PRECISION ACOUSTICS

AptFlex F40

AptFlex F40, from Acoustic Polymers Ltd, is a glass-sphere syntactic foam made by using a high-performance epoxy resin as the polymeric binder. The product can be supplied as a 2 part 'liquid' kit, or as a moulded product in rod or sheet form. Supplied in 2 component kit form it presents the end-user with the option of casting detailed shapes without subsequent and costly machining. The cured product is hard, tough and of low specific gravity. Mouldings can be easily machined to produce intricate and detailed components.

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THIS COMBINATION OF PROPERTIES PRODUCES A MATERIAL THAT CAN BE USED IN AREAS SUCH AS:

- Structural buoyancy modules
- Transducer construction
- Thermal insulation cladding
- Acoustic de-coupling and isolation

The system exhibits a high hydrostatic compressive strength and excellent chemical resistance to a wide range of media.

AptFlex F40 is part of a range of syntactic foams and is not suitable for deep water applications (beyond a depth of 500 m). AptFlex F40 provides comparable buoyancy to F30 whilst offering greater acoustic absorption.

TYPICAL PROPERTIES

Appearance	Bright Yellow
Mix ratio (by mass)	2.0:1 (A:B)
Shore D hardness	68 ± 3
Density	670 ± 20 kg / m^3
Density Part A	520 ± 20 kg / m^3
Density Part B	973 ± 20 kg / m^3
Average wave speed (1 MHz to 10 MHz)	2017 ± 30 m / s
Acoustic impedance	1.35 MRayls
Poisson's ratio	0.375 ± 0.05
Hydrostatic crush strength	6.2 MPa / 9000 psi
Equivalent ocean failure depth	600 meters / 2,050 feet
Operating temperature of cured material	130 °C (long-term) 160 °C (short-term <30 mins)

CURING TIMES

Pot life	2-3 hours	
Gel time	5-6 hours	
Cure time	@ 20 °C	2 weeks
	@ 60 °C	16 hours

INSERTION LOSS

Insertion loss (IL) is defined as

$$IL = -20 \log_{10}\left(\frac{P_t}{P_i}\right)$$

where P_t is the amplitude of the acoustic pressure transmitted through a sample and P_i is the amplitude of the acoustic pressure incident upon it.

This has been experimentally determined for two samples of AptFlex F40, and this is shown in Figure 1.

The dynamic range of IL measurement is approximately 40 dB and values higher than this cannot be guaranteed.

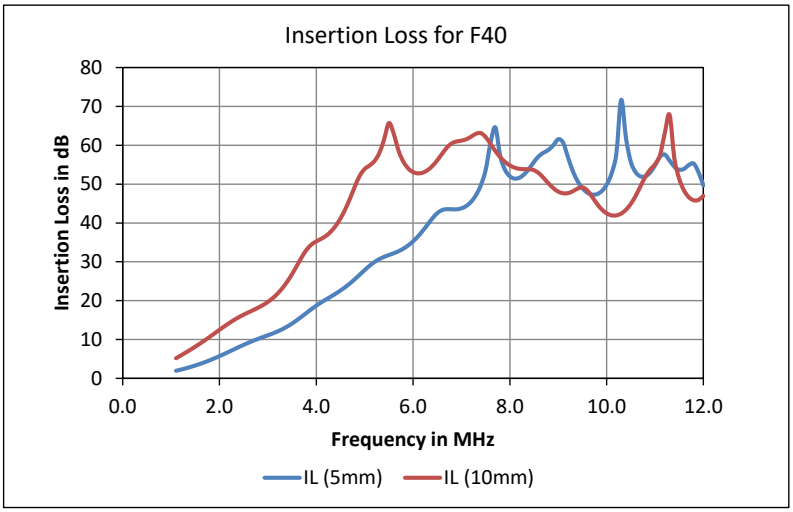

Figure 1 – Insertion loss vs Frequency for AptFlex F40

ATTENUATION

Attenuation (α) is evaluated from the measurement of Insertion Loss for 2 samples of the same material, but of different thicknesses. It is calculated as

$$\alpha = \frac{IL_1 - IL_2}{\Delta z}$$

where IL_1 is Insertion loss of sample 1, IL_2 is Insertion loss of sample 2 and Δz is the difference between the thicknesses of the two samples. This has been experimentally determined for AptFlex F40, and this is shown in Figure 2.

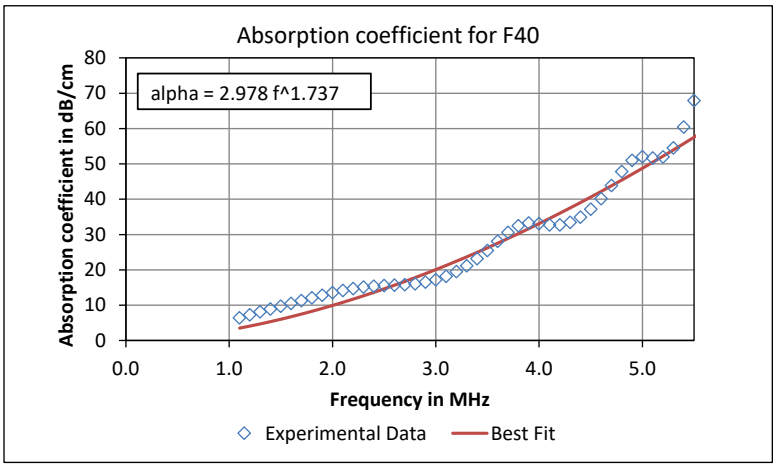

Figure 2 – Attenuation vs Frequency for AptFlex F40

ECHO REDUCTION

Echo Reduction (ER) is defined as

$$ER = -20\ log_{10}\left(\frac{P_r}{P_i}\right)$$

where P_r is the amplitude of the acoustic pressure reflected from a sample and P_i is the amplitude of the acoustic pressure incident upon it.
This has been experimentally determined for two samples of AptFlex F40, and this is shown in Figure 3.
The dynamic range of ER measurement is approximately 40 dB and values higher than this cannot be guaranteed.

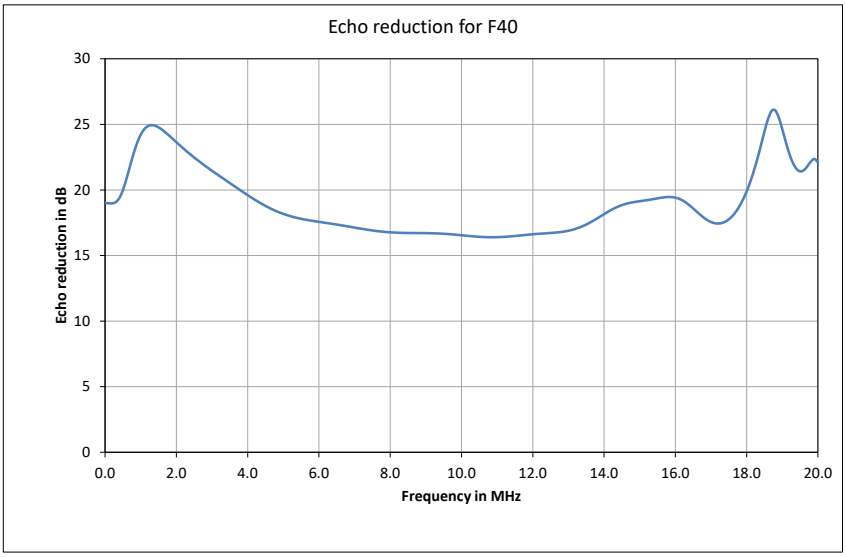

Figure 3 – Echo Reduction vs Frequency for AptFlex F40

PHASE VELOCITY

Phase velocity is evaluated from the measurement of transit time across 2 samples of the same material.
This has been experimentally determined for AptFlex F40, and this is shown in Figure 4.

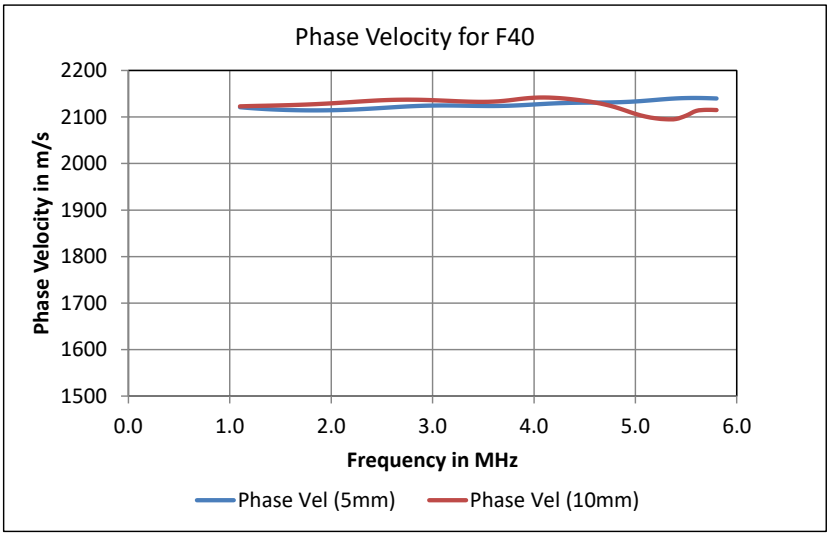

Figure 4 – Phase velocity vs Frequency for AptFlex F40