



## Moler insulating bricks

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



### HIPOR · HIPOROS · POROS SUPRA · M-EXTRA

#### DESCRIPTION

SKAMOL Moler insulating bricks include a range of grades in various combinations of bulk density, mechanical strength and thermal conductivity. Moler bricks 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 from diatomaceous earth, which is a unique raw material consisting of a natural mixture of diatoms and plastic clay.

The range of SKAMOL Moler insulating bricks 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 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 are categorized into two groups: porous and solid.

#### Porous bricks

- HIPOR
- HIPOROS
- POROS

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

#### Solid bricks

- SUPRA
- M-EXTRA

Solid grade bricks of natural porosity combining high mechanical strength with good insulating qualities. M-EXTRA grade combines low density with high strength and has good resistance to melts and slags.

#### What makes diatomaceous earth so applicable?

The unique mix between minuscule opaline honeycomb structured algae skeletons and montmorillonitic plastic clay combines good insulating properties at high temperatures with high strength. The Danish diatomaceous earth known as Moler consists of a 50 million year old marine sediment of the remains of diatom algae that has been admixed in the sea with just enough plastic clay to give a strong bond but not more than the ideal insulating properties of the porous biosilica particles remain intact. Due to the origin the silica is amorphous and does not have the adverse health properties associated with crystalline silica.

#### APPLICATION

SKAMOL Moler insulating bricks 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.

#### 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 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.

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

#### Jointing mortar recommended

As insulating mortar to be used with SKAMOL Moler bricks, we recommend Skamol FL-06. When bricks are placed without a jointing mortar, we recommend using a BB-filler, for filling the joints between bricks. For additional information, please see separate data sheets.

## SHAPES AND SIZES

### Standard sizes

Skamol offers a standard programme, which covers all basic sizes normally used as back-up insulation in heat intensive industries.

### Non-standard sizes

As non-standard sizes Skamol offers a wide range of different brick shapes. All non-standard sizes are available as derivatives of standard sizes. Please submit inquiry.

### Special sizes

Special sizes can be supplied to order. Detailed information on availability and minimum quantity will be supplied on request.

The following sizes are standard:

Metric:	
Length x width:	Thickness:
220 x 110	60 mm
230 x 114	38 – 64 - 76 mm
250 x 124	64 – 76* mm
250 x 250*	90 mm
US/British:	
Length x width:	Thickness:
9" x 4½"	1½" – 2½" – 3"

\*) These formats are not available in M-EXTRA grade.

### Dimensional tolerances

SKAMOL Moler bricks are supplied as machined bricks. The bricks are machined on all six faces to close dimensional tolerances for applications requiring tight brickwork, straight courses and the highest degree of accuracy.

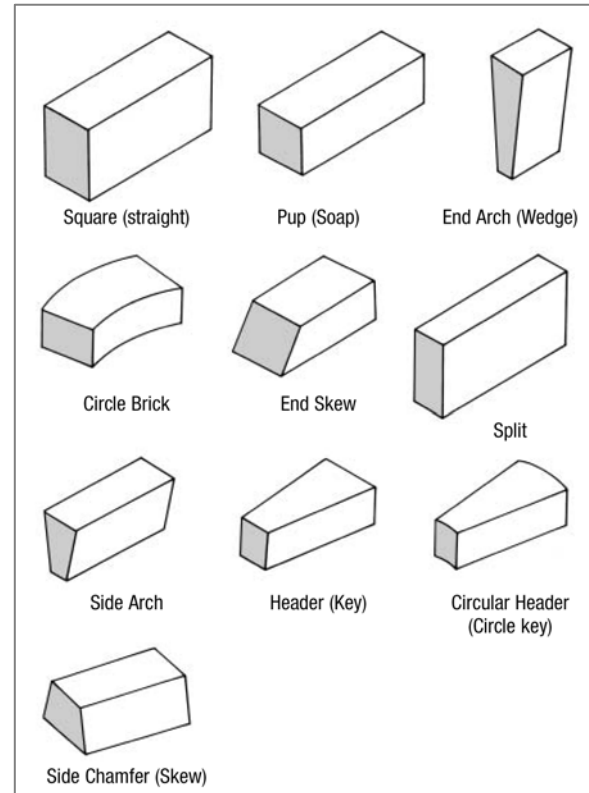
Dimensional tolerances for HIPOR, HIPOROS, POROS:

Length, width, thickness ..... ± 0.5 mm (0.02")

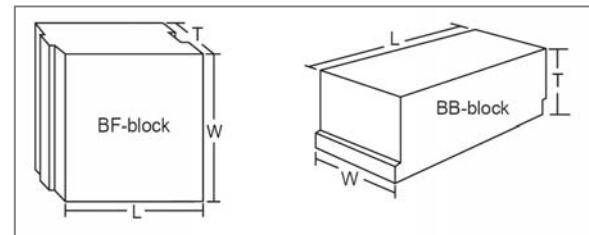
Dimensional tolerances for SUPRA and M-EXTRA:

Length, width, thickness ..... + 0.5 mm (0.02") – 1%  
 ..... or -1 mm (0.04")  
 whichever is the greater

## Brick shapes



## Block sizes



# SKAMOL Moler insulating bricks

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

Grade		HIPOR	HIPOROS	POROS*	SUPRA**	M-EXTRA
<b>Maximum service temperature</b>						
	°C	900	900	950	950	1000
	°F	1652	1652	1742	1742	1832
<b>Bulk density, dry</b>						
	kg/m <sup>3</sup>	550	570	650	750	950
	lbs/cu.ft.	34	36	41	47	59
<b>Cold crushing strength (EN 1094-5:1995)</b>						
@ room temperature	MPa	1.4	1.6	3.5	7.5	18.0
	lbs/sq.in.	203	232	508	1088	2610
<b>Modulus of rupture (EN 993-6:1995)</b>						
	MPa	0.5	0.5	1.0	1.8	4.0
	lbs/sq.in.	73	73	145	261	580
<b>Total porosity (EN 1094-4: 1995)</b>						
	%	77	76	72	68	60
<b>Permeability to air (BS EN 993-4: 1995)</b>						
	nPm	18.5	16.5	6.0	2.0	0.5
<b>Creep in compression (EN 993-9: 1997)</b>						
50 h at 100°C (212°F) below max. service temperature load 0.1 MPa (14.5 lbs/sq.in.)	%	1.3	1.5	1.5	1.5	1.5
<b>Specific heat</b>						
	KJ/(kg×K)	0.80	0.70	0.80	0.80	0.80
	BTU/(lb×°F)	0.19	0.17	0.19	0.19	0.19
<b>Coefficient of reversible thermal expansion (BS 1902: section 5.3: 1990)</b>						
@ 20°C-750°C (68°F-1382°F)	K <sup>-1</sup>	2.0x10 <sup>-6</sup>	3.0x10 <sup>-6</sup>	3.0x10 <sup>-6</sup>	3.0x10 <sup>-6</sup>	3.0x10 <sup>-6</sup>
	°F <sup>-1</sup>	1.1x10 <sup>-6</sup>	1.6x10 <sup>-6</sup>	1.6x10 <sup>-6</sup>	1.6x10 <sup>-6</sup>	1.6x10 <sup>-6</sup>
<b>Resistance to thermal shock (EN 993-11: 1998)</b>						
	cycles	> 30	> 30	> 30	> 30	> 50
<b>Linear reheat shrinkage (EN 1094-6: 1999)</b>						
	%	1.0	1.0	1.0	1.0	1.0
<b>Pyrometric cone equivalent (ASTM C24-89 ORTON cones)</b>						
	°C	1350	1200	1350	1350	1350
	°F	2462	2192	2462	2462	2462
<b>Thermal conductivity (ASTM C-182 supplemented by ASTM C-201)</b>						
mean temp. @ 200°C	W/(m×K)	0.091	0.110	0.135	0.152	0.219
@ 400°C		0.101	0.130	0.151	0.179	0.238
@ 600°C		0.113	0.150	0.164	0.194	0.254
@ 392°F	BTU/(sq.ft×h×°F/in)	0.631	0.763	0.936	1.054	1.519
@ 752°F		0.700	0.902	1.047	1.241	1.650
@ 1112°F		0.784	1.040	1.137	1.345	1.761
<b>Chemical analysis, typical</b>						
	%					
Silica	SiO <sub>2</sub>	77	72	77	77	77
Titanium oxide	TiO <sub>2</sub>	0.7	0.7	0.7	0.7	0.7
Ferric oxide	Fe <sub>2</sub> O <sub>3</sub>	7.0	7.0	7.0	7.0	7.0
Alumina	Al <sub>2</sub> O <sub>3</sub>	9.0	8.0	9.0	9.0	9.0
Magnesium oxide	MgO	1.3	1.2	1.3	1.3	1.3
Calcium oxide	CaO	0.8	6.5	0.8	0.8	0.8
Sodium oxide	Na <sub>2</sub> O	0.4	0.4	0.4	0.4	0.4
Potassium oxide	K <sub>2</sub> O	1.6	1.5	1.6	1.6	1.6
Sulphur trioxide	SO <sub>3</sub>	1.0	1.2	1.0	1.0	1.0
Loss on ignition 1025°C (1877°F)	LOI	1.0	1.5	1.0	1.0	1.0
<b>Colour</b>						
		red	red	red	red	red
<b>HS Tariff number</b>						
(Harmonized Commodity Description and Coding System)						6901.00.00

\*) The POROS grade corresponds to SM-65 grade.

\*\*) The SUPRA grade corresponds to LR-1750 grade.

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.

June 2009