HexWeb® HRH-10

Aramid Fiber/Phenolic Resin Honeycomb

HEXCEL®

Product Data Sheet

Description

HexWeb® HRH-10® is manufactured from NOMEX® aramid fiber 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. Using this process, a wide range of cell sizes, paper thicknesses, and densities can be produced. The standard product line 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, environment 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 jets, such as the 737, 747, 777, 767, 787, A320, A350, A380 etc., 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 HexWeb® 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-Core® configuration is a hexagonal HexWeb® honeycomb that has been over expanded in the W direction, providing a rectangular cell shape that facilitates curving or form in the L direction.

Standard Dimensions

HexWeb® HRH-10 honeycomb is available in the following standard sizes:

Products	L	W	Block T (in)	T minimum
All HRH-10 Materials	48 in. +/-2 in.	96 in. +/-6 in.	20 or 32	0.125 in.

Thickness Tolerance

Standard tolerances on cut thickness are as follows:
0.125 in. to 2.000 in. tolerance will be ± 0.006 in.
2.001 in. to 3.000 in. tolerance will be ± 0.010 in.
3.001 in. and over tolerance will be ± 0.125 in.

Special thickness tolerances as well as other L, W, and T dimensions are available upon special request.

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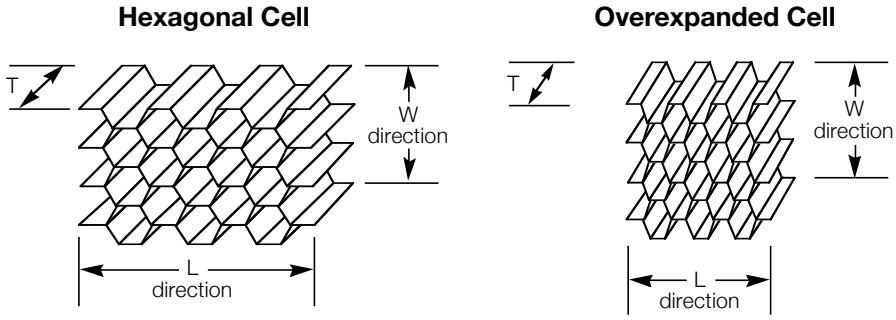
Type Designation
HexWeb® HRH-10® honeycomb is designated as follows:

Material – Cell Size – Density

Example: HRH-10 – 1/8 – 3.0

Where:
HRH-10® - designates honeycomb type
1/8 - is the cell size in inches
3.0 - 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



Images for explanation only and do not represent actual appearance.

Availability
HexWeb® HRH-10® is supplied as follows:
SHIPPING TERMS: FCA Hexcel, Casa Grande, AZ, USA (Incoterms 2010)
MATERIAL TITLE TRANSFER: Hexcel, Casa Grande, AZ, USA
Lead times will vary with the particular core type selected.
The information in this Data Sheet is subject to change without notice.
Contact your 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 over expanded (OX) cell shapes, HexWeb® HRH-10® is available in Flex-Core®, a very flexible core material. (See Flex-Core® Data Sheet) HexWeb® HRH-10® can be provided machined or formed to your specific requirements, including flat pieces cut to size, simple tapers, edge chamfering, double 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 AMS-3711 and AMS-81986. 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 blankets 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 minimum of 100 cubic inches of core will be ± 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 - HexWeb® HRH-10® does not exceed one cell water migration in 24 hours when tested per AMS STD-410.

Mechanical Properties - The table on the next page lists the HexWeb® HRH-10® product line and mechanical properties when tested per AMS-STD-401 using 0.500 inch core thickness. The typical values represent the mean average of a relatively large number of test values obtained from many blocks of HexWeb® honeycomb. The minimum properties represent recommended minimum average specification values.

Mechanical Properties of HexWeb® HRH-10® at Room Temperature
Typical Values Represented Below

Hexcel Honeycomb Designation Material – Cell Size – Density		Compressive					Plate Shear					
		Bare		Stabilized			L Direction			W Direction		
		Strength psi		Strength psi		Modulus ksi	Strength psi		Modulus ksi	Strength psi		Modulus ksi
		typ	min	typ	min	typ	typ	min	typ	typ	min	typ
Hexagonal	HRH-10 - 1/8 - 1.8	105	85	115	95	8	90	75	3.8	50	40	1.5
	HRH-10 - 1/8 - 3.0	300	235	325	270	20	175	155	6.0	100	85	3.5
	HRH-10 - 1/8 - 4.0 (2.5mil)	520	400	575	470	28	255	225	8.6	140	115	4.7
	HRH-10 - 1/8 - 4.0 (2.0mil)p*	550	430	600	500	28	220	200	7.7	125	100	4.3
	HRH-10 - 1/8 - 5.0	700	560	770	620	37	325	275	10.2	175	150	5.4
	HRH-10 - 1/8 - 6.0	1050	850	1125	925	60	385	330	13.0	200	170	6.5
	HRH-10 - 1/8 - 8.0	1675	1370	1830	1450	78	480	400	16.0	260	210	9.5
	HRH-10 - 1/8 - 9.0	2000	1525	2100	1600	90	515	425	17.5	300	250	11.0
	HRH-10 - 3/16 - 1.8	120	95	130	105	8	90	75	3.8	50	40	1.9
	HRH-10 - 3/16 - 2.0	120	100	140	105	11	110	90	4.3	60	45	2.1
	HRH-10 - 3/16 - 3.0	300	235	325	270	20	175	140	6.5	100	85	3.4
	HRH-10 - 3/16 - 4.0	500	430	540	470	28	245	215	7.8	140	110	4.7
	HRH-10 - 3/16 - 6.0	935	780	1020	865	60	420	370	13.0	225	200	6.5
	HRH-10 - 1/4 - 1.5	80	65	90	75	6	70	55	3.0	35	25	1.3
	HRH-10 - 1/4 - 2.0	140	115	155	125	11	105	85	4.0	50	40	2.0
	HRH-10 - 1/4 - 3.1	285	240	310	265	21	185	160	6.5	90	75	3.0
	HRH-10 - 1/4 - 4.0	440	360	480	390	28	250	205	8.0	125	100	3.5
	HRH-10 - 3/8 - 1.5	95	75	105	80	6	70	55	3.0	35	25	1.5
	HRH-10 - 3/8 - 2.0	140	115	155	125	11	90	72	3.7	55	36	2.4
	HRH-10 - 3/8 - 3.0	290	240	320	270	17	185	160	5.6	95	80	3.5
OX-Core	HRH-10/OX - 3/16 - 1.8	110	85	120	95	7	65	45	2.0	70	50	3.0
	HRH-10/OX - 3/16 - 3.0	320	260	350	285	17	115	95	3.0	135	110	6.0
	HRH-10/OX - 3/16 - 4.0	600	500	650	550	26	130	105	4.6	150	130	8.4
	HRH-10/OX - 1/4 - 3.0	350	280	385	310	17	110	90	3.0	135	110	6.0

Test data obtained at 0.500 inch thickness.

p = Preliminary values based on limited data

Other cell sizes, densities, and dimensions may be available on special request. Please contact your nearest Hexcel Sales Office for additional information. One block minimum buy may apply.

Additional Properties

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

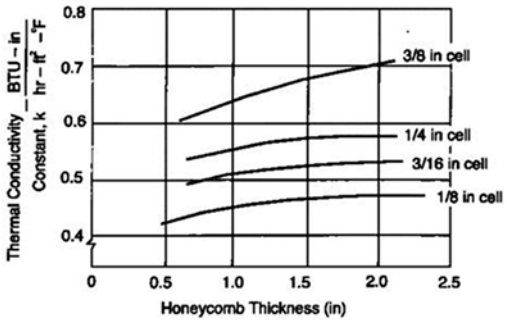
Dielectric Constant

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	Polarization Parallel to L		Polarization Parallel to W	
	E Parallel L	E Parallel W	E Parallel L	E Parallel W
1.5	1.09	1.09	1.04	1.03
2.0	1.10	1.10	1.05	1.04
3.0	1.11	1.11	1.07	1.05
4.0	1.13	1.13	1.10	1.07
5.0	1.15	1.15	1.14	1.09
6.0	1.19	1.19	1.18	1.11

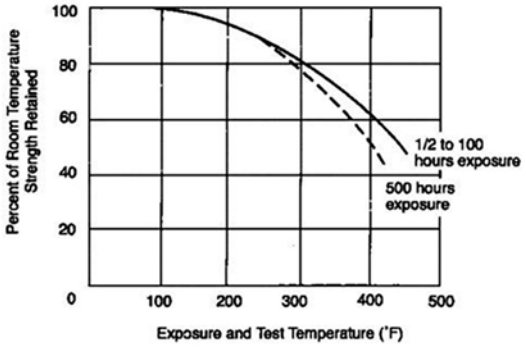
Thermal Conductivity

Several honeycomb cores have been tested for thermal conductivity. The figure to the right shows the results of this evaluation for HexWeb® 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

HexWeb® 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 450°F to 500°F, the properties drop off rapidly at those temperatures; however, when returned to ambient conditions, most of its original strength is retained.



For more information

Hexcel is a leading worldwide supplier of composite materials to aerospace and industrial markets. Our comprehensive range includes:

- HexTow® carbon fibers
- HexForce® reinforcements
- HiMax™ multiaxial reinforcements
- HexPly® prepregs
- HexMC® molding compounds
- HexFlow® RTM resins
- Redux® adhesives
- HexTool® tooling materials
- HexWeb® honeycombs
- Acousti-Cap® sound attenuating honeycomb
- Engineered core
- Engineered products

For US quotes, orders and product information call toll-free 1-888-611-4038. For other worldwide sales office telephone numbers and a full address list, please go to:

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