

## Vermiculite insulating boards

hot-face and back-up insulation for Iron & Steel Industries

### Skamol V-1100 (600) · V-1100 (700) Skamol VIP-900 · VIP-12 HS

#### Description

The Skamol V-1100 (600), Skamol V-1100 (700) and Skamol VIP-12 HS is a range of vermiculite based insulating boards recommended for the high-temperature industries. They have good thermal properties, are highly thermal shock resistant and show a reasonable wear resistance. Especially the VIP-12 HS has been designed to obtain a high strength and good wear resistance.

The low thermal conductivity of the vermiculite boards secures application of V-1100 (600), V-1100 (700) and VIP-12 HS to be energy saving and thus cost effective.

Skamol vermiculite boards cover several grades in various combinations of bulk density, thermal conductivity properties and compressive strength. Standard grades include:

- V-1100 (600)
- V-1100 (700)
- VIP-900
- VIP-12 HS

#### Application

V-1100 and VIP-12 vermiculite insulating boards are clean to handle and easy to install. The product composition allows for easy cutting, machining and shaping of all board types on site using ordinary wood-working tools.

Jointing mortar recommended is Skamol FL-06, see separate data sheet "Skamol insulating mortars".

#### Skamol V-1100 (600) and V-1100 (700)

V-1100 boards combine high strength with low thermal conductivity and are designed for a maximum service temperature of 1100°C (2012°F). The whole range of boards is ideal for back-up insulation, and the V-1100 (600) and V-1100 (700), can be used as hot-face application in furnaces with very mild flue gas containing no wear particles. V-1100 boards are not attacked by molten aluminium; therefore they can be applied in the secondary aluminium industry, for example in holding furnaces, filter boxes and in launders as back-up insulation and as top lid. The high physical strength of V-1100 (700) combined with good thermal resistance makes the board ideal as back-up insulation in continuous caster tundishes.

#### Skamol VIP-900 and VIP-12 HS

Both the VIP-200 and VIP-12 HS has a maximum service temperature of 1150°C (2102°F). They have very good thermal conductivity characteristics. This combined with the good thermal shock and wear resistance makes the boards very applicable in torpedo cars, steel ladles and tundishes of continuous casters as back-up insulation and as hot-face application in furnaces of mild condition, i.e. flue gases containing only few particles of low wear-resisting characteristics.

#### Standard sizes

Skamol V-1100 (600), V-1100 (700) and VIP-12 HS boards are available in the following standard sizes:

| Metric:      |                                |                |
|--------------|--------------------------------|----------------|
|              | Length x width:                | Thickness:     |
| V-1100 (600) | 1000 x 610 mm<br>1000 x 305 mm | 20 – 75 mm     |
| V-1100 (700) | 997 x 610 mm                   | 16 – 50 mm     |
| VIP-900      | 1000 x 610 mm                  | 20 – 75 mm     |
| VIP-12 HS    | 610 x 305 mm                   | 12.7 – 40 mm   |
| US/British:  |                                |                |
| V-1100 (600) | 36" x 24"<br>36" x 12"         | ¾" through 3"  |
| V-1100 (700) | 36" x 24"                      | ⅝" through 2"  |
| VIP-900      | 36" x 24"                      | ¾" through 3"  |
| VIP-12 HS    | 24" x 12"                      | ½" through 1½" |

Derivatives cut from standard boards and special shapes to meet specific design requirements are made on request. Extensive know-how on special shapes and designs is available.

#### Dimensional tolerances

Length and width ..... ± 2.5 mm (0.10")  
 Thickness ..... ± 1.0 mm (0.04")

# SKAMOL vermiculite insulating boards

Hot-face and back-up insulation up to 1150 °C (2102 °F)

| Grade   |                                | V-1100 (600)         | V-1100 (700)         | VIP-900               | VIP-12 HS            |
|---|--------------------------------|----------------------|----------------------|-----------------------|----------------------|
| <b>Maximum service temperature</b>  |                                |                      |                      |                       |                      |
|   | °C                             | 1100                 | 1100                 | 1150                  | 1150                 |
|   | °F                             | 2012                 | 2012                 | 2102                  | 2102                 |
| <b>Bulk density, dry</b>  |                                |                      |                      |                       |                      |
|   | kg/m <sup>3</sup>              | 600                  | 700                  | 900                   | 1225                 |
|   | lbs/cu.ft.                     | 37                   | 44                   | 56                    | 77                   |
| <b>Compressive strength (EN 1094-5: 1995)</b>                                   |                                |                      |                      |                       |                      |
| @ room temperature  | MPa                            | 4.2                  | 4.5                  | 6.3                   | 18.5                 |
|   | lbs/sq.in.                     | 609                  | 653                  | 914                   | 2683                 |
| <b>Modulus of rupture (EN 993-6: 1995)</b>                                      |                                |                      |                      |                       |                      |
|   | MPa                            | 1.6                  | 2.0                  | 2.1                   | 5.0                  |
|   | lbs/sq.in.                     | 232                  | 290                  | 305                   | 725                  |
| <b>Apparent porosity</b>  |                                |                      |                      |                       |                      |
|   | %                              | 76                   | 74                   | 67                    | 55                   |
| <b>Specific heat</b>  |                                |                      |                      |                       |                      |
|   | KJ/(kg×K)                      | 0.94                 | 0.94                 | 0.97                  | 1.00                 |
|   | BTU/(lb×°F)                    | 0.224                | 0.224                | 0.23                  | 0.24                 |
| <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>                | 11x10 <sup>-6</sup>  | 11x10 <sup>-6</sup>  | 10.5x10 <sup>-6</sup> | 10x10 <sup>-6</sup>  |
|   | °F <sup>-1</sup>               | 6.1x10 <sup>-6</sup> | 6.1x10 <sup>-6</sup> | 5.9x10 <sup>-6</sup>  | 5.6x10 <sup>-6</sup> |
| <b>Resistance to thermal shock (EN 993-11: 1998)</b>                            |                                |                      |                      |                       |                      |
| heating to 950°C (1742°F)   | cycles                         | >20                  | >30                  | -                     | >20                  |
| <b>Linear reheat shrinkage (EN 1094-6: 1999)</b>                                |                                |                      |                      |                       |                      |
| 12 h at 1000°C (1832°F)   | %                              | 1.0                  | 1.0                  | -                     | -                    |
| 12 h at 1100°C (2012°F)   |                                | -                    | -                    | 1.2                   | 0.9                  |
| <b>Pyrometric cone equivalent (ASTM C24-89 ORTON cones)</b>                     |                                |                      |                      |                       |                      |
|   | °C                             | 1300                 | 1300                 | 1310                  | 1330                 |
|   | °F                             | 2372                 | 2372                 | 2390                  | 2426                 |
| <b>Thermal conductivity (ASTM C-182)</b>  |                                |                      |                      |                       |                      |
| mean temp. @ 200°C  | W/(m×K)                        | 0.16                 | 0.19                 | 0.23                  | 0.27                 |
| @ 400°C   |                                | 0.18                 | 0.20                 | 0.25                  | 0.29                 |
| @ 600°C   |                                | 0.20                 | 0.21                 | 0.26                  | 0.30                 |
| @ 800°C   |                                | 0.22                 | 0.22                 | 0.28                  | 0.32                 |
| @ 1000°C  |                                | -                    | -                    | 0.30                  | 0.33                 |
| @ 392°F   | BTU/(sq.ft.×h×°F/in)           | 1.11                 | 1.32                 | 1.59                  | 1.87                 |
| @ 752°F   |                                | 1.25                 | 1.39                 | 1.73                  | 2.01                 |
| @ 1112°F  |                                | 1.39                 | 1.46                 | 1.80                  | 2.08                 |
| @ 1472°F  |                                | 1.53                 | 1.53                 | 1.94                  | 2.22                 |
| @ 1832°F  |                                | -                    | -                    | 2.08                  | 2.29                 |
| <b>Chemical analysis, typical</b>   |                                |                      |                      |                       |                      |
|   | %                              |                      |                      |                       |                      |
| Silica  | SiO <sub>2</sub>               | 46                   | 46                   | 48                    | 48                   |
| Titanium dioxide  | TiO <sub>2</sub>               | 0.7                  | 0.7                  | 1.5                   | 1.1                  |
| Ferric oxide  | Fe <sub>2</sub> O <sub>3</sub> | 5.5                  | 5.5                  | 5.4                   | 3.5                  |
| Alumina   | Al <sub>2</sub> O <sub>3</sub> | 7.0                  | 7.0                  | 16                    | 27                   |
| Magnesium oxide   | MgO                            | 19                   | 19                   | 14                    | 7.4                  |
| Calcium oxide   | CaO                            | 3.5                  | 3.5                  | 3.4                   | 4.7                  |
| Sodium oxide  | Na <sub>2</sub> O              | 0.2                  | 0.2                  | 0.1                   | 0.3                  |
| Potassium oxide   | K <sub>2</sub> O               | 10                   | 10                   | 6.8                   | 6.2                  |
| Loss on ignition 1025°C (1877°F)  | LOI                            | 7.0                  | 7.0                  | 3.6                   | 2.4                  |
| <b>Colour</b>   |                                |                      |                      |                       | SAND                 |
| <b>HS Tariff number</b>   |                                |                      |                      |                       |                      |
| (Harmonized Commodity Description and Coding System)                            |                                |                      |                      |                       | 6806.90.00           |

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.

Note: The TC values for Skamol V-1100 (600) and V-1100 (700) at 800°C are estimated.

For VIP-900 and VIP-12 HS the value at 1000°C (1832°F) is estimated.

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Skamol A/S is DS/EN ISO 9001 certified