

Kaolite® LI Monolithics up to 2600°F (1427°C)

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Product Description

Kaolite 2000-LI is a lower density cast/gun 2000°F (1093°C) monolithic traditionally used to reduce the amount of supporting furnace steel work required and provide more insulation with a thinner lining.

Kaolite 2300-LI and Kaolite 2300-LI Gun are 2300°F (1260°C) low iron, lightweight monolithics which incorporates a high-purity binder for applications where hydrogen or reducing atmospheres are present. Kaolite 2300-LI AHR Gun has additional alkali hydrolysis resistance capability due to its special high purity formulation.

Kaolite 2500-LI and Kaolite 2500-LI Gun are low iron, lightweight monolithics that contains intermediate purity calcium- aluminate cement. Total iron oxide contents of 0.9% enables use where hydrogen or reducing atmospheres are present. Its low thermal conductivity and density produces the most economical 2500°F (1371°C) insulating monolithic on a per cubic foot basis.

Kaolite 2600-LI and Kaolite 2600-LI Gun are low iron 2600°F (1427°C) designed especially for use in petrochemical applications. They incorporate a cement of sufficient purity for low iron content and high-intermediate temperature strengths.

Features

- Light weight and low thermal conductivity reduce both the quantity of heat storage and heat transfer producing significant savings in furnace fuel consumption
- Lower densities reduce the amount of supporting furnace steelwork required and provide more insulation with a thinner lining

Applications

- Backup insulation in two component linings in petrochemical process units
- Hot face lining in ductwork from waste heat recovery boilers and process unit
- F.C.C.U. linings - regenerator.
- Hydrogen or reducing atmosphere linings
- Radiant section in steam flood generators.
- Hydrogen or reducing atmosphere linings.
- Steam flood generator convection sections and target walls

Instructions for Using

Casting

Highest strength is obtained with monolithic refractory by using the least amount of clean mixing water that will allow thorough working of material into place by vibrating. A mechanical mixer is required for proper placement (paddle-type mortar mixers are best suited). Mix for 6 minutes to achieve a good ball-in-hand consistency. Place material within 30 minutes after mixing.

Gunning

Use suitable gunite equipment. The gun grade material should be pre-dampened uniformly with approximately:

Kaolite 2000-LI Gun	9-12%
Kaolite 2300-LI Gun	7-9%
Kaolite 2300-LI AHR Gun	5-7%
Kaolite 2500-LI Gun	6-8%
Kaolite 2600-LI Gun	6-8%

by weight of clean water in a mechanical mixer before placing into gun. This will reduce rebound and dust. Add required water at nozzle for effective placement. Suggested air pressure at the nozzle is 20 to 35 psi.

Precautions

Store bagged monolithics in a dry place, off the ground and when possible with the original shrink wrapping intact. Normal shelf life is 12 months if properly stored.

Watertight forms must be used when placing material. All porous surfaces that will come in contact with the material must be waterproofed with a suitable coating or membrane. For maximum strength, cure 24 hours under damp conditions before initial heat-up. Keep freshly placed monolithic warm during cold weather, ideally between 50°F and 80°F until wet curing is completed. New monolithic installation must be heated slowly the first time.

Freshly placed lightweight monolithic are prone to a deteriorating condition called alkali hydrolysis when they are kept in a non-dried state for a sustained period of time. Under these conditions, the monolithic should be force-dried soon after placement to help retard the possible deterioration effects. Kaolite 2300-LI AHR Gun has special alkali hydrolysis resistance, especially when used in combination with Kaoseal AHR Blue coating in place of a typical curing compound.

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Monolithic Product Name	Kaolite 2000-LI	Kaolite 2300-LI	Kaolite 2300-LI Gun	Kaolite 2500-LI	Kaolite 2500-LI Gun	Kaolite 2600-LI	Kaolite 2600-LI Gun
Material Class	Crystalline Silica						
Material method of installation	cast/gun	cast	gun	cast	gun	cast	gun
Physical Properties							
Temperature use limit, °F	2000	2300	2300	2500	2500	2600	2600
Temperature use limit, °C	1093	1260	1260	1371	1371	1427	1427
Placement, average lb to place 1 ft ³	38	61	62	70	71	83	84
Placement, average kg to place 1 m ³	18	28	29	31	32	38	38
Pounds per bag, lb	20	40	40	50	50	50	50
Pounds per bag, kg	9	18	18	23	23	23	23
Shelf life, months	12	12	12	12	12	12	12
Water, %, recommended							
casting by vibrating	78-90	46-54	-	38-47	-	29-35	-
Density, ASTM C 134, pcf							
dried 24 hrs @ 220°F	36-47	62-73	63-74	72-83	72-83	85-96	85-96
fired @ 1500°F	31-42	55-66	56-67	65-76	65-76	79-89	79-89
Density, ASTM C 134, kg/m³							
dried 24 hrs @ 104°C	577-753	993-1169	1010-1186	1154-1330	1154-1330	1362-1538	1362-1538
fired @ 816°C	513-657	881-1057	897-1073	1041-1218	1041-1218	1250-1410	1250-1410
Modulus of Rupture, MOR, ASTM C 133, psi							
dried 24 hrs @ 220°F	60-120	120-200	120-200	175-275	175-275	250-400	300-500
fired 5 hrs @ 1500°F	55-110	110-200	110-225	125-250	125-250	250-350	225-400
fired 5 hrs @ temperature use limit, °F	75-150	150-250	150-300	200-350	250-400	400-800	500-900
Modulus of Rupture, MOR, ASTM C 133, MPa							
dried 24 hrs @ 104°C	0.41-0.83	0.83-1.38	0.83-1.38	1.21-1.90	1.21-1.90	2.07-3.45	2.07-3.44
fired 5 hrs @ 816°C	0.38-0.76	0.80-1.38	0.80-1.55	0.86-1.72	0.86-1.72	1.38-2.41	1.72-2.76
fired 5 hrs @ temperature use limit, °C	0.52-1.03	1.03-1.72	1.03-2.07	1.38-2.41	1.72-2.75	2.75-5.52	3.45-6.21
Cold crushing strength, CCS, ASTM C 133, psi							
dried 24 hrs @ 220°F	225-400	350-600	350-600	600-1200	600-1200	850-1600	950-1700
fired 5 hrs @ 1500°F	175-350	350-900	350-900	550-1100	550-1100	900-1600	950-1700
fired 5 hrs @ temperature use limit, °F	200-375	400-1000	400-1000	800-1400	700-1300	1200-2000	1100-2000
Cold crushing strength, CCS, ASTM C 133, MPa							
dried 24 hrs @ 104°C	1.55-2.76	2.41-4.13	2.41-4.13	4.14-8.28	4.14-8.28	5.86-11.03	6.55-11.7
fired 5 hrs @ 816°C	1.21-2.41	2.41-6.21	2.41-6.21	3.79-7.59	3.79-7.59	6.20-11.0	6.55-11.7
fired 5 hrs @ temperature use limit, °C	1.38-2.59	2.76-6.89	2.76-6.89	5.52-9.65	4.83-8.97	8.28-13.79	7.58-13.79
Permanent Linear Shrinkage, ASTM C 113, %							
dried 24 hrs @ 220°F (104°C)	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2	0 to -0.2
fired 5 hrs @ 1500°F (816°C)	-0.6 to -1.3	-0.1 to -0.55	-0.2 to -0.6	-0.1 to -0.4	-0.2 to -0.5	-0.1 to -0.4	-0.2 to -0.5
fired 5 hrs @ temperature use limit, °F (°C)	-1.5 to -3.0	-1.0 to -2.0	-1.0 to -2.0	-0.5 to -1.5	-0.5 to -1.5	-0.5 to -1.5	-0.5 to -1.5

Compliance data sheets for specific applications or job requirements are available upon request. The values given herein are typical average values obtained in accordance with accepted test methods and are subject to normal manufacturing variations. They are supplied as a technical service and are subject to change without notice. The data contained herein should not be used for specification purposes. Check with your Morgan Advanced Materials office to obtain current information.

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Chemical Analysis, % weight basis after firing

Alumina, Al ₂ O ₃	30	40	37	44	41	47	45
Silica, SiO ₂	46	38	42	36	39	36	38
Ferric Oxide, Fe ₂ O ₃	1.4	0.9	0.9	0.9	0.9	1	1
Titanium Oxide, TiO ₂	1	1.4	1.4	1.4	1.4	1.5	1.8
Calcium Oxide, CaO	16	18 (10)	17 (9)	17 (11)	16 (11)	13 (10)	13 (10)
Magnesium Oxide, MgO	0.5	0.2	0.2	0.2	0.2	0.2	0.2
Alkalies as Na ₂ O and K ₂ O	4.5	1.2	1.2	1	1	0.8	0.8

Thermal Conductivity, BTU-in/hr-ft², per ASTM C201

Mean Temperature @ 500°F	1.1	1.48	1.48	1.76	1.76	2.7	2.9
1000°F	1.3	1.62	1.62	1.95	1.95	2.9	2.9
1500°F	1.5	1.77	1.77	2.15	2.15	3	3
2000°F	-	1.90	1.90	2.36	2.36	3.2	3.2

Thermal Conductivity, W/m·K, per ASTM C201

Mean temperature @ 260°C	0.14	0.21	0.21	0.25	0.25	0.39	0.42
538°C	0.19	0.23	0.23	0.28	0.28	0.42	0.42
815°C	0.22	0.26	0.26	0.31	0.31	0.43	0.43
1093°C	-	0.28	0.28	0.34	0.34	0.46	0.46

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