brominated Biphenyl Oxides[4]	NA	Yes	No	Typical
Contains Metal Oxides[4]	NA	Yes	No	Typical

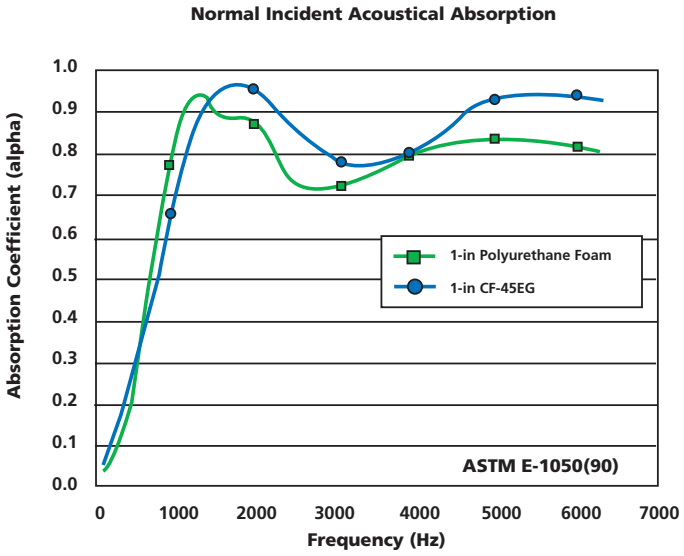
[1]Modified with no pre-flexing and smaller indentation foot with a constant multiplier of 10.24 to adjust for indentation foot size.

[2]UL File No. E90847

[3]Internal test based on ASTM D5279, modified for foam sample 1-in diameter, 7-mm thick, compressed 30%, in Torsional Mode at 10 Hz, 0.3% Amplitude, Heat ramp = 2C/min. PaarPhysica DMA.

[4]Verification possible via X-ray Fluorescence, FTIR or other test method.





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CONFOR® CF-47 and CF-47EG Foams

Typical Properties

Property	Test Reference or Apparatus	CF-47	CF-47-EG	Spec or Typical
Color	NA	Green	Green	Spec
IFD (lbs/50 in²)	ASTM D3574(95) Test B_1 (Modified)[1]	55-70	55-70	Spec
Flammability	UL 94[2]	Listed HBF @ min 6.0-mm	Listed HF-1 @ min 2.0-mm	Spec
Tear Resistance (lbf)	ASTM D3574(95)	5.5	6.0	Typical
Tensile Strength (psi)	ASTM D3574(95)	25.2	26.5	Typical
Elongation (%)	ASTM D3574(95)	98	105	Typical
Tg (Peak Loss Modulus)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	15C	15C	Typical
Peak Tan Delta @ Temp (C)	From DMA at 10 Hz & 0.3 amplitude, 30% compression[3]	1.1-1.2 @ 40C	1.2-1.3 @ 39C	Typical
Compression Set (%) (21C)	ASTM D3574(95) 22 hrs @ 21C Compressed 50%	<1.0	<1.0	Typical
Compression Set (%) (70C)	ASTM D3574(95) 22 hrs @ 70C Compressed 50%	<1.0	<1.0	Typical
Density (lb/ft³)	ASTM D3574(95)	5.6-6.0	5.6-6.0	Typical
Contains Volatile Silicones	Dynamic Headspace Analysis with GC/MS	Yes	No	Typical
Contains Poly-brominated Biphenyl Oxides[4]	NA	Yes	No	Typical
Contains Metal Oxides[4]	NA	Yes	No	Typical

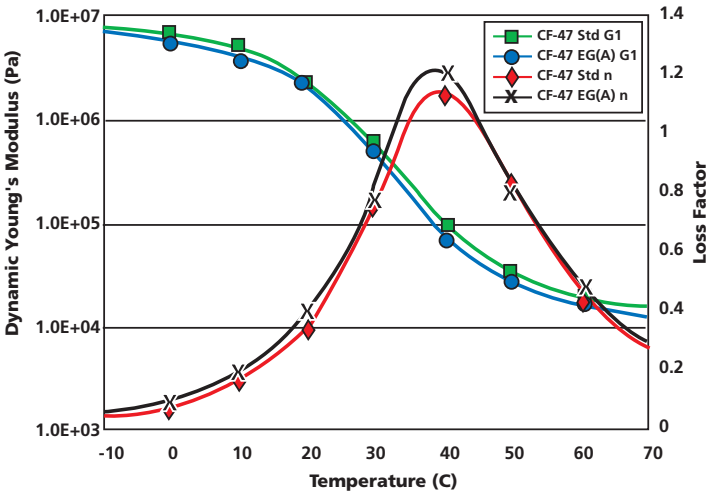
[1]Modified with no pre-flexing and smaller indentation foot with a constant multiplier of 10.24 to adjust for indentation foot size.

[2]UL File No. E90847

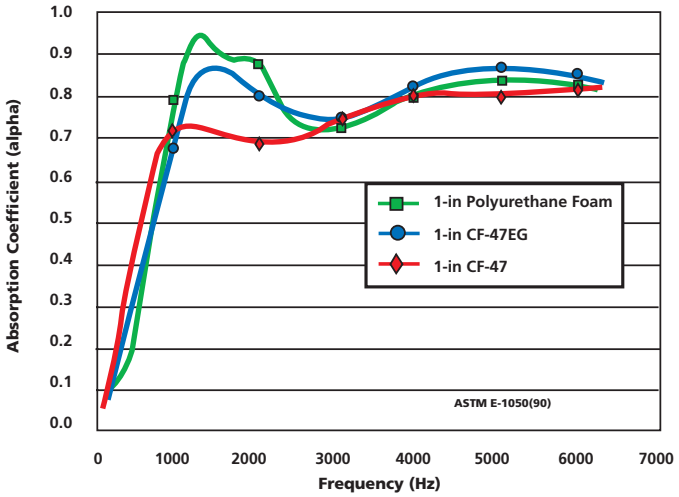
[3]Internal test based on ASTM D5279, modified for foam sample 1-in diameter, 7-mm thick, compressed 30%, in Torsional Mode at 10 Hz, 0.3% Amplitude, Heat ramp = 2C/min. PaarPhysica DMA.

[4]Verification possible via X-ray Fluorescence, FTIR or other test method.

Dynamic Young's Modulus and Loss Factor versus Temperature
CF-47, CF-47EG



Normal Incident Acoustical Absorption



The data listed are typical or average values based on tests conducted by independent laboratories or by the manufacturer. They are indicative only of the results obtained in such tests and should not be considered as guaranteed maximums or minimums. Materials must be tested under actual service to determine their suitability for a particular purpose.

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