Morgan Advanced Materials

# Insulating Firebrick products : low & high temperature

| Product Name | K®-23 | TC™-23 | IFB 23 Tile | K-25 | K-26 | TC-26 | JM™-28 | JM™-30 |
|---|---|---|---|---|---|---|---|---|
| **Hot Face temperature use limit,** °F (°C) | 2300 (1260) | | | 2500 (1371) | 2600 (1427) | | 2800 (1538) | 3000 (1649) |
| **Melting point,**°F (°C) | 2750 (1510) | | | 2800 (1538) | 3000 (1649) | | 3190 (1754) | |
| **Density,** ASTM C 134 | | | | | | | | |
| lbs/9in (kg/229mm) straight | 1.93 (0.87) | 1.9 (0.85) | 2.2 (1.0) | 2.3 (1.5) | 2.3 (1.1) | 2.8 (1.3) | 3.2 (1.46) | 3.8 |
| pcf (kg/m$^3$) | 31 - 35 (497 - 560) | 30 - 36 (480 - 576) | 37 (593) | 38 - 41 (593 - 641) | 40 (640) | 48 (770) | 55 (890) | 65 (1041) |
| **Modulus of Rupture, psi (MPa),** ASTM C 133 | 115 (0.79) | 105 (0.72) | | 135 (0.93) | | 200 (1.4) | 220 (1.5) | 250 (1.74) |
| **Cold Crushing Strength,** psi (MPa), ASTM C 133 | 145 (1.0) | 130(0.9) | | 200 (1.38) | | 270 (1.9) | 340 (2.3) | 440 (3.05) |
| **Permanent Linear Change,** %, ASTM C 210 | | | | | | | | |
| fired @ 2250°F (1232°C) | 0 to -0.1 | 0 to -0.2 | 0 to -0.1 | - | | | | |
| @ 2450°F (1343°C) | - | - | - | -0.3 | - | | | |
| @ 2550°F (1400°C) | | | | - | -0.8 | -0.1 | - | |
| @ 2750°F (1510°C) | | | | | - | - | -0.5 | - |
| @ 2950°F (1620°C) | | | | | | | - | -0.7 |
| @ 3150°F (1732°C) | | | | | | | | -0.4 |
| **Deformation Under Hot Load,** % @ 10 psi, ASTM C 16 | | | | | | | | |
| 1 1/2 hrs. @ 2000°F (1093C) | 0 | | | - | | - | | |
| @ 2200°F (1204°C) | 0.3 | - | 0.1 | | 0.2 | 0.1 | - | |
| @2400°F (1315°C) | - | | | | - | 0.2 | 0.3 | |
| **Chemical Analysis,** % Weight basis after firing | | | | | | | | |
| Alumina, $Al_2O_3$ | 38 | 38.5 | 46 | 48 | 47 | 67 | 70 | |
| Silica, $SiO_2$ | 45 | 47.5 | 37.5 | 37.5 | 48.6 | 30.5 | 28 | |
| Ferric oxide, $Fe_2O_3$ | 0.3 | 0.4 | 0.3 | 0.3 | 0.7 | 0.5 | 0.3 | |
| Titanium oxide, $TiO_2$ | 1.6 | 1.6 | 1.4 | 1.2 | 1.3 | 0.6 | 1.2 | |
| Calcium oxide, CaO | 15 | 11 | 14 | 13 | 0.3 | 0.3 | 0.2 | |
| Magnesium oxide, MgO | 0.1 | 0.2 | 0.1 | | | | | |
| Alkalies, as $Na_2O$ | 0.5 | 0.3 | 0.4 | 0.3 | 2.0 | 1.0 | 0.2 | |
| **Coefficient of Reversible Thermal Expansion,** in./in.•°F•10$^{-6}$ | 3.0 | - | 3.1 | 3.1 | - | 3.4 | 3.5 | |
| **Thermal Conductivity,** BTU•in./hr•ft$^2$•°F (W/m•K), ASTM C 182 | | | | | | | | |
| mean temp. @ 500°F (260°C) | 0.86 (0.13) | 1.0 (0.14) | 1.06 (0.15) | 1.12 (0.17) | 1.6 (0.23) | 2.3 (0.33) | 2.8 (0.40) | |
| @ 1000°F (538°C) | 1.08 (0.15) | 1.3 (0.18) | 1.22 (0.18) | 1.28 (0.19) | 1.9 (0.27) | 2.4 (0.34) | 2.9 (0.42) | |
| @ 1500°F (815°C) | 1.32 (0.19) | 1.6 (0.23) | 1.38 (0.20) | 1.46 (0.22) | 2.2 (0.32) | 2.5 (0.36) | 3.1 (0.45) | |
| @ 2000°F (1093°C) | 1.57 (0.23) | 1.8 (0.25) | 1.54 (0.22) | 1.65 (0.25) | 2.6 (0.37) | 2.6 (0.37) | 3.3 (0.47) | |
| @ 2500°F (1371°C) | - | | | 1.88 (0.28) | - | 2.7 (0.38) | 3.5 (0.49) | |
| **Brick Identifier,** printed on brick | 23 | | 25 | 26 | | 28 | 30 | |

**Safety Data Sheet (SDS):** are available for all our products. Data sheets, in other languages, can also be found by visiting our website.
Please visit our website **www.morganthermalceramics.com** and click on the Safety Data Sheets Quick Link on our home page.



**Imperial** information

# Mortar products : dry and wet

| Product Name | High-Temp™ | Smoothset™ | | Air-Set™ | | Air-Set 3000 EG | K-Bond® | | Mul-Set® F | | Coastal® 90 | Coastal 90 AS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | heat setting | wet, air setting | dry, air setting | wet, air setting | dry, air setting | wet, air setting | wet, air setting | dry, air setting | wet, air setting | dry, air setting | wet, air setting | dry, air setting |
| **Classification temperature rating,** °F (°C) | 3000 (1649) | 2850 (1566) | 2900 (1593) | 3000 (1649) | | | | | 3200 (1760) | | 3250 (1788) | 3300 (1816) |
| **Type of Brick** | IFB | | | | | | | | IFB/Insalcor | | Firebrick | |
| **Quantities required,** lb (kg)/1000 brick[1] | 220 - 250 (100 - 113) | 250 - 320 (113 - 145) | 180 - 240 (82 - 109) | 360 - 400 (163 - 181) | 275 - 300 (125 - 136) | 250 - 320 (113 - 145) | 300 - 360 (136 - 163) | 220 - 280 (100 - 127) | 300 - 350 (136 - 159) | 200 - 300 (91 - 136) | 240 - 320 (109 - 145) | 450 - 550 (204 - 249) |
| **Lbs required to Brush Coat,** 100 sq ft (9 sq m) | 26 (12) | 22 (10) | 20 (9) | 22 (10) | 20 (9) | 22 (10) | | 20 (9) | 22 (10) | 20 (9) | - | |
| **Average recommended water,** % | | | | | | | | | | | | |
| Trowel | 26 | - | 29 | - | 31 | - | | 20 | - | 22 | - | 23 |
| Dip | 44 | | 50 | | 52 | | | 37 | | 33 | | 45 |
| **Pounds per Bag, lb (kg)** | 50 (23) | 55 (25), drum | 50 (23) | 55 (25), drum | 50 (23) | 55 (25), drum | 55 (25), drum | 50 (23) | 55 (25), drum | 50 (23) | 55 (25), drum | 50 (23) |
| **Shelf life, months** | 12 | 3 - 6 | 12 | 6 - 12 | 12 | 6 - 9 | >12 | 12 | 6 - 12 | 12 | 6 - 12 | 12 |
| **Chemical Analysis,** % Weight basis after firing | | | | | | | | | | | | |
| Alumina, $Al_2O_3$ | 45 | 36 | 38 | 46 | 45 | 44 | 47 | | 66 | | 87 | |
| Silica, $SiO_2$ | 50 | 57 | 58 | 47 | 48 | 50 | 47 | 48 | 28 | 24 | 8 | 7 |
| Ferric oxide, $Fe_2O_3$ | 1.0 | 0.9 | 1.0 | 0.8 | 1.1 | 0.8 | 0.9 | | 1.2 | | 0.3 | 0.2 |
| Titanium oxide, $TiO_2$ | 2.2 | 1.7 | 1.9 | 1.7 | 1.9 | | 0.7 | 1.1 | 2.2 | | | 0.1 |
| Calcium oxide, CaO | 0.2 | | | 0.1 | 0.2 | 0.1 | | 0.5 | 0.1 | | trace | |
| Magnesium oxide, MgO | 0.1 | | | | | | | 0.4 | | | 0.1 | |
| Alkalies as $Na_2O$ | 0.6 | 4 | 2.8 | 2.1 | 2.2 | 2.6 | 4.3 | 2.1 | - | | | |
| Boron oxide, $B_2O_3$ | 0.7 | - | | | | | | | | | | |

[1] Amount of mortar used for laying either insulating firebrick or firebrick varies according to masonry practice. A range of quantities is shown for each respective type of brick listed above.

# Firebrick products

| Product Name | SR-90® | SR-99® | SR-99 LS | Insalcor® |
|---|---|---|---|---|
| **Hot Face temperature use limit,** °F (°C) | 3100 (1704) | 3200 (1760) | | 3250 (1788) |
| **Melting point,** °F (°C) | 3480 (1915) | 3660 (2016) | | 3350 (1843) |
| **Density,** ASTM C134, lbs/9in (kg/229mm) straight | 10.6 (0.07) | 11.3 (0.08) | - | 4.6 (2.09) |
| pcf (kg/m$^3$) | 180 (2880) | 193 (3091) | | 82 (1314) |
| **Modulus of Rupture,** psi (MPa), ASTM C 133 | | | | |
| @ room temperature | 3600 (24.83) | 3800 (26.21) | 4200 (28.97) | 350 (2.4) |
| @ 2000°F (1093°C) | 4500 (31.03) | 2900 (20.00) | - | - |
| @ 2300°F (1260°C) | 4200 (28.97) | 1600 (11.03) | 2000 (13.79) | - |
| @ 2600°F (1427°C) | 2900 (20.00) | 800 (5.52) | | - |
| @ 2800°F (1538°C) | 2100 (14.48) | 650 (4.48) | - | - |
| **Cold Crushing Strength,** psi (MPa), ASTM C 133 | 9000 (62.05) | 8000 (55.16) | 9000 (62.05) | 1000 (6.9) |
| **Permanent Linear Change,** % After 24 hrs, ASTM C 210 | | | | |
| 5 hrs @ 3200°F (1649°C) | 1.5 | - | - | - |
| 24 hrs @ 3200°F (1649°C) | - | -0.1 | | |
| 72 hrs @ 3200°F (1649°C) | | - | -0.6 | |
| **Deformation Under Hot Load,** % @ 25 psi, ASTM C 16 | | | | |
| 1 1/2 hrs @ 2640°F (1449°C) | 0 | -0.3 | - | 0.1 |
| 1 1/2 hrs @ 2800°F (1538°C) | 0.1 | | | - |
| 1 1/2 hrs @ 3000°F(1649°C) | | - | | |
| 1 1/2 hrs @ 3200°F(1760°C) | | | | |
| 150 hrs @ 3200°F(1760°C) | <0.25 | | | |
| **Porosity,** % ASTM C 20 | 18 | 17 | 20 | |
| **Coefficient of Reversible Thermal Expansion,** in./in.•°F•10$^{-6}$ (mm/mm•°C•10$^{-6}$) | - | | | 3.8 (6.8) |
| **Chemical Analysis,** % Weight basis after firing | | | | |
| Alumina, $Al_2O_3$ | 90 | 99.4 | 99.5 | 77 |
| Silica, $SiO_2$ | 10 | 0.4 | 0.1 | 21 |
| Ferric oxide, $Fe_2O_3$ | 0.2 | 0.1 | trace | 0.4 |
| Titanium oxide, $TiO_2$ | trace | trace | | 0.6 |
| Calcium oxide, CaO | 0.1 | | 0.2 | 0.1 |
| Magnesium oxide, MgO | trace | | trace | |
| Alkalies as $Na_2O$ | 0.2 | 0.1 | 0.2 | 0.3 |
| **Thermal Conductivity,** BTU•in/hr•ft$^2$•°F (W/m•K), ASTM C 182 | | | | |
| mean temperature @ 500°F (260°C)) | 24.6 (3.55) | 38.9 (5.61) | | 5.5 (0.79) |
| @ 1000°F (538°C) | 21.5 (3.10) | 30.7 (4.42) | | 5.6 (0.80) |
| @ 1500°F (816°C) | 19.4 (2.80) | 25.5 (3.68) | | 6.3 (0.91) |
| @ 2000°F (1093°C) | 17.7 (2.55) | 21.6 (3.11) | | 7.6 (1.09) |
| @ 2500°F (1371°C) | 16.5 (2.38) | 19.1 (2.75) | | 9.2 (1.33) |

**Safety Data Sheet (SDS):** are available for all our products. Data sheets, in other languages, can also be found by visiting our website.
Please visit our website **www.morganthermalceramics.com** and click on the Safety Data Sheets Quick Link on our home page.