



Moler insulating bricks and blocks for back-up insulation – up to 1000°C (1832°F)

**HIPOR · HIPOROS · POROS · SM-65
BF-BLOCK · BB-BLOCK · SUPRA · LR-1750
ROTOL · M-EXTRA “E”**

Description

SKAMOL Moler insulating bricks and blocks include a wide range of grades in various combinations of bulk density, mechanical strength and thermal conductivity. Moler bricks and blocks are fired and are designed for a maximum service temperature of 900°C (1652°F) to 1000°C (1832°F) – see product data for individual values.

All grades are manufactured exclusively from Moler – the unique raw material found in Northwest Denmark and consisting of a natural mixture of diatoms and plastic clay.

The range of SKAMOL Moler insulating bricks and blocks is characterized by their excellent insulating properties, high mechanical strength, low weight, and increasing strength at rising temperatures. Heat expansion and contraction factors are negligible resulting in high resistance to thermal shock. For a porous material Moler bricks and blocks offer low permeability to gases and are capable of withstanding mild acid attacks. An outstanding feature is the high content of amorphous silica accounting for an increased viscosity being induced into attacking slags or melts.

The various grades of Moler insulating bricks and blocks are categorized into two groups: porous and solid.

Porous bricks

Porous bricks and blocks include the following grades:

- HIPOR
- HIPOROS
- POROS
- SM-65
- BF-block
- BB-block

HIPOR, HIPOROS and POROS grades

Lightweight porous bricks with very low thermal conductivity, moderate to adequate mechanical strength. Low heat storage, minimal creep in compression, and low thermal expansion.

SM-65 grade

Lightweight brick with good insulating qualities and adequate strength for most applications.

BF & BB-block

Large blocks combining low density with ample strength and good insulation values. Designed for quick and economical installation.

BF-blocks have a tongue-and-groove finish of the vertical jointing faces. 15 blocks are required for 1 m² (11 sq.ft.) of masonry.

BB-blocks are designed with interlocking rebated sides. Available in a special design with V-shaped rebates for powder filling. 30 blocks cover 1 m² (11 sq.ft.).

Solid bricks

Solid bricks and blocks include the following grades:

- SUPRA
- LR-1750
- ROTOL
- M-EXTRA “E”

SUPRA, LR-1750 grades

Solid grade bricks of natural porosity combining high mechanical strength with good insulating qualities. The LR-1750 grade has a low sulphur content making it suitable for insulation in furnaces where nickel alloys are present.

ROTOL, M-EXTRA “E” grades

Solid bricks characterized by exceptionally high mechanical strength without sacrificing the insulating value. The ROTOL brick has excellent volume stability, high resistance to gas permeability and a low content of sulphur making it applicable in furnaces where nickel alloys are present. The M-EXTRA “E” grade offers an extremely high mechanical strength and has good resistance to melts and slags.

Jointing mortars recommended

For insulating mortars or fillers to be used with SKAMOL Moler bricks and blocks please consult separate folders on “SKAMOL insulating mortars” and “SKAMOL insulating castables & aggregates”.

Standard sizes

SKAMOL Moler insulating bricks are available as standard squares (straights), splits, pups (soaps), arches and wedges, headers (keys), skewers, and circle bricks in all internationally approved standard sizes as well as other sizes compatible with the refractory bricks with which they are often used.

Special shapes can be manufactured to meet particular design requirements. Detailed information on availability will be supplied on request.

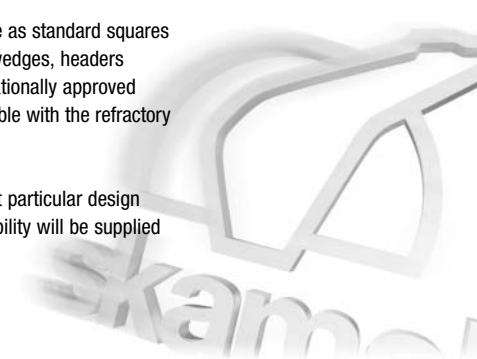
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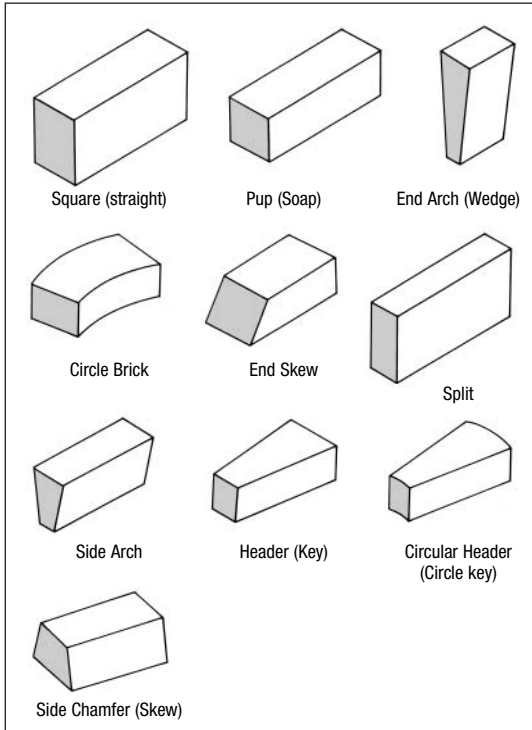
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Brick shapes



Dimensional tolerances – bricks

Dimensional tolerances applicable to standard brick sizes of all grades:

Brick finish	Length / Width / Thickness
Trimmed all 6 faces (standard)	+ 0.5 mm (0.02") - 1% or -1 mm (0.04") whichever is the greater
Machined all 6 faces	±0.5 mm (0.02")

Dimensional tolerances – blocks

Length and thickness	± (2 mm + 1%)
Width	± 0.5 mm

Machined and trimmed bricks

SKAMOL Moler bricks are supplied as machined bricks or trimmed bricks.

Machined bricks are machined on all 6 faces to close dimensional tolerances for applications requiring tight brickwork, straight courses and the highest degree of accuracy.

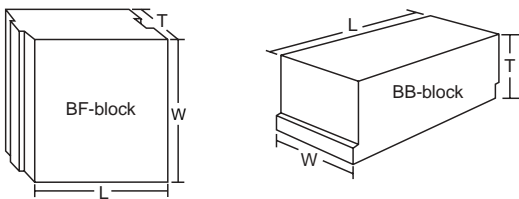
Trimmed bricks are trimmed to wider dimensional tolerances for applications requiring less tight brickwork for instance due to the use of mortars.

Typical standard brick sizes include:

Standard sizes – bricks	
Metric:	
Length × width:	Thickness:
230 × 114 mm	38-51-64-76 mm
250 × 124 mm	50-64 mm
240 × 120 mm	60 mm
220 × 110 mm	60 mm
US/British:	
Length x width:	Thickness:
9" × 4½"	1½"-2"-2½"-3"

Details on availability of brick sizes exceeding standard sizes are supplied upon request.

Typical block sizes include:



Standard sizes – BF-blocks	
Metric:	
Length × width:	Thickness:
250 × 270 mm	76-100-114-124 mm

Standard sizes – BB-blocks	
Metric:	
Length x width:	Thickness:
250 × 135 mm	76-100-114-124 mm
250 × 131 mm	
246 × 135 mm	
246 × 131 mm	

	HIPOR	HIPOROS	POROS	SM-65	SUPRA	LR-1750	ROTOL	M-EXTRA E	BB-BLOCKS	BF-BLOCKS
Trimmed all 6 faces (standard)	•	•	•	•	•	•	•	•	•	•
Machined all 6 faces	•	•	•	•	•	•	•	•	•	•
Unmachined	•	•	•	•	•	•	•	•	•	•

Application

SKAMOL Moler insulating bricks and blocks are primarily used for back-up insulation, typically in industrial kilns and furnaces behind a refractory lining.

Porous grades

The porous grades are suitable for temperatures up to 950°C (1742°F) and are used for non to medium load-bearing constructions as back-up insulation of refractory linings offering a high degree of thermal efficiency and cost savings. A variety of uses includes lining of aluminium reduction cells, carbon baking furnaces, iron- and steelworks processing furnaces, ceramic kilns, incinerators, combustion plants, cement pre-calciners and grate coolers.

Installation of BF-blocks

When used in non load-bearing furnace walls supported at both sides no mortar is necessary in the horizontal joints, and mortar can be saved in the vertical joints because of the tongue-and-groove design. The amount of mortar required will be determined by the degree of gas-tightness required of the wall. In cases where the good mechanical strength of the blocks is utilised for constructional purposes careful jointing with SKAMOL M-20 mortar is recommended.

Installation of BB-blocks

BB-blocks should be laid dry, fitted closely and with staggered joints crosswise. No mortar is required, but all V-shaped joints should be sealed with SKAMOL BB-FILLER brushed in thoroughly. The free-flowing capacity of the powder enables a complete joint filling. Estimated consumption: 3 kg BB-FILLER per m², equivalent to 100 kg (220 lbs) per 1000 blocks. It is recommended to finish off by leaving a thin levelling layer of filler on top of the blocks before mounting the refractory lining.

Solid grades

The solid grades are suitable for temperatures up to 1000°C (1832°F) and are used in load-bearing constructions as back-up insulation of refractory linings combining high mechanical strength with good insulating properties.

SUPRA grade

SUPRA Moler bricks have a variety of uses in for instance flue gas and hot air ducts, regenerators, boilers, circulating fluidized-bed boilers (CFB), chimneys, tunnel kilns, kiln cars, glass furnaces and secondary steel furnaces. Especially recommended for locations where load-bearing properties are essential.

LR-1750 grade

LR-1750 is composed to meet the specific design requirements for back-up insulation in bottom and sidewall of carbon baking furnaces. However, the high service temperature also favours application in e.g. aluminium reduction cells, holding furnaces, chimneys, and hot blast stoves.

ROTOL, M-EXTRA "E" grades

For insulating linings in applications where a very high crushing strength is required. ROTOL and M-EXTRA "E" can be applied as back-up insulation in for instance rotary kilns, shaft kilns, lime kilns and zinc stripping furnaces. They are also suitable for hot air ducts and heat exchangers and can be used hot-face in furnaces operating at maximum 700°C (1292°F).

What makes Moler so applicable?

Moler is a more than 50 million-year-old unique type of diatomaceous earth found in Denmark and is internationally known as Moler ("Mo-clay").

Moler is a marine sediment consisting of about 60% microscopically small diatoms, each made up of hundreds of thin-walled cells containing pockets of still air. In addition to this, by a happy coincidence of nature, a small but accurate proportion of plastic clay has been admixed with the diatoms, thus forming a perfect blend, which cannot be reproduced by any known mechanical process.

SKAMOL Moler insulating bricks and blocks

for back-up insulation – up to 1000°C (1832°F)

Grade		HIPOR	HIPOROS	POROS	SM-65	BF-BLOCK	BB-BLOCK
Maximum service temperature							
	°C	900	900	900	950	900	900
	°F	1652	1652	1652	1742	1652	1652
Bulk density, dry							
	kg/m ³	550	570	625	650	650	650
	lbs/cu.ft.	34	36	39	41	41	41
Cold crushing strength (EN 1094-5: 1995)							
@ room temperature	MPa	1.4	1.6	2.5	3.5	2.5	2.5
	lbs/sq.in.	203	232	363	508	363	363
Modulus of rupture (EN 993-6: 1995)							
	MPa	0.5	0.5	0.7	1.0	-	-
	lbs/sq.in.	73	73	102	145	-	-
Total porosity (EN 1094-4: 1995)							
	%	77	76	74	72	72	72
Permeability to air (BS EN 993-4: 1995)							
	nPm	18.5	16.5	9	6	8	8
Creep in compression (EN 993-9: 1997)							
after fluoride gas exposure, 50h at 800°C (1472°F), load 0.1 MPa (14.5 lbs/sq.in.)	%	1.3	1.5	0.7	1.5	1.5	1.5
Specific heat							
	kJ/(kg×K)	0.80	0.70	0.80	0.80	0.80	0.80
	BTU/(lb×°F)	0.19	0.17	0.19	0.19	0.19	0.19
Coefficient of reversible thermal expansion (BS 1902: section 5.3: 1990)							
@ 20°C-750°C (68°F-1382°F)	K ⁻¹	2×10 ⁻⁶	3×10 ⁻⁶	2×10 ⁻⁶	3×10 ⁻⁶	2×10 ⁻⁶	2×10 ⁻⁶
	°F ⁻¹	1.1×10 ⁻⁶	1.6×10 ⁻⁶	1.1×10 ⁻⁶	2×10 ⁻⁶	1.1×10 ⁻⁶	1.1×10 ⁻⁶
Resistance to thermal shock (EN 993-11: 1998)							
	cycles	> 30	> 30	> 30	> 30	> 30	> 30
Linear reheat shrinkage (EN 1094-6: 1999)							
	%	1	1	1	1	1	1
Pyrometric cone equivalent (ASTM C24-89 ORTON cones)							
	°C	1350	1300	1350	1350	1350	1350
	°F	2462	2372	2462	2462	2462	2462
Thermal conductivity (ASTM C-182 supplemented by ASTM C-201)							
mean temp.	@ 200°C	W/(m×K)	0.09	0.11	0.13	0.13	0.13
	@ 400°C		0.10	0.12	0.15	0.15	0.15
	@ 600°C		0.11	0.13	0.17	0.17	0.17
	@ 392°F	BTU/(sq.ft×h×°F/in)	0.63	0.76	0.92	0.90	0.90
	@ 752°F		0.70	0.83	1.03	1.04	1.04
	@ 1112°F		0.78	0.90	1.17	1.18	1.18
Chemical analysis, typical							
	%						
Silica	SiO ₂	77	72	77	77	77	77
Titanium oxide	TiO ₂	0.7	0.7	0.7	0.7	0.7	0.7
Ferric oxide	Fe ₂ O ₃	7	7	7	7	7	7
Alumina	Al ₂ O ₃	9	8	9	9	9	9
Magnesium oxide	MgO	1.3	1.2	1.3	1.3	1.3	1.3
Calcium oxide	CaO	0.8	6.5	0.8	0.8	0.8	0.8
Sodium oxide	Na ₂ O	0.55	0.4	0.4	0.4	0.4	0.4
Potassium oxide	K ₂ O	1.46	1.5	1.6	1.6	1.6	1.6
Sulphur trioxide	SO ₃	1.18	1.2	1.2	1	1	1
Loss on ignition 1025°C (1877°F)	LOI	1.5	1.5	1	1	1	1
Colour							
		Red	Red	Red	Red	Red	Red

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.

SKAMOL Moler insulating bricks and blocks

for back-up insulation – up to 1000°C (1832°F)

Grade		SUPRA	LR-1750	ROTOL	M-EXTRA E	
Maximum service temperature						
	°C	900	950	950	1000	
	°F	1652	1742	1742	1832	
Bulk density, dry						
	kg/m ³	750	750	800	950	
	lbs/cu.ft.	47	47	50	59	
Cold crushing strength (EN 1094-5: 1995)						
@ room temperature	MPa	7.0	7.5	10.0	18.0	
	lbs/sq.in.	1015	1088	1450	2610	
Modulus of rupture (EN 993-6: 1995)						
	MPa	1.8	1.8	2.5	4.0	
	lbs/sq.in.	261	261	363	580	
Total porosity (EN 1094-4: 1995)						
	%	68	68	66	60	
Permeability to air (BS EN 993-4: 1995)						
	nPm	2	2	1	0.5	
Creep in compression (EN 993-9: 1997)						
after fluoride gas exposure, 50h at 800°C (1472°F), load 0.1 MPa (14.5 lbs/sq.in.)	%	1.4	1.5	0.8	0.8	
Specific heat						
	kJ/(kg×K)	0.80	0.80	0.80	0.80	
	BTU/(lb×°F)	0.19	0.19	0.19	0.19	
Coefficient of reversible thermal expansion (BS 1902: section 5.3: 1990)						
@ 20°C-750°C (68°F-1382°F)	K ⁻¹	2×10 ⁻⁶	3×10 ⁻⁶	3×10 ⁻⁶	3×10 ⁻⁶	
	°F ⁻¹	1.1×10 ⁻⁶	2×10 ⁻⁶	2×10 ⁻⁶	2×10 ⁻⁶	
Resistance to thermal shock (EN 993-11: 1998)						
	cycles	> 30	> 30	> 30	> 50	
Linear reheat shrinkage (EN 1094-6: 1999)						
	%	1	1	1	1	
Pyrometric cone equivalent (ASTM C24-89 ORTON cones)						
	°C	1350	1300	1350	1350	
	°F	2462	2462	2462	2462	
Thermal conductivity (ASTM C-182 supplemented by ASTM C-201)						
mean temp.	@ 200°C	W/(m×K)	0.15	0.15	0.18	0.24
	@ 400°C		0.17	0.17	0.19	0.27
	@ 600°C		0.19	0.19	0.20	0.29
	@ 392°F	BTU/(sq.ft×h×°F/in)	1.04	1.04	1.25	1.66
	@ 752°F		1.18	1.18	1.32	1.87
	@ 1112°F		1.32	1.32	1.39	2.01
Chemical analysis, typical						
	%					
Silica	SiO ₂	77	77	77	77	
Titanium oxide	TiO ₂	0.7	0.7	0.7	0.7	
Ferric oxide	Fe ₂ O ₃	7	7	7	7	
Alumina	Al ₂ O ₃	9	9	9	9	
Magnesium oxide	MgO	1.3	1.3	1.3	1.3	
Calcium oxide	CaO	0.8	0.8	0.8	0.8	
Sodium oxide	Na ₂ O	0.4	0.4	0.4	0.4	
Potassium oxide	K ₂ O	1.6	1.6	1.6	1.6	
Sulphur trioxide	SO ₃	1.2	1	1	1	
Loss on ignition 1025°C (1877°F)	LOI	1.5	1	1	1	
Colour						
		Red	Red	Red	Red	

Data are average results of tests conducted under standard procedures and are subject to variation. Data contained in this data sheet are supplied in good faith as a technical service and are subject to change without notice. Misprint and errors excepted.