TECHNICAL DATASHEET

# CYCOM® 919 Advanced Composite Prepregs

## Description:

CYCOM® 919 is a modified epoxy resin supplied on graphite glass and aramid reinforced fiber. This resin system offers controlled flow and high elongation permitting direct lamination to honeycomb without the use of additional adhesive.

These properties make lightweight sandwich structures possible where impact resistance or a thinner-skin are important design considerations. Examples include radomes subject to rain erosion and aircraft interiors subject to physical abuse. Other applications are secondary aircraft structures and recreation products.

These advanced composites are serviceable over a temperature range of -67°F (-55°C) to 200°F (93°C), and can be fully cured at 235°F (112°C) to 260°F (127°C) in 60 minutes.

**For more information, contact:**
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## Features and benefits:

- **Excellent structural properties in solid laminates of moderate thickness**
- **Exceptional toughness**
- **Controlled flow and high elongation**
- **Extensively used for radomes and aircraft interiors**
- **Flame retardant. Fire-resistant under FAA-453**
- **Serviceable to 200°F (93°C)**
- **No post cure required**
- **Curing pressures range from 12 psi vacuum to 100 psi (0.084 MPa to 0.70 MPa) positive pressure**
- **20 day out time at room temperature**



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## Typical prepreg properties

| **Fiber** | "E" glass fiber | | Kevlar[a] 49 Aramid fiber | | Thornel[b] 300 Graphite Yarn | Ceylon[c] graphite fiber | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Weave style** | 120 | 7781 | 285 | 120 | 3070P | Untape 145 g/m$^2$ | 3070P | 3K10 5HS | 3K13 5HS |
| **Finish** | Silane | | CS800 | | Epoxy compatible | | | | |
| **Resin content,** % by Wt | 40 ± 2 | | 50 ± 3 | | 45 ± 2 | 39 ± 3 | | | |
| **Flow**, % at 250°F (121°C) 50 psi (0.35 MPa) | 9 ± 5 | 7 ± 5 | 9 ± 5 | | 12 ± 5 | 15 ± 5 | | 15 ± 3 | |
| **Gel time,** minutes at 250°F (121°C) | 8 ± 4 | | | | | | | | |
| **Volatile content,** max % | 2.0 | | | | 1.5 | 2.5 | | | |
| **Shelf life** | Six months from date of shipment at recommended storage conditions | | | | | | | | |
| **Recom-mended storage** | Store at or below 0°F (-18°C) | | | | | | | | |

[a] Product of DuPont
[b] Product of Amoco Fiber Products
[c] Product of CCF BASF

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## Laminating and curing technique

The following procedure is one frequently used in preparing autoclave or vacuum cured laminates.

1. Place the lay-up on a tool or caul sheet which has been treated with a release agent or film. Insert a thermocouple into the lay-up near the center ply of the thickest edge section, outside the net trim line.

2. Cover entirely with a release film. Normally, no edge resin bleeder system is used. In those cases where vertical resin bleeder system is specified, permeable Armalon[a] fluorocarbon coated fabric may be used. The amount of resin bled away is controlled by the number of dry plies of resin bleeder cloth placed over the perforated release sheet.

3. Install a vacuum bag by standard techniques. Insert at least two vacuum ports through the bag connecting one to the vacuum source and the other, at a point on the part furthest from the source, to a calibrated vacuum gauge. Position part in the oven or autoclave and draw vacuum to check for bag or system leaks.

4. To cure, draw vacuum, usually 20 to 21 inches Hg (.68 atmospheres), and apply the desired positive air pressure if an autoclave is being used.

5. Commence the heat-up cycle, typically about 3.5°F (1.9°C) per minute, to 250°F (121°C). Hold for 60 minutes at 250°F (121°C). All temperatures are measured by the previously installed thermocouple.

6. Upon completion of cure, turn off heat and cool under pressure until part temperature has fallen below 150°F (66°C). When fully cooled, the part may be debagged, trimmed and machined as necessary. A post cure is not required.

[a] Product of DuPont

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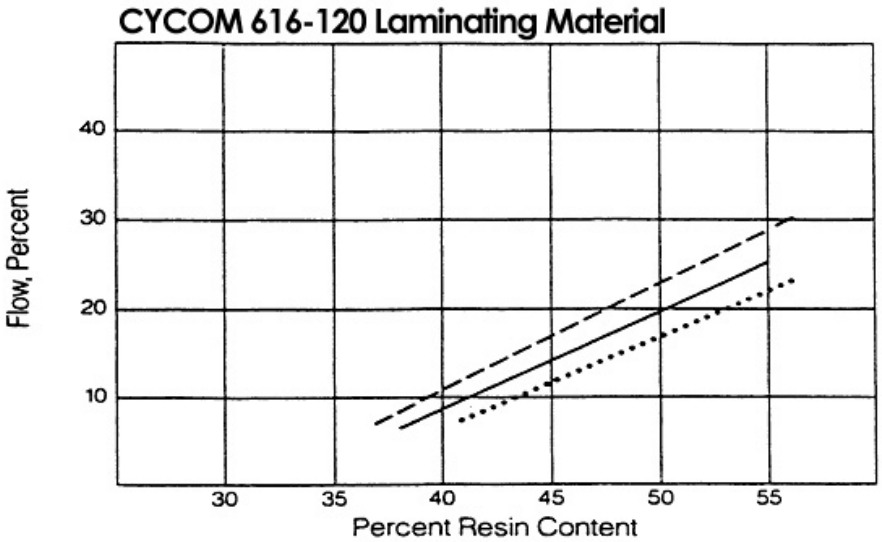
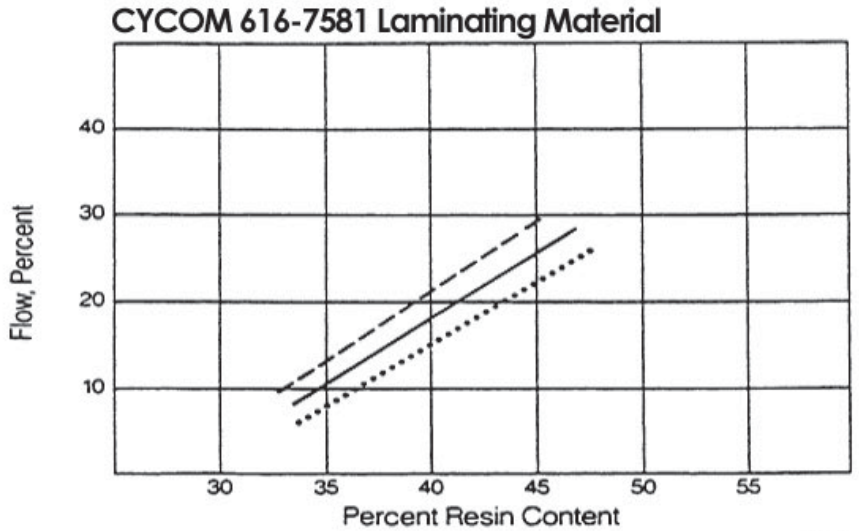
## Laminating materials




Percent Flow Versus Resin Content
In Relation To Various Bonding Pressures

50 psi (.35 MPa)
30 psi (.21 MPa)
15 psi (.10 MPa)

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## Table I — Mechanical performance[1]

| **Product description** | "E" glass fiber | | "E" glass fiber | |
|---|---|---|---|---|
| Weave style | 7781 | | 7781 | |
| Number of plies | 12 | | 12 | |
| Cure pressure, psi (MPa) | Vacuum only | | 30 (0.21) | |
| Cure temperature | 250°F (121°C) | | 250°F (121°C) | |
| Cure time (cool under pressure) | One hour | | One hour | |
| Cure rate per minute | 3.5°F (1.9°C) | | 3.5°F (1.9°C) | |
| **Physical properties** | | | | |
| Resin content, % by weight | 32 | 42 | 32 | 42 |
| **Mechanical properties** | | | | |
| **Tensile strength, Ksi (MPa)** | | | | |
| 75°F (24°C) | 68 (470) | 49 (339) | 70 (482) | 60 (415) |
| 75°F (24°C) wet* | 60 (414) | -- | 62 (427) | -- |
| 160°F (71°C) ½ hour | 53 (369) | 40 (278) | 57 (393) | 49 (338) |
| 200°F (95°C) ½ hour | 48 (333) | 36 (249) | 49 (335) | 42 (286) |
| 250°F (121°C) ½ hour | 41 (283) | -- | 41 (283) | 39 (271) |
| **Tensile modulus, Msi (GPa)** | | | | |
| 75°F (24°C) | 3.9 (27) | 2.9 (20) | 3.9 (27) | 3.0 (21) |
| 75°F (24°C) wet* | 3.6 (25) | -- | 3.4 (23) | -- |
| 160°F (121°C) ½ hour | 3.6 (25) | 2.6 (18) | 3.5 (24) | 2.8 (19) |
| **Compressive strength , Ksi (MPa)** | | | | |
| 75°F (24°C) | 70 (480) | 48 (330) | 69 (476) | 60 (455) |
| 75°F (24°C) wet* | 49 (338) | -- | 49 (338) | -- |
| 160°F (71°C) ½ hour | 46 (318) | 33 (229) | 46 (318) | 48 (334) |
| 200°F (95°C) ½ hour | 39 (267) | 27 (189) | 39 (268) | 36 (251) |
| 250°F (121°C) ½ hour | 29 (202) | -- | 30 (205) | 29 (196) |
| **Compressive modulus, Msi (GPa)** | | | | |
| 75°F (24°C) | 4.2 (29) | 3.1 (21) | 4.4 (30) | 3.9 (27) |
| 75°F (24°C) wet* | 4.2 (29) | -- | 4.1 (28) | -- |
| **Flexural strength, Ksi (MPa)** | | | | |
| 75°F (24°C) | 94 (646) | 74 (511) | 104 (739) | 86 (592) |
| 75°F (24°C) wet* | 78 (540) | 65 (448) | 85 (586) | 71 (487) |
| 160°F (71°C) ½ hour | 74 (511) | 57 (393) | 84 (580) | 69 (475) |
| 200°F (95°C) ½ hour | 53 (367) | 41(285) | 69 (475) | 59 (409) |
| 250°F (121°C) ½ hour | 38 (260) | -- | 44 (301) | -- |
| **Flexural modulus, Msi (GPa)** | | | | |
| 75°F (24°C) | 4.0 (28) | 2.9 (20) | 4.2 (29) | 3.2 (22) |
| 75°F (24°C) wet* | 3.9 (27) | 2.6 (18) | 3.9 (27) | 3.0 (21) |
| 160°F (71°C) ½ hour | 3.1 (21) | 2.3 (16) | 3.3 (23) | 2.6 (18) |
| 200°F (95°C) ½ hour | 2.8 (19) | 2.2 (15) | 3.3 (23) | 2.5 (17) |
| 250°F (121°C) ½ hour | 2.5 (18) | -- | 2.9 (20) | -- |
| **Interlaminar shear, Ksi (MPa)** | | | | |
| 75°F (24°C) | 4.2 (29) | 3.3 (23) | 4.3 (29) | 4.1 (28) |
| 75°F (24°C) wet* | 3.9 (27) | -- | 3.8 (26) | -- |
| 160°F (71°C) ½ hour | 3.6 (25) | 2.6 (18) | 4.3 (30) | 3.9 (27) |
| 200°F (95°C) ½ hour | 3.4 (23) | 2.1 (14) | 3.7 (25) | 3.6 (25) |
| 250°F (121°C) ½ hour | 2.5 (18) | -- | 2.7 (19) | 2.7 (19) |

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## Table I — Mechanical performance[1], cont.

| | | |
|---|---|---|
| **Product description** | "E" glass fiber | "E" glass fiber |
| Weave style | 7781 | 7781 |
| Number of plies | 12 | 12 |
| Cure pressure, psi (MPa) | Vacuum 12 (0.08) | Autoclave 30 (0.21) |
| Cure temperature | 250°F (121°C) | 250°F (121°C) |
| Cure time (cool under pressure) | One hour | One hour |
| Cure rate per minute | 3.5°F (1.9°C) | 3.5°F (1.9°C) |
| **Physical properties** | | |
| Resin content, % by weight | 42 | 42 |
| **3 plyskin sandwich properties*** | | |
| **Sandwich peel, in. Lb/3 in. (Nm/m)** | | |
| 75°F (24°C) | 32 (47) | 38 (56) |
| 160°F (71°C) ½ hour | 28 (42) | 39 (58) |
| 200°F (95°C) ½ hour | 36 (53) | 49 (73) |
| 250°F (121°C) ½ hour | -- | 54 (80) |
| **Flatwise tensile, psi (MPa)** | | |
| 75°F (24°C) | 949 (6.6) | -- |
| 160°F (71°C) ½ hour | 696 (4.8) | 180 (8.1) |
| 200°F (95°C) ½ hour | 691 (4.8) | 833 (5.8) |
| 250°F (121°C) ½ hour | -- | 630 (4.4) |
| **Flexural strength , psi (MPa) (tested in warp direction)** | | |
| 75°F (24°C) | 497 (3.4) | 533 (3.7) |
| 160°F (71°C) ½ hour | 398 (2.8) | 348 (2.4) |
| 200°F (95°C) ½ hour | 348 (2.4) | 315 (2.2) |
| 250°F (121°C) ½ hour | -- | -- |
| **Flexural strength , psi (MPa) (tested in fill direction)** | | |
| 75°F (24°C) | 319 (2.2) | 332 (2.3) |
| 160°F (71°C) ½ hour | 296 (2.0) | 300 (2.1) |
| 200°F (95°C) ½ hour | 265 (1.8) | 249 (1.7) |
| 250°F (121°C) ½ hour | -- | 177 (1.2) |

1 Where testing options for either warp or fill may apply. Warp conditions are assured unless otherwise indicated.

2 Honeycomb core 3/16" - 0.002" NP 5052 ½" thick. (4.76 mm - 0.051 mm NP 5052, 12.7 mm thick)

* Wet — two hour water boil

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## Table II — Mechanical performance[1]

| **Product description** | Kevlar | Kevlar | Thornel |
|---|---|---|---|
| Orientation | 49 fiber | 49 fiber | 300 fiber |
| Weave style | 120 | 285 | 3070P |
| Number of plies | 24 | 12 | 14 |
| Cure pressure, psi (MPa) | 35 (0.25) | 35 (0.25) | 100 (0.70) |
| Cure temperature | 250°F (121°C) | 250°F (121°C) | 250°F (121°C) |
| Bleeder | None | None | None |
| Cure time (cool under pressure) | One hour | One hour | One hour |
| Cure rate per minute | 6°F (3°C) | 6°F (3°C) | 6°F (3°C) |
| **Physical properties** | | | |
| Cured ply thickness, inches (mm) | 0.0045 (0.114) | 0.0100 (0.254) | 0.0079 (0.200) |
| Specific gravity, g/cc | 1.4 | 1.4 | 1.6 |
| Resin content, % by weight | 48 | 47 | 39 |
| Water absorption, % | 0.4 | 0.3 | -- |
| **Mechanical properties** | | | |
| **Tensile strength, Ksi (MPa)** | | | |
| 75°F (24°C) | 66 (454) | 76 (527) | 85 (598) |
| 75°F (24°C) wet* | 62 (430) | 74 (509) | -- |
| 160°F (71°C) ½ hour | 63 (438) | 74 (509) | -- |
| 180°F (82°C) | -- | -- | 82 (577) |
| **Tensile modulus, Msi (GPa)** | | | |
| 75°F (24°C) | 4.2 (29) | 4.4 (30) | 9.1 (64) |
| **Compressive strength, Ksi (MPa)** | | | |
| 75°F (24°C) | 25 (174) | 26 (179) | 57 (401) |
| 75°F (24°C) wet* | 24 (165) | 25 (174) | -- |
| 160°F (71°C) ½ hour | 18 (128) | 19 (130) | -- |
| 180°F (82°C) | -- | -- | 36 (253) |
| **Compressive modulus, Msi (GPa)** | | | |
| 75°F (24°C) | 4.4 (30) | 3.7 (25) | 9.3 (65) |
| **Flexural strength, Ksi (MPa)** | | | |
| 75°F (24°C) | -- | 63 (434) | 107 (752) |
| 75°F (24°C) wet* | -- | 60 (413) | -- |
| 160°F (71°C) ½ hour | -- | 57 (393) | -- |
| 180°F (82°C) | -- | -- | 67 (471) |
| **Flexural modulus, Msi (GPa)** | | | |
| 75°F (24°C) | -- | 4.2 (29) | 7.6 (53) |

1 Where testing options for either warp or fill may apply.
Warp conditions are assured unless otherwise indicated.

* Wet — two hour water boil

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## Table III — Mechanical performance[1]

| **Product description** | Graphite | Graphite | Graphite | Graphite |
|---|---|---|---|---|
| Weave style | unitape | 3070P | 3K105H5 | 3K135H8 |
| Number of plies | 8.16 | -- | -- | -- |
| Average ply thickness, inch (mm) | 0.0060 (0.152) | 0.0080 (0.204) | 0.0115 (0.292) | 0.0155 (0.394) |
| Cure pressure, psi (MPa) | autoclave - 40 (0.27) | | | |
| Cure temperature | 250°F (121°C) | | | |
| Cure time (cool under pressure) | Two hours | | | |
| Cure rate per minute | 3.5°F (1.9°C) | | | |
| **Mechanical properties** | | | | |
| **Tensile strength, Ksi (MPa)** | | | | |
| -67°F (-55°C) | 272 (1875) | 140 (965) | -- | -- |
| 75°F (24°C) | 290 (1999) | 145 (999) | 155 (1068) | 140 (965) |
| 75°F (24°C) wet* | -- | -- | -- | -- |
| 160°F (71°C) ½ hour | 298 (2054) | 135 (931) | -- | -- |
| **Tensile modulus, Msi (GPa)** | | | | |
| -67°F (-55°C) | 19.8 (137) | 10.0 (69) | -- | -- |
| 75°F (24°C) | 19.3 (133) | 9.0 (62) | 9.6 (66) | 9.6 (66) |
| 75°F (24°C) wet* | -- | -- | -- | -- |
| 160°F (71°C) ½ hour | 18.5 (127) | 9.0 (62) | -- | -- |
| **Compressive strength , Ksi (MPa)** | | | | |
| 75°F (24°C) | 234 (1613) | 112 (772) | 125 (862) | 115 (793) |
| 75°F (24°C) wet* | -- | -- | -- | -- |
| 160°F (71°C) ½ hour | 155 (1069) | 90 (620) | -- | -- |
| 160°F (71°C) wet* | -- | -- | 85 (586) | -- |
| **Compressive modulus, Msi (GPa)** | | | | |
| 75°F (24°C) | 17.0 (117) | 9.0 (62) | 9.5 (65) | 9.6 (66) |
| 75°F (24°C) wet* | -- | -- | -- | -- |
| 160°F (71°C) ½ hour | 16.5 (114) | 8.5 (59) | -- | -- |
| 160°F (71°C) wet* | -- | -- | 9.2 (63) | -- |
| **Interlaminar shear, Ksi (MPa)** | | | | |
| 75°F (24°C) | 12.5 (86) | -- | -- | -- |
| 75°F (24°C) wet* | -- | -- | -- | -- |
| 160°F (71°C) ½ hour | 7.0 (48) | -- | -- | -- |
| **Short beam shear, Ksi (MPa)** | | | | |
| 75°F (24°C) | -- | 10.0 (69) | 9.8 (68) | 10.0 (69) |
| 160°F (71°C) wet* | -- | 5.0 (34) | 5.5 (38) | -- |

1 Where testing options for either warp or fill may apply.
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* Wet — two hour water boil

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## Health and safety information

Refer to Material Safety Data Sheet number 6562.

## Important notice

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