AREMCO
High Temperature Solutions

Since 1965, our success has been a result of this simple business strategy:

- Understanding Customer Requirements.
- Providing Outstanding Service and Support.
- Producing High Quality Technical Materials and Equipment.
- Solving Difficult Technical Problems.

CONTENTS

Aremco's advanced material division is a leader in the development and production of technical ceramics, adhesives, coatings, sealants and potting compounds for applications to 3200 °F. These materials are used throughout industry in the design of sensors, electrical components and analytical instruments. Industries served include automotive, aerospace, chemical processing, metallurgical, power generation and semiconductor.

Aremco offers a wide range of full-fired and machinable ceramics for applications in the aerospace, automotive, electrical, heat-treating, metallurgical, semiconductor industries, and more.

CERAMIC GRADES

Machinables

502-600	Mica Glass-Ceramic
502-800	Macor Glass-Ceramics
502-900	Calcium Silicate
502-1100-UF	Aluminum-Silicate, Un-Fired
502-1400-BF	Aluminum Oxide, Bisque-Fired, 96%
502-1600	Boron Nitride, 99%

Full-Fired, Dense

502-676	Magnesium Oxide, 99.4%
502-1100-FF	Aluminum-Silicate, Full-Fired
502-1400-96	Aluminum Oxide, 96%
502-1400-998	Aluminum Oxide, 99.8%
502-1900-MSZ	Zirconium Oxide, Magnesium Stabilized
502-1900-YTZP	Zirconium Oxide, Yttria Stabilized

BN Composites

502-1810	Boron Nitride-Aluminum Oxide
502-1820	Boron Nitride-Aluminum Nitride
502-1830	Boron Nitride-Zirconium Oxide

Additional ceramics including Silicon Carbide and Silicon Nitride are available upon request.

TYPICAL APPLICATIONS

Aerospace
Gas Nozzles, Thermal Insulators, Space Mirrors, and Nose Cones.

Automotive
Diesel Port Liners, Manifold Insulation, Catalyst Support Systems, Flow Separator Housings, Regenerator Cores, Turbine Nozzles.

Electrical
Connector Housings, Heater And Resistor Supports, Stand-Offs, Instrument and Appliance Insulators, Coil Forms and Bobbins.

Electronics
Wafer Chucks, Insulators, Vacuum Tube Structures, Microwave Housings, Arc Barriers, X-Ray Equipment, and PVD Applications.

Heat Treating
Brazing and Carburizing Fixtures, Induction Heating Tubes, Furnace and Tooling Insulation, Kiln Furniture, Welding Jigs, Hot Forming Dies.

Metallurgical
Molten Metal Crucibles, Nozzles, Troughs, Liners, Transfer Rollers, Structural Parts, Filters, Thermocouple Sheaths, Permanent Molds.

Petrochemical
High Temperature Corrosion and Wear-Resistant Components.

Plastics
Hot Die Parts for Thermoplastic Forming Equipment.

MACHINABLE GRADES

502-600 Glass-Ceramic
Recommended for high dielectric and mechanical strength requirements and temperatures to 1100 °F (593 °C). Used for high voltage insulators, lamp housings, thermal switches, and radiation parts. Readily machined and no firing required. Plates are available from ⅛″ to 1″ thick; rods from ¼″ to 1″ diameter.

502-800 Macor Glass-Ceramic
Recommended for temperatures to 1472 °F (800 °C) and peaks up to 1832 °F (1000 °C). Demonstrates low thermal conductivity, high strength, high electrical insulation, zero porosity, non-wetting, and coefficient of thermal expansion similar to most metals and sealing glasses. Machines to tight tolerances up to 0.0005″, surface finish of less than 20µin, and polishes to a smoothness of 0.5µin. Used for ultra high vacuum, aerospace, nuclear, welding, fixturing, and medical applications. Readily machined and no firing required. Bars, disks, rods and plates are available from 1⁄16″ thick up to 12″ diameter.

502-900 Calcium Silicate (CS-85)
Structural insulation that combines high strength and excellent thermal insulating characteristics for use in heat treating, fire protection, and electrical applications. Also ideal for direct contact with non-ferrous metals. Machines easily and is available in ¼″ to 3″ thick sheets × 4′ × 8′.

502-1100-UF Alumino-Silicate, Unfired
Machined easily to close tolerances and can be used as-is or fired to increase temperature resistance and improve mechanical strength. Used for prototyping and small production runs of electrical and thermal insulators and brazing and heat-treating fixtures. Standard plates from ¼″ to 1″ thick × 12″ × 12″; rods from ¼″ to 4″ diameter × 12″; bars from 1″ × 1″ to 4″ × 4″ × 12″.

502-1400-BF Aluminum Oxide, 96%, Partially Fired
Partially Fired alumina is machined easily to close tolerances and can be used as-is or fired to increase mechanical and thermal properties. This ceramic offers excellent corrosion, abrasion, and electrical and thermal shock resistance. Used for producing guides, fixtures, nozzles, pump liners, shafts, valve seats, and more. Plates are available from ¼″ to ¾″ thick × 6″ × 6″; rods from ¼″ to 3″ diameter × 10″ long.

502-1600 Boron Nitride, 99%
Hot-pressed boron nitride provides high thermal conductivity, electrical insulation, and low coefficient of thermal expansion. Grades are non-reactive with molten salts, aluminum and other metals. Easily machined and available in plates from ¼″ to 1″ thick; rods from ¼″ to 3″ diameter by 12″ long, and bars from ¼″ × ¼″ to 2″ × 2″.

FULL-FIRED, DENSE CERAMICS

502-676 Magnesium Oxide
This is a high density, fine grain, 99.38% magnesium oxide fabricated into thin-walled crucibles from 1″ to 6″ diameter and 1″ to 10″ high for applications to 3270 °F (1800 °C). Used for processing beta-alumina, metal alloys, piezoelectrics, and superconductors.

502-1100-FF Alumino-Silicate, Full-Fired
Offers higher temperature resistance and improved mechanical strength over 502-1100-UF. Used for prototyping and small production runs of electrical and thermal insulators and brazing and heat-treating fixtures. Recommended for producing insulators, standoffs, feed-thrus, furnace carriers, and brazing fixtures.

502-1400-96 Alumina, Full-Fired, 96%
High strength aluminum oxide offers excellent corrosion, abrasion, and electrical and thermal shock resistance. Used for producing guides, fixtures, nozzles, pump liners, shafts, valve seats, and more.

502-1400-998 Alumina, Full-Fired, 99.8%
Higher strength, higher purity aluminum oxide ideal for metallurgical applications in which sensitivity to impurities may exist.

502-1900-MSZ Magnesia Partially Stabilized Zirconia
This grade offers the highest level of fracture toughness of all the zirconia materials and far exceeds that of aluminum oxide. Features include excellent fracture, corrosion, thermal shock, and wear resistance. Used for pump parts, valve components, bearings, and wear linings.

502-1900-YTZP Yttria Stabilized Zirconia
This grade offers the highest flexural strength of all the zirconia materials. The fine grain size lends itself to be used in cutting tools where a very sharp edge can be achieved and maintained due to its high wear resistance. Also provides excellent mechanical strength, corrosion and thermal shock resistance, impact toughness, and very low thermal conductivity. Used for structural components, wear parts, fiber optic ferrules and sleeves, oxygen sensors, solid oxide fuel cells.

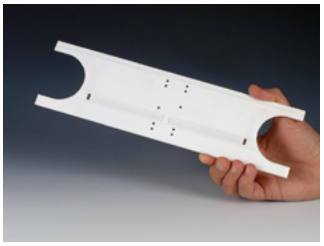
BORON NITRIDE COMPOSITES

502-1810 BN-Al_2O_3
Hot-pressed BN-Al_2O_3 demonstrates good mechanical, thermal conductivity and electrical properties compared to BN. For use at temperatures to 1000 °C in air and 1700 °C in a vacuum or inert atmosphere. Ideal for producing gas atomization nozzles for the thermal spray industry.

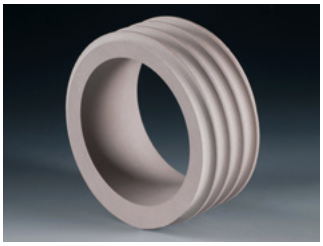
502-1820 BN-AlN
Hot-pressed BN-AlN demonstrates high thermal conductivity and electrical resistivity, and good mechanical properties compared to BN. For use at temperatures to 1000 °C in air and 1800 °C in a vacuum or inert atmosphere. Ideal for applications requiring high thermal conductivity and electrical insulation in the semiconductor industry.

502-1830 BN-ZrO_2
Hot-pressed BN-ZrO_2 demonstrates the highest mechanical strength of all BN composites. Ideal for metallurgical/foundry applications for producing molds, molten liquid nozzles, and continuous casting separation rings.

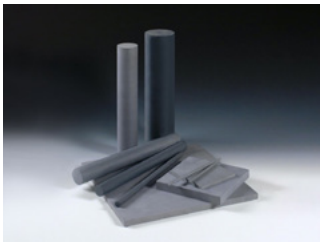
502-600



502-800



502-1100-FF



502-1100-UF

502-1600

MACHINABLE CERAMICS

Material Properties	502-600	502-800	502-900	502-1100-UF	502-1100-FF	502-1400-BF	502-1600[1]
Composition-Purity	Glass Ceramic	Macor Glass Ceramic	CS-85 Calcium Silicate	Alumino-Silicate Un-Fired	Alumino-Silicate Full-Fired	Alumina, 96% Bisque-Fired	Boron Nitride, 99%
Thermal Properties							
Max Use Temperature							
Oxidizing, °F, (°C)	1100 (593)	1472 (800)	1800 (1000)	1000 (537)	2100 (1150)	2600 (1427)	1650 (900)
Vacuum, °F, (°C)	1100 (593)	1472 (800)	1800 (1000)	1000 (537)	2100 (1150)	2600 (1427)	3270 (1800)
Inert, °F, (°C)	1100 (593)	1472 (800)	1800 (1000)	1000 (537)	2100 (1150)	2600 (1427)	3990 (2200)
Coefficient Thermal Expansion, in/in/°F x 10^{-6} (°C)	5.8 (10.5)	7.0 (12.6)	—	2.5 (4.5)	2.9 (5.2)	3.5 (6.3)	0.2 (0.3)
Thermal Conductivity, W/m-K	1.3	1.5	0.3	1.6	1.3	4.3	50
Mechanical Properties							
Compressive Strength, psi (Mpa)	32,000 (221)	50,000 (345)	10,300 (71)	12,000 (83)	25,000 (172)	9,000 (62)	12,300 (85)
Flexural Strength, psi (Mpa)	11,000 (72.9)	13,600 (94)	3,000 (21)	4,000 (28)	10,000 (69)	4,000 (28)	5,075 (35)
Hardness, Rockwell A	47	48	—	39	45	42	19
Electrical Properties							
Volume Resistivity, ohm-cm	1×10^{12}	1×10^{17}	4.5×10^{12}	1×10^{14}	1×10^{14}	1×10^{14}	$> 1 \times 10^{14}$
Dielectric Strength, volts/mil	380	785	61	80	100	80	865
Dielectric Loss, 1 MHz	0.012	~0.005	—	0.06	0.053	0.003	< 0.0002
Dielectric Constant, 1 MHz	6.8	~6.0	—	5.8	5.3	5.5	4
Physical Properties							
Density, g/cc	2.80	2.52	1.36	2.60	2.30	3.00	2.00
Water Absorption, %	0.0	0.0	—	2.5	2.3	25	—

*Measurements taken at 25 °C. Additional data at elevated temperatures may be available upon request.

MACHINING GUIDELINES

Fixturing
Hold parts carefully to prevent chipping or cracking. Place soft paper sheet in between ceramic and gripping jaws as needed. Support plates for drilling or milling operations using a soft backup block and mounting adhesive such as Aremco's Crystalbond 509 or 590 (refer to Technical Bulletin A9). Support cylinders using an internal metal sleeve. Do not use pointed screws to hold parts.

Lubricant
A low concentrate water-soluble lubricant is recommended for 502-600 and 502-800. Dry machining is recommended for 502-1100-UF, 502-1400-BF, 502-1600-99 because these ceramics have high open porosity and absorb water readily.

Cutting
Use sharp cutting tools only as ceramics are abrasive and dull cutters may cause localized heating that leads to chipping. Carbide tools (Titanium coated or Tungsten) and/or bonded diamond wheels are preferred but high-speed tools can be used for short runs. Cut downwards into the work, never up from the bottom. Maintain speeds from 2000–2500 rpm and advance the cut by feel.

Drilling
Solid carbide drills, preferably with micro-grain carbide, will give best results. Do not drill thru in order to avoid chipping. For best results, work from one side, then rotate piece and work from the other side. Otherwise, allow for 1⁄16″ of extra material on drill break-thru side to allow for grinding cleanup. For large quantities, accurate two-sided hardened bushed drill jigs will provide accurate results. The drill should be advanced slowly by ¼″ per turn.

Drill Size	Spindle Speed*	Feed Rate
¼″	300–2000 rpm	.003–.005
½″	250–1200 rpm	.004–.007
¾″	200–700 rpm	.005–.010
1″	100–300 rpm	.006–.012

*The higher end of the speed range is recommended for most products except 502-800 Macor.

Grinding
Use silicon carbide resin-bonded wheels for surface grinding at speeds recommended by the wheel manufacturer. Use a soft, coarse-grained wheel for heavy grinding. Use 1% soluble oil solution to extend life of grinding wheels. Use a 35-grit Blanchard-Besley type grinder for rough heavy grind; use a 60–80-grit wheel for surface grinders.

Milling
Micro-grain Carbide end mills are recommended.

Drill Size	Spindle Speed
¼″	< 1000 rpm
½″	< 800 rpm
¾″	< 600 rpm
1″	< 400 rpm

Depth of Cut .050–.070″ per cut
Feed Rate 3″ per minute

Slotting
Slotting may be accomplished using a metal-bonded diamond or silicon carbide wheel on a surface grinder for slots up to 0.050″. Alternatively, a carbide end-mill can be used making small cuts up to 0.025″ with plenty of lubricant.

Tapping
Use sharp tungsten carbide tool bits. For internal threads, make clearance holes slightly larger than standard tap drill recommendations. Chamfer both sides of hole prior to threading to minimize chipping. Run the tap in one direction only as turning the tap back and forth can cause chipping. Continuously flush with air, water or coolant to clear chips and dust from the tap.

Cleaning
When coolant is used, bake out parts at 200–250 °F for 1–2 hours to remove residual moisture. Remove any discoloration caused by the lubricant by clean firing up to 1000 °F.

502-1100-UF Unfired—Machining & Firing Notes
Typical tolerances after firing are ± 1% or ± 0.005″ whichever is greater. Tighter tolerances can be achieved by wet grinding after firing. Machine all dimensions 1–2% undersize to allow for expansion during firing. All dimensions including centered and off-centered internal holes will increase by this percentage after firing. Maximum recommended cross-sectional thickness is ⅜″. Hollow cut or drill holes thru the unfired ceramic to maintain a ⅜″ maximum cross-section. When it is necessary to exceed ⅜″, do not exceed ⅝″ and the rate of firing should be slowed.

Bake at 200 °F for two hours to remove moisture and increase temperature at a rate of 200 °F per hour maximum (slower for thicker sections) to 1100 °F. Soak at 1100 °F for six hours, then increase temperature at a rate of 200 °F per hour to 2050 °F and soak for 30 minutes for each ¼″ of cross-section (eg. soak a ½″ thick part for one hour). Turn off furnace and allow cooling to below 150 °F before removing parts.

502-1400-BF Bisque-Fired—Firing Notes
This product has been bisque-fired to 2475 °F, but additional firing to 3075–3125 °F can be performed to achieve high density, hardness and mechanical strength. Allow for 15–18% shrinkage using the following firing schedule. Raise temperature 500 °F per hour to 2000 °F and 200 °F per hour to 3125 °F. Soak for 12 hours then cool to room temperature before removing parts.


502-1400-96


502-1400-96 + Glazing


502-1400-998

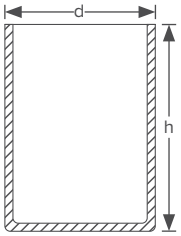

502-676

DENSE CERAMICS — ALUMINUM OXIDE, MAGNESIUM OXIDE, ZIRCONIUM OXIDE

Material Properties[1]	502-1400-96	502-1400-998	502-676	502-1900-MSZ	502-1900-YTZP
Composition-Purity	Aluminum Oxide 96%[2]	Aluminum Oxide 99.8%	Magnesium Oxide[2] 99.4%	Zirconia Magnesia Stabilized (3.5%)	Zirconia Yttria Stabilized (12.0%)
Thermal Properties					
Max Use Temperature	3100 (1700)	3050 (1675)	3270 (1800)	2200 (1200)	930 (500)
Coefficient Thermal Expansion, in/in/°F x 10^{-6} (°C)	3.5 (6.3)	3.6 (6.5)	7.7 (13.9)	4.9 (8.9)	3.8 (6.9)
Thermal Conductivity, W/m-K	23	30	2.2	3	2.2
Mechanical Properties					
Compressive Strength, psi (Mpa)	300,000 (2,070)	325,000 (2,240)	120,000 (830)	270,000 (1860)	360,000 (2,485)
Flexural Strength, psi (Mpa)	52,000 (360)	55,000 (380)	35,500 (240)	90,000 (620)	13,800 (950)
Fracture Toughness, $Mpa.m^{0.5}$	4–5	3–4	—	12	10
Hardness, Rockwell R-45N	81	86	70	78	80
Electrical Properties					
Volume Resistivity, ohm-cm	$>1\times10^{14}$	$>1\times10^{14}$	1×10^{12}	$>1\times10^{13}$	$>1\times10^{13}$
Dielectric Strength, volts/mil	250	290	150	300	240
Dielectric Loss, 1 MHz	0.0004	< 0.0001	—	0.0016	—
Dielectric Constant, 1 MHz	9.1	9.8	9.6	22.7	30.0
Physical Properties					
Density, g/cc	3.71	3.91	3.45	5.72	6.02
Gas Permeability	Gas Tight	Gas Tight	—	Gas Tight	Gas Tight
Water Absorption, %	0.0	0.0	4.5	0.0	0.0
Color	White	Ivory	Light-Brown	Light-Yellow	Ivory

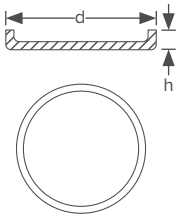
Reference Notes
[1] Property measurements were taken at 25 °C. Additional data at elevated temperatures may be available upon request.
[2] Slip-cast crucibles and flanged lids are available in stock shapes up to 6″ diameter and 10″ high.

-FB



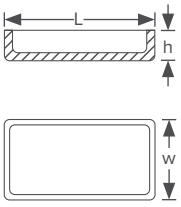
FLAT BOTTOM

-RDT



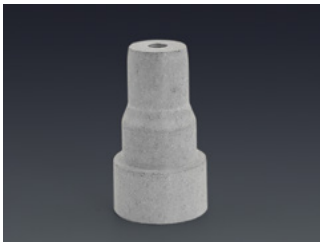
CRUCIBLE COVER (OR ROUND TRAY)

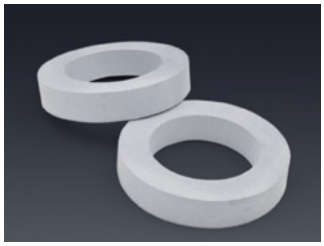
-RT

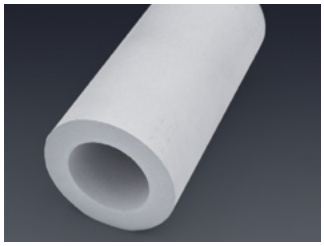


RECTANGULAR TRAY


502-1810

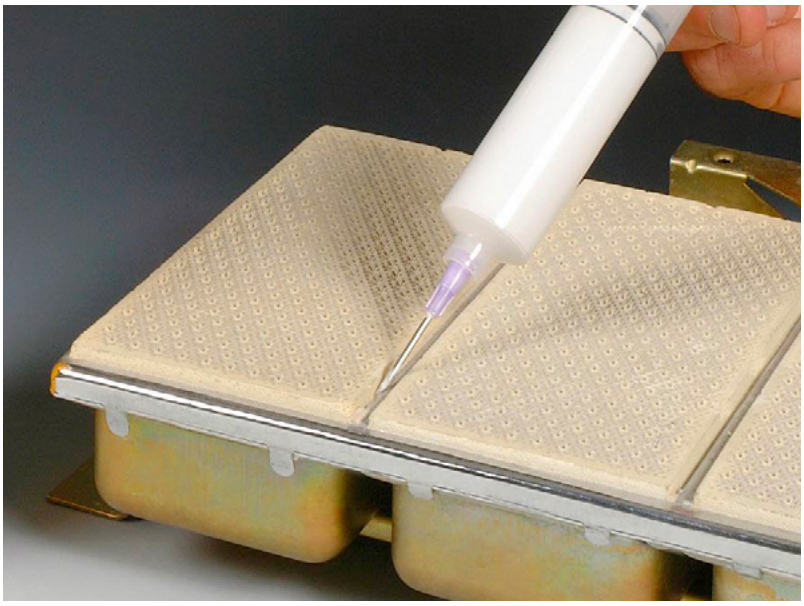

502-1820


502-1830

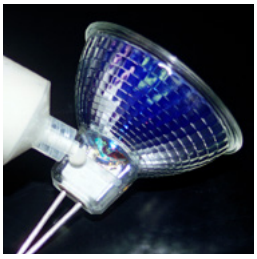

502-1830

DENSE CERAMICS — BN COMPOSITES

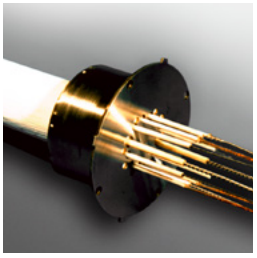
Material Properties[1]	502-1810	502-1820	502-1830
Composition	BN + Al_2O_3	BN + AlN	BN + ZrO_2
Binder	B_2O_3	B_2O_3	B_2O_3
Thermal Properties			
Max Use Temperature			
Oxidizing, °F, (°C)	1830 (1000)	1830 (1000)	1830 (1000)
Vacuum, °F, (°C)	3180 (1750)	3270 (1800)	3180 (1750)
Inert, °F, (°C)	3180 (1750)	3270 (1800)	3180 (1750)
Coefficient Thermal Expansion, in/in/°F x 10^{-6} (°C)	1.1 (2.0)	1.6 (2.8)	2.0 (3.5)
Thermal Conductivity, W/m-K	30	85	30
Mechanical Properties			
Compressive Strength, psi (Mpa)	21,025 (145)	27,725 (205)	31,900 (220)
Flexural Strength, psi (Mpa)	9,425 (65)	12,325 (85)	13,050 (90)
Electrical Properties			
Volume Resistivity, ohm-cm	$> 1 \times 10^{13}$	$> 1 \times 10^{13}$	1×10^{12}
Dielectric Constant, 1 MHz	3.8	7.2	8.5
Physical Properties			
Density, g/cc	2.25–2.35	2.75–2.85	2.90–3.00
Water Absorption, %	1.8	1.3	1.2
Color	Light Grey	Grey	Grey



Ceramabond™ 685-N bonds infrared heater.

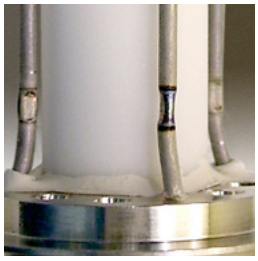


Ceramabond™ 835-M bonds halogen lamp.



Ceramabond™ 503 coats heater used to 1700 °C.

Ceramabond™ 685-N bonds ceramic honeycomb to cylinder housing.



Ultra-Temp™ 516 seals heater assembly.

Aremco's high temperature ceramic adhesives are formulated using a broad range of ceramics fillers and inorganic binders, and are ideal for bonding, potting and sealing ceramics, composites, graphite, refractory metals, quartz, and semiconductors for applications to 3200 °F (1760 °C).

Part No.	Filler	Bonding*	Principal Use
503	Al_2O_3	C–C	Dense Ceramics; Alumina-to-Alumina
552		C–C, C–M	Solid Oxide Fuel Cells; Low CTE Metals
569		C–C, C–M, Quartz	Probes, Sensors, Resistors, Igniters, Heaters
670		C–C, C–M	Ceramic Textiles, Thread-Locking
671		C–C, C–M, M–M	Ceramic Textiles, Thread-Locking
835-M		C–C, C–M, Quartz	Halogen Lamps
835-MB		C–C, C–M, Quartz	Halogen Lamps
865	AlN	C–C, C–M	Probes & Sensors; Thermal Conductivity
600-N	$Al_2O_3 – SiO_2$	C–C, C–M	Refractory Repair
668		C–C, C–M	Oxygen Sensors, Heaters
571	MgO	C–M, M–M	Heaters, Induction Coils, Sensors
632	Mica	Mica	Mica Heaters
618-N	SiO_2	C–C, Quartz	Porous Ceramics, Quartz Tubes & Vessels
516	ZrO_2	C–C, C–M	Thermocouples, Semiconductor Wafers
685-N		C–C, C–M	Gasketing, Heaters, Igniters
835		C–C, C–M	Halogen Lamps
885		C–C	Zirconia, Solid Oxide Fuel Cells
890	SiC	C–C	Crucibles, Heaters, Sagger Plates

*C–C = Ceramic-to-Ceramic C–M = Ceramic-to-Metal M–M = Metal-to-Metal

TYPICAL APPLICATIONS

Electrical
- Halogen Lamps
- Heaters
- Igniters
- Fiberoptics
- Resistors
- Solid Oxide Fuel Cells

Instruments & Sensors
- Gas Chromatographs
- High Vacuum Components
- Liquid Metal Inclusion Counters
- Mass Spectrometers
- Oxygen Analyzers
- Strain Gauges
- Semiconductors
- Temperature Probes

Mechanical
- Ceramic Honeycombs
- Ceramic Textiles
- Graphite Blocks
- Refractory Insulation
- Sagger Plates
- Thread-Locking

HIGH TEMPERATURE CERAMIC ADHESIVES PROPERTIES

Part Number		503	552	569	670	671	835-M	835-MB	600-N	668
Tradename		Ceramabond™								
Major Constituent		Al_2O_3							$Al_2O_3 – SiO_2$	
Color		White	White	White	White	White	White	White	Tan	White
Temperature Limit, °F (°C)		3000 (1650)	3000 (1650)	3000 (1650)	3000 (1650)	3200 (1760)	3000 (1650)	3000 (1650)	3000 (1650)	2500 (1371)
No. Components		1	1	1	1	1	1	2	1	1
Viscosity, cP		50,000–90,000	53,000–73,000	Paste	2,500–5,000	40,000–80,000	30,000–40,000	40,000–80,000	5,000–15,000	40,000–80,000
Specific Gravity, g/cc		2.35–2.55	1.90–2.20	2.15–2.30	1.80–1.95	2.05–2.15	2.35–2.45	2.00–2.15	2.00–2.05	2.20–2.40
CTE, in/in/°F × 10^{-6} (°C)		4.0 (7.2)	4.3 (7.7)	4.2 (7.6)	4.3 (7.7)	4.3 (7.7)	4.0 (7.2)	3.8 (6.8)	3.0 (5.4)	4.0 (7.2)
Handling	**Mix Ratio,** powder:liquid	NA	NA	NA	NA	NA	NA	100 : 60–80	NA	NA
Handling	**Thinner**	503-T	552-T	569-T	670-T	671-T	835-M-T	835-MB-T	600-T	668-T
Handling	**Solvent**	Water	Water	Water	Water	Water	Water	Water	Water	Water
Handling	**Application Temperature,** °F	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90
Handling	**Storage Temperature,** °F	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90
Handling	**Shelf Life,** months	6	6	6	6	6	6	6	6	6
Curing	**Air Set,** hrs	≤ 1	1–4	1–4	1–4	1–4	1–4	1–4	1–4	1
Curing	**Heat Cure,** °F, hrs	200, 2 + 500, 2 + 700, 2	200, 2 + 500, 2	200, 2	200, 2	200, 2	200, 2	200, 2 + 350, 2 + 500, 2	200, 2 + 350, 1	200, 1–4
Dielectric Strength, volts/mil @ RT		171	173	138	142	182	163	202	203	118
Torque Strength, ft-lbs[1]		60	52	38	60	57	63	27	14	38
Moisture Resistance[2]		Good	Excellent	Excellent	Excellent	Excellent	Good	Good	Excellent	Excellent
Alkali Resistance[2]		Fair	Good	Good	Good	Excellent	Excellent	Excellent	Good	Excellent
Acid Resistance[2]		Excellent	Good	Excellent	Good	Good	Good	Good	Good	Good

Footnotes

[1] Tested using a torque wrench after bonding a pre-oxidized ½″–13 nut and bolt and final curing at 1000 °F.

[2] Properties were evaluated after curing at 700 °F for 2 hours.

General Notes

1. Ceramabond adhesives do not contain volatile organic compounds (VOCs).
2. Special pigments available upon request.
3. Many adhesives including 503, 516, 552, 569, 571, 618-N, 671, 835-M, and 890 can be formulated using 1-5 micron ceramic powders. Add “-VFG” to the part number (eg. 503-VFG).

Abbreviations

NA Not Applicable
NM Not Measured

HIGH TEMPERATURE CERAMIC ADHESIVES PROPERTIES

Part Number		865	571[3]	632	618-N	890[4]	516	685-N	835	885[4]
Tradename		Ceramabond™								
Major Constituent		AlN	MgO	Mica	SiO_2	SiC	$ZrO_2 – ZrSiO_4$			
Color		Gray	Off-White	Tan	Off-White	Blue-Gray	Tan	Tan	Tan	Tan
Temperature Limit, °F (°C)		3000 (1650)	3200 (1760)	2300 (1260)	3000 (1650)	3000 (1650)	3200 (1760)	3000 (1371)	3000 (1371)	3200 (1760)
No. Components		1	2	1	1	1	1	1	1	1
Viscosity, cP		Paste	20,000–90,000	10,000–25,000	40,000–60,000	35,000–55,000	40,000–70,000	5,000–20,000	20,000–40,000	10,000–20,000
Specific Gravity, g/cc		1.95–2.15	1.90–2.20	1.45–1.50	1.80–1.90	1.70–1.75	2.15–2.30	1.85–1.95	2.25–2.35	2.65–2.70
CTE, in/in/°F × 10^{-6} (°C)		1.5 (2.7)	7.0 (12.6)	4.7 (8.5)	.33 (.59)	2.4 (4.4)	4.1 (7.4)	4.5 (8.1)	4.0 (7.2)	4.0 (7.2)
Handling	**Mix Ratio,** powder:liquid	NA	1.0:1.0, 1.5:1.0	NA	NA	NA	NA	NA	NA	NA
Handling	**Thinner**	865-T	571-T	632-T	618-N-T	890-T	516-T	685-N-T	835-T	885-T
Handling	**Solvent**	Water	Water	Water	Water	Water	Water	Water	Water	Water
Handling	**Application Temperature,** °F	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90
Handling	**Storage Temperature,** °F	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90
Handling	**Shelf Life,** months	6	6	6	6	6	6	6	6	6
Curing	**Air Set,** hrs	1–4	1–4	1–4	1–4	≤ 1	1–4	1–4	≤ 1	≤ 1
Curing	**Heat Cure,** °F, hrs	200, 2 + 350, 2 + 500, 2	200, 2	200, 2 + 500, 2	200, 2 + 500, 2 + 700, 2	200, 2 + 500, 2 + 700, 2	200, 2 + 500, 2 + 700, 2	200, 2	200,2	200, 2 + 500, 2 + 700, 2
Dielectric Strength, volts/mil @ RT		187	91	150	156	73	188	176	111	105
Torque Strength, ft-lbs[1]		27	22	2	77	40	50	35	50	40
Moisture Resistance[2]		Excellent	Excellent	Good	Excellent	Good	Good	Excellent	Good	Good
Alkali Resistance[2]		Good	Good	Good	Good	Good	Excellent	Good	Good	Good
Acid Resistance[2]		Good	Fair	Good	Good	Good	Good	Good	Good	Good

Footnotes

[1] Tested using a torque wrench after bonding a pre-oxidized ½″–13 nut and bolt and final curing at 1000 °F.
[2] Properties were evaluated after curing at 700 °F for 2 hours.
[3] Ceramabond™ 571 ranges for viscosity and specific gravity reflect a powder-to-liquid mix ratio that ranges from 1-to-1 to 1.5-to-1.
[4] Ceramabond™ 885 and 890 are also available in high pH, silicate-bonded systems. Part numbers are 885-K and 890-K. Contact Aremco for special pricing.

General Notes

1. Ceramabond adhesives do not contain volatile organic compounds (VOCs).
2. Special pigments available upon request.
3. Many adhesives including 503, 516, 552, 569, 571, 618-N, 671, 835-M, and 890 can be formulated using 1-5 micron ceramic powders. Add “-VFG” to the part number (eg. 503-VFG).

Abbreviations

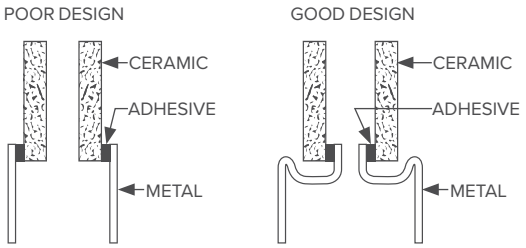
NA Not Applicable
NM Not Measured

DESIGN GUIDELINES

General design criteria for bonding with ceramic adhesives are similar to those for epoxy adhesives. Main considerations include the **coefficient of thermal expansion, joint design, glue line thickness,** and **operating environment.**

Coefficient of Thermal Expansion

CERAMIC-TO-METAL RECOMMENDED DESIGN

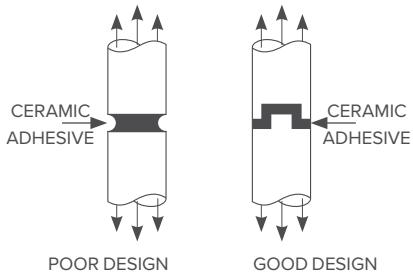


Due to the high thermal loading implicit in most ceramic adhesive applications, the joint design should account for the difference in the coefficient of thermal expansion between the adhesive and the components that are being joined. In the illustration above, note that the "poor" design loads the adhesive in tension since the metal expands faster than the ceramic. The "good" design allows for this thermal mismatch and loads the adhesion in compression, offering higher reliability.

Joint Design

Most adhesives offer relatively poor tensile-shear strength, so it is important to design a joint that will distribute the mechanical stress by maximizing the length of the glue line as shown in this illustration.

CERAMIC-TO-CERAMIC RECOMMENDED JOINT DESIGN



Glue Line Thickness

The clearance between mating parts at operating temperature should be 2–8 mils (50–200 microns). Less than 2 mils will prevent uniform adhesion; greater than 8 mils will often result in cohesive shear failure within the adhesive. A maximum depth of 0.25" is recommended when using a ceramic adhesive for a small potting application.

Operating Environment

These adhesives offer excellent chemical, electrical and ultra high thermal resistance, and do not outgas under high vacuum. The main limitations are (a) relatively low mechanical strength and (b) slight porosity after curing. Contact Aremco for suggestions about how to reduce porosity and produce gas-tight seals.

APPLICATION PROCEDURES

Surface Preparation

Smooth surfaces are difficult to bond and should be etched, abrasive blasted or oxidized, then cleaned thoroughly prior to application. Aremco's Corr-Prep™ CPR2000 is recommended for etching metals. Porous substrates should be pre-coated with a binder (thinner) to prevent separation and absorption of the adhesive binder. Add a "-T" to the part number (eg. 503-T) to designate the product thinner.

Mixing

One-part adhesives tend to settle and should be mixed thoroughly prior to use. Refer to Tech Bulletin A12 for information about Aremco's **Model 7000 Pneumatic Mixer.** Mix ratios for two-part adhesives are shown in the Property Chart. Viscosity may be adjusted by thinning up to 20% by weight.

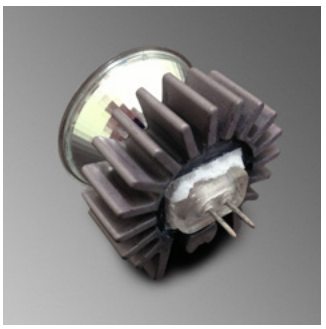
Application

Apply a thin coat of adhesive to each surface using a brush, spatula or dispenser. Using a clamp or similar tool, maintain a uniform glue line of 2–8 mils (200–500 microns) by applying even pressure across the assembly. Wipe away excess material prior to drying. Refer to Tech Bulletin A12 for optional dispensing tools.

Model 7000 Mixer

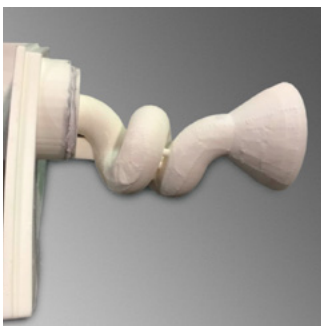
Curing

Refer to the Property Chart for specific curing instructions for each product.

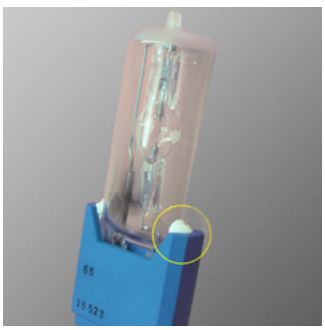


Ceramabond™ 835-M bonds heat sink to halogen lamp.

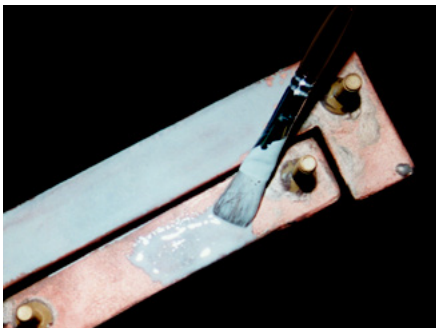
Ceramabond™ 569 bonds flex heater to quartz vessel.



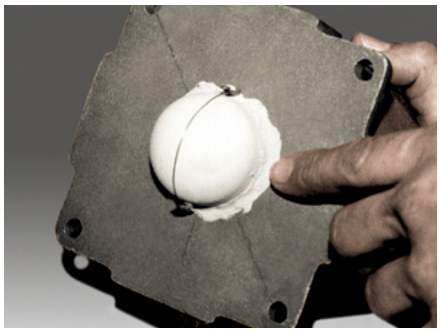
Ceramabond™ 503 coats spiral cantilevered sensor.



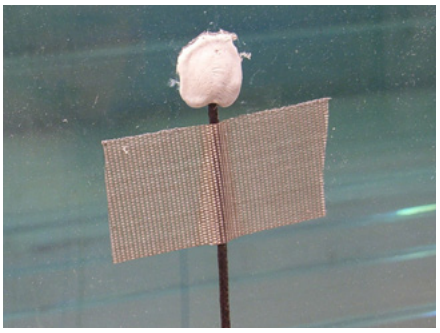
Ceramabond™ 569 bonds IR heater to ceramic insulator.



Ceramabond™ 571 coats copper induction heater.

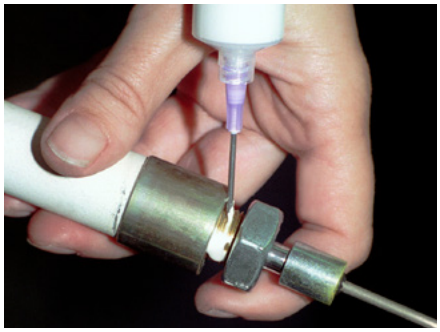


Ceramabond™ 571 coats oxygen sensor.



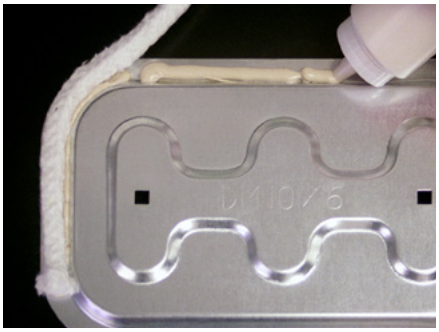
Ceramabond™ 571 bonds thermocouple to glass.

Ceramabond™ 618-N bonds porous ceramic filter elements.

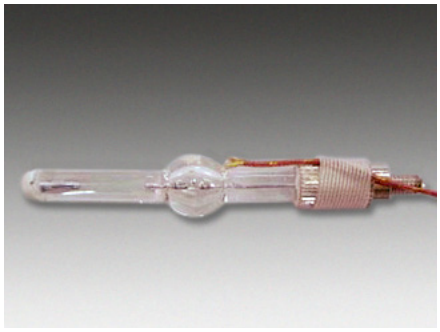


Ceramabond™ 671 used as a high temp threadlocker.

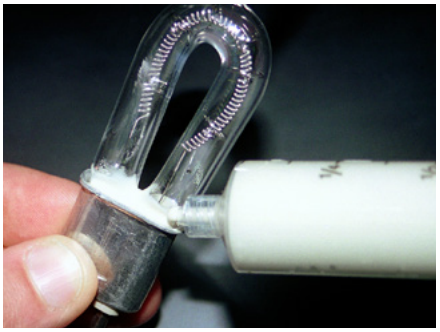
Ceramabond™ 503 repairs furnace saggar plate.



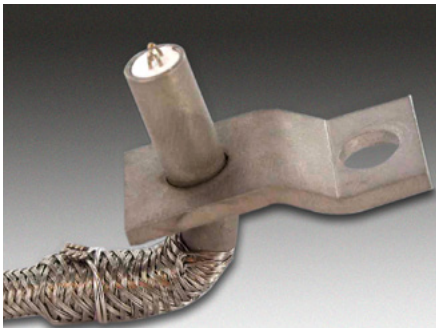
Ceramabond™ 685-N bonds ceramic gasket.



Ultra-Temp™ 516 bonds thermocouple to quartz tube.

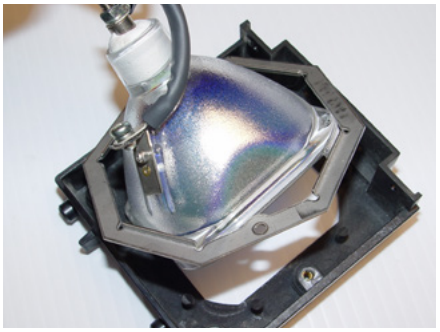


Ceramabond™ 835 bonds halogen lamp.



Ceramabond™ 552 seals thermocouple in metal housing.

Ceramabond™ 835-M bonds cover to halogen lamp.



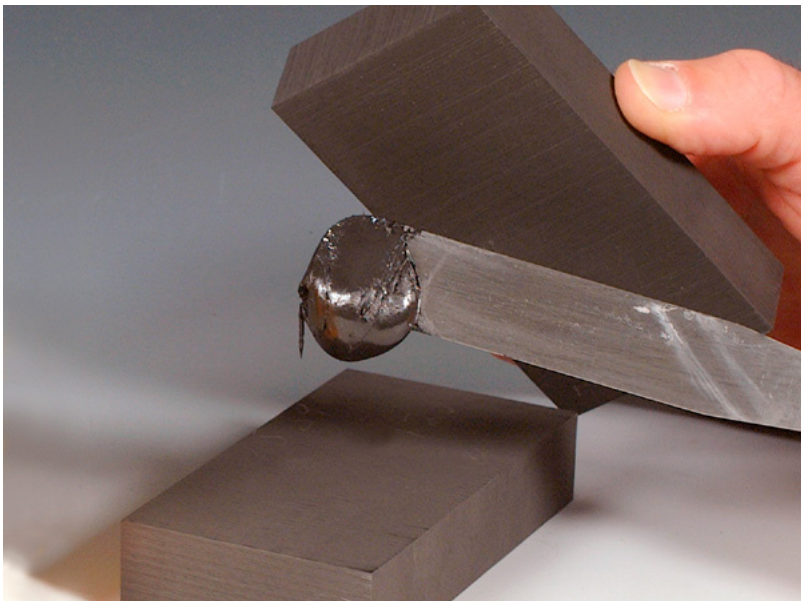
Ceramabond™ 835-M bonds halogen lamp.

CERAMIC ADHESIVE SELECTOR CHART

	Material	CTE °F (°C)	503	552	569	670	671	835-M	835-MB	600-N	600-HV	668	865	571	632	618-N	890	516	685-N	835	885
						Al_2O_3					$Al_2O_3 – SiO_2$		AlN	MgO	Mica	SiO_2	SiC		$ZrO_2 – ZrSiO_4$		
CERAMICS	Alumina	4.4 (7.9)	•	•	•	•	•	•	•			x		x							
	Alumina-Silica	1.8 (3.2)								x	x	•									
	Aluminum Nitride	1.5 (2.7)											•			x					
	Beryllia	4.1 (7.4)	•	x	x	x	x	x										x	x	x	x
	Boron Carbide	2.6 (4.7)	x									x					x				
	Boron Nitride	4.2 (7.6)	x																		
	Borosilicate Glass	1.8 (3.2)	x													•					
	Calcium Silicate	3.0 (5.4)				•															
	Ceramic Textile	–				•	x												x		
	Cordierite	1.1 (2.0)														•					
	Graphite	4.3 (7.7)	x														x				
	Macor	5.2 (9.4)		x	•	x	x	x				x		x	x						
	Mica	4.7 (8.5)													•						
	Mullite	3.0 (5.4)	x	x	x	x						•						x	x	x	
	Quartz	0.30 (0.54)	x		x			x	x			x				•				x	
	Refractory, Dense	–	•														•				x
	Refractory, Light Weight	–								•	•										
	Sapphire	4.2 (7.6)	•		x	x		x	x			x									
	Silica	0.31 (0.56)										x				•					
	Silicon Carbide	2.9 (5.2)	x														•				
	Silicon Nitride	1.8 (3.2)	x									x	x			x	x				
	Steatite	4.0 (7.2)		x	•		x	x	x			x							x	•	
	Zirconia	5.7 (10.3)																x	x	x	•
	Zirconia Silicate	4.0 (7.2)																•	•	•	x
METALS	Aluminum	15.0 (27.0)												•							
	Brass	10.2 (18.4)												•							
	Cast Iron	5.9 (10.6)		x	x	x	x	x				x		•	x				x		
	Copper	9.3 (16.7)												•							
	Inconel	6.4 (11.5)		x	x	x	x	x				x		•							
	Molybdenum	2.9 (5.2)		x	•	x	x	x				•						x	x	x	
	Nickel	7.2 (13.0)												•							
	Nickel-Iron	2.6 (4.7)		x	•	x	x	x				•						x	x	x	
	Platinum	4.9 (8.8)	•	x	x	x															
	Silicon	1.6 (2.9)										x	x					x	x	x	
	Silver	10.6 (19.1)												x							
	Stainless (300 Series)	9.6 (17.3)										x		x							
	Stainless (400 Series)	6.2 (11.2)		x	x	x	x	x				x		•				x	x	x	
	Steel (1010)	6.5 (11.7)		x	x	x	x	x				x		•				x	x	x	
	Tantalum	3.9 (7.0)		x	x	x	x	x				•		x				x	x	x	
	Titanium	5.8 (10.4)		x	x	x	x	x				x		•				x	x	x	
	Tungsten	2.5 (4.5)		x	•	x	x	x				•						x	x	x	

• = Preferred, x = Applicable

Refer to Price List for availability of sample kits and complete order information.



Graphi-Bond™ 551-RN bonds graphite blocks.

Graphi-Bond™ 551-RN seals sensor in carbon brushes.

Aremco's high temperature graphite adhesives are formulated using both phenolic and silicate binders to bond carbon, carbon fiber composite (CFC), and graphite components, structures and tools used in a broad range of applications to 5400 °F (2985 °C).

Part No.	551-RN	551-RN-MV	669
Filler	Graphite	Carbon	Graphite
Binder	Phenolic	Phenolic	Silicate
Consistency	High Viscosity	Medium Viscosity	Low Viscosity
Use Atmosphere	Reducing/Vacuum	Reducing/Vacuum	Oxidizing
Bond Strength	High	Ultra-High	Moderate
Max Temperature	5400 °F (2985 °C)	5400 °F (2985 °C)	1400 °F (760 °C)

TYPICAL APPLICATIONS

Bonding
- Graphite Insulation
- Carbon Brick
- Carbon Foam & Felt
- Carbon Fiber Composites
- Graphite Rams & Punches
- Graphite Sight Tubes
- Graphite Pour Spouts
- Graphite Foil to Rigid Graphite Insulation
- Graphite Foil to CFC

Laminating
- Carbon Fiber Composites

Reparing
- Graphite Trays, Dies, Jigs, Fixtures
- Patch Holes
- Fix Scratches
- Repair Susceptors

Sealing
- Porosity in Carbon & Graphite

HIGH TEMPERATURE GRAPHITE ADHESIVES PROPERTIES

Part Number		551-RN[1,2]	551-RN-MV[1,2]	669
Tradename			Graphi-Bond™	
Major Constituent		Graphite	Carbon	Graphite
Color		Black	Black	Black
Temperature Limit, °F (°C)		5400 (2985)	5400 (2985)	1400 (760)
No. Components		1	1	1
Viscosity, cP		Paste	60,000–90,000	20,000–40,000
Specific Gravity, g/cc		1.45–1.50	1.15–1.25	1.45–1.50
CTE, in/in/°F × 10^{-6} (°C)		4.1 (7.4)	4.1 (7.4)	4.2 (7.6)
Handling	**Mix Ratio,** powder:liquid	NA	NA	NA
Handling	**Thinner**	Ethanol[3]	Ethanol[3]	669-T / H_2O
Handling	**Application Temperature,** °F	40–90	40–90	50–90
Handling	**Storage Temperature,** °F	30–75	30–75	40–90
Handling	**Shelf Life,** months	6	6	6
Curing	**Air Set,** hrs	1–4	1–4	1–4
Curing	**Heat Cure,** °F, hrs	265, 4 + 500, 2	265, 4 + 500, 2	200, 2
Bond Type		99% Carbonaceous	99% Carbonaceous	Silicate-Graphite
Dielectric Strength, volts/mil @ RT		75	130	105
Lap-Shear Strength, psi @ RT Post-Cure		810	1425	224
Moisture Resistance		Excellent	Excellent	Excellent
Alkali Resistance		Good	Good	Good
Acid Resistance		Good	Good	Good

APPLICATION PROCEDURES

Surface Preparation
Remove any loose or embedded carbon or graphite dust thoroughly prior to adhesive application and make sure the substrate is completely dry and free of moisture.

Mixing
Make sure adhesive is brought to room temperature prior to application and remix as needed using a spatula or automatic equipment. Refer to Tech Bulletin A12 for information about Aremco's **Model 7000 Pneumatic Mixer.** Viscosity may be adjusted by using the thinner indicated in the property chart up to 20% by weight.

Application
Apply a thin coat of adhesive to each substrate using a proper tool. Use a clamp to maintain a uniform glue line thickness of 5–10 mils across the joint. Wipe away excess material prior to drying and curing.

Curing
Refer to the Property Chart for specific curing instructions for each product. Note that excessive film thickness or rapid heating may result in blisters.

Footnotes
[1] Graphi-Bond 551-RN and 551-RN-MV are also offered in a two-part, resin and powder, kit. Add "-X" to part number.
[2] Graphi-Bond 551-RN and 551-RN-MV volatile loss is complete at ~1300 °F (700 °C). Major loss occurs at 200–400 °C, methane at < 400 °C, hydrogen to 700 °C.
[3] Graphi-Bond™ 551-RN and 551-RN-MV can also be thinned with methanol and isopropyl alcohol.

Abbreviations
NA Not Applicable

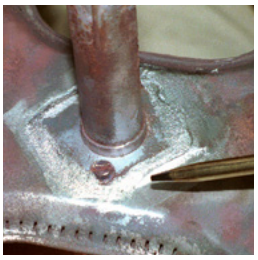
Refer to Price List for availability of sample kits and complete order information.

AREMCO

HIGH TEMPERATURE CERAMIC-METALLIC PASTES

Technical Bulletin A3

Pyro-Putty® High Temperature Pastes are used to seal joints and repair defects in cast aluminum, cast iron, steel and stainless steel. Formulated using the most advanced organic and inorganic-ceramic technologies, these materials resist temperatures to over 2000 °F. Applications for Pyro-Putty® are widespread and found typically in the aerospace, automotive, foundry, heat-treating, incineration, and power generation industries.



Pyro-Putty® 653 seals corroded burner manifold.

Pyro-Putty® 950 seals turbo.

Ceramic-Metallic Filled Inorganic Pastes

Pyro-Putty® 653

- Ceramic & Stainless Filled, One-Part, Water-Based Paste
- For Vertical Surfaces to ½" Thick
- Repairs Cast Iron, Steel & Stainless Parts to 2000 °F

Pyro-Putty® 1000

- Ceramic & Aluminum Filled, Two-Part, Water-Based System
- For Vertical Surfaces to ½" Thick
- Repairs Cast Iron, Steel & Stainless Parts to 1400 °F

Pyro-Putty® 2400

- Ceramic & Stainless Filled, One-Part, Water-Based Paste
- For Applications to ⅜" Thick
- Repairs Cast Iron, Steel & Stainless Parts to 2000 °F

TYPICAL APPLICATIONS

- Afterburners
- Boilers
- Castings
- Exhaust Stacks
- Headers
- Incinerators
- Manifolds
- Molds and Dies
- Heat Exchangers

Ceramic-Filled Resinous Pastes

Pyro-Putty® 950

- Ceramic Fiber Filled, Organic-Resinous Gasket Seal
- For sealing High Temperature Joints to 950 °F, 750 psi
- Cures to a Tough, Pliable, Chemically Resistant Material

Pyro-Putty® 1500

- Ceramic Fiber Filled, Organic-Resinous Gasket Seal
- Seals Boiler Doors & Molten Metal Systems
- Easy to Apply & Remove, For Uses to 2300 °F

TYPICAL APPLICATIONS

- Turbines
- Boilers
- Heat Exchangers
- Compressors
- Pumps
- Blowers
- Piping
- Ducting
- Furnaces
- Ovens
- Steam Valves
- Foundry Molds

PYRO-PUTTY® PROPERTIES

Type		Ceramic-Metallic Filled Inorganic Pastes			Ceramic-Filled Resinous Pastes	
Part Number		**653**	**1000**	**2400**	**950**	**1500**
Filler		Stainless	Aluminum	Stainless	Ceramic Fiber	Ceramic Fiber
Color		Metallic Gray	Light Gray	Metallic Gray	Silver Gray	Gray Brown
Temperature Limit, °F (°C)		2000 (1093)	1400 (760)	2000 (1093)	950 (510)	2300 (1260)
Specific Gravity, g/cc		1.90	1.80	1.50	1.09	1.27
Viscosity, cP		Paste	Paste	Paste	Paste	Paste
No. Components		1	2	1	1	1
Mix Ratio, Powder:Liquid		NA	2:1	NA	NA	NA
Curing	**Air Set,** hrs	2–4	2–4	5–7	NA	1–2
Curing	**Heat Cure,** °F/hrs	200 / 3–4	160 / 1–2	200 / 2–4	400 / 1 or 225 / 6	200 / 1
Shelf Life, months		6	6	6	6	6
Storage, °F		40–90	40–90	40–90	40–90	40–90
Packaging		Pint, Quart, Gallon, 5-Gallon	Pint, Quart, Gallon, 5-Gallon	Pint, Quart, Gallon, 5-Gallon	11 oz. Tube	11 oz. Tube, Pint, Quart, Gallon, 5-Gallon

APPLICATION PROCEDURES

Surface Preparation
All surfaces must be free of oil, grease, dirt, corrosives or other contaminants before application. Porous metal castings should be baked at high temperature to burn off embedded oils. Smooth metal surfaces should be abrasive blasted with a coarse media to a minimum SP-10 near white blast (0.001" minimum profile) for best results.

Mixing
All products should be mixed thoroughly to a uniform consistency prior to use. Product viscosities may be reduced by adding a maximum of 5–10% by weight of the appropriate thinner. Thinner may be ordered by adding a "-T" to the product number (eg. 653-T). The mix ratio for Pyro-Putty® 1000 is 2.0 parts powder to 1.0–1.5 parts liquid by weight. This ratio will produce the consistency of a thick paste. Pyro-Putty® 1000 will outgas slightly after mixing and it is recommended that the mixture be limited to the amount required for a specific application. Store mixed material at room temperature in a plastic container that is approximately twice the mixture volume. Allow to outgas for 24 hours. Remix contents thoroughly prior to use. Note that mixture will not begin to harden in a closed container for over 24 hours. Hardening will initiate when mixture is removed from container and exposed to air.

Application
Pyro-Putty® products may be applied using a spatula, putty knife or caulk gun. For cross-sections greater than ⅛"–¼" multiple applications should be made to avoid blistering. Cross-sections for all products should not exceed ½"–¾" (⅜" maximum for Pyro-Putty® 2400).

Curing
The following instructions are guidelines for curing. Alternative cure times may be appropriate depending on the size of the application.

Pyro-Putty® 653
1. Air dry for 2 hours at room temperature and up to 4 hours for thick cross-sections.
2. Heat cure at 200 °F for 3 hours.
3. For multiple applications, air set for 1–2 hours between coats, then heat cure at 200 °F for 3–4 hours after the last coat.

Pyro-Putty® 950
1. This product can be cured in service at the operating temperature of the equipment.
2. For curing before service, heat cure the joint without pressure at 400 °F for 30–60 minutes or 225 °F for 4–6 hours.

Pyro-Putty® 1000
1. A heat cure is not required for cross-sections less than ⅛" thick. Air dry at room temperature for a minimum of 2–4 hours prior to use.
2. A heat cure is recommended for cross-sections greater than ⅛" thick. Air dry at room temperature for a minimum of 2–4 hours, then heat cure at 160 °F for 1–2 hours.
3. After curing, this product can be sanded to achieve a bright aluminum appearance.

Pyro-Putty® 1000 bonds heater.

Pyro-Putty® 2400 seals high temp ducting.

Pyro-Putty® 2400 seals high temp threads.

Pyro-Putty® 1500
1. This product dries at room temperature and cures in service at the operating temperature of the equipment.

Pyro-Putty® 2400
1. Air dry at room temperature for a minimum of 5–7 hours, longer for thick cross-sections.
2. A heat cure is not required if the use temperature exceeds 400 °F. Otherwise, heat cure at 200 °F for 2–4 hours.

Storage
Unopened containers have a six month shelf life when stored at room temperature. Make sure opened containers are capped securely to prevent evaporation. Place a plastic film in between the cap and container to prevent air leakage. The container may be inverted periodically to minimize settling. Store container between 40 °F and 90 °F.

Safety
Read Material Safety Data Sheet carefully before using any of the above products. Prolonged skin contact should be avoided due to possible irritation. In the uncured state, materials can be washed from the skin with a mild soap and water. If any material contacts eyes, flush continuously with water or neutralizing solutions, then consult a physician immediately.

Refer to Price List for complete order information.

Aremco Ceramacast™ products provide the most expansive range of ceramic- and silicone-based materials for the assembly of high temperature, high power electrical devices, fixtures, molds and tooling.

PRODUCT HIGHLIGHTS

Aluminum Oxide Systems

510	Coarse Grain Castable for Tooling and Induction Heaters
515	Fine Grain, High Strength Potting Compound
575	Fine Grain Potting Compound for Small Devices
575-N	Fine Grain Castable for Potting & Tooling
576-N	Medium Grain Castable for Large Potting & Tooling

Aluminum Nitride System

675-N	Thermally Conductive Fine Grain Compound for Potting

Magnesium Oxide System

584	Two-Part, Fast-Set, Compound for Casting & Potting

Silicon Dioxide Systems

645-N	Low Thermal Conductivity, Low Expansion, Light-Weight
905	Moisture Resistant Silicone, Coarse Grain Compound
905-FG	Moisture Resistant Silicone, Fine Grain Compound

Silicon Carbide Systems

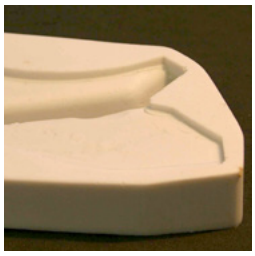
673	Thermally Conductive Two-Part Molding Compound
673-N	Thermally Conductive Adhesive & Potting Compound

Zirconium Oxide System

646-N	High Density, High Strength Castable & Potting Compound

Zirconium Silicate Systems

505-N	High Strength Compound for Molding & Potting
586	High Strength Dispensable Compound for Potting & Casting
900-N	High Density, High Strength Molding Compound

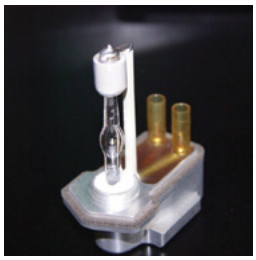


Ceramacast™ 900-N casts small, dense part.

Ceramacast™ 645-N insulates metal collar.

Ceramacast™ 673 mold for down-hole drill bit.

Ceramacast™ 673-N bonds SiC combustion nozzle.

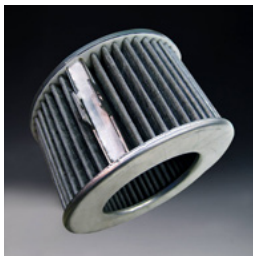


Ceramacast™ 575-N bonds Xenon arc lamp.

Ceramacast™ 586 pots ignitor and cartridge heater.

Ceramacast™ 645-N fixture resists propane torch.

Ceramacast™ 505-N is used in high temp filter assembly.



Ceramacast™ 586 is used in high temp filter assembly.

Ceramacast™ 586 pots high power resistor.

CERAMACAST™ HIGH TEMPERATURE POTTING AND CASTING MATERIALS PROPERTIES

Product Number	510	515	575	575-N	576-N	675-N	584	645-N	905[3]	905-FG[3]	673	673-N	646-N	505-N	586	900-N
Major Constituent	Aluminum Oxide					Aluminum Nitride	Magnesium Oxide	Silicon Dioxide			Silicon Carbide		Zirconium Oxide	Zirconium Silicate		
Binder	$CaO\text{-}Al_2O_3$	$K_2\text{-}SiO_2$	$CaO\text{-}Al_2O_3$	$MgO\text{-}P_2O_5$		$MgO\text{-}P_2O_5$	SiO_2	$MgO\text{-}P_2O_5$	Silicone		$CaO\text{-}Al_2O_3$	$MgO\text{-}P_2O_5$	$MgO\text{-}P_2O_5$	$K_2\text{-}SiO_2$	$MgO\text{-}P_2O_5$	$MgO\text{-}P_2O_5$
Temperature Limit, °F (°C)	3200 (1760)	3000 (1650)	3000 (1650)	3000 (1650)	3000 (1650)	2200 (1200)	2800 (1535)	3000 (1650)	900 (482)	900 (482)	2500 (1371)	2500 (1371)	3000 (1650)	2800 (1535)	2800 (1535)	2800 (1535)
CTE, in/in/°F × 10^{-6} (°C)	3.9 (7.0)	4.5 (8.1)	4.3 (7.7)	4.3 (7.7)	4.1 (7.4)	2.9 (5.2)	6.5 (11.7)	1.5 (2.7)	2.0 (3.8)	2.0 (3.8)	3.8 (6.8)	2.9 (5.2)	3.1 (5.6)	2.7 (4.9)	2.7 (4.9)	2.8 (5.0)
Volume Resistivity, ohm-cm @ RT	10^9	10^9	10^9	10^9	10^9	10^{13}	10^9	10^9	10^{11}	10^{11}	NA	NA	10^9	10^9	10^9	10^9
Dielectric Strength, volts/mil @ RT	75	250	150	150	150	300	100	300	> 250	> 250	NA	NA	250	100	125	125
Compressive Strength, psi	8,000	11,000	7,500	11,800	10,200	2,000	4,500	7,000	NM	NM	5,000	5,000	11,500	12,800	8,000	11,200
Porosity, %	< 7.0	< 2.0	< 6.0	< 2.0	< 2.0	< 3.0	< 6.0	< 5.0	< 0.5	< 0.5	< 9.0	< 4.0	< 2.0	< 2.0	< 2.0	< 2.0
pH	3–4	11–12	3–4	2–3	2–3	2–3	11–12	2–3	NM	NM	5–6	2–3	2–3	10–11	2–3	2-3
Moisture Resistance	Good	Good	Good	Good	Good	Good	Good	Good	Excellent	Excellent	Good	Good	Good	Excellent	Good	Good
Alkali Resistance	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
Acid Resistance[1]	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good	Good
No. Components	1 + H_2O	1 + H_2O	1 + H_2O	1 + H_2O^2	1 + H_2O^2	1 + H_2O^2	2	1 + H_2O^2	2	2	2	1 + H_2O^2	1 + H_2O^2	1 + H_2O	1 + H_2O^2	2
Mix Ratio, powder:liquid	100 : 15–19	100 : 12–14	100 : 19–22	100 : 13–15	100 : 12–14	100 : 16–18	100 : 25-30	100 : 21–23	2 : 1	3 : 1	100 : 17–20	100 : 13–14	100 : 12–14	100 : 11–13	100 : 13–15	100 : 11–13
Mixed Viscosity, cP	12,000	10,000	16,000	11,000	9,000	15,000	18,000	10,000	Paste	Paste	16,000	12,000	9,000	10,000	15,000	20,000
Shrinkage, % at 1000 °F	< 1.0	< 1.0	< 1.0	< 0.3	< 0.3	< 0.3	< 4.0	< 0.3	< 1.0	< 1.0	< 1.0	< 0.3	< 0.3	< 0.3	< 0.3	< 1.0
Pot Life, hrs	2–3	2–3	2–3	1–2	1–2	1–2	< 10 mins	1–2	NA	NA	< 20 mins	1–2	1–2	1–2	1–2	< 45 mins
Shelf Life, months	12	12	12	12	12	12	1	12	905-L:6 905-P:12	12	12	12	12	12	12	12
Color	Light Gray	White	White	White	White	Light Gray	Off-White	Off-White	Off-White	White	Gray	Gray	Tan	Off-White	Off-White	Off-White
Approximate Powder Density, lbs/gal	15	12	12	12.5	14.5	10.5	12	11	P-9.6/L-4.8	P-9.6/L-3.2	12	14.5	15.5	14	13	13

Reference Notes

[1] All products are attacked by hydrofluoric acid.

[2] These products can be mixed alternatively with HLB-1 Hydrophobic Liquid Binder to achieve higher moisture resistance.

[3] Ceramacast™ 905 and 905-FG moisture resistance, porosity and shrinkage were tested at 900 °F only.

Abbreviations

NA Not Applicable

NM Not Measured

APPLICATION PROCEDURES

Mixing

Blend powder thoroughly prior to adding water or liquid binder. Use the following mix ratios, adding the liquid into the powder and mixing thoroughly until smooth and uniform. Pour the mixture carefully into one side of the part. Vibrate as required to eliminate air bubbles. Agitate continuously or refrigerate to extend the pot life.

	Weight Ratios			
Product	Powder	Liquid	Min	Max
505-N	100	Water	11	13
510	100	Water	15	19
515	100	Water	12	14
575	100	Water	19	22
575-N	100	Water, HLB-1	13	15
576-N	100	Water, HLB-1	12	14
584	100	584-L	25	30
586	100	Water, HLB-1	13	15
645-N	100	Water, HLB-1	21	23
646-N	100	Water, HLB-1	12	14
673	100	673-L	17	20
673-N	100	Water, HLB-1	13	14
675-N	100	Water, HLB-1	16	18
900-N	100	Water	11	13
905*	100	905-L	45	55
905-FG*	100	905-FG-L	30	35

*Ceramacast™ 905 and 905-FG are offered primarily in two-part kits consisting of a powder and liquid binder. The kit for 905 includes the 905-P powder and 905-L liquid; the kit for 905-FG includes the 905-FG-P powder and 905-FG-L liquid.

The liquid portion of these kits can also be supplied as a powdered binder and the user would add the solvent methyl ethyl ketone in a 1:1 ratio by weight at the time of use. The powdered binder is recommended for international customers for which hazardous freight charges associated with shipping solvent-based systems can be cost prohibitive. Use part numbers 905X and 905-FGX to order powder binder kits.

Note that Ceramacast™ 905 and 905-FG are not pourable. After the powder is thoroughly wet-out by the liquid binder, load the mixture to a filter bag and squeeze out the residual liquid. Ladle the mixture into the part and cure as recommended to obtain a dense, moisture resistant part.

Curing

Ceramacast™ 505-N, 515

1. Dry for 16–24 hours at room temperature.
2. Bake at 200 °F for 1–4 hours.
3. Bake at 250 °F for 1–4 hours.
4. Bake at 350 °F for 1 hour.
5. Final cure at 500 °F for 1 hour.

Ceramacast™ 510, 575, 673

1. Dry for 16–24 hours at room temperature..
2. Bake at 200 °F for 3–4 hours.
3. Final cure at 250 °F for 1 hour.

Ceramacast™ 584

1. Material will set in approximately 10 minutes.
2. Air dry for a minimum of 2 hours.
3. Bake at 200 °F for 2 hours.
4. Final cure at 250 °F for 3 hours.

Ceramacast™ 575-N, 576-N, 586, 645-N, 646-N, 673-N, 675-N, 900-N

1. Dry for 8 hours minimum at room temperature.
2. Bake at 200 °F for 2–4 hours.
3. Final cure at 250 °F for 3 hours.
4. Final cure at 450 °F for 30–60 minutes if using HLB-1 Hydrophobic Liquid Binder.

Ceramacast™ 905, 905-FG

1. Dry for 24 hours room temperature to allow solvent to evaporate.
2. Bake at 150 °F for 1 hour.
3. Bake at 250 °F for 1 hour.
4. Bake at 350 °F for 1 hour.
5. Final cure at 450 °F for 1 hour.

Special Notes

1. Chemically absorbed water will remain in all products even after curing at 250–350 °F. TGA studies indicate that chemically-absorbed water will be fully removed after exposure to 800–1000 °F. Curing at higher temperatures than recommended in the Curing section should be performed to obtain optimal electrical resistance and mechanical strength.
2. If cracking occurs, possible causes include (a) excessive water or liquid binder was used, (b) curing occurred too rapidly, or (c) the cross-sectional thickness of the casting is too high. Contact Aremco for assistance if cracking persists.
3. Ceramacast™ products tend to react with aluminum molds. Use Aremco's EZ-Cast™ 580-N Flexible Silicone Rubber Molding Compound to avoid problems when casting ceramic parts.
4. Refer to Safety Data Sheet prior to use.

SILICONE MOLDING COMPOUNDS

Aremco's EZ-Cast™ 580N is an ideal compound for producing high reliability master molds. This silicone rubber compound exhibits high tear strength, very low shrinkage and high flexibility, all requirements for detailed reproduction.

PROPERTIES		
Upper Temp. Limit, °F (°C)		400 (204)
Lower Temp. Limit, °F (°C)		−76 (−60)
Flexibility		High
Hardness, Durometer, Shore A		45
Tensible Strength, psi		600 Min
Tear Strength, Die B lb/in		110 Min
Elongation, %		400 Min
Linear Shrinkage, %		< 0.1
Handling	**No. of Components**	2
	Mixed Viscosity, cP	30,000
	Specific Gravity, g/cc	1.3
	Mix Ratio, resin:catalyst	10:1
	Pot Life, mins	30
Shelf Life, @RT, months		6
Color		Beige Resin; Deep Red Catalyst
Weight/Gal		10 lbs resin, 1 lb catalyst

Instructions For Use

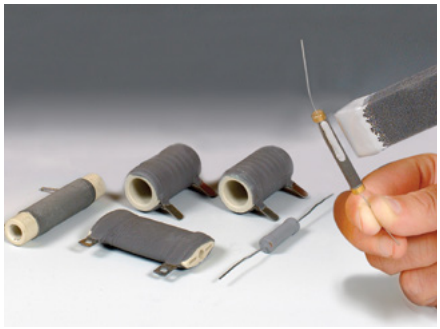
1. Machine a master pattern from aluminum and secure master into an aluminum box with removable sides. If a wooden mold is used, make sure that the mold is sealed with wax and that tapers are included to facilitate removal. *Mold should allow for a cast part wall thickness of ⅜" – ½" minimum.*
2. Premix base and activator thoroughly before blending the components together in a ratio of 10 parts base to 1 part activator.
3. Vacuum degas at 29 in Hg. The mixture will rise to about 3–4 times its original volume, then collapse. Hold vacuum for another 1–2 minutes then release.
4. Pour slowly into a master, to fill all details and prevent air entrapment. Cure for 16–24 hours at room temperature, or 3–4 hours at 120 °F, or 1–2 hours at 150 °F. In humid atmosphere, heat cure for best results.

EZ-CAST™ FLEXIBLE MOLDS IN TWO EASY STEPS

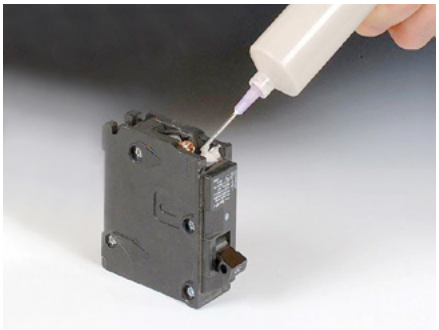
Place the machined master, a duplicate of the finished casting, into a pan, and pour the EZ-Cast™ over the master.

Cure the EZ-Cast™ mold and peel out your finished pliable mold.

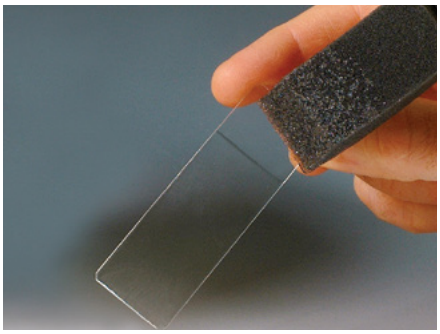
Refer to Price List for complete order information.



Cerama-Dip™ 538-N coats high power resistors.



Ceramacoat™ 512-N insulates circuit breaker terminal.



Aremco-Seal™ 529 transparent high temp sealer.

PRODUCT HIGHLIGHTS

Ceramic-Inorganic

512-N Viscous, off-white, electrical insulation paste for circuit breakers, power resistors and solenoids to 2400 °F (1316 °C).

538-N Low viscosity, light gray, electrical insulation coating for high power resistors and rheostats to 2400 °F (1316 °C). Black and green pigments also available.

540 Medium viscosity, green pigmented, phosphate-bonded, high strength, electrical insulation coating for applications to 3000 °F (1650 °C).

Silicone

529 Transparent silicone sealer with exceptional electrical and moisture resistance to 800 °F (427 °C). High viscosity (HV) and very high viscosity (VHV) versions available.

Silicone-Ceramic

4030 Translucent-white, low-viscosity sealer for porous materials to 900 °F (482 °C).

CP4000-S2 Silicone-resin based, room temperature curing, black pigmented coating for use to 1100 °F (593 °C).

CP4050 Silicone-emulsion based, green pigmented, electrical insulation coating for use to 1100 °F (593 °C). Also available in black, white, blue, brown, yellow and orange pigments.

CP4050-S1 Silicone-resin based, green pigmented, electrical insulation coating for use to 1100 °F (593 °C). Also available in black, white, blue, brown, yellow and orange pigments.

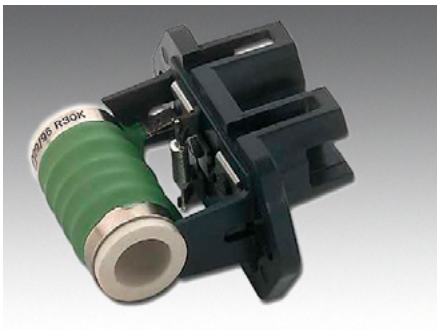
Silicone-Glass

SGC4000 Silicone-glass-ceramic, gray, low viscosity, scratch resistant coating 900 °F (482 °C).

SGC4000-HT Silicone-glass-ceramic, gray, low viscosity, scratch resistant coating 1400 °F (760 °C).

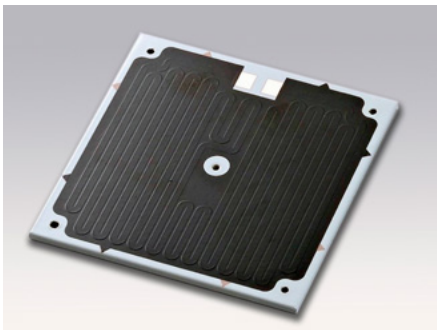
Glass

GC4000 Glass-enamel, gloss-black coating for stainless steel to 1000 °F (538 °C).



Cerama-Dip™ 538-N-GRN coats high power resistor.

Cerama-Dip™ 538-N-BLK coats rheostats.



Glass-Coat™ SGC4000 applied to thick-film heater.

HIGH TEMPERATURE ELECTRICAL COATINGS & SEALANTS

Type	CERAMIC-INORGANIC					SILICONE-CERAMIC			
Product Number	**512-N**	**538-N**	**538-N-BLK**	**538-N-GRN**	**540**	**4030**	**CP4000-S2**	**CP4050**	**CP4050-S1**
Tradename	Ceramacoat™	Cerama-Dip™				Aremco-Seal™		Corr-Paint™	
Color (cured)	Off-White	Light Gray	Black	Green	Green	Translucent-White	Black	Green	Green
Maximum Temperature, °F (°C)	2400 (1316)	2400 (1316)	2400 (1316)	2400 (1316))	3000 (1650)	900 (482)	1100 (593)	1100 (593)	1100 (593)
No. Components	1	1	1	1	1	1	1	1	1
Viscosity, cP[1]	60,000–80,000	5,000–15,000	5,000–15,000	20,000–30,000	15,000–25,000	50–100	250–500	500–750	300–500
Specific Gravity, g/cc	1.98	1.55	1.57	1.73	2.22	1.31	1.45	1.31	1.36
Dielectric Breakdown Strength, VDC/mil	160	135	110	142	70	> 750	675	285	1500
Solids by Weight, %	75.9	55.3	55.5	62.3	75.0	55.8	71.5	48.5	57.1
Solids by Volume, %	55.0	32.3	32.6	42.0	48.9	43.3	75.2	39.5	44.3
WFT, mils (microns)[2]	1.82 (46.2)	3.10 (78.6)	3.07 (78.0)	2.38 (60.5)	2.05 (52.0)	2.31 (58.6)	1.33 (33.8)	2.53 (64.3)	2.3 (57.4)
DFT, mils (microns)[3]	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft²/gal (m²/liter)	882 (21.6)	518 (12.7)	523 (12.8)	674 (16.5)	784 (19.2)	695 (17.1)	1206 (29.6)	634 (15.6)	710 (17.4)
Curing, Min Air Set, hrs[5]	2–4	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Curing, Heat Cure, °F, hrs	200, 2–4 + 350, 1–2 + 500, 1	200, 2–4 + 350, 1–2	200, 2–4 + 350, 1–2	200, 2–4 + 350, 1–2	200, 1–2 + 350, 1–2 + 500, 1	480, 0.75	Not Required	480, 0.75	480, 0.75
Application Temperature, °F	50–90	50–90	50–90	50–90	50–90	50–120	50–120	50–120	50–120
Thinner	512-N-T	538-N-T	538-N-T	538-N-T	540-T	Distilled Water	T-Butyl Acetate	Distilled Water	PM Acetate
Flash Point, °F/°C	NA	NA	NA	NA	NA	> 212 (100)	~ 113 (45)	> 212 (100)	~118 (48)
Volatiles, lbs/gal	0.00	0.00	0.00	0.00	0.0	0.87	1.81	0.98	4.90
Shelf Life, months	6	6	6	6	6	6	6	6	6
Storage Temperature, °F	55–85	55–85	55–85	55–85	55–85	55–85	55–85	55–85	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Where a value is provided for "Min Air Set", it is recommended that the coating set at room temperature for, at minimum, the specified time prior to curing.

Abbreviations

NA Not Applicable
NR Not Required
DFT Dry Film Thickness
WFT Wet Film Thickness

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Quartz should be sandblasted whenever possible. Smooth metal surfaces should be sandblasted or etched using Aremco's Corr-Prep™ CPR2000.

HIGH TEMPERATURE ELECTRICAL COATINGS & SEALANTS

Type	SILICONE			SILICONE-GLASS		GLASS
Product Number	**529**	**529-HV**	**529-VHV**	**SGC4000**	**SGC4000-HT**	**GC4000**
Tradename		Aremco-Seal™			Glass-Coat™	
Color (cured)	Clear	Clear	Clear	Light Gray	Black	Black
Maximum Temperature, °F (°C)	800 (427)	800 (427)	800 (427)	900 (482)	1400 (760)	1000 (538)
No. Components	1	1	1	1	1	1
Viscosity, cP[1]	50–250	1,200–1,600	12,000–14,000	40–80	900–1,200	200–400
Specific Gravity, g/cc	1.05	1.09	1.22	1.59	1.61	1.65
Dielectric Breakdown Strength, VDC/mil	> 335	> 430	> 375	1,000	1,000	45
Solids by Weight, %	68.0	74.9	80.0	74.0	79.0	62.2
Solids by Volume, %	60.9	69.0	75.3	55.5	53.6	37.8
WFT, mils (microns)[2]	1.64 (41.7)	1.45 (36.8)	1.33 (33.7)	1.80 (45.8)	1.87 (47.4)	2.64 (67.1)
DFT, mils (microns)[3]	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft^2/gal (m^2/liter)	976 (24.0)	1106 (27.2)	1208 (29.6)	890 (21.8)	860 (21.1)	607 (14.9)
Curing, Min Air Set, hrs[5]	0.5–1.0	0.5–1.0	0.5–1.0	0.25	0.25	0.5
Curing, Heat Cure, °F, hrs	200, 0.5–1 + 480, .75–1	200, 0.5–1 + 480, .75–1	200, 0.5–1 + 480, .75–1	200, 0.25 + 480, 0.25 + 1000, 0.20	200, 0.25 + 480, 0.25 + 1300, 0.20	200, 10 Min + 1000, 20 Min + 1300, 3 Min
Application Temperature, °F	50–90	50–90	50–90	50–120	50–120	50–90
Thinner	MEK	MEK	MEK	Ethanol	PM Acetate	Water
Flash Point, °F/°C	77 (25)	82 (28)	86 (30)	96 (36)	115 (46)	NA
Volatiles, lbs/gal	2.80	2.28	2.00	3.50	3.90	0.00
Shelf Life, months	6	6	6	6	6	6
Storage Temperature, °F	40–90	40–90	40–90	40–90	40–90	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Where a value is provided for "Min Air Set", it is recommended that the coating set at room temperature for, at minimum, the specified time prior to curing.

Abbreviations

NA Not Applicable
NR Not Required
DFT Dry Film Thickness
WFT Wet Film Thickness

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Quartz should be sandblasted whenever possible. Smooth metal surfaces should be sandblasted or etched using Aremco's Corr-Prep™ CPR2000.

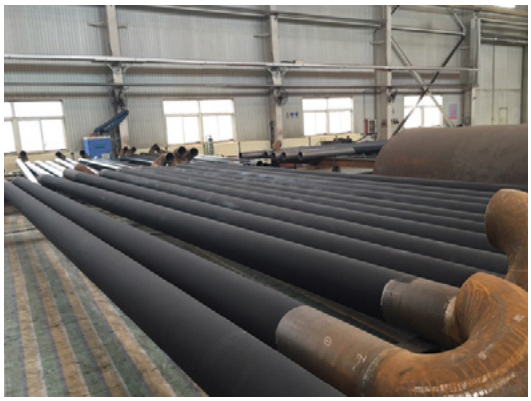
Refer to Price List for complete order information.

PRODUCT HIGHLIGHTS

Aremco's HiE-Coat™ 840-Series line of high emissivity coatings are black-body formulations designed to significantly improve the thermal efficiency of infrared heaters, furnaces, incinerators, and ovens used throughout the appliance, ceramics, chemical processing, metallurgical, and refining industries. Natural gas and oil savings in the range of 5–10% are typical using these coatings.

840-C	Ceramic-based, black-pigmented coating for ceramic fiber modules, light-weight refractory board, and dense refractories to 2000 °F (1093 °C).
840-CX	Ceramic-based, black-pigmented coating for ceramic fiber modules, light-weight refractory board, and dense refractories to 2400 °F (1316 °C).
840-CM	Ceramic-based, black-pigmented coating for dense refractories and refractory metals to 2000 °F (1093 °C).
840-M	Ceramic-based, black pigmented coating for carbon and stainless steel to 2000 °F (1093 °C).
840-MX	Ceramic-based, black pigmented coating for carbon and stainless steel to 2400 °F (1316 °C).
840-MS	Silicone-Ceramic, black pigmented coating for aluminum, copper, carbon and stainless steel to 1100 °F (593 °C).

High emissivity coatings absorb and re-radiate significantly more radiant and convective heat than an uncoated burner tube or refractory to a cooler load. For refractories lined systems, this reduces the amount of heat stored in the lining which results in less thermal shock and related thermal stresses, resulting in longer refractory life and reduced maintenance costs. Since less energy is absorbed by the refractory lining, faster heat-ups result, reducing cycle time and energy costs.

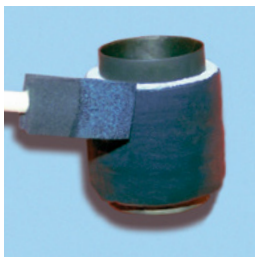


HiE-Coat™ 840-M coats gas-fired heating tubes.

HiE-Coat™ 840-C coats ceramic fiberboard infrared heater.

HiE-Coat™ 840-M coats industrial heat exchanger.

HiE-Coat™ 840-M coats gas burner component.



HiE-Coat™ 840-C coats exhaust pipe insulation.

HiE-Coat™ 840-Series coatings are ideal for improving the radiant heat transfer efficiency in gas-fired furnaces and kilns used in petrochemical refineries and the ceramic, chemical process and power generation industries. These coatings are typically applied to metal process tubes and refractory liners including ceramic fiber, dense brick, castables, and insulating firebrick.

HiE-Coat™ 840-C applied to ceramic fiber module.

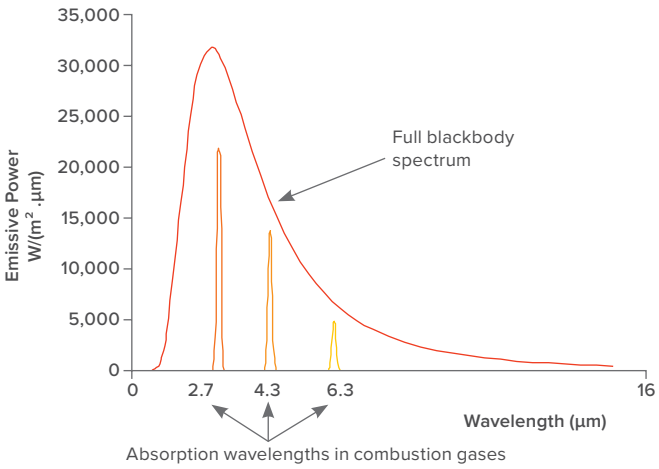
HiE-Coat™ 840-C, 840-CM & 840-CX Refractory Coatings

Uncoated refractory reflects a majority of incident radiant energy back into the furnace flue gas at the same spectral wavelength at which it is emitted from the gas. Energy is then re-absorbed by the gas, limiting the amount of energy transferred to the work-load.

High emissivity coatings on furnace walls absorb more of the incident radiant energy and re-emit this energy across the full black-body wavelength spectrum. This spectral redistribution of emitted energy allows more radiant energy to pass through the flue gas and be transferred to the work-load.

Given that absorbed heat is immediately re-radiated to the cooler work-load, more heat is made available causing the flue gas temperature to decrease because less of the available heat is absorbed and stored in the refractory lining. As such, the refractory lining stays cooler and experiences less thermal shock and stress. Lower refractory temperatures reduce devitrification and shrinkage of ceramic fiber modules and dense refractories resulting in longer refractory life and reduced maintenance costs.

Emissive Power vs Wavelength Chart

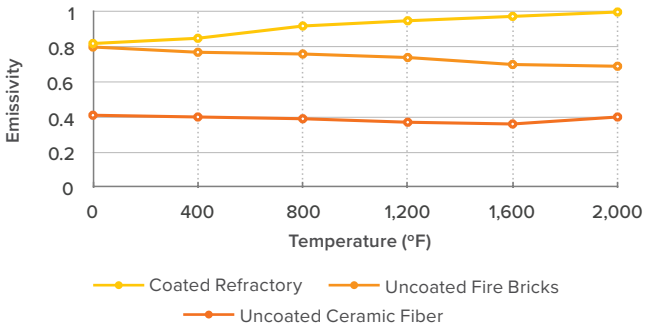


This chart illustrates the full blackbody spectrum versus the absorption wavelengths in combustion gases.

High Emissivity Coating Benefits for Refractory-Lined Furnaces

- Rapid Heat-Up
- Shorter Cycle Times
- Decreased Fuel Consumption
- Increased Heat Transfer
- Improved Temperature Uniformity
- Increased Refractory Life
- Minimizes Refractory Dusting
- Reduced Build Up of Gas By-Products on Refractory

Increased Emissivity of Coated Refractory vs Uncoated Firebrick vs Uncoated Ceramic Fiber

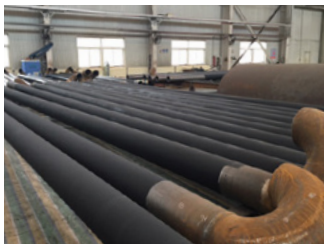


This chart illustrates emissivity of coated versus uncoated firebrick and ceramic fiber.

HiE-Coat™ 840-M, 840-MS & 840-MX Metal Tube Coatings

This series of high emissivity coatings is available for maximizing the thermal efficiency of radiant heater process tubes. These coatings help to limit scale formation thereby improving the thermal conductivity of the tubes and radiant heat output. Tube scale causes a significant drop in thermal conductivity requiring additional energy input to maintain the same production rate. HiE-Coat™ metal coatings applied in a dry film thickness of 2–3 mils helps to significantly reduce oxidation and corrosion of the metal tube.

HiE-Coat™ 840-M coats industrial heat exchanger.

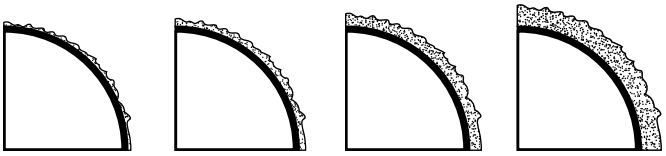


HiE-Coat™ 840-M coats gas-fired heating tubes.

High Emissivity Coating Benefits for Refractory-Lined Furnaces

- Improved Thermal Conductivity
- Increased Production Rate
- Decreased Fuel Consumption
- More Uniform Tube Wall Temperature
- Longer Tube Life
- Lower Emissions

Effect of soot buildup on thermal conductivity of process tubes

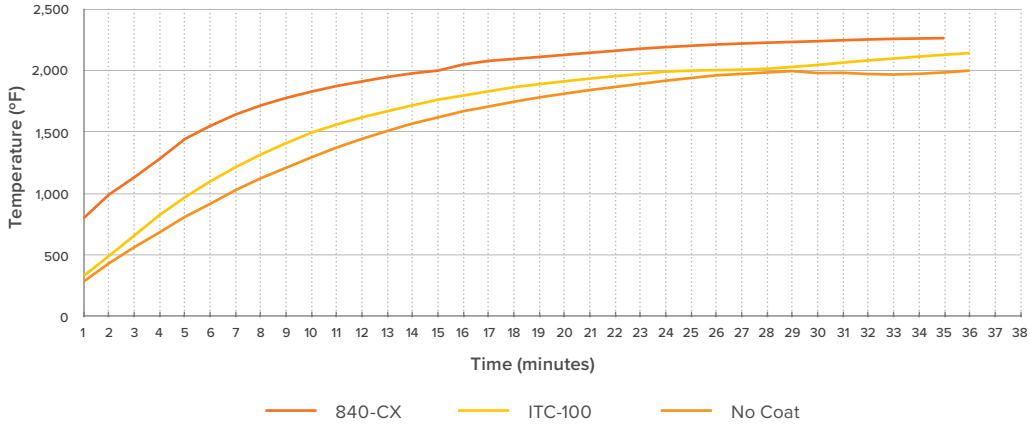


1/32″	1/16″	1/8″	3/16″
Soot Loss 9.5%	Soot Loss 26.2%	Soot Loss 45.3%	Soot Loss 69%

Case Study

HiE-Coat™ 840-CX was applied to a specialty propane gas forge that was properly designed and well insulated to limit heat losses. The ramp up temperature was compared to both uncoated refractory and refractory coated using a competitor's product called ITC-100. It was found that the 840-CX helped to achieve a 200 °F higher forging temperature in one-half the time.

Forge Ramp Speed



HiE-Coat™ 840-CX applied to a gas-fired forge.

HIE-COAT™ HIGH EMISSIVITY COATINGS

Product Number	840-C	840-CX[6]	840-CM	840-M	840-MX[6]	840-MS
Type			Inorganic-Ceramic			Silicone-Ceramic
Applications	Light-Weight Refractory	Light-Weight Refractory	Dense Refractory	Carbon Steel	Carbon Steel	Aluminum
	Fiber Modules	Fiber Modules	Refractory Metals	Stainless Steel	Stainless Steel	Copper
	Dense Refractory	Dense Refractory				Carbon & Stainless Steel
Color (cured)	Jet Black	Jet Black	Jet Black	Jet Black	Jet Black	Jet Black
Maximum Temperature, °F (°C)	2000 (1093)	2400 (1316)	2000 (1093)	2000 (1093)	2400 (1316)	1100 (593)
No. Components	1	1	1	1	1	1
Mix Ratio, by Weight (by Volume)	NA	NA	NA	NA	NA	NA
Viscosity, cP[1]	70–160	50–150	600–800	400–800	300–700	250–500
Specific Gravity, g/cc	1.60	1.52	1.54	1.61	1.57	1.49
Solids by Weight, %	58.5	51.5	48.0	47.3	47.3	57.1
Solids by Volume, %	27.3	20.25	19.9	22.1	22.1	42.5
WFT, mils (microns)[2]	3.66 (92.9)	4.94 (125.4)	5.03 (127.7)	4.52 (114.8)	4.52 (114.8)	2.40 (61.0)
DFT, mils (microns)[3]	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.0 (25.4)	1.0 (25.4)	1.00 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft^2/gal (m^2/liter)	438 (10.8)	325 (8.0)	319 (7.8)	355 (8.7)	355 (8.7)	681 (16.7)
Curing, Min Air Set, hrs[5]	1.0–2.0	1.0–2.0	1.0	1.0	1.0	1.0
Curing, Heat Cure, °F, hrs	200, 1	200, 1	200, 0.5 + 500 / 1	200, 1 + 500 / 1	200, 1 + 500 / 1	480 / .75
Application Temperature, °F	50–90	50–90	50–90	50–90	50–90	50–120
Thinner	840-C-T	840-CX-T	840-CM-T	840-M-T	840-MX-T	PM Acetate
Flash Point, °F/°C	NA	NA	NA	NA	NA	~118 (48)
Volatiles, lbs/gal	0.0	0.0	0.0	0.0	0.0	5.3
Shelf Life, months	6	6	6	6	6	6
Storage Temperature, °F	55–85	55–85	55–85	55–85	55–85	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer; spindle and speed selection vary depending on the product.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Where a value is provided for "Min Air Set", it is recommended to set the coating at room temperature for, at minimum, the specified time prior to curing.
[6] Part numbers ending in "X" are made with black pigment that does not contain any copper; copper can produce "greening" of the coating when exposed to flame impingement.

Surface Preparation Notes

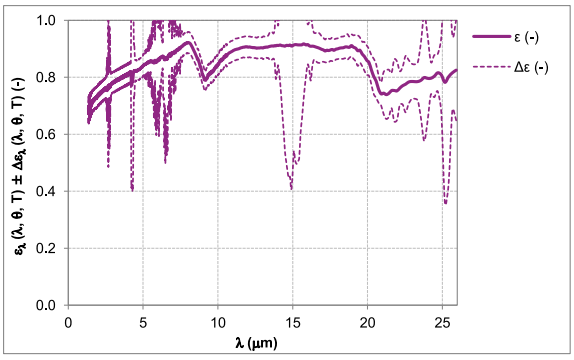
All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Quartz should be sandblasted whenever possible. Smooth metal surfaces should be sandblasted or etched using Aremco's Corr-Prep™ CPR2000.

Abbreviations

NA	Not Applicable	DFT	Dry Film Thickness
NR	Not Required	WFT	Wet Film Thickness

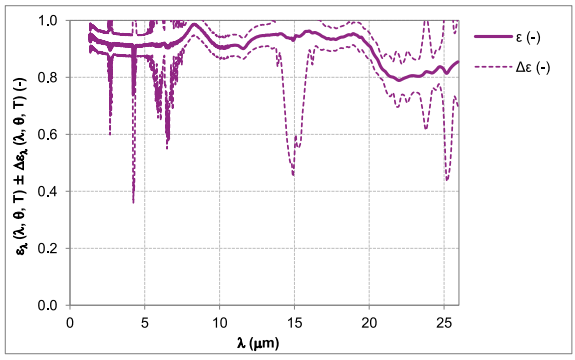
Spectral Normal Emissivity at 800 °C

HiE-Coat™ 840-C



λ (μm)	2	3.5	4.7	8.3	10	12.5	17.5	20	25
ε_λ (λ,θ,T) (-)	0.735	0.799	0.827	0.903	0.848	0.904	0.896	0.860	0.809
Δε (-), k = 2	0.036	0.036	0.036	0.037	0.035	0.036	0.042	0.051	0.066

HiE-Coat™ 840-M



λ (μm)	2	3.5	4.7	8.3	10	12.5	17.5	20	25
ε_λ (λ,θ,T) (-)	0.924	0.915	0.911	0.986	0.906	0.943	0.934	0.913	0.832
Δε (-), k = 2	0.038	0.037	0.037	0.039	0.037	0.037	0.041	0.047	0.062

For more Spectral Normal Emissivity Charts, visit aremco.com/tech-notes

Refer to Price List for complete order information.

PRODUCT HIGHLIGHTS

542 Single part, low viscosity, water-dispersed, aluminum phosphate solution for penetrating ultra-fine porosity in thermal applications 3000 °F (1650 °C).

503-VFG-C Single part, alumina-filled, phosphate-bonded, abrasion and corrosion resistant sealer for thermal spray applications to 3000 °F (1650 °C). Available in standard colors as follows:

503-VFG-C-WHT	White
503-VFG-C-BLK	Black
503-VFG-C-BLU	Blue
503-VFG-C-RED	Red
503-VFG-C-ORG	Orange

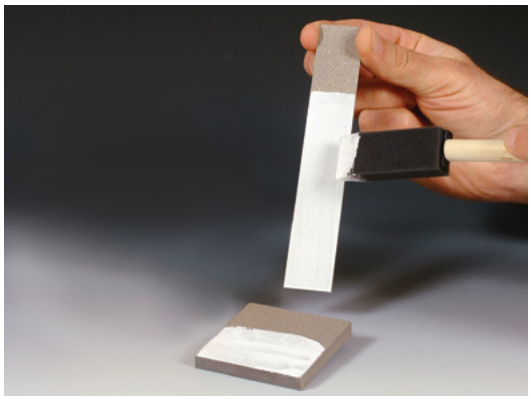
CP2000 Single part, urethane-based, gloss black, low viscosity, room temperature curing, abrasion and corrosion resistant sealer for applications to 400 °F (204 °C).

CP2070 Two-part, gray colored, Novolac-epoxy with exceptional abrasion and corrosion resistance for continuous operations to 300 °F (150 °C) and intermittent use to 400 °F (204 °C).

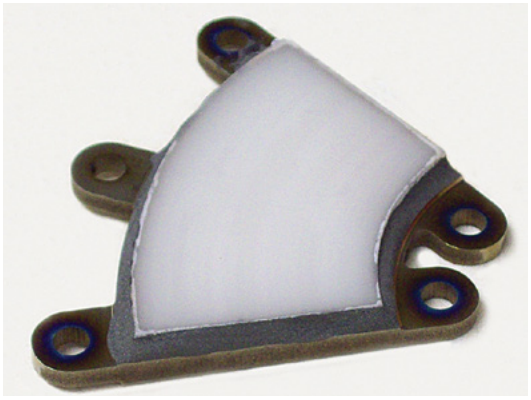
CP2080 Two-part, clear, Novolac-epoxy with exceptional abrasion and corrosion resistance for continuous operations to 300 °F (150 °C) and intermittent use to 400 °F (204 °C).

CP4010 Single part, silicone-emulsion and aluminum-filled, water-dispersed, low viscosity, heat-curable sealer ideal offering exceptional moisture resistance to 1100 °F (593 °C).

CP4010-S1 Single part, silicone-resin and aluminum-filled, water-dispersed, low viscosity, heat-curable sealer ideal offering exceptional moisture resistance to 1100 °F (593 °C).



Ceramacoat™ 503-VFG-C-WHT applied to thermal spray substrate.



Ceramabind™ 542 seals thermal spray on sensor.

CP2000 seals thermal spray on small heater.

CP2000 seals thermal spray on motor housing.

HIGH TEMPERATURE THERMAL SPRAY SEALANTS

Product Number	542	503-VFG-C	CP2000	CP2070	CP2080	CP4010	CP4010-S1
Tradename	Ceramabind™	Ceramacoat™	Corr-Paint™				
Type	Inorganic		Urethane	Novolac-Epoxy		Silicone	
Color (cured)	Clear	Assorted[6]	Gloss Black	Gray	Clear	Aluminum	Aluminum
Maximum Temperature, °F (°C)	3000 (1650)	3000 (1650)	400 (204)	300 (150)	300 (150)	1100 (593)	1100 (593)
No. Components	1	1	1	2	2	1	1
Mix Ratio, by Weight (by Volume)	NA	NA	NA	100:42 (2:1)	100:40 (2:1)	NA	NA
Viscosity, cP[1]	35–45	5,000–7,000	200–240	800–1000	600–1000	200–600	250–500
Specific Gravity, g/cc	1.47	2.34	1.05	1.10	1.10	1.05	1.00
Solids by Weight, %	41.0	76.0	67.0	100.0	100.0	44.2	41.0
Solids by Volume, %	22.0	53.7	49.0	100.0	100.0	41.6	42.4
WFT, mils (microns)[2]	4.54 (115.3)	1.86 (47.3)	2.00 (50.5)	1.00 (25.4)	1.00 (25.4)	2.4 (61.0)	2.4 (61.0)
DFT, mils (microns)[3]	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.0 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft^2/gal (m^2/liter)	353 (8.7)	861 (21.1)	722 (17.7)	1604 (39.3)	1604 (39.3)	611 (14.9)	680 (16.7)
Curing, Min Air Set, hrs[5]	1.0–2.0	1.0–2.0	0.5	8.0	8.0	1.0	1.0
Curing, Heat Cure, °F, hrs	200, 1 + 500, 1 + 700, 1	200, 1 + 500, 1 + 700, 1	RT, 24 or 250, 1	RT, 24	RT, 24 or 150, 2	450, 1 or 480, 0.75	480, 0.75
Application Temperature, °F	50–90	50–90	50–90	50–90	50–90	50–120	50–120
Thinner	Water	503-T, Water	Hi-Flash Naptha	Xylene	Xylene	Distilled Water	PM Acetate
Flash Point, °F/°C	NA	NA	140 (60)	> 200 (93)	> 200 (93)	> 212 (100)	~108 (42)
Volatiles, lbs/gal	0.00	0.00	2.86	0.00	0.0	0.86	5.7
Shelf Life, months	6	6	12	12	12	6	6
Storage Temperature, °F	55–85	55–85	40–80	40–90	40–90	55–85	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer; spindle and speed selection vary depending on the product.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Where a value is provided for "Min Air Set", it is recommended to set the coating at room temperature for, at minimum, the specified time prior to curing.

Ceramacoat™ 503-VFG-C

[6] Available in the following standard colors:

503-VFG-C-WHT	White
503-VFG-C-BLK	Black
503-VFG-C-BLU	Blue
503-VFG-C-RED	Red
503-VFG-C-ORG	Orange

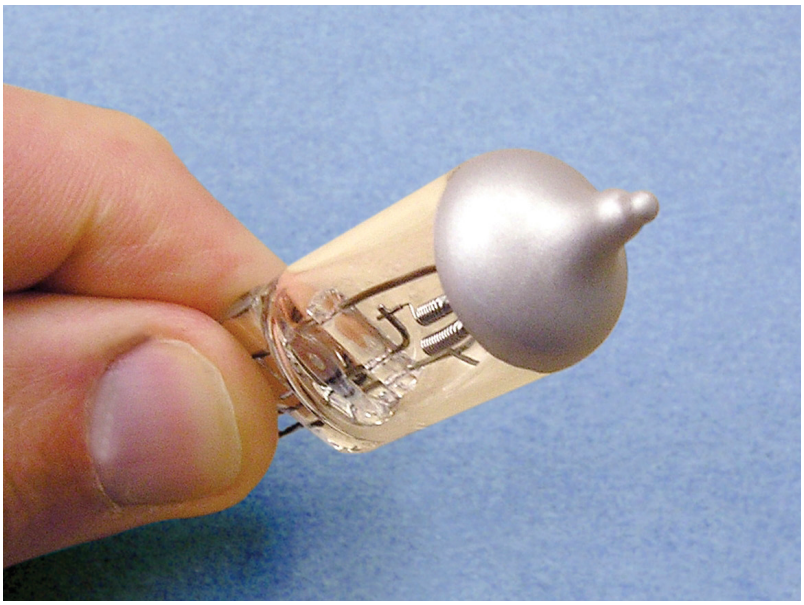
Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Quartz should be sandblasted whenever possible. Smooth metal surfaces should be sandblasted or etched using Aremco's Corr-Prep™ CPR2000.

Abbreviations

NA	Not Applicable
NR	Not Required
DFT	Dry Film Thickness
WFT	Wet Film Thickness

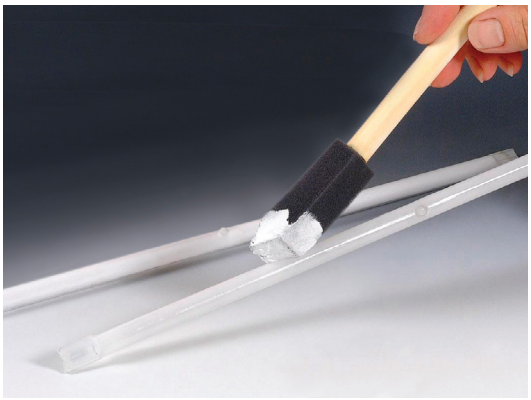
Refer to Price List for complete order information.



Lamp-Coat™ LC4010-GL applied to auto headlamp.

Lamp-Coat™ LC4040-SG applied to IR heater.

Ceramacoat™ 845-GLT applied to auto headlamp.



Quartz-Coat™ 850 applied to quartz IR heater tube.

PRODUCT HIGHLIGHTS

Ceramic-Inorganic

845	Single part, waterborne, silicon-filled, phosphate-bonded, brown-black coating for glass and quartz to 2000 °F (1093 °C). Primarily used for marking ceramic parts and coating automotive headlamps, stadium lighting and quartz vessels for the semiconductor industry. Standard viscosity is 200–400 cP; a higher viscosity coating, 845-HV, in the range of 500–800 cP is available upon request. Additional colors below are offered.
845-BLK	Jet Black
845-BLU	Cobalt Blue
845-GRY	Light-Gray
845-GLT	Light-Green
845-GDK	Dark-Green
845-SIL	Silver
845-WHT	White

Glass

613	Glass-filled adhesive/sealer for use with porous ceramics and refractories to 1150 °F (620 °C).
617	Glass-filled adhesive/sealer for use with porous ceramics and refractories to 1500 °F (816 °C).
850	Glass-ceramic filled, white reflective coating for glass and quartz to 1500 °F (816 °C).

Silicone

LC4010-BT	Aluminum-filled coating for application over black top coated headlamps to 1020 °F (550 °C).
LC4010-GL	Aluminum-filled coating for application directly over uncoated headlamps to 1020 °F (550 °C).
LC4040-SG	White reflective coating for use on mercury vapor lamps and other high temperature glass and quartz components to 1200 °F (649 °C).

HIGH TEMPERATURE COATINGS FOR CERAMICS, GLASS & QUARTZ

Type	INORGANIC-CERAMIC									GLASS			SILICONE		
Product Number	**845**	**845-HV**	**845-BLK**	**845-BLU**	**845-GRY**	**845-GLT**	**845-GDK**	**845-SIL**	**845-WHT**	**613**	**617**	**850**	**LC4010-BT**	**LC4010-GL**	**LC4040-SG**
Tradename	Quartz-Coat™		Ceramacoat™							Aremco-Seal™		Quartz-Coat™	Lamp-Coat™		
Color (cured)	Brown-Black	Brown-Black	Jet Black	Blue	Gray	Light Green	Dark Green	Matte Silver	Off-White	Light Gray	Clear	White	Silver	Silver	White
Maximum Temperature, °F (°C)	2000 (1093)	2000 (1093)	1500 (816)	1500 (816)	1500 (816)	1500 (816)	1500 (816)	1500 (816)	1500 (816)	1150 (620)	1500 (816)	1600 (871)	1020 (550)	1020 (550)	1200 (649)
No. Components	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Viscosity, cP[1]	200–400	500–800	1,000–1,500	500–1,000	400–700	750–1,250	800–1,000	400–900	400–700	1,000–2,000	1,100–1,500	500–1,000	40–50	300–400	250–500
Specific Gravity, g/cc	1.44	1.51	1.66	1.64	1.65	1.66	1.67	1.46	1.83	1.39	1.45	1.84	1.07	1.05	1.70
Solids by Weight, %	50.1	52.8	52.9	50.9	51.8	52.9	52.9	44.4	41.3	54.0	51.3	61.3	57.0	35.8	70.9
Solids by Volume, %	22.9	31.9	32.0	23.6	25.2	26.7	26.7	23.1	22.9	41.6	40.5	31.4	49.5	31.9	52.7
WFT, mils (microns)[2]	3.24 (82.3)	3.13 (79.6)	2.90 (73.8)	4.24 (107.8)	3.97 (100.8)	3.74 (95.0)	3.74 (95.0)	4.34 (110.1)	4.12 (104.6)	2.40 (61.0)	2.47 (62.7)	3.18 (80.8)	2.02 (51.3)	3.13 (79.6)	1.90 (48.2)
DFT, mils (microns)[3]	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)	1.00 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft²/gal (m²/liter)	495 (12.2)	512 (12.6)	552 (13.6)	378 (9.3)	404 (9.9)	429 (10.5)	429 (10.5)	370 (9.1)	389 (9.6)	668 (16.4)	650 (15.9)	504 (12.4)	794 (19.5)	512 (12.6)	845 (20.8)
Curing, Min Air Set, min[5]	10	10	10	10	10	10	10	10	10	30–60	30	30	10	5	60
Curing, Heat Cure, °F, min[6]	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	200, 10 + 900, 5	1150, 30	200, 30 + 350, 60 + 1830, 1	1650, 15	200, 15 + 900, 10	200, 30 + 900, 10	200, 60 + 450, 60 + 1300, 15
Application Temperature, °F	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–120	50–120	50–120
Thinner	845-T	845-T	845-T	845-T	845-T	845-T	845-T	845-T	845-T	Water	Water	Water	PM Acetate	Ethanol	PM Acetate
Flash Point, °F/°C	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	~ 118 (48)	~ 118 (48)	~115 (46)
Volatiles, lbs/gal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	6.1	3.8
Shelf Life, months	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Storage Temperature, °F	55–85	55–85	55–85	55–85	55–85	55–85	55–85	55–85	55–85	40–90	40–90	40–90	40–90	40–90	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer; spindle and speed selection vary depending on the product.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Where a value is provided for "Min Air Set", it is recommended that the coating set at room temperature for, at minimum, the specified time prior to curing.
[6] Recommended ramp rate is 10 °F per minute.

Abbreviations

NA Not Applicable
NR Not Required
DFT Dry Film Thickness
WFT Wet Film Thickness

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Quartz should be sandblasted whenever possible. Smooth metal surfaces should be sandblasted or etched using Aremco's Corr-Prep™ CPR2000.

Refer to Price List for complete order information.

Aremco's refractory coatings offer the ultimate protection of high temperature components used in the processing of ceramics, glass, metals, and plastics.

FEATURES

- Ultra Hi-Temp Resistance
- Non-Wetted by Molten Metals, Salts, Glass & Plastics
- High Lubricity for Easy Part Release
- Minimizes Cast Surface Defects
- Increases Mold & Die Life
- For Use in Oxidizing, Reducing & Vacuum Atmospheres

APPLICATIONS

- Composite Forming
- Glass Forming
- Metal Casting
- Injection Molding
- Ceramic Hot-Pressing
- Metal Powder Sintering
- Welding
- Brazing

PRODUCT HIGHLIGHTS

Graphi-Coat™ 623
This patented coating is a two-part, silica-bonded, titanium diboride filled, oxidation resistant coating for protecting graphite crucibles, electrodes, and heat-treating fixtures to 2000 °F (1093 °C).

Pyro-Paint™ 634-AL
This high purity alumina, two-part coating seals alumina fiberboards and shapes to fill porosity and resist molten metals to 3200 °F (1760 °C). Increases heat reflectivity to improve furnace efficiency by reducing ramp up times.

Pyro-Paint™ 634-ALP
This phosphate-bonded, single-part alumina coating bonds exceptionally well to dense refractories, providing high abrasion and corrosion resistance for operating temperatures to 3200 °F (1760 °C).

Pyro-Paint™ 634-AS and 634-AS1
These alumina-silica, single-part coatings increase the durability of refractory fiberboards by sealing the substrate to minimize dusting and resist wetting by non-ferrous metals to 2300 °F (1260 °C).

Pyro-Paint™ 634-BN and 634-BNSC
These lubricious, boron nitride, single-part coatings are used to seal refractory fiberboards and metals from wetting by non-ferrous metals, salts, glasses and plastics. Select 634-BN for hard-coat and 634-BN(SC) for a more consumable soft-coat.

Pyro-Paint™ 634-GR
This single-part graphite coating improves parting of aluminum permanent molds, non-sticking in glass forming, and lubrication and stop-off in metalworking and wire drawing. Provides superior release, surface finish and mold protection.

Pyro-Paint™ 634-SIC
This single-part, silicon carbide coating improves the oxidation resistance of graphite crucibles, electrodes, and heat-treating fixtures to 2550 °F (1400 °C).

Pyro-Paint™ 634-YO
This single-part, yttrium oxide coating protects graphite, ceramic and metals, exposed to reactive metals such as titanium, uranium and their alloys under inert or vacuum atmospheres to 2732 °F (1500 °C).

Pyro-Paint™ 634-ZO
This single-part, zirconium oxide coating produces a hard, oxidation resistant coating on carbon and stainless steel and a range of refractory metals including molybdenum, platinum, rhodium, and titanium to 3270 °F (1800 °C). Good for sealing porous refractories and protecting resistance heating elements from oxidation and residue buildup that causes arcing and reduced element life.

HIGH TEMPERATURE REFRACTORY COATINGS PROPERTIES

Part Number	623	634-AL	634-ALP	634-AS	634-AS-1	634-BN	634-BNSC	634-GR	634-SIC	634-YO	634-ZO
Principal Application	Reduce Oxidation of Graphite	Seal Alumina Fiberboard	Seal Dense Refractory	Seal Refractory Fiberboard		Resist Wetting of Non-Ferrous Alloys on Refractories		Resist Wetting of Glass, Metal	Reduce Oxidation of Graphite	Resist Reactive Metals	Prevent Oxidation of Metals
Major Constituent	Titanium DiBoride	Aluminum Oxide		Alumina-Silica		Boron Nitride		Graphite	Silicon Carbide	Yttrium Oxide	Zirconium Oxide
Color	Gray	White	White	Off-White	White	White	White	Black	Gray	Off-White	Off-White
Temperature Limit, °F (°C)	2000 (1093)	3200 (1760)	3200 (1760)	2300 (1260)	2300 (1260)	1560 (850)[1]	1560 (850)[1]	2200 (1200)	2550 (1400)	2732 (1500)	3270 (1800)
No. Components	2	2	1	1	1	1	1	1	1	1	1
Mix Ratio[2]	60 : 40	75 : 25	NA	NA	NA	NA	NA	NA	NA	NA	NA
Viscosity, cP	200–400	100–200	5,000–7,000	500–800	10,000–20,000	500–1,500	10–100	100–250	750–2,000	200–400	1,000–2,000
Specific Gravity, g/cc	2.15	2.46	2.38	1.55	1.60	1.15	1.20	1.24	2.00	1.55	2.02
Solids by Weight, %	78.7	81.3	76.0	64.3	64.9	19.8	30.0	47.5	68.2	45.0	59.2
Solids by Volume, %	52.7	56.1	53.7	41.1	40.7	18.0	13.3	31.6	42.0	14.0	29.6
WFT, mils (microns)[6]	1.9 (48.2)	1.8 (45.3)	1.9 (47.3)	2.4 (61.7)	2.5 (62.4)	5.6 (141.5)	7.5 (190.7)	3.2 (80.5)	2.4 (60.5)	7.1 (180.9)	3.4 (86.0)
DFT, mils (microns)[7]	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage @ 1 mil, ft^2/gal (m^2/liter)	845 (20.7)	899 (22.1)	861 (21.1)	660 (16.2)	653 (16.0)	288 (7.1)	214 (5.3)	506 (12.4)	674 (16.5)	225 (5.5)	474 (11.6)
Recommended Curing **Min Air Set,** hrs **Hours Cure** °F/hrs[3]	1 1400/0.25	2 200/2	1 200/2, 800/1	2 200/2	2 200/2	2 200/2	2 200/2	2 200/2	1 200/2, 800/1	0.5 200/1	2 200/2
Application Temperature, °F	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90	50–90
Thinner[4]	623-T	634-AL-T	634-ALP-T	634-AS-T	634-AS-T	634-BN-T	634-BNSC-T	634-GR-T	634-SIC-T	H_2O	634-ZO-T
Coating pH	8–9.5	4–5	2–3	8–9.5	8–9.5	11–12	4–5	8–9	2–3	7–8	11–12
Flash Point, °F	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Weight/Gallon, lbs[5]	12.5	12.0	16.5	12.0	12.5	9.5	10.0	10.0	16.5	12.0	14.5
Shelf Life, months	6	6	6	6	6	6	6	6	6	6	6
Storage Temperature, °F	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90

Reference Notes

[1] Temperature limit applies to oxidizing atmospheres only. Can be used in vacuum/inert atmospheres to 2000 °C.
[2] Mix ratio is Powder : Liquid. Ratios may be altered as required to adjust viscosity.
[3] A short cure is recommended, however, most of these products can be air set then ramped up to operating temperature immediately.
[4] Distilled water may also be used to thin all products. Use 1–2% distilled water by weight.
[5] For two-part systems, this only refers to the weight per gallon for the powder portion of the mixture.
[6] Estimated Wet Film Thickness (WFT).
[7] Recommended Dry Film Thickness (DFT).

Abbreviations

NA Not Applicable

Refer to Price List for complete order information.

Corr-Paint™ CP2050-LF coats flare stack.

Corr-Paint™ CP2060

Corr-Paint™ CP2060 coats pump housing.

Corr-Paint™ CP2000 coats motor housing.

Aremco's Corr-Paint™ epoxy and urethane-based coatings are used for producing corrosion and wear resistant barriers to 500 °F. Typical applications include tanks, pipelines, boilers, precipitators, scrubbers, bag houses, cyclones, hoppers and other process equipment used in the power, pulp and paper, and chemical processing industries.

PRODUCT HIGHLIGHTS

Urethane

CP2000	Jet Black
CP2010	Aluminum
CP2020	Gray

Epoxy-Phenolics

CP2050-FF	Fine-Fiber Reinforced
CP2050-LF	Large-Fiber Reinforced
CP2050-NF	Unfilled

Novolac-Epoxies

CP2060	SiC Filled, Hi-Build, 500 °F
CP2070	Gray, Low Viscosity, 300 °F
CP2075	Gray, Hi-Build, 400 °F

FEATURES

- Single-Part, No Mixing
- Low Viscosity
- Cures at Room Temperature
- High Wear Resistance
- Excellent Salt Spray Resistance
- Maximum Temperature, 400 °F

- Two-Part Systems
- High Viscosity for Thick Depositions
- Cures at Room Temperature
- Excellent Corrosion Resistance
- Excellent Wear Resistance
- Maximum Use Temperature, 500 °F

- Two-Part Systems
- Cures at Room Temperature
- Excellent Corrosion Resistance
- Excellent Wear Resistance

CORROSION PROTECTIVE URETHANE & EPOXY COATINGS PROPERTIES

Type		URETHANE			EPOXY-PHENOLIC	NOVOLAC-EPOXY		
Product Number		**CP2000**	**CP2010**	**CP2020**	**CP2050-XX**[1]	**CP2060**[1]	**CP2070**	**CP2075**
Color (cured)		Gloss Black	Aluminum	Gloss Gray	Brown-Red	Gray	Gray	Gray
Temp. Continuous, °F(°C)		400 (204)	400 (204)[2]	400 (204)[2]	400 (204)	500 (260)	300 (150)[7]	400 (204)
No. Components		1	1	1	2	2	2	2
Mix Ratio, by Weight		NA	NA	NA	1 : 1	100 : 8	100:42 (2 : 1 Vol)	100:26 (3:1 Vol)
Viscosity, cP		200–240	300–600	200–500	Paste	Paste	800–1000	Paste
Specific Gravity, g/cc		1.05	1.08	1.08	1.60	1.90	1.10	1.10
Solids by Weight, %		67.0	70.0	72.0	100.0	100.0	100.0	100.0
Solids by Volume, %		49.0	66.0	77.0	100.0	100.0	100.0	100.0
WFT, mils (microns)[3]		4.0 (101.6)	4.0 (101.6)	4.0 (101.6)	50+ (1270.0)	50+ (1270.0)	7.0 (177.8)	20.0 (508.0)
DFT, mils (microns)[4]		2.0 (50.8)	2.6 (67.1)	3.1 (78.7)	50+ (1270.0)	50+ (1270.0)	7.0 (177.8)	20.0 (508.0)
Theoretical Dry Film Coverage[5] @ 1 mil, ft²/gal (m²/liter)		722 (17.7)	1058 (25.9)	1235 (30.3)	1604 (39.3)	1604 (39.3)	1604 (39.3)	1604 (39.3)
Primer		NR	NR	NR	NR	NR	NR	NR
Drying	**Touch,** hrs	4–6	4–6	4–6	6–8	4	5	5
Drying	**Handling,** hrs	6–8	6–8	6–8	12–14	6–8	8	8
Drying	**Recoat, (min/max),** hrs	3/7	6/12	3/7	4/48	4/8	4/8	4/8
Curing	**Min Air Set,** hrs[6]	0.5	1	0.5	2	8	8	8
Curing	**Cure,** °F/hrs	RT/24 or 250/1	RT/24 or 250/1	RT/24 or 250/1	RT/48 or 175/4	RT/48 or 250/6	RT/24	RT/24 or 175/4
Application Temp., °F		50–90	50–90	50–90	50–90	50–90	50–90	50–90
Thinner		Hi-Flash Naptha	Hi-Flash Naptha	Hi-Flash Naptha	NR	NR	Xylene	Xylene
Pot Life, hrs at room temp.		NA	NA	NA	0.70	0.75 (500g)	0.35 (200g)	0.5 (200g)
Flash Point, °F (°C)		140 (60)	140 (60)	140 (60)	> 200 (93)	> 200 (93)	> 200 (93)	> 200 (93)
VOC's, lbs/gal		2.86	3.00	2.80	0.00	0.00	0.00	0.00
Shelf Life @RT, months		12	12	12	12	12	12	12
Storage Temperature, °F		40–90	40–90	40–90	40–90	40–90	40–90	40–90

Reference Notes

[1]

Technical Notes for Epoxy Coatings	CP2050-XX	CP2060	CP2070	CP2075
Lap Shear Strength to Aluminum, psi				
25 °C	2,700	2,300	2050	2260
65 °C	–	–	1900	2100
100 °C	1,800	2,000	1250	1420
150 °C	900	1,200	225	430
175 °C	300	900	–	–
Flexural Strength, psi	13,400	11,500	12,000	12,000
Compressive Strength, psi	10,300	12,000	8,500	8,500
Elongation, %	3	2	< 2	< 2
Hardness, Shore D	86	90	85	85

[2] CP2010 will begin to discolor at 300 °F.
[3] Estimated Wet Film Thickness (WFT).
[4] Recommended Dry Film Thickness (DFT).
[5] Actual coverage will vary depending on material losses during mixing and application.
[6] Where a value is provided for "Min Air Set", it is recommended that the coating set at room temp. for, at minimum, the specified time prior to curing.
[7] Withstands intermittent service temperatures of 350–400 °F if cured for 2 hours at 185 °F.

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Smooth metal surfaces should be abrasive blasted to an SSPC-SP10 near white blast. Remove abrasive residue using air pressure; do not clean with organic solvents

Aremco's Corr-Prep™ CPR2000 is recommended as an alternative when sandblasting is not possible. This is a specially formulated, water-based, zinc phosphate metal etching solution that is non-toxic, non-flammable, non-caustic, and non-corrosive. It etches metal to provide surface profile for superior coating adhesion to aluminum, galvanized metal, steel, and stainless steel. It also helps to improve long-term corrosion protection. Application is simple—just brush or spray liquid on the substrate, allow to sit for 20–30 minutes, then rinse off and dry substrate thoroughly prior to coating.

CHEMICAL RESISTANCE CHART

Chemical	%	CP2000	CP2050	CP2060	CP2070	CP2075
ACIDS						
Acetic Acid	20%	B	B	B	B	B
Acetic Acid	80%	B	B	B	B	B
Hydrochloric Acid	10%	A	A	A	A	A
Hydrochloric Acid	20%	A	A	A	A	A
Nitric Acid	10%	A	A	A	A	A
Nitric Acid	20%	B	B	B	B	B
Nitric Acid	50%	D	D	D	D	C
Nitric Acid	100%	D	D	D	D	B
Phosphoric Acid	< 40%	B	A	A	A	A
Phosphoric Acid	40–100%	D	C	C	C	C
Sulfuric Acid	10%	A	A	A	A	A
Sulfuric Acid	10–75%	C	B	B	B	B
Sulfuric Acid	75–100%	D	D	D	D	C
BASES						
Potassium Hydroxide		A	A	A	A	A
Sodium Hydroxide	20%	A	A	A	A	A
Sodium Hydroxide	50%	A	A	A	A	A
Sodium Hydroxide	80%	A	A	A	A	A
FUELS & SOLVENTS						
Acetone		B	B	B	B	B
Alcohol		A	A	A	A	A
Crude Oil		A	A	A	A	A
Diesel		A	A	A	A	A
Gasoline		A	A	A	A	A
Heptane		A	A	A	A	A
Jet Fuel		A	A	A	A	A
Kerosene		A	A	A	A	A
Methyl Ethyl Ketone		B	B	B	B	B
Methylene Chloride		B	B	A	A	A
Toluene		A	A	A	A	A
Xylene		A	A	A	A	A

Abbreviations

NA	Not Applicable
NR	Not Required
DFT	Dry Film Thickness
WFT	Wet Film Thickness
RT	Room Temperature

Key

A	No Effect or Excellent
B	Minor Effect or Good
C	Moderate Effect or Fair
D	Severe Effect or Not Recommended

Refer to Price List for complete order information.

AREMCO

HIGH TEMPERATURE SILICONE-POLYESTER COATINGS
Technical Bulletin A6-S2

Corr-Paint™ CP4000-S

Corr-Paint™ CP4040-S

Corr-Paint™ CP4040-S

Aremco's Corr-Paint™ CP40xx-S series coatings are formulated using an advanced silicone-polyester resin combined with inorganic fillers and pigments to offer continuous temperature resistance to 600 °F (316 °C) and intermittent resistance to 800 °F (427 °C).

These coatings are single-part, heat curable systems that adhere to a wide range of materials including metals, ceramics, glass, quartz, and refractories, and offer outstanding resistance to outdoor weathering, UV light, salt spray corrosion, oxidation, detergents, and thermal shock.

PRODUCT HIGHLIGHTS

- Single-Part, No Mixing
- Low Viscosity
- Maximum Use Temperature, 600 °F (316 °C)
- Intermittent Use Temperature, 800 °F (427 °C)
- Bonds to Ceramics, Glass, Quartz, Metals
- Excellent Resistance to Moisture & Salt Spray
- Resists Thermal Shock
- Resists Ultraviolet Light

AVAILABLE COLORS*

- CP4000-S Black
- CP4010-S Aluminum
- CP4020-S Gray
- CP4040-S White
- CP4050-S Green
- CP4060-S Red
- CP4070-S Blue
- CP4080-S Yellow
- CP4090-S Brown
- CP4095-S Orange

* All colors are matte finish. The colors represented here are approximate and the actual product color may vary.

TYPICAL APPLICATIONS

- Bag Houses
- Boiler Casings
- Chimneys
- Cyclones
- Ducting
- Heaters
- Heat Exchangers
- Exhaust Systems
- Engines
- Furnaces
- Ovens
- Kilns
- Lighting Fixtures
- Process Vessels
- Reformers
- Scrubbers
- Stacks
- Turbochargers

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Rev. 8/16

HIGH TEMPERATURE SILICONE-POLYESTER COATINGS PROPERTIES

Type		SILICONE-POLYESTER									
Product Number		**CP4000-S**	**CP4010-S**	**CP4020-S**	**CP4040-S**	**CP4050-S**	**CP4060-S**	**CP4070-S**	**CP4080-S**	**CP4090-S**	**CP4095-S**
Color (cured)		Black	Aluminum	Gray	White	Green	Red	Blue	Yellow	Brown	Orange
Temperature Continuous, °F (°C)		600 (316)	600 (316)	600 (316)	600 (316)	600 (316)	600 (316)	600 (316)	600 (316)	600 (316)	600 (316)
Temperature Intermittent, °F (°C)		800 (427)	800 (427)	800 (427)	800 (427)	800 (427)	800 (427)	800 (427)	800 (427)	800 (427)	800 (427)
No. Components		1	1	1	1	1	1	1	1	1	1
Viscosity, cP[1]		400–600	300–400	200–400	300–500	250–350	500–700	150–250	300–500	400–600	550–750
Specific Gravity, g/cc		1.45	1.00	1.42	1.37	1.46	1.47	1.43	1.40	1.45	1.40
Solids by Weight, %		69.9	37.0	62.1	42.1	62.1	62.1	62.1	62.1	62.1	62.1
Solids by Volume, %		57.7	36.7	58.5	49.2	57.4	57.4	59.0	57.7	58.6	58.9
WFT, mils (microns)[2]		1.73 (44.0)	2.73 (69.2)	1.71 (43.4)	2.03 (51.6)	1.74 (44.3)	1.74 (44.3)	1.69 (43.0)	1.73 (44.0)	1.71 (43.3)	1.70 (43.2)
DFT, mils (microns)[3]		1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft²/gal (m²/liter)		925 (22.7)	589 (14.5)	938.0 (23.0)	789.7 (19.4)	920.3 (22.6)	921.1 (22.6)	946.7 (23.2)	925.6 (22.7)	940 (23.1)	944 (23.2)
Primer[5]		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Drying	**Touch,** hrs	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2
Drying	**Handling,** hrs	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4
Drying	**Recoat, (min/max),** hrs	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24
Curing	**Min Air Set,** hrs[6]	1	1	1	1	1	1	1	1	1	1
Curing	**Cure,** °F/hrs[7,8]	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75
Application Temperature, °F		50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120
Thinner		PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate
Pot Life, hrs at room temp.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Flash Point, °F (°C)		118 (48)	115 (46)	115 (46)	115 (46)	115 (46)	115 (46)	115 (46)	115 (46)	115 (46)	115 (46)
VOC's, lbs/gal		3.6	5.3	3.6	3.4	3.7	3.7	3.6	3.7	3.6	3.6
Shelf Life @RT, months		6	6	6	6	6	6	6	6	6	6
Storage Temperature, °F		40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer, LV3 Spindle @ 30 RPM.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Primer is only recommended for exterior applications in which salt fog or moisture are present.
[6] Where a value is provided for "Min Air Set", it is recommended to set the coating at room temperature for, at minimum, the specified time prior to curing.
[7] Adequate ventilation is required when curing these products as some outgassing will occur.
[8] Curing is recommended but not absolutely required if the system is raised slowly to a minimum of 450 °F within 24–48 hours of application and not exposed to high moisture or rain during this initial dwell period.

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Smooth metal surfaces should be abrasive blasted to an SSPC-SP6 near white blast. Remove abrasive residue using air pressure; do not clean with organic solvents.

Aremco's Corr-Prep™ CPR2000 is recommended as an alternative when sandblasting is not possible. This is a specially formulated, water-based, zinc phosphate metal etching solution that is non-toxic, non-flammable, non-caustic, and non-corrosive. It etches metal to provide surface profile for superior coating adhesion to aluminum, galvanized metal, steel, and stainless steel. It also helps to improve long-term corrosion protection. Application is simple — just brush or spray liquid on the substrate, allow to sit for 20–30 minutes, then rinse off and dry substrate thoroughly prior to coating.

Application Notes: Mix thoroughly before use to redisperse fillers and pigments. Apply using a brush, roller or spray gun. When spraying, a maximum dry film thickness of 2 mils (0.002") can be achieved by applying two coats. Recommended fluid nozzle diameter is 40–50 mils, atomizing presure of 40–50 psi, and distance from work of 8–10". Adequate ventilation is required when applying and curing the coating. Read Safety Data Sheet for further safety instructions.

Abbreviations

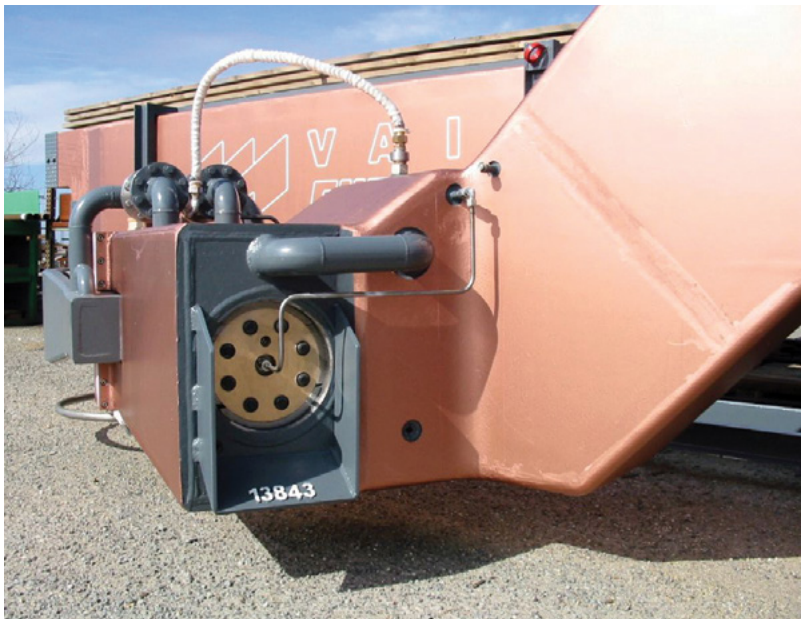
NA Not Applicable
NR Not Required
DFT Dry Film Thickness
WFT Wet Film Thickness
RT Room Temperature

Refer to Price List for complete order information.

AREMCO

HIGH TEMPERATURE SILICONE RESIN COATINGS

Technical Bulletin A6-S3



Corr-Paint™ CP4020-S1

Corr-Paint™ CP4000-S1

Aremco's Corr-Paint CP40xx-S1 series coatings are formulated using an advanced solvent-based silicone resin combined with inorganic fillers and pigments to offer temperature resistance up to 1400 °F (760 °C).

These coatings are single-part, heat curable systems that adhere to a wide range of materials including metals, ceramics, glass, quartz, and refractories, and offer outstanding resistance to outdoor weathering, UV light, salt spray corrosion, oxidation, some chemicals, and thermal shock.

PRODUCT HIGHLIGHTS

- Single-Part, No Mixing
- Low Viscosity
- Maximum Use Temperature, 1100–1400 °F (593–760 °C)
- Good Chemical Resistance
- Bonds to Ceramics, Glass, Quartz, Metals
- Excellent Resistance to Moisture & Salt Spray
- Resists Thermal Shock
- Resists Ultraviolet Light
- Solvent-Based

AVAILABLE COLORS*

- CP4000-S1 Black
- CP4000-S1-HT Black
- CP4010-S1 Aluminum
- CP4020-S1 Gray
- CP4040-S1 White
- CP4050-S1 Green
- CP4060-S1 Red
- CP4070-S1 Blue
- CP4080-S1 Yellow
- CP4090-S1 Brown
- CP4095-S1 Orange

* All colors are matte finish. The colors represented here are approximate and the actual product color may vary.

TYPICAL APPLICATIONS

- Bag Houses
- Boiler Casings
- Chimneys
- Cyclones
- Ducting
- Heaters
- Heat Exchangers
- Exhaust Systems
- Engines
- Furnaces
- Ovens
- Kilns
- Lighting Fixtures
- Process Vessels
- Reformers
- Scrubbers
- Stacks
- Turbochargers

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Rev. 4/18

HIGH TEMPERATURE SOLVENT-BASED SILICONE COATINGS PROPERTIES

Type		SILICONE										
Product Number		**CP4000-S1**	**CP4000-S1-HT**	**CP4010-S1**	**CP4020-S1**	**CP4040-S1**	**CP4050-S1**	**CP4060-S1**	**CP4070-S1**	**CP4080-S1**	**CP4090-S1**	**CP4095-S1**
Color (cured)		Black	Black	Aluminum	Gray	White	Green	Red	Blue	Yellow	Brown	Orange
Temperature Continuous, °F (°C)		1100 (593)	1400 (760)	1100 (593)	1100 (593)	1100 (593)	1100 (593)	1100 (593)	1100 (593)	1100 (593)	1100 (593)	1100 (593)
No. Components		1	1	1	1	1	1	1	1	1	1	1
Viscosity, cP[1]		250–500	900–1200	250–500	150–250	250–500	300–500	600–800	350–500	300–500	300–500	500–700
Specific Gravity, g/cc		1.49	1.61	1.00	1.35	1.34	1.36	1.34	1.35	1.36	1.38	1.37
Solids by Weight, %		57.1	79.0	41.0	57.1	57.1	57.1	57.4	56.6	56.6	56.6	56.6
Solids by Volume, %		42.5	53.6	42.4	44.4	44.4	44.3	45.1	44.3	43.4	43.2	43.4
WFT, mils (microns)[2]		2.4 (59.8)	1.9 (47.4)	2.4 (59.9)	2.3 (57.3)	2.3 (57.2)	2.3 (57.4)	2.2 (56.4)	2.3 (57.3)	2.3 (58.6)	2.3 (58.6)	2.3 (58.6)
DFT, mils (microns)[3]		1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft²/gal (m²/liter)		681 (16.7)	860 (21.1)	680 (16.7)	711 (17.5)	712 (17.5)	710 (17.4)	723 (17.7)	711 (17.4)	696 (17.1)	694 (17.0)	697 (17.1)
Primer[5]		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Drying	**Touch,** hrs	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2
Drying	**Handling,** hrs	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4
Drying	**Recoat, (min/max),** hrs	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24
Curing	**Min Air Set,** hrs[6]	1	1	1	1	1	1	1	1	1	1	1
Curing	**Cure,** °F/hrs[7,8]	480 / .75	200 / .25	480 / .75	480 / .75	480 / .75	480 / .75	480 / .75	480 / .75	480 / .75	480 / .75	480 / .75
			480 / .25									
			1200 / .25									
Application Temperature, °F		50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120
Thinner		PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate	PM Acetate
Pot Life, hrs at room temp.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Flash Point, °F (°C)		~ 118 (48)	~ 118 (48)	~ 108 (42)	~ 118 (48)	~ 118 (48)	~ 118 (48)	~ 118 (48)	~ 118 (48)	~ 118 (48)	~ 118 (48)	~ 118 (48)
VOC's, lbs/gal		5.3	3.9	5.7	4.8	4.8	4.9	4.8	4.9	4.9	5.0	5.0
Shelf Life @RT, months		6	6	6	6	6	6	6	6	6	6	6
Storage Temperature, °F		40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90	40–90

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer, LV3 Spindle @ 30 RPM.

[2] Estimated Wet Film Thickness (WFT).

[3] Recommended Dry Film Thickness (DFT).

[4] Actual coverage will vary depending on material losses during mixing and application.

[5] Primer is only recommended for exterior applications in which salt fog or moisture are present.

[6] Where a value is provided for "Min Air Set", it is recommended to set the coating at room temperature for, at minimum, the specified time prior to curing.

[7] Adequate ventilation is required when curing these products as some outgassing will occur.

[8] Curing is recommended but not absolutely required if the system is raised slowly to a minimum of 500 °F within 24–48 hours of application and not exposed to high moisture or rain during this initial dwell period.

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Smooth metal surfaces should be abrasive blasted to an SSPC-SP6 near white blast. Remove abrasive residue using air pressure; do not clean with organic solvents.

Aremco's Corr-Prep™ CPR2000 is recommended as an alternative when sandblasting is not possible. This is a specially formulated, water-based, zinc phosphate metal etching solution that is non-toxic, non-flammable, non-caustic, and non-corrosive. It etches metal to provide surface profile for superior coating adhesion to aluminum, galvanized metal, steel, and stainless steel. It also helps to improve long-term corrosion protection. Application is simple — just brush or spray liquid on the substrate, allow to sit for 20–30 minutes, then rinse off and dry substrate thoroughly prior to coating.

Application Notes: Mix thoroughly before use to redisperse fillers and pigments. Apply using a brush, roller or spray gun. When spraying, a maximum dry film thickness of 2 mils (0.002") can be achieved by applying two coats. Recommended fluid nozzle diameter is 40–50 mils, atomizing presure of 40–50 psi, and distance from work of 8–10". Adequate ventilation is required when applying and curing the coating. Read Safety Data Sheet for further safety instructions.

Abbreviations

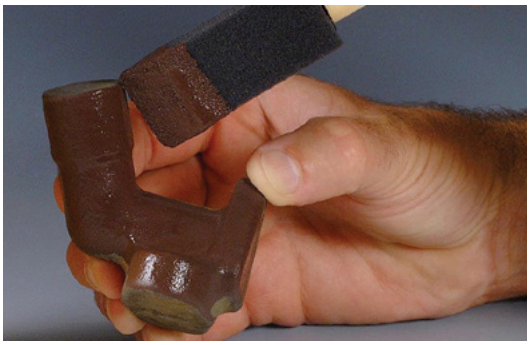
NA	Not Applicable	DFT	Dry Film Thickness
NR	Not Required or Recommended	WFT	Wet Film Thickness
		RT	Room Temperature

Refer to Price List for complete order information.

AREMCO

HIGH TEMPERATURE SILICONE EMULSION COATINGS
Technical Bulletin A6-S4

Corr-Paint™ CP4020



Corr-Paint™ CP4090

Corr-Paint™ CP4060

Corr-Paint™ CP4070

Aremco's Corr-Paint™ CP40xx series coatings are formulated using an advanced water-based silicone emulsion combined with inorganic fillers and pigments to offer VOC compliant coatings with continuous temperature resistance to 1100 °F (593 °C) and intermittent resistance to 1200 °F (649 °C).

These coatings are single-part, heat curable systems that adhere to a wide range of materials including metals, ceramics, glass, quartz, and refractories, and offer outstanding resistance to outdoor weathering, UV light, salt spray corrosion, oxidation, some chemicals, and thermal shock.

AVAILABLE COLORS*

- CP4000 Black
- CP4010 Aluminum
- CP4020 Gray
- CP4040 White
- CP4050 Green
- CP4060 Red
- CP4070 Blue
- CP4080 Yellow
- CP4090 Brown
- CP4095 Orange

* All colors are matte finish. The colors represented here are approximate and the actual product color may vary.

PRODUCT HIGHLIGHTS

- Single-Part, No Mixing
- Low Viscosity
- Maximum Use Temperature, 1100 °F (593 °C)
- Intermittent Use Temperature, 1200 °F (649 °C)
- Bonds to Ceramics, Glass, Quartz, Metals
- Excellent Resistance to Moisture & Salt Spray
- Resists Thermal Shock
- Resists Ultraviolet Light
- Good Chemical Resistance
- Water-Based
- Low Volatile Organic Compounds (VOCs)

TYPICAL APPLICATIONS

- Bag Houses
- Boiler Casings
- Ceramic Cloth
- Ceramic Fiberboard
- Chimneys
- Cyclones
- Ducting
- Heaters
- Heat Exchangers
- Exhaust Systems
- Engines
- Furnaces
- Ovens
- Kilns
- Lighting Fixtures
- Process Vessels
- Reformers
- Scrubbers
- Stacks
- Turbochargers

HIGH TEMPERATURE WATER-BASED SILICONE COATINGS PROPERTIES

Type		SILICONE									
Product Number		**CP4000**	**CP4010**	**CP4020**	**CP4040**	**CP4050**	**CP4060**	**CP4070**	**CP4080**	**CP4090**	**CP4095**
Color (cured)		Flat Black	Aluminum	Gray	White	Green	Red	Blue	Yellow	Brown	Orange
Temperature Continuous, °F (°C)		1100(593)	1100(593)	1100(593)	1100(593)	1100(593)	1100(593)	1100(593)	1100(593)	1100(593)	1100(593)
No. Components		1	1	1	1	1	1	1	1	1	1
Viscosity, cP[1]		400–800	200–600	400–800	400–900	500–750	750–950	300–600	500–700	300–500	500–700
Specific Gravity, g/cc		1.32	1.05	1.28	1.27	1.31	1.31	1.25	1.33	1.32	1.32
Solids by Weight, %		51.5	44.2	44.2	44.2	48.5	46.5	44.8	47.0	44.5	44.5
Solids by Volume, %		38.1	41.6	38.2	46.1	39.5	38.3	38.5	38.0	37.8	37.8
WFT, mils (microns)[2]		2.6 (66.5)	2.4 (61.0)	2.6 (66.4)	2.2 (55.1)	2.5 (64.3)	2.6 (66.3)	2.6 (66.3)	2.6 (66.8)	2.7 (67.2)	2.6 (64.9)
DFT, mils (microns)[3]		1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft²/gal (m²/liter)		611 (14.9)	668 (16.4)	613 (15.1)	740 (18.2)	634 (15.6)	614 (15.1)	617 (15.2)	610 (15.0)	606 (14.9)	628 (15.4)
Primer[5]		NR	NR	NR	NR	NR	NR	NR	NR	NR	NR
Drying	**Touch,** hrs	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2	1–2
Drying	**Handling,** hrs	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4	2–4
Drying	**Recoat, (min/max),** hrs	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24
Curing	**Min Air Set,** hrs[6]	1	1	1	1	1	1	1	1	1	1
Curing	**Cure,** °F/hrs[7,8]	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75	450 / 1 or 480 / .75
Application Temperature, °F		50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120	50–120
Thinner		Distilled Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water	Distilled Water
Pot Life, hrs at room temp.		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Flash Point, °F (°C)		> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)
VOC's, lbs/gal		1.04	0.86	0.99	0.98	0.98	0.98	1.01	0.95	0.98	0.98
Shelf Life @RT, months		6	6	6	6	6	6	6	6	6	6
Storage Temperature, °F		55–85	55–85	55–85	55–85	55–85	55–85	55–85	55–85	55–85	55–85

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer, LV3 Spindle @ 30 RPM.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during mixing and application.
[5] Primer is only recommended for exterior applications in which salt fog or moisture are present and the operating temperature is less than 750 °F.
[6] Where a value is provided for "Min Air Set", it is recommended to set the coating at room temperature for, at minimum, the specified time prior to curing.
[7] Adequate ventilation is required when curing these products as some outgassing will occur.
[8] Curing is recommended but not absolutely required if the system is raised slowly to a minimum of 450 °F within 24–48 hours of application and not exposed to high moisture or rain during this initial dwell period.

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Smooth metal surfaces should be abrasive blasted to an SSPC-SP6 near white blast. Remove abrasive residue using air pressure; do not clean with organic solvents.

Aremco's Corr-Prep™ CPR2000 is recommended as an alternative when sandblasting is not possible. This is a specially formulated, water-based, zinc phosphate metal etching solution that is non-toxic, non-flammable, non-caustic, and non-corrosive. It etches metal to provide surface profile for superior coating adhesion to aluminum, galvanized metal, steel, and stainless steel. It also helps to improve long-term corrosion protection. Application is simple — just brush or spray liquid on the substrate, allow to sit for 20–30 minutes, then rinse off and dry substrate thoroughly prior to coating.

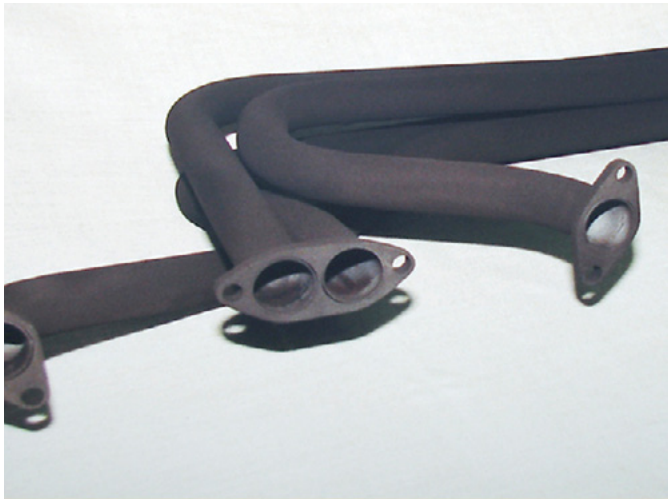
Application Notes: Mix thoroughly before use to redisperse fillers and pigments. Apply using a brush, roller or spray gun. When spraying, a maximum dry film thickness of 2 mils (0.002") can be achieved by applying two coats. Recommended fluid nozzle diameter is 40–50 mils, atomizing presure of 40–50 psi, and distance from work of 8–10". Adequate ventilation is required when applying and curing the coating. Read Safety Data Sheet for further safety instructions.

Abbreviations

NA	Not Applicable	DFT	Dry Film Thickness
NR	Not Required or Recommended	WFT	Wet Film Thickness
		RT	Room Temperature

Refer to Price List for complete order information.

Corr-Paint™ CP3015-AL



Corr-Paint™ CP3015-BL

Aremco's Corr-Paint™ CP3015-xx series coatings are silicate-bonded, ceramic and/or metal-filled, aqueous-based systems that provide excellent resistance to thermal shock, oxidation, and chemical corrosion, with good color stability for applications as high as 1500 °F (816 °C).

These coatings are single-part, fast curing systems that adhere well to carbon and stainless steels, ceramics and refractories. Mainly recommended for interior system protection, several standard colors are provided and custom colors are available upon request.

TYPICAL APPLICATIONS

- Bag Houses
- Boiler Casings
- Ceramic Cloth
- Ceramic Fiberboard
- Chimneys & Stacks
- Heaters
- Heat Exchangers
- Exhaust Systems
- Engines
- Furnaces, Ovens, Kilns
- Rotary Calciners

PRODUCT HIGHLIGHTS

CP3015-AL	Aluminum-Ceramic, 1200 °F (649 °C)
CP3015-BL	Black Pigmented, 1500 °F (816 °C)
CP3015-GR	Gray Pigmented, 1400 °F (760 °C)
CP3015-SS	Stainless Steel, 1400 °F (760 °C)
CP3015-WH	Off-White, Zirconia Filled, 1500 °F (816 °C)

ULTRA HIGH TEMPERATURE CERAMIC COATINGS PROPERTIES

Product Number		CP3015-AL	CP3015-BL	CP3015-GR	CP3015-SS	CP3015-WH
Color		Aluminum	Black	Gray	Stainless Steel	White
Temperature Continuous, °F (°C)		1200 (649)	1500 (816)	1400 (760)	1400 (760)	1500 (816)
No. Components		1	1	1	1	1
Viscosity, cP[1]		250–900	600–900	600–900	200–500	600–900
Specific Gravity, g/cc		1.32	1.54	1.38	1.47	1.37
Solids by Weight, %		36.8	50.0	40.0	42.3	40.0
Solids by Volume, %		19.3	46.3	19.6	41.4	20.6
WFT, mils (microns)[2]		5.20 (131.9)	2.16 (54.9)	5.09 (129.4)	2.42 (61.4)	4.87 (123.6)
DFT, mils (microns)[3]		1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)	1.0 (25.4)
Theoretical Dry Film Coverage[4] @ 1 mil, ft²/gal (m²/liter)		309 (7.6)	742 (18.2)	315 (7.7)	664 (16.3)	330 (8.1)
Primer[5]		NR	NR	NR	NR	NR
Drying	**Touch,** hrs	1–2	1–2	1–2	1–2	1–2
Drying	**Handling,** hrs	2–4	2–4	2–4	2–4	2–4
Drying	**Recoat, (min/max),** hrs	1 / 24	1 / 24	1 / 24	1 / 24	1 / 24
Curing	**Min Air Set,** hrs[6]	1	1	1	1	1
Curing	**Cure,** °F/hrs[7]	200/2 + 500/1	200/2 + 500/1	RT / 24	RT / 24	RT / 24
Application Temperature, °F		50–90	50–90	50–90	50–90	50–90
Thinner		CP3015-AL-T	CP3015-BL-T	CP3015-GR-T	CP3015-SS-T	CP3015-WH-T
Pot Life, hrs at room temp.		NA	NA	NA	NA	NA
Flash Point, °F (°C)		> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)	> 212 (100)
VOC's, lbs/gal		0	0	0	0	0
Shelf Life @RT, months		6	6	6	6	6
Storage Temperature, °F		40–85	40–85	40–85	40–85	40–85

Reference Notes

[1] Viscosity is measured using a Brookfield LV Viscometer, LV3 Spindle @ 30 RPM.
[2] Estimated Wet Film Thickness (WFT).
[3] Recommended Dry Film Thickness (DFT).
[4] Actual coverage will vary depending on material losses during application.
[5] Primer is only recommended for exterior applications in which salt fog or moisture are present.
[6] Where a value is provided for "Min Air Set", it is recommended to set the coating at room temperature for, at minimum, the specified time prior to curing.
[7] Curing is recommended but not absolutely required if the system is raised slowly to a minimum of 500 °F within 24–48 hours of application and not exposed to high moisture or rain during this initial dwell period.

Surface Preparation Notes

All surfaces should be free of oil, grease, dirt, corrosives, oxides, paints or other foreign matter. No further preparation is required when coating ceramics, refractories or graphites. Smooth metal surfaces should be abrasive blasted to an SSPC-SP10 near white blast. Remove abrasive residue using air pressure; do not clean with organic solvents.

Aremco's Corr-Prep™ CPR2000 is recommended as an alternative when sandblasting is not possible. This is a specially formulated, water-based, zinc phosphate metal etching solution that is non-toxic, non-flammable, non-caustic, and non-corrosive. It etches metal to provide surface profile for superior coating adhesion to aluminum, galvanized metal, steel, and stainless steel. It also helps to improve long-term corrosion protection. Application is simple—just brush or spray liquid on the substrate, allow to sit for 20–30 minutes, then rinse off and dry substrate thoroughly prior to coating.

Application Notes: Mix thoroughly before use to redisperse fillers and pigments. Apply using a brush, roller or spray gun. When spraying, a maximum dry film thickness of 2 mils (0.002") can be achieved by applying two coats. Recommended fluid nozzle diameter is 40–50 mils, atomizing presure of 40–50 psi, and distance from work of 8–10". Adequate ventilation is required when applying and curing the coating. Read Safety Data Sheet for further safety instructions.

Abbreviations

NA	Not Applicable
NR	Not Required or Recommended
DFT	Dry Film Thickness
WFT	Wet Film Thickness
RT	Room Temperature

Refer to Price List for complete order information.

Aremco offers an impressive selection of high performance epoxies for specialty bonding and potting applications to 600 °F. These products can be applied to a myriad of substrates, offering exceptional chemical, electrical and mechanical properties.

PRODUCT HIGHLIGHTS

Ultra High Temperature

526N	Clear-Amber, 1:1 System for Tough Bonding Applications.
570	Single-Part Contact Adhesive, Excellent Flexibility.
805	Aluminum-Filled, Low Shrinkage, High Thermal Conductivity, For Bonding & Molding.
2330	Single-Part, Heat Curable, Silicone Elastomer Adhesive.
2335	Ceramic-Filled, Low Expansion, High Lap-Shear Strength & Chemical Resistance, Low Outgassing.

High Temperature, Special Purpose

568	Aluminum-Filled, 1:1, High Bond Strength, Excellent Thermal Conductivity.
631	Clear-Amber, 1:1, High Bond Strength & Corrosion Resistance.
807	10 Minute Set, Non-Sagging, 1:1, Excellent Electrical & Mechanical Properties.
820	Clear, 1:1, 45-Minute Cure System with Good Flexibility.
2150	Fast-Setting, Ceramic-Filled, High Vibration Resistance & Bond Strength.

High Temperature Potting Compounds

2315	High Temperature Resistance, Thermally Conductive, Low Viscosity.
2315X	Similar to 2315 Providing Improved Crack Resistance & Bond Strength.
2318	High Temperature, Low Viscosity, Room Temperature Cure.
2340	High Temperature, Low Viscosity, Low Expansion, High Glass Transition Temperature & Chemical Resistance.

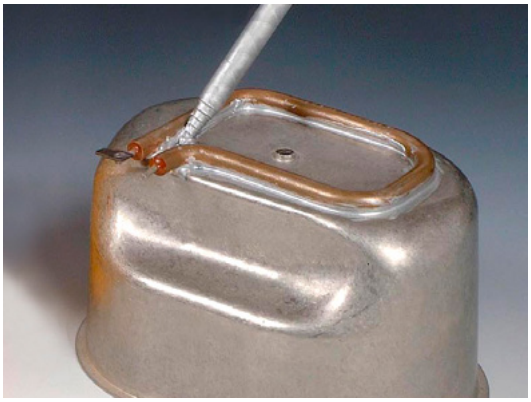
High Temperature, Maintenance & Repair

657	Stainless-Steel Filled, 1:1, High Bond Strength & Corrosion Resistance.
2200	Glass Fiber & Kevlar-Reinforced, Epoxy-Novolac, High Strength & Excellent Abrasion & Corrosion Resistance.
2210	Aluminum & Ceramic-Filled, Vibration & Impact Resistant; For Repairing Aluminum Mold & Wear Surfaces.
2220	Ceramic-Filled, High Chemical Resistance, Machinable; For Repairing Deeply Corroded Parts.

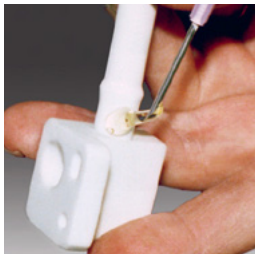
Ultra High Bond Strength

2300	Unfilled, Low Viscosity, Rubberized Epoxy, Exceptional Bond Strength & Chemical Resistance.
2310	Ceramic-Filled, 1:1, High Lap Shear & Peel Strength, Resistant to Extreme Shock, Vibration & Flexing; Ideal for Autoclave & Cryogenics.
2320	Toughened, Unfilled, Fast-Setting, BPA Free, 2:1, High Peel & Shear Strength.

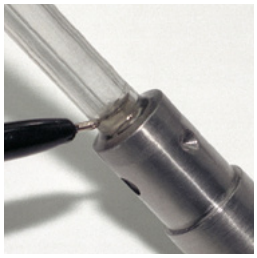
Aremco-Bond™ 570 bonds ceramic to copper nozzle.



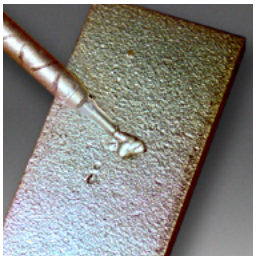
Aremco-Bond™ 568 bonds copper coil.



Aremco-Bond™ 526N bonds alumina to alumina ceramic.



Aremco-Bond™ 631 bonds sapphire tube to stainless steel.



Aremco-Bond™ 657-FST repairs defects in cast iron.

Aremco-Bond™ 2150 bonds ceramic wear tile.

HIGH PERFORMANCE EPOXIES PROPERTY CHART

Category		Ultra High Temperature					High Temperature, Special Purpose					High Temperature Potting Compounds				High Temperature, Maintenance & Repair				Ultra High Bond Strength		
Product Number		526N[5,6]	570	805	2330	2335	568	631[5,6]	807	820	2150	2315[6]	2315X	2318	2340	657	2200	2210	2220	2300	2310	2320
Handling & Curing	**Mix Ratio by Weight,** resin:hardener[1]	1:1	NA	100:12	NA	100:5.5	1:1	1:1	1:1	1:1	100:13	100:25	100:25	100:12	100:10	1:1	1:1	100:11	100:28	100:10	1:1	2:1
	Specific Gravity, g/cc @ 25 °C	1.23	0.95	1.66	1.43	1.80	0.85	1.12	1.39	1.15	1.50	1.95	1.95	1.58	1.76	1.65	1.60	1.80	1.70	1.10	1.35	1.10
	Mixed Viscosity, cP @ 25 °C	8,500	35,000	11,000	38,000	Paste	Paste	25,000	75,000	12,000	Paste	3,000	4,000	16,000	39,000	Paste	Paste	Paste	Paste	5,000	45,000	35,000
	Pot Life, 100 gm mass @ 25 °C, hrs	2.50	NA	≤ 1.0	NA	1.50	4.00	4.00	0.25	0.25	> 8	2.00	> 8	0.70	> 4	4.00	0.70	1.00	1.00	0.75	0.75	1.00
	Recommended Cure, hr/°F	2/200 + 2/325	.3/180 + .5/350	24/100 + 2/200	1/200	2/200 + 2/350	2/200	2/200	1/RT	.75/RT	24/RT	2/160 + 2/300	2/160 + 2/300	4/RT + 2/200	2/175 + 2/300	2/200	24–48/RT	24–48/RT	12–24/RT	2/150	2/150	24–48/RT
	Alternate Cure, hr/°F	3–4/300	24/RT + .5/350	24/RT + 2/200	.75 / 300 or .50 / 400 F	8/300	24–48/RT	24–48/RT	—	—	1/RT + 4/175	6/250	4/220	24–48/RT	6/250	24–48/RT	4/175	2/200	2/200	48/RT	48/RT	2/200
Cured Properties	**Temperature Resistance,** °F	−76 / +572	−76 / +600	−103 / +572	−76 / +572	−67 / +572	−85 / +400	−85 / +400	−67 / +266	−58 / +392	−67 / +400	−67 / +365	−67 / +365	−67 / +248	−40 / +430	−85 / +400	−67 / +400	−67 / +400	−67 / +400	−67 / +350	−67 / +325	−67 / +250
	Temperature Resistance, °C	−60 / +300	−60 / +316	−75 / +300	−60 / +300	−55 / +300	−65 / +204	−65 / +204	−55 / +130	−50 / +200	−55 / +204	−55 / +185	−55 / +185	−55 / +120	−40 / +220	−65 / +204	−55 / +204	−55 / +204	−55 / +204	−55 / +175	−55 / +165	−55 / +120
	CTE, in/in/°F x 10^{-6} (°C)	18 (33)	48 (86)	25 (45)	94 (170)	14 (25)	33 (60)	27 (49)	32 (59)	16 (29)	18 (32)	19 (34)	19 (34)	39 (70)	9 (16)	30 (54)	19 (34)	15 (28)	18 (32)	37 (66)	43 (77)	33 (60)
	Thermal Conductivity, Btu-in/hr-ft^2-°F	—	—	12.5	—	—	9.0	—	—	—	—	8.4	8.4	4.4	—	—	—	11.0	—	—	—	—
	Tensile Shear Strength, psi[2]	2,800	3,750	1,800	425	2,000	2,500	3,000	1,135	1,200	2,350	—	—	1,135	—	2,500	2,300	2,600	2,700	4,560	4,770	4,800
	Flexural Strength, psi[3]	18,000	ND	15,500	—	13,600	11,400	10,200	—	8,000	11,800	12,300	12,300	14,100	13,800	12,000	13,400	14,100	16,000	13,500	12,000	—
	Volume Resistivity, ohms-cm @ RT	4.0 x 10^{14}	1.0 x 10^{13}	1.0 x 10^{5}	2.0 x 10^{15}	2.0 x 10^{15}	1.0 x 10^{5}	1.2 x 10^{14}	2.0 x 10^{14}	2.0 x 10^{14}	1.0 x 10^{15}	1.0 x 10^{16}	1.0 x 10^{16}	3.0 x 10^{15}	3.8 x 10^{15}	ND	1.0 x 10^{15}	1.0 x 10^{13}	2.0 x 10^{15}	1.0 x 10^{15}	3.0 x 10^{13}	2.0 x 10^{14}
	Dielectric Strength, volts/mil	450	300	50	550	450	80	440	380	860	460	480	480	460	460	ND	460	420	480	380	410	1,100
	Dielectric Constant, 1.0 kHz	3.01	ND	ND	3.3	4.8	ND	3.12	4.4	6	4.2	4.7	4.7	4.8	4.3	ND	4.7	6.5	6.8	3.5	4.3	—
	Dissipation Factor	0.01	ND	ND	0.02	0.0007	ND	0.01	0.03	0.04	0.04	0.01	0.01	0.014	0.004	ND	0.01	0.09	0.01	0.008	0.4	—
	Chemical Resistance	Good	Excellent	Good	Good	Excellent	Excellent	Good	Excellent	Excellent	Good	Excellent	Excellent	Excellent	Excellent	Excellent	Good	Good	Very Good	Very Good	Good	Good
	Color	Amber	Black	Gray	Red	Beige	Gray	Amber	Gray	Clear	Light Gray	Black	Black	Black	Black	Gray	Rust Brown	Gray	Black	Milky Clear	Black	Off-White
	Hardness, Shore D	89	ND	87	43 (Shore A)	90	75	75	73	65	84	92	92	89	90	75	88	89	88	85	78	78
	Cure Shrinkage, in/in[4]	0.01	ND	0.003	0.003	0.0031	0.002	0.002	0.009	0.008	0.004	0.003	0.003	0.003	0.0034	0.002	0.009	0.005	0.003	0.003	0.001	0.001

Reference Notes

[1] Epoxies mixed in a 1:1 ratio are available in 50ml dual barrel cartridges. Add "-C" to part number (eg. 568-C). Request 9700 mechanical dispenser, 9800 pneumatic dispenser or 9850 plunger. Also request 9905 3.5" or 9910 6" static mixing nozzles.

[2] Tested according to ASTM D1002-94. This is a standard test method for determining the shear strength of single lap-joint metal coupons in tension loading.

[3] Tested according to ASTM D790, "Flexural Properties of Unreinforced and Reinforced and Electrically Insulating Materials, Method-L, Three Point Loading System".

[4] Linear shrinkage is measured using a ¾ lb casting mass.

[5] Also available filled with aluminum oxide, inorganic black pigment or both. Part numbers are 526N-ALOX, 631-ALOX, 526N-BL, 631-BL, 526N-ALOX-BL, and 631-ALOX-BL.

[6] Meets NASA outgassing requirements.

Application Notes

Surface Preparation: All surfaces must be free of oil, grease, dirt, corrosives, oxides, paint or other foreign matter. Sand blast or abrade non-porous surfaces, or etch using Aremco's Corr-Prep™ CPR2000.

Mixing: Two component products should be mixed thoroughly prior to dispensing. For high viscosity systems each component can be preheated separately at 100–125 °F to facilitate mixing and dispensing. Use Aremco's 9700 or 9800 50ml dispensing systems for precise mixing of two component products.

Application: In most cases, the adhesive should be applied to both surfaces maintain a glue line of less than 10 mils. After assembling the parts, pressure should be applied to the assembly to prevent warpage and reduce air entrapment. Refer to curing guidelines in the above property chart.

Abbreviations

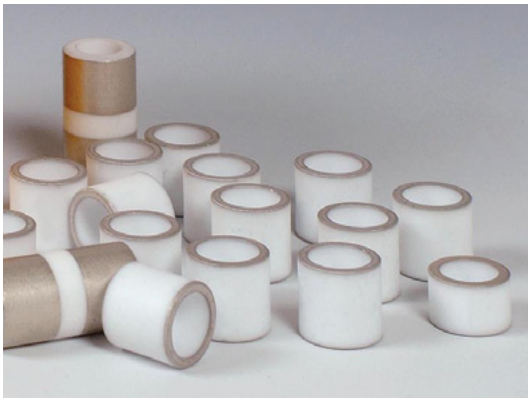
NA Not Applicable
ND Not Determined
RT Room Temperature

Refer to Price List for complete order information.

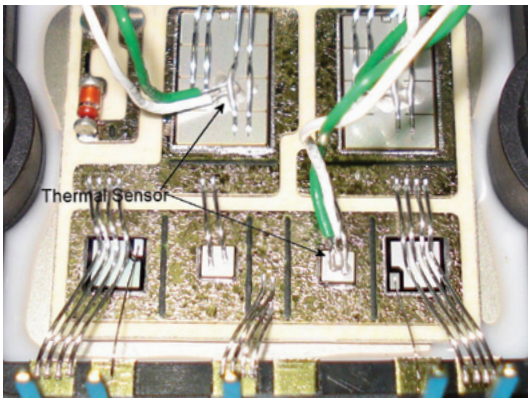
Aremco offers a broad range of electrically and thermally conductive adhesives & coatings that provide solutions to a variety of electrical, electronics and thermal design problems throughout industry.

PRODUCT HIGHLIGHTS

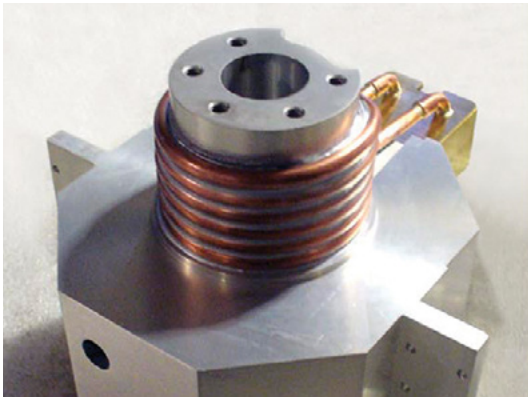
Part Number	Adhesive/Coating	Filler	Conductivity		Max Temp °F (°C)
			Electrical	Thermal	
525-N	Adhesive	Silver	✓	✓	340 (170)
556	Adhesive	Silver	✓	✓	340 (170)
556-LV	Adhesive	Silver	✓	✓	340 (170)
556-HT-HC	Adhesive	Silver	✓	✓	390 (200)
556-HT-UHC	Adhesive	Silver	✓	✓	390 (200)
556-HT-SP	Adhesive	Silver	✓	✓	445 (230)
568	Adhesive	Aluminum		✓	400 (204)
597-A	Adhesive	Silver	✓	✓	1700 (927)
597-C	Coating	Silver	✓	✓	1700 (927)
598-A	Adhesive	Nickel	✓	✓	1000 (538)
598-C	Coating	Nickel	✓	✓	1000 (538)
614	Adhesive	Nickel	✓	✓	360 (180)
616	Adhesive	Silver	✓	✓	360 (180)
805	Adhesive	Aluminum		✓	572 (300)
860	Adhesive	Aluminum Nitride		✓	400 (204)



Pyro-Duct™ 597-C metallizes ceramic tubes.



Aremco-Bond™ 556-HT-SP used to bond thermal sensor.



Aremco-Bond™ 568 bonds copper heat exchange tube to aluminum.

ELECTRICALLY & THERMALLY CONDUCTIVE ADHESIVES & COATINGS

Properties	ADHESIVES													COATINGS	
Product Number	**525-N**	**556**	**556-LV**	**556-HT-UHC**	**556-HT-HC**	**556-HT-SP**	**597-A**	**598-A**	**568[3]**	**614**	**616**	**805**	**860[3]**	**597-C**	**598-C**
Resin type	Epoxy						Ceramic		Epoxy					Silicone	Ceramic
Filler	Silver Flake	Silver Flake	Silver Flake	Silver Flake	Silver Flake	Silver Flake	Silver Flake	Nickel Flake	Aluminum	Nickel Flake	Silver-Coated Glass	Aluminum	Aluminum Nitride	Silver Flake	Nickel Flake
Particle Size, microns	< 28	< 20	< 20	< 20	< 20	< 44	< 20	< 20	< 20	< 20	< 130	< 50	< 10	< 20	< 20
No. Components	1	2	2	2	2	2	1	1	2	2	2	2	2	1	1
Mix Ratio, by Weight, resin:hardener	NA	1:1	100:4	100:2	100:2	1:1	NA	N/A	1:1	1:1	1:1	100:12	1:1	NA	NA
Mixed Specific Gravity, g/cc @ 25 °C	1.85	3.2	2.9	3.7	3.1	3.1	2.3	2.8	0.85	1.8	1.53	1.66	1.90	2	1.5
Mixed Viscosity, cP @ 25 °C	Paste	35,000–40,000	4,000–6,000	40,000–50,000	40,000–45,000	35,000–45,000	Paste	20,000–25,000	Paste	100,000–110,000	50,000–60,000	11,000	40,000	400–800	400–600
Pot Life, 25 gms @ 25 °C	NA	1 Hr	1 Hr	> 48 Hrs	48 Hrs	> 48 Hrs	NA	N/A	4.0 Hr	0.75 Hr	0.75 Hr	< 1.0 Hr	4.0 Hr	NA	NA
Recommend Cure, hr/°F	2/300	2/200	2/200	2/175	2/200	1/350	2/RT + 2/200	2/RT + 2/200	2/200	2/100	2/100	24/100 + 2/200	2/200	1/RT + .5/480	2/RT + 2/200
Alternate Cure, hr/°F	6/250	24/RT	24/RT	0.5/250 or 0.25/300	1/250	2/300	—	—	24–48/RT	1/200 or 8/RT	1/200 or 8/RT	24/RT + 2/200	24–48/RT	—	—
Service Temperature, °F (°C)[1]															
Continuous	340 (170)	340 (170)	340 (170)	390 (200)	390 (200)	445 (230)	1700 (927)	1000 (538)	400 (204)	360 (180)	360 (180)	572 (300)	400 (204)	1700 (927)	1000 (538)
Intermittent	375 (190)	375 (190)	375 (190)	480 (250)	480 (250)	570 (300)	—	—	—	400 (205)	400 (205)	—	—	—	—
Volume Resistivity, ohm-cm	0.006	0.0009	0.0008	< 0.0003	< 0.0001	< 0.0004	0.0002	0.005	1.0×10^5	0.025	0.002–0.004	1.0×10^5	1.0×10^{15}	0.0002	0.005
Tensile Shear Strength, psi[2]	2,500	1,700	1,100	> 1,000	1,700	1,400	—	—	2,500	2,500	1,000	1,800	1,375	—	—
Thermal Conductivity, W/m-K	2.1	2.2	2.2	12.4	2.2	3.5	9.1	2.6	1.3	0.5	0.4	1.8	1.2	9.1	2.6
Hardness, Shore D	76	72	84	90	90	88	—	—	75	78	78	87	75	—	—
Color	Silver	Silver	Silver	Silver	Silver	Silver	Silver	Dark Gray	Gray	Dark Gray	Tan	Gray	Gray	Silver	Dark Gray
Shelf Life, months	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6

Reference Notes

[1] The low end of the service temperature range for all products is approximately −67 °F (−55 °C).

[2] Tested according to ASTM D1002-94 at 25 °C, a method for determining the shear strength of a single lap-joint of metal substrates in tensile loading.

[3] Available as a faster-setting. Add "-FSLV" (eg. 568-FSLV).

Application Notes

Surface Preparation: All surfaces must be free of oil, grease, dirt, corrosives, oxides, paint or other foreign matter. Sand blast or abrade non-porous surfaces, or etch using Aremco's Corr-Prep™ CPR2000.

Mixing: Two component products should be mixed thoroughly prior to dispensing. For high viscosity systems each component can be preheated separately at 100–125 °F to facility mixing and dispensing. Aremco-Bond™ 568 is available in 50ml cartridges. Order 568-C 50ml Cartridge, 9910 6" Mixing Nozzle and 9850 Plunger or 9700 Mechanical Dispense Gun.

Application: Apply adhesive to both surfaces maintaining a glue line of less than 10 mils. Assemble parts and apply pressure to prevent warpage and reduce air entrapment. Refer to curing guidelines in above property chart.

Abbreviations

NA Not Applicable
RT Room Temperature

Refer to Price List for complete order information.

Aremco's Heat-Away™ greases are ceramic and metal-filled systems that offer exceptional electrical and thermal properties up to 680 °F (360 °C). These materials are used in high power electronics, heat pipes, high vacuum systems, and other heat management applications.

Heat-Away™ 639 coats process heater to improve thermal contact.

PRODUCT HIGHLIGHTS

Part Number	Filler	Conductivity		Vacuum Compatible	Temp. Range °F (°C)
		Electrical	Thermal		
637	Alumina		✓		550 (288)
638	Aluminum Nitride		✓		550 (288)
639	Aluminum		✓		550 (288)
640	Copper		✓		550 (288)
641	Silver	✓	✓		550 (288)
641-EV	Silver	✓	✓	✓	550 (288)
641-HT-EV	Silver	✓	✓	✓	680 (360)

HEAT-AWAY™ THERMALLY CONDUCTIVE GREASES

Product Number	637	638	639 [2]	640 [2]	641	641-EV [1]	641-HT-EV [1]
Filler	Alumina	Aluminum Nitride	Aluminum	Copper	Silver	Silver	Silver
Temperature Resistance, °F	−60 / +550	−60 / +550	−60 / +550	−60 / +550	−60 / +550	−60 / +550	−23 / +680
Temperature Resistance, °C	−51 / +288	−51 / +288	−51 / +288	−51 / +288	−51 / +288	−51 / +288	−5 / +360
Thermal Conductivity, W/m-K	0.475	2.23	3.04	4.68	5.58	5.58	5.58
Dielectric Strength, volts/mil	300	300	40	4	4	—	—
Volume Resistivity, ohm-cm [3]	10^{14}	10^{14}	10^{4}	10^{3}	< 0.0002	< 0.0002	< 0.0006
Chemical Resistance	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent	Excellent
Water Absorption	Nil	Nil	Nil	Nil	Nil	Nil	Nil
Solids, %	100	100	100	100	100	100	100
Specific Gravity, g/cc	2.42	2.27	1.35	1.33	3.90	4.30	4.20
Color	White	Gray	Aluminum	Copper	Silver	Silver	Silver

Reference Notes

[1] Heat-Away 641-EV and 641-HT-EV are electrically and thermally conductive greases rated for high vacuum systems.

Temperature, °C (°F)	Vapor Pressure (Torr)	
	641-EV	641-HT-EV
20 (68)	3×10^{-14}	$\leq 4 \times 10^{-15}$
50 (122)	2×10^{-12}	Not Measured
100 (212)	1×10^{-9}	$\leq 2 \times 10^{-10}$
200 (392)	2×10^{-6}	$\leq 3 \times 10^{-7}$

[2] Caution: Exposure to voltages in excess of rated maximum may cause a permanent electrical leak path.

[3] Volume resistivity is measured < 0.002" thick after exposure to 500 °F.

Refer to Price List for complete order information.

Aremco's Crystalbond™ mounting adhesives are ideal for temporarily mounting a range of materials that require dicing, polishing, and other machining processes. These mounting adhesives exhibit good bond strength and adhere readily to ceramics, glass, metals, and quartz. When processing is complete, these adhesives are removed by re-heating and cleaning with a suitable solvent.

PRODUCT HIGHLIGHTS

Crystalbond™ 509

Mid-range melting point of 165 °F (74 °C). Provides excellent adhesion and minimizes clogging of diamond tools when compared to many waxes. Transparent in thin cross-sections. Soluble in acetone or Aremco's proprietary **Crystalbond™ 509-S Stripper,** a low odor, non-flammable, biodegradable, water-rinsible solvent. Available in three standard colors and both round sticks and rectangular bars:

Crystalbond™ 509-1A	Light Amber	Round Stick, ⅞″ Dia × 7″
Crystalbond™ 509-1B	Light Amber	Rectangular Bar, ⅝″ × 1″ × 7″
Crystalbond™ 509-2A	Dark Amber	Round Stick, ⅞″ Dia × 7″
Crystalbond™ 509-2B	Dark Amber	Rectangular Bar, ⅝″ × 1″ × 7″
Crystalbond™ 509-3A	Clear Turquoise	Round Stick, ⅞″ Dia × 7″
Crystalbond™ 509-3B	Clear Turquoise	Rectangular Bar, ⅝″ × 1″ × 7″

Crystalbond™ 555

Low melting point of 120 °F (49 °C).

Crystalbond™ 555-HMP

Mid-range melting point of 150 °F (66 °C).

Use 555 and 555-HMP for low stress machining processes, dry plasma etching or silicon wafers, de-paneling copper plated Teflon boards, and dicing ceramic green tape. Transparent in thin cross-sections and soluble in hot water. Available in rectangular bars, ⅝″ × 1″ × 7″.

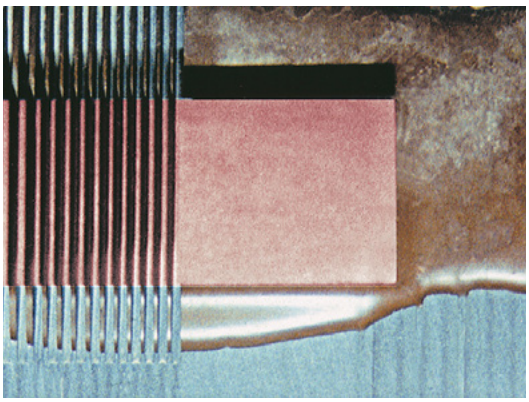
Crystalbond™ 590

High melting point of 300 °F (150 °C). High strength, flexible adhesive, ideal for dicing high aspect ratios. Soluble in isopropyl alcohol or Aremco's proprietary **Crystalbond™ 590-S Stripper,** a water-dispersible, environmentally safe powder concentrate. Available in two standard forms:

Crystalbond™ 590-STK	Rectangular Stick, ⅝″ × 1″ × 7″
Crystalbond™ 590-PDR	Granular Powder

Crystalbond™ 509-1A, 509-2A, 509-3A

Crystalbond™ 555-HMP



Crystalbond™ 590 bonds Boron Carbide ceramic diced into 25–50 mil sections.

TYPICAL APPLICATIONS

- Machining advanced ceramics
- Lapping and polishing optical components
- Dicing ceramic substrates
- Dicing semiconductor wafers
- Dicing ferrites, glasses and piezoelectrics
- Dicing metal and optical single crystals
- Mounting cross-sections for SEM
- Backfilling components for support
- Dry plasma etching

CRYSTALBOND™ PRODUCT SPECIFICATIONS

Part Number	509	555	555-HMP	590
Flow Point, °F (°C)	165 (74)	120 (49)	150 (66)	300 (150)
Tensile Strength, psi	1,160[1]	220	335	950[2]
Solvent	509-S or Acetone	Hot Water	Hot Water	590-S or Isopropanol
Available Colors	509-1 | Light Amber 509-2 | Dark Amber 509-3 | Clear-Turquoise	White	White	Brown
Available Forms	Stick, ⅞″ Dia × 7″ Stick, ⅝″ × 1″ × 7″	Stick, ½″ × 1″ × 7″	Stick, ½″ × 1″ × 7″	590-PDR | Powder 590-STK | ⅝″ × 1″ × 7″
Weight	0.20 Lbs/Stick	0.15 Lbs/Stick	0.15 Lbs/Stick	0.50 Lbs/Stick

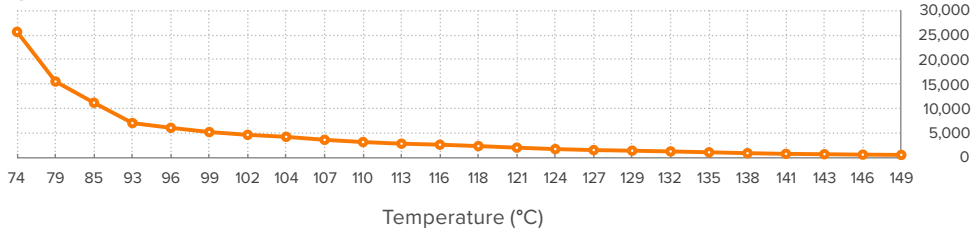
Reference Notes

[1] Crystalbond™ 509 tensile strength measured using a solution of 60 parts 509 and 40 parts Acetone by weight.

[2] Crystalbond™ 590 tensile strength measured using a solution of 36 parts 590 and 64 parts Isopropanol by weight.

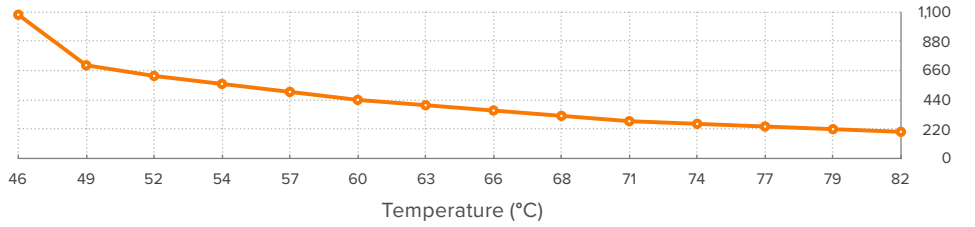
CRYSTALBOND™ — VISCOSITY VS. TEMPERATURE

Crystalbond™ 509



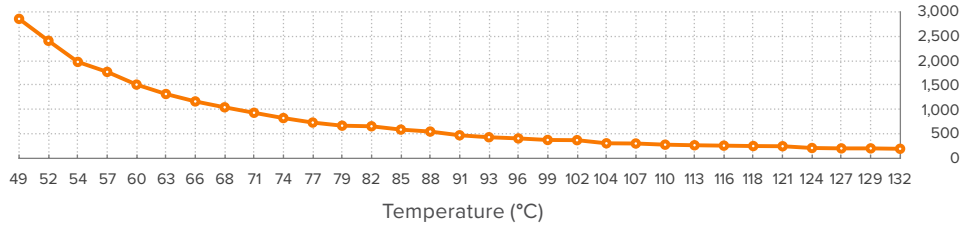
#2 Spindle
@12 RPM used for viscosity < 2,500 cP,
@6 RPM for viscosity 2,500–5,000 cP,
@3 RPM for viscosity 5,000–7,500 cP,
@1.5 RPM for viscosity 7,500–15,500 cP,
@1 RPM for viscosity 15,500–26,000 cP.

Crystalbond™ 555



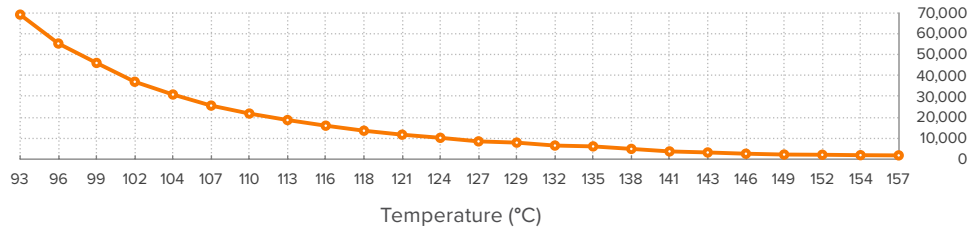
#3 Spindle
@6 RPM used for viscosity < 1,100 cP.

Crystalbond™ 555-HMP

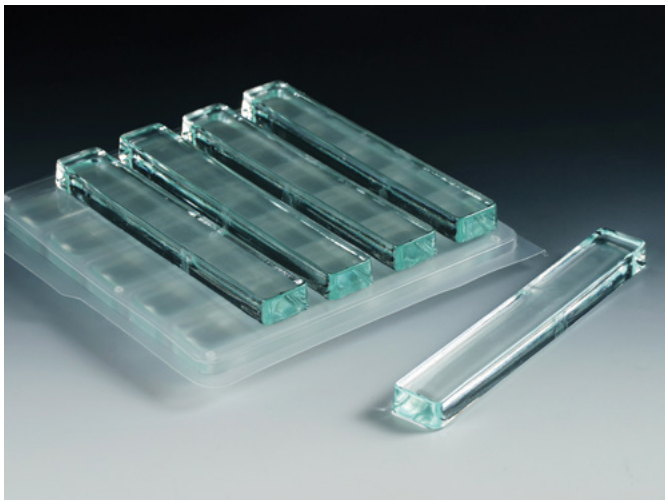


#3 Spindle
@30 RPM used for viscosity < 3,000 cP.

Crystalbond™ 590



#4 Spindle
@6 RPM used for viscosity < 55,500 cP,
@3 RPM for viscosity 55,500–70,000 cP.



Crystalbond™ 509-3B

Crystalbond™ 590

APPLICATION PROCEDURES

Crystalbond™ Adhesives | General Procedure

1) Using a hot plate or oven, heat a ceramic or glass mounting block to the flow temperature of the selected adhesive. Make sure to work in a well-ventilated area, and do not overshoot the flow temperature, otherwise, the adhesive will begin to decompose and polymerize, causing a reduction in strength.

2) Apply a uniform layer of adhesive to the heated mounting plate and place the substrate over the adhesive. Using a weight, apply even pressure to the substrate to remove air bubbles and to ensure that the substrate is parallel to the plate. Apply a fillet of the adhesive around the perimeter of the substrate to increase the holding strength.

3) Remove the mounting plate from the heat source and allow it to cool slowly to room temperature until the adhesive is hardened. Cool for 20–30 minutes before processing.

4) Process the substrate as required, then remove the parts by re-heating the mounting block to the flow temperature. Use a tool to remove the substrate from the mounting plate and follow Cleaning section.

Crystalbond™ 509 | Liquid Procedure

1) This adhesive can be applied in a thin, uniform film by dissolving and spin-coating, spraying or brushing onto the substrate. Simply crush the adhesive stick into a powder and mix with acetone in a ratio of 80 parts acetone to 20 parts 509 by weight.

2) Spin-coat, spray or brush the solution onto the parts and allow solvent to evaporate for a minimum of 5 minutes. A heat gun can be used to accelerate the evaporation rate.

3) Press parts together and heat to ~165 °F for 10–15 minutes, then cool to room temperature before processing.

Crystalbond™ 590-PDR | Liquid Procedure

1) Blend approximately 65 parts isopropyl alcohol and 35 parts 590-PDR powder by weight. Stir contents regularly to prevent settling of solids.

2) Apply a thin film of the mixture to both substrates to be bonded and evaporate solvents naturally or using an oven at ~250 °F for ~10 minutes. Remove from oven and allow to cool.

3) Clamp parts together and place in oven at 300 °F for ~30 minutes. Remove parts and allow to cool to room temperature before processing.

OPTIONAL CLEANING AGENTS

Crystalbond™ 509-S Stripper

This is a high performance, environmentally safe, non-ionic cleaning agent developed specifically for removing Crystalbond 509 and other polymer coatings and inorganic particulates.

Features

- Low Evaporation Rate
- Rinses with Water
- Non-Flammable
- Non-Reactive with Metals
- Biodegradable

Usage

509-S works best with an ultrasonic system at 120–140 °F (50–60 °C). The evaporation rate is much slower than acetone so a good lifecycle will be achieved in comparison. Replace 20% of the stripper with new material as adhesive residue begins to concentrate. Refer to process diagram for a suggested cleaning procedure.

Rinsing

A stepwise, warm rinsing process is recommended after removing the adhesive. Rinse in a dilute, non-ionic surfactant or liquid detergent system, followed by a final rinse in deionized water to eliminate water spots due to hard salts and contaminant re-deposition.

Compatibility

This cleaner is non-reactive with metals; however, it will react with many types of polymers and plastics such as elastomers and rubbers. Contact Aremco with any questions about compatibility.

Handling and Storage

This cleaner is readily biodegradable and non-toxic to marine life. The use of gloves and goggles is recommended. Respiratory protection or ventilation is recommended under normal handling. When heated, vapors should be ventilated from the work space. Keep container tightly closed and store in a cool, dry, well ventilated area or cabinet. Isolate from incompatibles such as corrosives, oxidizers, or strong reducing agents.

Crystalbond™ 590-S Stripper

This is an environmentally safe, water dispersible, powder concentrate prepared primarily for use with Crystalbond 590 and other mounting waxes. It can also be used to remove silicones, greases, oils, soils, finishing compounds, and normal contaminants.

Features

- Water Soluble
- Non-Reactive with Metals
- Biodegradable
- Non-Flammable

Usage

Add 6–8 ounces (170–225g) of 590-S powder concentrate to each gallon of water and allow to dissolve completely. Heat solution to 120–160 °F (50–70 °C) and immerse parts for a minimum of 5 minutes until the wax dissolves. Use an ultrasonic system for best results. Replace 20% of the stripper with new material as adhesive residue begins to concentrate in the stripper. Refer to process diagram for a suggested cleaning procedure.

Rinsing

A stepwise, warm rinsing process is recommended after removing the adhesive. Rinse in a dilute, non-ionic surfactant or liquid detergent system, followed by a final rinse in deionized water to eliminate water spots due to hard salts and contaminant re-deposition.

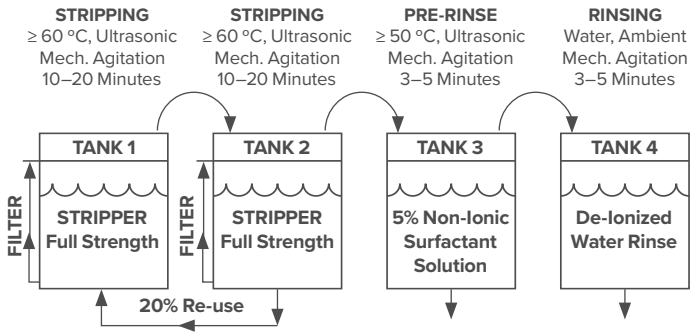
Compatibility

This stripper is non-reactive with ceramics, glass and metals such as brass, copper, iron, and silicon. It is reactive with strong acids.

Handling and Storage

This stripper is biodegradable and inert. It is a caustic material, so gloves and eye goggles should be used for personal protection. Keep container tightly closed and store in a cool, dry, well ventilated area or cabinet. Isolate from incompatibles such as strong acids.

Suggested Process Diagram For Cleaning

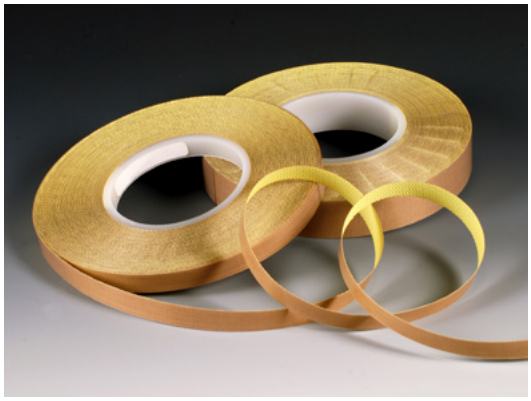


Refer to Price List for complete order information.

Pyro-Tape™ 682 is a family of high temperature, high performance tapes used in a wide range of industrial applications for plasma spray masking, heat reflectivity and abrasion, chemical, and electrical resistance. Pyro-Tape™ products are available in rolls up to 1" wide as well as custom widths and preformed shapes.

PRODUCT	APPLICATIONS	FEATURES
682-CR	Chemical Resistance	• Teflon (DuPont registered) coated fiberglass tape. • Chemical resistance of Teflon for corrosive environments. • Non-stick covering for heat seal bars and rubber molds used in the fabrication of composites.
682-DS	Double Sided	• Assembly of high temp components and films.
682-ER	Electrical Resistance	• Electrical insulation for process instrumentation, wiring and harnesses. • RF induction coil insulation. • Transformer, terminal and connector insulation. • Masking gold fingers for printed circuit board wave soldering.
682-HR	Heat Reflection	• Protective wrap for pipes exposed to high heat. • Heat mask for process instrumentation. • Protective wrap for chutes, rails and slides.

Pyro-Tape™ 682-HR Heat Reflective Tape



Pyro-Tape™ 682-CR Chemically Resistant Tape

PYRO-TAPE™ 682 PRODUCT SPECIFICATIONS

Product Number	Tape Description	Total Tape Cross-Section in/mm	Temp[1] °F (°C)	Adhesion Value oz/in	Tape Tensile Strength lbs/in	Volume Resistivity[2] ohm-cm	Dielectric Strength volts/mil	Dielectric Constant
682-CR	Single layer, Teflon-coated fiberglass with high strength silicone adhesive	0.009 / 0.228	–100 / +500 (–73 / +260)	50	120	NA	6,000	NA
682-DS	Double-sided, single layer, fiberglass tape with silicone adhesive	0.007 / 0.018	–100 / +500 (–73 / +260)	25	175	NA	NA	NA
682-ER	Single layer polyimide film with silicone adhesive	0.001 / 0.0015	–100 / +500 (–73 / +260)	25	30	1.0×10^{17}	8,000	3.4
682-HR	Bi-layer aluminum-fiberglass with silicone adhesive	0.077 / 0.177	–100 / +500 (–73 / +260)	40	150	NA	NA	NA

Reference Notes
[1] For plasma spray work, tapes will withstand flash temperatures far in excess of maximum operating temperatures.
[2] Volume resistivity is for film only. No data for film with adhesive backing.

PYRO-TAPE™ 682-TB THERMAL BARRIER CERAMIC TAPE

The new 682-TB tape is a woven silica fabric tape with temperature resistance as high as 2500 °F used to offer thermal insulation for pipes. The Pyro-Tape™ 682-TB has an adhesive backing which is used to ease wrapping around pipes. The adhesive will burn off at 275 °F, and then the tape is secured to the pipe in intervals with stainless steel wire.

Pyro-Tape™ 682-TB Heat Barrier Tape

PRODUCT SPECIFICATIONS

Product	Tape Thickness	Tape Width	Thermal Conductivity[1] BTU-in/hr-ft^2-°F	Silica Content	Roll Length
682-TB1-1	0.030″ / 0.76mm	1″	1.0	> 96%	150′
682-TB1-2	0.030″ / 0.76mm	2″	1.0	> 96%	150′
682-TB1-4	0.030″ / 0.76mm	4″	1.0	> 96%	150′
682-TB2-1	0.054″ / 1.37mm	1″	1.1	> 96%	75′
682-TB2-2	0.054″ / 1.37mm	2″	1.1	> 96%	75′
682-TB2-4	0.054″ / 1.37mm	4″	1.1	> 96%	75′

Reference Notes

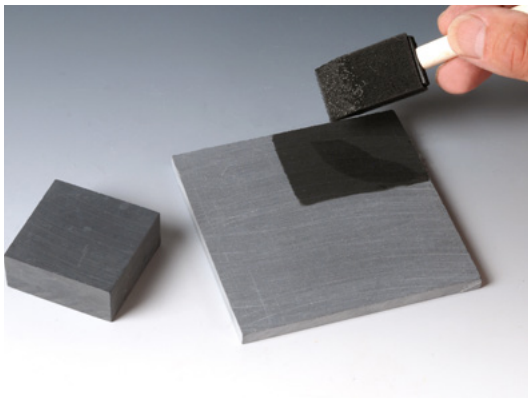
[1] Measured at a average temperature of 600 °F.

AREMCO

HIGH TEMPERATURE INORGANIC BINDERS

Technical Bulletin A11

Aremco's Ceramabind™ materials are unique inorganic, water-based binder systems used in the formulation of specialty adhesives, coatings, sealants and putties for applications to 3200 ºF. The versatility of Aremco's Ceramabind™ products enables users to blend formulations using most ceramic, glass and metal-oxide powders. Specific properties such as coefficient of thermal expansion, thermal conductivity, dielectric strength, and chemical and moisture resistance can be optimized.



Ceramabind™ 542 seals porosity in ceramic plate.

PRODUCT HIGHLIGHTS

542 An acidic, etching solution which is ideal for use in adhesive systems for bonding non-porous ceramics and glass. Stable when mixed with copper. Reacts with bases such as carbonates, oxides and hydroxides of alkali metals.

642 A basic solution which is highly compatible with most ceramic and metal powders. Good wettability and tack, and excellent acid resistance after curing. Extremely moisture resistant after a high temperature cure. Sets up in thick cross-sections when properly formulated.

643-1 A basic solution compatible with most ceramic and metal powders. Excellent binder for producing high temperature protective coatings and refractory and chemically resistant adhesives and patching materials. Fully cures at low temperatures and sets up in thick cross-sections when properly formulated.

643-2 Similar to 643-1. Excellent for formulating thin coatings that set at room temperature and can be raised rapidly to high temperatures.

644-A An acidic, colloidal alumina binder developed for mixing with sized refractory flours and grains to produce high temperature refractory coatings for ceramic fiber boards. Used as a superior standalone system to rigidize refractory fiber shapes.

644-S A colloidal silica aqueous solution which produces high adhesive strength. Ideal for blending with all types of granular and fibrous ceramics. Excellent resistance to temperature, moisture and mechanical shock.

830 A basic solution compatible with most oxide and metal powders. Ideal for formulating high pigment-to-binder ratios to produce dense adhesives and coatings. Sets at room temperature to a moisture resistant film and does not require a heat cure. Use only for thin coating systems less than 1 mil thick.

875 An acidic powdered binder system used to formulate high strength, hydraulic-setting cements for electrical potting or molding applications. A powder blend is typically formulated by adding one part binder to four parts filler by weight. Water is then added in a ratio of 15–20 parts to 100 parts powder blend by weight.

880 High temperature, water-dispersible silicone resin for producing corrosion and moisture resistant coatings and sealing porous ceramics.

TYPICAL PRODUCT SPECIFICATIONS

Product	542	642	642A	643-1	643-2	644-A	644-S	830	875	880
pH	2.5	10.7	10.7	11.0	11.5	4.0	9.0	11.4	2.8	6.5
Specific Gravity, g/cc	1.47	1.41	1.25	1.26	1.27	1.23	1.40	1.20	1.36	1.04
Viscosity, cP	50	370	200	60	30	7	35	10	NA	480
Solids Content, % by weight	40	40	25	30	30	30	40	25	100	50
Temperature Resistance, °F (°C)	3200 (1760)	3000 (1650)	3000 (1650)	3000 (1650)	3000 (1650)	3000 (1650)	3200 (1760)	2000 (1093)	3000 (1650)	1200 (650)

Aremco Products, Inc., 707-B Executive Boulevard, Valley Cottage, NY 10989 **T** (845) 268-0039 **E** aremco@aremco.com **W** aremco.com

Rev. 4/15

APPLICATION GUIDELINES

Mixing & Application

1. Liquid binder-to-powder weight ratios of 4:1 to 1:1 are recommended when formulating adhesives, coatings and pastes. Powder binder (875) to filler ratio of 1:4 is recommended.
2. Blend powder slowly into binder until desired viscosity is achieved. Vacuum degas as required to reduce entrapped air.
3. Apply mixture to clean surfaces. Extremely smooth surfaces are difficult to wet and should be sandblasted, etched, or slightly oxidized wherever possible. Porous substrates tend to absorb and separate the binder from the powder; these substrates should be pre-coated with the binder only prior to applying the mixture.

Curing

Ceramabind™ 542

1. Air dry at room temperature for 1–2 hours.
2. Heat cure at 200 °F for 1–2 hours.
3. Heat cure at 500 °F for 1–2 hours.
4. Final cure at 700 °F for 1 hour for maximum adhesive strength and moisture resistance.

Ceramabind™ 642, 642A, 643-1, 643-2

1. Air dry at room temperature for 1–2 hours.
2. Heat cure at 200 °F for 2–4 hours.
3. Heat cure at 350 °F for 1–2 hours.
4. Final cure at 500 °F for 1 hour.

Ceramabind™ 644-A, 644-S

1. Air dry at room temperature for 2–4 hours.
2. No heat cure is required if substrate is ramped slowly at ~200 °F per hour to the operating temperature.

Ceramabind™ 830

1. Air dry at room temperature for 1–2 hours.
2. No heat cure is required.

Ceramabind™ 875

1. Air dry at room temperature for 1–2 hours.
2. Heat cure at 200 °F for 2–4 hours.
3. Final cure at 250 °F for 2–4 hours.
4. Note: This binder can also be set at room temperature in 16–24 hours without heat curing.

Ceramabind™ 880

1. Air dry at room temperature for 1–2 hours.
2. Final cure at 450 °F for 1 hour or 480 °F for 45 minutes.

Storage

Unopened containers have a six-month shelf life when stored at room temperature. Make sure opened containers are capped securely to prevent evaporation. Place a plastic film in between the cap and container to prevent air leakage. Store containers between 45 °F and 95 °F.

CERAMABIND™ COMPATIBILITY CHART

Product	542	642 / 642A	643-1 / 643-2	644-S	644-A	830	875	880
Aluminum	R	S	R	S	R	S	R	S
Aluminum Oxide	S	S	S	S	S	S	S	S
Aluminum Nitride	R	S	S	S	S	S	S	S
Boron Nitride	S	S	S	R	S	S	S	S
Brass	S	S	S	S	S	S	R	S
Bronze	S	S	S	S	S	S	R	S
Chromium	R	S	S	S	S	S	R	S
Cobalt	R	S	S	S	S	S	R	S
Copper	S	R	S	S	S	S	R	S
Dolomite	S	S	S	S	S	S	S	S
Inconel	S	S	S	S	S	S	S	S
Indium	S	S	S	S	S	S	R	S
Indium Oxide	S	S	S	S	S	S	R	S
Invar	S	S	S	S	S	S	S	S
Iron	R	S	S	S	S	S	R	S
Iron Oxide	R	S	S	S	S	S	S	S
Magnesium Oxide	R	S	S	R	S	S	R	S
Manganese Dioxide	S	S	S	S	S	S	R	S
Mica	S	S	S	S	S	S	S	S
Molybdenum	R	S	S	S	S	S	S	S
Mullite	S	S	S	S	S	S	S	S
Neodymium Oxide	R	S	S	S	S	S	R	S
Nickel	R	S	S	S	R	S	R	S
Nichrome	S	S	S	S	S	S	R	S
Silicon Dioxide	S	S	S	S	S	S	S	S
Silicon	S	S	S	S	S	S	R	S
Silicon Carbide	R	S	S	R	S	S	S	S
Stainless Steel	R	S	S	R	S	S	S	S
Tantalum	R	S	S	R	S	S	S	S
Titanium	R	S	S	R	S	S	S	S
Titanium Diboride	R	R	R	S	S	S	R	S
Titanium Dioxide	S	S	S	R	S	S	S	S
Zinc	S	S	S	R	S	S	R	S
Zirconium Carbide	R	S	S	S	S	S	S	S
Zirconium Diboride	R	S	S	S	S	S	S	S
Zirconium Oxide	S	S	S	S	S	S	S	S
Zirconium Silicate	S	S	S	S	S	S	S	S

Key
S = Stable R = Reacts

Safety

Read Material Safety Data Sheet carefully prior to use. All Ceramabind™ products are water-based materials which can be washed from the skin, in the uncured state, with mild soap and warm water. Prolonged skin contact should be avoided to prevent irritation. If any material contacts the eyes, flush continuously with water or neutralizing solutions, then consult a physician immediately.

Aremco offers a good selection of mechanical and pneumatic dispensing tools which are tailored for its ceramic and epoxy-based products.

TOOLS FOR ONE-COMPONENT CERAMIC SYSTEMS

Syringe and cartridge-style systems can be used with Aremco's ceramic and ceramic metallic high-temperature systems.

Two standard 30cc syringes are offered, one for manual use, the other for use with a mechanical dispense gun.

A standard 6 oz. (173cc) high density polyethylene cartridge with ¼ NPT female threads is also offered. Manual and pneumatic hand guns, and plastic and stainless steel needles are also provided.

All metal and plastic components are easily reused since Aremco's ceramic and ceramic-metallic products are all water-based systems.

Syringe Options

8000 30cc Manual Syringe with Plunger and Tip Cap
8100 Squeeze Bottle, 9 oz.

8200 30cc Mechanical Syringe Gun
- 8201 30cc Barrel, Plunger and Tip Cap Kit
- 8202 30cc End Cap

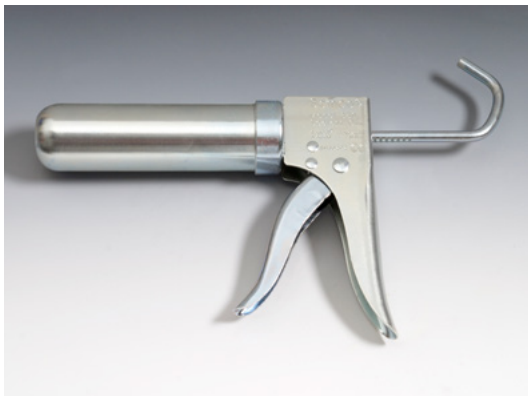
Cartridge Options

8500 Manual Hand Gun
8510 Pneumatic Hand Gun
- 8515 6 oz. Cartridge
- 8516 Plunger
- 8517 Rear Cap
- 8518 Tip Cap

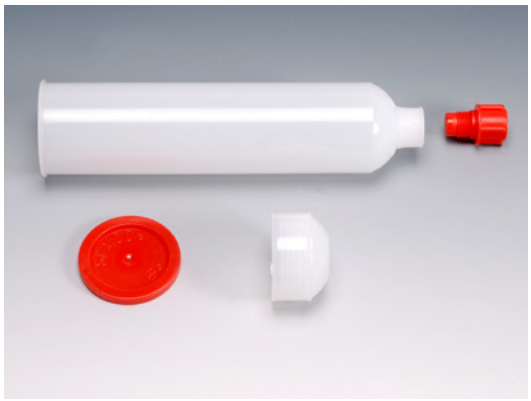
Plastic Nozzles, ¼ NPT
- 8525 1/16″ Orifice, 4.0″ Long
- 8530 ⅛″ Orifice, 4.0″ Long

Stainless Steel Needles, ¼ NPT × 2.5″ Long
- 8535 8 Gauge (0.128″)
- 8540 10 Gauge (0.102″)
- 8545 12 Gauge (0.081″)
- 8550 14 Gauge (0.064″)

8200 30cc Dispense Gun



8500 6 oz. Dispense Gun



851X 6 oz. Cartridge, Plunger, End Cap & Tip Cap

8535, 8540, 8545, 8550 Stainless Steel Needles

992X Nozzle Adapter and Needles

TOOLS FOR TWO-COMPONENT EPOXY SYSTEMS

A standard 50ml dual barrel cartridge is offered for Aremco's High Performance 1:1 Epoxy Systems. Most 1:1 products described in Technical Bulletins A7 and A8 are offered in pre-packaged 50ml cartridges. Part numbers for dispense guns, nozzles and needles are provided below.

9700	Mechanical Dispense Gun
9850	Hand-Held Plunger
9900	Un-Filled Dual Barrel Cartridge (25ml/barrel) Including (2) Pistons and Tip Cap
9905	Static Mixing Nozzle, 3.5″
9910	Static Mixing Nozzle, 6.0″
9920	Mixer-Needle Adapter
9921	Needle, .063″ ID × ½″ L
9922	Needle, .047″ ID × ½″ L
9923	Needle, .033″ ID × ½″ L
9924	Needle, .023″ ID × ½″ L
9925	Needle, .016″ ID × ½″ L
9926	Needle, .010″ ID × ½″ L

Larger cartridge sizes including 75ml, 200ml and 400ml are available upon request.

9700 50ml Dispense Gun

MIXER FOR ONE- AND TWO-COMPONENT SYSTEMS

Aremco offers the Model 7000 low-cost, heavy duty, air operated mixer ideal for mixing pint, quart and gallon containers.

PRODUCT HIGHLIGHTS — MODEL 7000

- Easy to Setup
- Heavy Duty Construction
- Compact Design
- Rubber Coated Clamps to Accommodate Pint, Quart & Gallon Containers
- Air Operated
- Rapid Mixing for Adhesives & Coatings (Typically 1–2 Minutes)
- Includes Oiler

Model 7000 Mixer

PRODUCT SPECIFICATIONS — MODEL 7000

Capacity	1.0 Gallon
Air Inlet	¼″ NPT
Air Consumption	1.35 CFM
Air Pressure	90–120 PSI
Speed	1400 Cycles/Minute

AREMCO

ACCU-COAT™ SCREEN PRINTERS

Technical Bulletin E1

Aremco's Accu-Coat™ Screen Printers offer the finest technology for precision screening of electronic components and other materials up to 24". Accu-Coat™ printers represent the best price/performance ratio throughout the industry, providing the most accurate, reliable and cost effective solution for your screen printing needs.

Accu-Coat™ Model 3230-D semi-automatic screen printer with microprocessor based controls and optic alignment system with a maximum 9" x 9" print area.

TYPICAL APPLICATIONS

- Co-Fired Ceramic Packages
- Multilayer Hybrid Circuits
- Liquid Crystal Displays
- SMT Boards
- Piezoelectric Thick Film Devices
- Thick Film Resistors & Capacitors
- Silicon Solar Cells
- Ceramic Brazing
- Instrument Panels
- Flexible Circuits

PRODUCT HIGHLIGHTS

Print Repeatability

Each Accu-Coat™ Screen Printer is based on a high precision two- or four-post die set which positions the print head directly above the part. The print head travels to and from the work in a single axis with a print repeatability of ±.0003", guaranteed over millions of cycles. An additional attribute of this design is that both substrates and tall parts such as ceramic rings and tubes can be accommodated since a clearance of 6"–8" between the print head and stage is provided.

Alignment and Registration

Part-to-screen alignment is accomplished using a precision x-y-theta stage with 2" x-y travel and 360° rotation. The theta adjustment is centered to the stage as opposed to competitive models which pivot the part about a corner requiring multiple x-y adjustments before setup is complete.

A low cost optic alignment system is also offered. With this option, during setup the ink is first printed on a sheet of mylar which is supported by an adjustable metal frame above the substrate. The operator then aligns the fixtured board to the printed pattern on the mylar sheet using the stage controls. A 10x or 20x magnification camera and monitor system is also provided to enhance the image when making critical alignments required for fine-pitch SMT boards or hybrid circuits. Multi-camera and split-monitor alignment systems are also available.

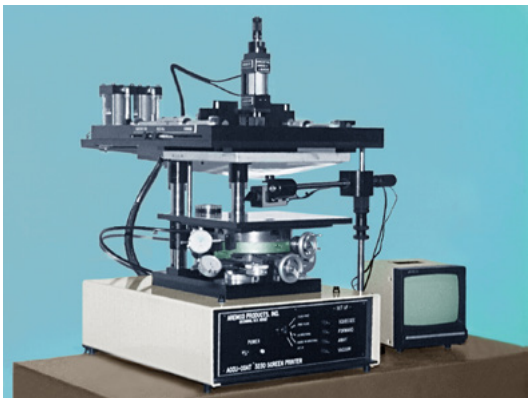
On & Off-Contact Printing

Both screens and stencils can be utilized with the Accu-Coat™ printers. Screens are used for off-contact printing where the squeegee deflects the screen in order to contact the substrate. Stencils are used for on-contact printing in which case the stencil is in direct contact with the substrate. In both on- and off-contact printing, the distance between the screen or stencil and the substrate is controlled easily to within .0005" using a "Z-stop" mechanism.

Controls

Accu-Coat™ screen printers are truly simple machines to operate. The user interfaces with the equipment through an easy-to-use control panel which provides five modes of operation. All modes are pre-programmed into a microprocessor. Modes include setup, print-flood, flood-print, and single and double print with paste hopover.

Vidalign™ 129-131 Optic Alignment System.



Accu-Coat™ Model 3230-B bench-top screen printer.

When switched to Setup mode, the user can independently control each drive cylinder in order to set snap-off distance, squeegee pressure, print speeds and print limits. These setup controls are described as follows:

Print Head Up-Down This is used to set the snap-off distance.

Squeegee Up-Down This is used to set the squeegee downstop (screen deflection) and squeegee pressure.

Squeegee Forward-Away This is used to set the squeegee travel limits and squeegee speed.

Vacuum On-Off This is used for temporary part hold down.

All automatic modes of operation are software-defined and custom print modes and alternative delays are easily provided. Various options such as a squeegee speed timer, multiprint mode (primarily used for co-fired ceramic via-filling applications) and cycle counter are also available.

Reliability

Accu-Coat™ Screen Printers are extremely rugged tools utilizing reliable industrial components and modern controls. A detailed user manual and diagnostics are provided with every shipment. Most of all, Aremco enjoys a three decade history of screen printer manufacturing and over 1,000 units in the field in Europe, Asia, Middle East, Canada, Austrailia, and throughout the USA.

ACCU-COAT™ SCREEN PRINTER SPECIFICATIONS

Accu-Coat™ Model	3230-BL	3230-B	3230-D	3240	3260
Max Print Area	9″ × 9″	9″ × 9″	9″ × 9″	14″ × 14″	20″ × 20″
Screen Frame ID	12″ × 12″	12″ × 12″	12″ × 12″	16″ × 16″	24″ × 24″
Frame Mounts	13″ × 13″	13″ × 13″	13″ × 13″	17.5″ × 17.5″	26″ × 26″
Max Part Height	6″	6″	6″	8″	8″
Print Repeatability	± 0.0003″	± 0.0003″	± 0.0003″	± 0.0003″	± 0.0003″
Snap-Off	On & Off Contact Printing	On & Off Contact Printing	On & Off Contact Printing	On & Off Contact Printing	On & Off Contact Printing
	Single-Point Micrometer Z-Control with 0.001″ Dial Indicator Readout	Single-Point Micrometer Z-Control with 0.001″ Dial Indicator Readout	Single-Point Micrometer Z-Control with 0.001″ Dial Indicator Readout	Three-Point Micrometer Z-Control with 0.001″ Dial Indicator Readout	Three-Point Micrometer Z-Control with 0.001″ Dial Indicator Readout
Control System	Pneumatic[1]	Microprocessor	Microprocessor	Microprocessor	Microprocessor
Control Modes	Independent Pneumatic Switches for Squeegee Up/Down, Print Head Up/Down & Print Drive In/Out	Setup, Print/Flood, Flood/Print, Single & Double Print with Hopover	Setup, Print/Flood, Flood/Print, Single & Double Print with Hopover	Setup, Print/Flood, Flood/Print, Single & Double Print with Hopover	Setup, Print/Flood, Flood/Print, Single & Double Print with Hopover
Control Options	Not Applicable	Cycle Counter, Squeegee Speed Timer, Multiprint	Cycle Counter, Squeegee Speed Timer, Multiprint	Cycle Counter, Squeegee Speed Timer, Multiprint	Cycle Counter, Squeegee Speed Timer, Multiprint
Squeegee Drive	Hydraulic, Variable Speed Control 0–15 IPS	Hydraulic, Variable Speed Control 0–15 IPS, Optional Electric Drive	Hydraulic, Variable Speed Control 0–15 IPS, Optional Electric Drive	Electric Drive, Variable Speed Control 0–12 IPS	Electric Drive, Variable Speed Control 0–12 IPS
Squeegee Type	Free-Floating 9.5″ Squeegee Holder with ⅜″ Square Blade and Flood Bar	Free-Floating 9.5″ Squeegee Holder with ⅜″ Square Blade and Flood Bar	Free-Floating 9.5″ Squeegee Holder with ⅜″ Square Blade and Flood Bar	Free-Floating 14.0″ Squeegee Holder with ⅜″ Square Blade and Flood Bar	Free-Floating 22.5″ Squeegee Holder with ⅜″ Square Blade and Flood Bar
Options	X-Y-Theta Stage, Vacuum Manifolds, Vacuum Pumps, Optic Alignment	X-Y-Theta Stage, Vacuum Manifolds, Vacuum Pumps, Optic Alignment	X-Y-Theta Stage, Vacuum Manifolds, Vacuum Pumps, Optic Alignment	X-Y-Theta Stage, Vacuum Manifolds, Vacuum Pumps, Optic Alignment	X-Y-Theta Stage, Vacuum Manifolds, Vacuum Pumps, Optic Alignment
Dimensions (L × W × H)	32″ × 24″ × 40″	32″ × 24″ × 40″	40″ × 30″ × 64″	40″ × 30″ × 64″	48″ × 38″ × 64″
Approx. Net Weight (lbs)	150	175	325	450	850
Service	No Electricals Required; 80–100 PSI at 5 CFM	110 VAC, 60 Hz, 5A or 220 VAC, 50 Hz, 3A; 80–100 PSI at 5 CFM	110 VAC, 60 Hz, 5A or 220 VAC, 50 Hz, 3A; 80–100 PSI at 5 CFM	110 VAC, 60 Hz, 5A or 220 VAC, 50 Hz, 3A; 80–100 PSI at 5 CFM	110 VAC, 60 Hz, 5A or 220 VAC, 50 Hz, 3A; 80–100 PSI at 5 CFM

Reference Notes

[1] Pneumatic control system can be upgraded to a Microprocessor system if semi-automatic controls are required at a later date.

Refer to Price List for complete order information.

ECONO-HEAT™ HIGH TEMPERATURE FURNACES

Technical Bulletin E2

Aremco offers a complete line of electric box furnaces from 0.5 to 7.5 cubic feet for applications to 2350 °F. All furnaces are ruggedly constructed and energy efficient, and a wide range of temperature controls are offered for every type of use. Custom features and sizes are also available upon request.

PRODUCT HIGHLIGHTS

- All furnaces are built with 3″ premium insulating firebrick and 1″ fiber board to permit rapid firing.
- Elements are protected in dropped recessed side wall grooves to provide even heating, longer life, and easy replacement.
- Outer shells are constructed using stainless steel to improve the casing resistance to high temperatures.
- Front-loading and top-loading door styles are offered.
- Alternate power requirements for domestic and international use are easily accommodated.
- Replacement elements are available on a just-in-time basis.
- User-friendly programmable controller.

TYPICAL APPLICATIONS

- Ash Determinations
- Assaying
- Tempering
- Hardening
- Heat Treating
- Glass Annealing
- Melting
- Fusions
- Dry Precipitates
- Curing Plastics
- Thermal Cycling
- Carbon & Sulphur Tests
- Cement Tests
- Glass & Enamel Tests
- Jominy Hardness Tests
- Petroleum Tests
- Powder Metallurgy
- Thermocouple Standardization
- Ceramic Tests
- Ignitions

TEMPERATURE CONTROLLER

All Econo-Heat™ furnaces are built using the Sentry Xpress 4.0 Temperature Controller by Orton. This controller is a 3-button, 4-segment LED controller that provides 5 built-in speed settings (ramp rate) and the capability to store up to 4 programs with a maximum of 8 segments per program. This flexible, user-friendly controller enables quick and easy programming by the operator.

OPTIONS

Econo-Heat™ furnaces can be modified to include useful features such as view ports, entry holes, or gas intake and exhaust fittings. Larger area and ultra-high temperature furnaces are also available. Contact Aremco's sales engineering department to discuss your requirements.

Econo-Heat™ 2928 Furnace. This model has a work area of 13″ × 13 ½″ × 8 ¾″ and is equipped with a single set point analog temperature controller.

The Econo-Heat™ furnace shown is a custom unit designed for an aerospace manufacturer for use in heat treating. This furnace has a work area of 42″ × 42″ × 65″, and a unique temperature control system consisting of 21 elements each with its own infinite control switch to permit uniform heating of complex shapes.

Econo-Heat™ 2931 Top-Loading Furnace. This model has a work area of 17″ × 20″ × 17″ and is capable of 2400 °F operation using single phase service, 240 Volts and 40 Amps.

Aremco Products, Inc., 707-B Executive Boulevard, Valley Cottage, NY 10989 **T** (845) 268-0039 **E** aremco@aremco.com **W** aremco.com

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ECONO-HEAT™ 2900-SERIES FURNACE SPECIFICATIONS

Model No.	Size (W"x D" x H")		Style		Power			Maximum Temp. °F (°C)	Approx. Weight (lbs)	Heating Elements Per Unit
	ID	OD (Approx)	Front Load	Top Load	Volts	Amp	Phase			
2927	8.5 × 9 × 8.75	16.5 × 17 × 21.75	X		120	15	1	2350 (1288)	80	2
2928	13 × 13.5 × 8.75	21 × 21.5 × 21.75	X		240	15	1	2350 (1288)	110	2
2929	22 × 22 × 13.5	30 × 30 × 26.5	X		240	45	1	2350 (1288)	295	3
2930	15 × 18 × 15	29.5 × 29 × 29		X	240	30	1	2350 (1288)	280	4
2931	17 × 17 × 20	31 × 31 × 31		X	240	40	1	2350 (1288)	300	4
2932	21.5 × 21.5 × 24.5	31 × 36 × 35		X	240	45	1	2350 (1288)	410	5

Refer to Price List for complete order information.