



**ES-215 SERIES
GRAPHITE FILLED
HIGH TEMPERATURE
EPOXY
SURFACE COAT**



DISTRIBUTED BY
 Freeman Mfg. & Supply Co.
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DESCRIPTION

ES-215 SERIES HIGH-TEMPERATURE SURFACE COATS were developed to meet the requirements of the aircraft and aerospace industry for use which demands higher temperature applications greater than 350°F (177°C). These surface coats have proven in tests that their compatibility with prepreg systems produce excellent surface conditions cured under heat and vacuum bagging. Thermo-cycling of these systems exhibit a great degree of high physical stability when used in tooling and composite fabrication. These systems are versatile in that they can be used in RHL and IHL heat environment applications. These qualities allow the fabricator a single system which will sustain both specifications in deference to using two different systems. These systems are hygienically safe for shop usage as they do not contain MDA OR VCHD. Use in conjunction with any ADTECH high temperature laminating resin.

TYPICAL HANDLING PROPERTIES @ 77°F (25°C):	<u>ES-215R/ES-215-IHG H</u>	<u>ES-215R/ES-215-1H</u>	<u>ES-215R/ES-215-2H</u>
Mix Ratio (parts by weight)	100R/17H	100R/18H	100R/22H
Mix Ratio (parts by volume)	4.80R/1H.....	4.4R/1H.....	3.46R/1H
Mixed Density.....	10.29 lbs/gallon	11.0 lbs/gallon	10.29 lbs/gallon
Specific Gravity	1.23 g/cc	1.31 g/cc	1.23 g/cc
Resin Viscosity.....	Thixotropic	Thixotropic	Thixotropic
Hardener Viscosity.....	50-60cps.....	50-60cps.....	50-60cps
Mixed Viscosity	100,000-150,000cps.....	50,000-70,000cps.....	20,000-56,000cps
Work Life	180-220 minutes.....	16 minutes	83 minutes
TackTime	10-12hrs(*optimum).....	45-60min.....	3-3 1/2hrs
Demold (ref: preliminary cure schedule, pg.2)			
Resin Color	Black	Black	Black
Hardener Color	Amber	Amber	Amber
Mixed Color	Black	Black	Black
Shelf Life Resin (in original unopened container)	1 year	1 year	1 year
Shelf Life Hardener (in original unopened container).....	2 years	2 years	2 years

TYPICAL PHYSICAL PROPERTIES (neat resin)	<u>ES-215R/ES-215-IHG H</u>	<u>ES-215R/ES-215-1H</u>	<u>ES-215R/ES-215-2H</u>
Ultimate Tensile Strength(ASTM D-638.91).....	4,938psi (34MPa)	7,101psi (49MPa)	3,593psi (25MPa)
Tensile Modulus(ASTM D-638.91)	645,100psi (4,448MPa)	803,400psi (5,539MPa) ..	559,900psi (3,860MPa)
Tensile Elongation(ASTM D-638.91).....	0.92%.....	1.2%.....	0.94%
Ultimate Compressive Strength(ASTM D-965.91)	21,690psi (150MPa)	21,700psi (150MPa)	20,820psi (144MPa)
Compressive Modulus(ASTM D-965.91)	241,600psi (1,666MPa)	227,100psi (1,566MPa) ..	250,200psi (1,725MPa)
Ultimate Flexural Strength(ASTM D-790.92)	8,416psi (58MPa)	8,108psi (56MPa)	9,253psi (64MPa)
Flexural Modulus(ASTM D-790.92).....	428,400psi (2,954MPa)	339,700psi (2,342MPa) ..	379,100psi (2,614MPa)
Coefficient of Thermal Expansion: (PPM/F (C)).....	16.3 (29.3)	31 (55.8)	20.3 (36.5)
Heat Deflection Temperature @ 66 psi(ASTM D-648.82)	382°F (194°C).....	301°F (149°C).....	307°F (153°C)
Heat Deflection Temperature @ 264 psi(ASTM D-648.82) ...	368°F (187°C).....	277°F (136°C).....	288°F (142°C)
Notched Izod Impact Strength (ASTM D-256.93A)	3.61 in/lbs/ft	5.68 in/lbs/ft	4.28 in/lbs/ft
Moisture Absorption (ASTM D-570.88)	0.163%.....	0.492%.....	0.342%
Hardness.....	88-90 Shore D	88-90 Shore D	87-88 Shore
Shrinkage.....	nil	nil	nil

(*)Note: Boeing specMMS-101 and M41-03-1 IHG per M01-D6-22-164 epoxy tool fabrication.

POST CURE SCHEDULE

PRELIMINARY CURE SCHEDULE

On model: Cure for 24 hours @ 77°F (25°C)
+ 2 hours @ 150°F (66°C)



You may attach support structure and demold tool after this schedule is completed.

POST CURE SCHEDULE

After completing the Preliminary Cure Schedule, complete the following:

- 1 hour @ 200°F (93°C)
- 1 hour @ 250°F (121°C)
- 1 hour @ 300°F (149°C)
- 3 hours @ 350°F (177°C)

HEATING AND COOLING RATES DURING POST CURE

Always allow tools made with ADTECH high temperature systems to gel at room temperature before subjecting them to post cure (24 hours is usually sufficient). This will prevent excessive exotherm and shrink stress from occurring. When oven curing laminated molds, always place the mold in a room temperature oven. Increase oven temperature at a rate of no more than 50°F (30°C) per hour. When heat cure is completed, turn off oven and allow molds to remain in the oven. Never remove mold from oven until mold temperature has been lowered to less than 100°F (38°C).

ES-215 Series Tech/Revised 1/13/15
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