HexWeb® HRH-10

Aramid Fibre/Phenolic Honeycomb

Product Data

Description

HexWeb HRH-10 is manufactured from aramid fibre sheets. A thermosetting adhesive is used to bond these sheets at the nodes, and, after expanding to the hexagonal or OX-Core' configuration, the block is dipped in phenolic resin. After curing the resin, slices are cut to the desired thickness. For special applications, such as air directionalizing, the honeycomb can be provided without the phenolic resin. Using this process, a wide range of cell sizes, thicknesses, and densities can be produced. The current product range is shown under Mechanical Properties.

Features

- High Strength at Low Densities
- Small Cell Sizes at Low Densities
- Damage Resistant Under Normal Shop Use
- Formable
- Fire-Resistant (self-extinguishing)
- Water and Fungus Resistant
- Excellent Dielectric Properties
- Good Bonding Surfaces
- Good Thermal and Electrical Insulator

Applications

HexWeb HRH-10 has been widely accepted throughout the aerospace industry and several commercial areas as a very tough, environmentally resistant core material in sandwich panels. It has been designed and used in flat and contoured shapes, with a wide variety of facing materials and adhesives, and it has extensive service in both structural and nonstructural parts. Most of the interior panels of commercial aircraft are made with this core material primarily because of its resilience, small cell size/low density combination, and its fire resistance. Exterior aircraft parts such as radomes, fairings, helicopter blades, flaps, etc., are designed with HRH-10 because of the features listed above. Surfboards and high-performance boats are but two additional applications where this core has been used because of its toughness and resistance to corrosive attack.
The OX configuration is a hexagonal honeycomb that has been overexpanded in the W direction, providing a rectangular cell shape that facilitates curving or forming in the L direction.

HEXCEL®

HexWeb® HRH-10

Standard Dimensions

HexWeb HRH-10 honeycomb is typically available in the following sizes.

Products	L	W	T maximum	T minimum	m² Per Panel
All HRH-10 Materials	1100 -0/+50mm	2500 -0/+100mm	900mm	3mm	2.75
	1250 -0/+50mm	2500 -0/+50mm	900mm	3mm	3.125

Thickness Tolerance

Tolerances on cut thickness are as follows:
3 to 50mm tolerance will be ± 0.125mm
50 to 100 tolerance will be ± 0.25mm
100mm and over tolerance will be ± 3.0mm

Special thickness tolerances as well as other L, W, and T dimensions are available upon special request. For large volume requirements it may be possible to supply panels to your specific size at little or no additional charge. Tolerances on L and W for pieces cut to size will depend on the core type and panel dimensions. Tight tolerances are not always possible because of the flexible nature of this material.

Type Designation

HexWeb HRH-10 honeycomb is designated as follows:

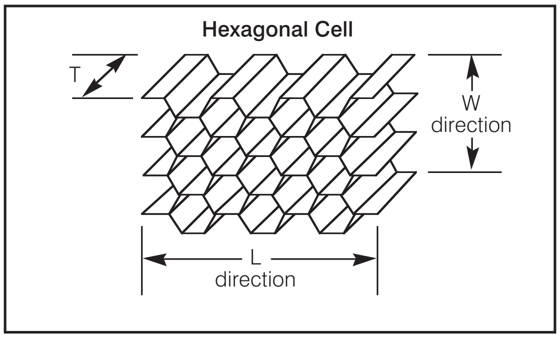
Material – Cell Size – Density

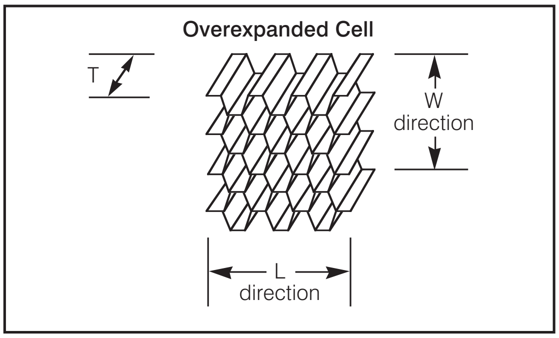
Example: HRH-10 – 3.2 – 48

Where:
HRH-10 - designates honeycomb type
3.2 - is the cell size in inches
48 - is the nominal density in pounds per cubic foot

Dimensional Nomenclature

T = Thickness, or cell depth
L = Ribbon direction
W = Direction of Expansion, or direction perpendicular to the ribbon





HexWeb® HRH-10

Availability

HexWeb HRH-10 will be shipped from Duxford, UK or Casa Grande, Arizona, USA. Lead times will vary with particular core types selected. Contact the nearest Hexcel Sales Office for delivery information.

Special Configuration and Shapes

Honeycomb cores can be custom designed with nonstandard mechanical property combinations to meet a variety of special applications. In addition to the hexagonal and overexpanded (OX) cell shapes, HexWeb HRH-10 is available in Flex-Core', a very flexible core material. (See Flex-Core Data Sheet DS3700.) HexWeb HRH-10 can be provided machined or formed to your specific requirements, including flat pieces cut to size, simple tapers, edge chamfering, doubler reliefs, or machining to complex and compound curvatures. Hexcel has unique capabilities to machine parts to unusual contours and to shape honeycomb by a variety of heat-forming techniques. Contact the nearest Hexcel Sales Office for additional information.

Specifications

HexWeb HRH-10 has been evaluated and approved for numerous corporate specifications and meets the requirements of SAE specifications AMS3711B and MIL-C-81986, Amendment 1. In addition, HexWeb HRH-10 meets the following parameters and properties.

Configuration - The cell size of hexagonal core will give the nominal cell dimensions in inches across the flats (nodes) of the cell. Cell size determination will be made by measuring the length of 10 consecutive cells in 6 random locations and averaging the results. Double laps will be permitted as long as the core sheets are within density tolerance. Unbonded nodes will be permitted to the extent that no opening larger than three times the nominal cell size is created and the minimum mechanical properties are obtainable.

Density - The tolerance on honeycomb density when measured on a minimum of 1640 cm^3 of core will be $\pm$10%.

Flame Retardance - HexWeb HRH-10 will meet the “self extinguishing” classification of FAA Air Crash Worthiness Rules and Regulations Section 25.853.

Water Migration - Does not exceed one cell water migration in 24 hours when tested per MIL-STD-401B.

Mechanical Properties - The table on the next page lists the HexWeb HRH-10 product line and mechanical properties when tested per MIL-STD-401B using 12.7mm core thickness. The typical values represent the mean average of a relatively large number of test values obtained from many blocks of honeycomb. Minimum properties are guaranteed minimum individual values when tested at ambient conditions per MIL-STD-401B.

Mechanical Properties of HexWeb HRH-10 at Room Temperature

Hexcel Honeycomb Metric Designation	Compression					Plate Shear					
	Bare		Stabilised			L Direction			W Direction		
Material - Cell - Density	Strength MPa		Strength MPa		Modulus MPa	Strength MPa		Modulus MPa	Strength MPa		Modulus MPa
Hexagonal	typ	min	typ	min	typ	typ	min	typ	typ	min	typ
HRH-10-1/16-3.4*	1.34	1.10	1.41	1.17	138	1.07	0.86	41	0.59	0.45	20
HRH10-3.2-29	**0.72**	**0.59**	**0.79**	**0.66**	**55**	**0.62**	**0.52**	**26**	**0.34**	**0.28**	**10**
HRH10-3.2-48	**2.07**	**1.62**	**2.24**	**1.86**	**138**	**1.21**	**1.07**	**41**	**0.69**	**0.59**	**24**
HRH10-3.2-64	**3.59**	**2.76**	**3.97**	**3.24**	**193**	**1.76**	**1.55**	**59**	**0.97**	**0.79**	**32**
HRH10-3.2-80	4.83	3.86	5.31	4.28	255	2.24	1.90	70	1.21	1.03	37
HRH10-3.2-96	7.24	5.86	7.76	6.38	414	2.66	2.28	90	1.38	1.17	45
HRH10-3.2-123**	10.60	8.00	11.30	9.00	500	3.10	2.60	105	1.70	1.40	60
HRH10-3.2-128	11.55	9.45	12.62	10.00	538	3.31	2.76	110	1.79	1.45	66
HRH10-3.2-144	13.79	10.52	14.48	11.03	621	3.55	2.93	121	2.07	1.72	76
HRH10-4.8-32	**1.00**	**0.83**	**1.05**	**0.95**	**76**	**0.76**	**0.62**	**30**	**0.41**	**0.31**	**14**
HRH10-4.8-48	**2.07**	**1.62**	**2.24**	**1.86**	**138**	**1.21**	**0.97**	**45**	**0.69**	**0.59**	**23**
HRH10-4.8-64	**3.45**	**2.97**	**3.72**	**3.24**	**193**	**1.69**	**1.48**	**54**	**0.97**	**0.76**	**32**
HRH10-4.8-72p**	4.40	3.90	4.50	4.00	250	2.30	1.90	75	1.20	1.00	35
HRH10-4.8-96	**6.45**	**5.38**	**7.03**	**5.97**	**414**	**2.90**	**2.55**	**90**	**1.55**	**1.38**	**45**
HRH10-6.4-24	0.55	0.45	0.62	0.52	41	0.48	0.38	21	0.24	0.17	9
HRH10-6.4-32	0.97	0.79	1.07	0.86	76	0.72	0.59	28	0.34	0.28	14
HRH10-6.4-50	1.97	1.66	2.14	1.83	145	1.28	1.10	45	0.62	0.52	21
HRH10-6.4-64	3.03	2.48	3.31	2.69	193	1.72	1.41	55	0.86	0.69	24
HRH10-9.5-24	0.66	0.52	0.72	0.55	41	0.48	0.38	21	0.24	0.17	10
HRH10-9.5-32	0.97	0.79	1.07	0.86	76	0.62	0.50	26	0.38	0.25	17
HRH10-9.5-48	2.00	1.66	2.21	1.86	117	1.28	1.10	39	0.66	0.55	24
OX-Core											
HRH10/OX-4.8-29	0.76	0.59	0.83	0.66	48	0.45	0.31	14	0.48	0.34	21
HRH10/OX-4.8-48	**2.21**	**1.79**	**2.41**	**1.97**	**117**	**0.79**	**0.66**	**21**	**0.93**	**0.76**	**41**
HRH10/OX-4.8-64	4.14	3.45	4.48	3.79	179	0.90	0.72	32	1.03	0.90	58
HRH10/OX-6.4-48	2.41	1.93	2.66	2.14	117	0.76	0.62	21	0.93	0.76	41

Bold print indicates products which are readily available from stock.

*Microcell product only available from Casa Grande, USA.

** Available EU only.

p = Preliminary values based on limited data.

Additional Properties

The following properties of HexWeb HRH-10 were obtained on representative production materials.

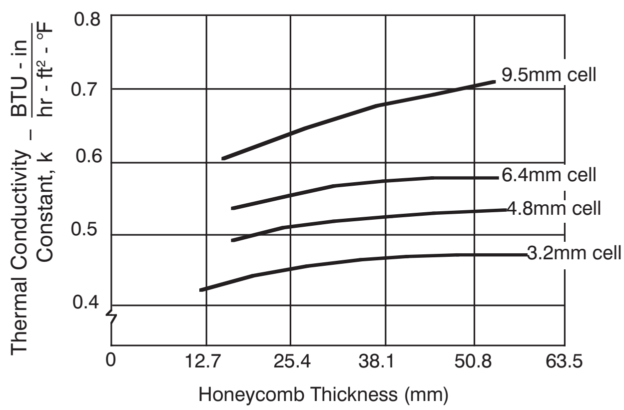
Dielectric Constant

The dielectric constant of a few core types has been measured at a frequency of 9375 MHz. Polarization parallel to both the L and W direction was used.

Core Density kg/m³	Polarization Parallel to L		Polarization Parallel to W	
	E Parallel L	E Parallel W	E Parallel L	E Parallel W
24	1.09	1.09	1.04	1.03
32	1.10	1.10	1.05	1.04
48	1.11	1.11	1.07	1.05
64	1.13	1.13	1.10	1.07
80	1.15	1.15	1.14	1.09
96	1.19	1.19	1.18	1.11

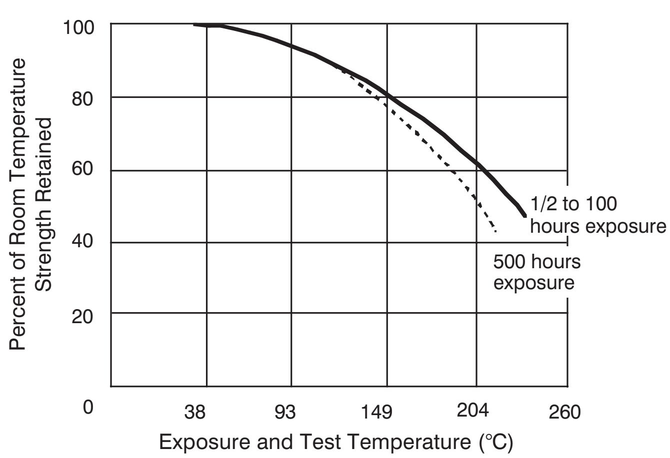
Thermal Conductivity

Several honeycomb cores have been tested for thermal conductivity. The figure to the right shows the results of this evaluation for HRH-10. The thermal conductivity constant varies with cell size and core thickness because the air convection affects inside the cells. Note the following values were obtained with the heat flow from top to bottom of the panel.



Properties at Elevated Temperatures

HRH-10 has been tested for shear and compressive strength at elevated temperatures and time exposures up to 500 hours. Because the Nomex softens between 230 to 260°C, the properties drop off rapidly at those temperatures; however, when returned to ambient conditions, most of its original strength is retained.



Important

All information is believed to be accurate but is given without acceptance of liability. Users should make their own assessment of the suitability of any product for the purposes required. All sales are made subject to our standard terms of sale which include limitations on liability and other important terms.

Publication ATU 123d (Jan 2013)

For More Information

Hexcel is a leading worldwide supplier of composite materials to aerospace and other demanding industries. Our comprehensive product range includes:

- Carbon Fibre
- RTM Materials
- Honeycomb Cores
- Carbon, glass, aramid and hybrid prepregs
- HexTOOL® composite tooling material
- Structural Film Adhesives
- Honeycomb Sandwich Panels
- Engineered Core
- Reinforcement Fabrics

For US quotes, orders and product information call toll-free 1-800-688-7734

For other worldwide sales office telephone numbers and a full address list please go to:

http://www.hexcel.com/contact/salesoffices