

H A S L E

WE PROTECT YOUR PROCESS





■ **We protect your process**

High-temperature processes are demanding and cost-intensive. These advanced processes make great demands on the processing equipment used. All equipment must help to ensure the longest service life possible, as well as minimise energy costs and environmental impact.

At HASLE, we take great pride in developing, manufacturing and supplying refractory materials to protect your process.

Our refractory materials are continuously being developed in close collaboration with our customers. We aim to be a market leader in materials specially designed to resist mechanical impact, chemical attack, shock, build-up and wear – resistance properties which ensure a long service life for the refractory lining. The characteristics of our company are quality, flexibility and quick response times.

Quality – because it is paramount to our customers that HASLE’s materials function optimally – every time. We give priority to ensuring that our

customers experience a high and uniform level of quality with all our products.

Flexibility – because our customers needs change over time – and from one job to another. We are ready to assist at all times with advice and guidance in selecting materials – to ensure the best results for our customers.

Quick response times – as every customer inquiry is important to us, we are constantly focused on ensuring quick responses and short lead times.

We look forward to protecting your process with the best refractory materials possible.

Michael Bladt

CEO, Owner
HASLE Refractories A/S



HASLE castables are made from the best raw materials



■ **All our castables are manufactured according to our own secret formulas, which are continuously being developed and improved**

Our castables are manufactured at our own factory, and the entire manufacturing process is designed to ensure that all our castables have a high level of uniform quality. We use only the best raw materials – in other words, we do not use recycled or semi-manufactured materials from other manufac-

turers. Our comprehensive quality control process ensures that all finished goods comply with our high requirements for particle-size distribution, workability, and physical properties when our products leave the factory.

Castables are usually grouped as follows: traditional castables, low-cement castables, insulating castables, gunning mixes and mortars. These are described on the following pages.



HASLE castables



HASLE traditional castables

are composed of relatively few, well-known components and have been in use for many years. This type of castable is used for jobs that are not too demanding – where mechanical and chemical action on the castable is relatively low.

HASLE low-cement castables

HASLE low-cement castables (LCC) were developed to create the best combination of mechanical strength, impact resistance and alkaline corrosion at high temperatures. LCCs low porosity characteristic reduces the risk of slag attack and corrosion. Low porosity also helps to make LCCs stronger than traditional castables. As a result, low-cement castables are highly resistant to alkaline attack, such as from sodium and potassium salts – compounds often found in biofuels, waste, etc.

This means that linings made of low-cement castables have a long service life and excellent durability and are more economical to use in the long term than traditional castables.

HASLE low cement gunning mixes

Our low cement mixes for dry gunning are based on the same high-quality raw materials as our well-known LC-castables. Hence chemical resistance

and mechanical strength are high and the LC-gunning mixes are suitable as primary linings. The grain-size distribution of the gunning mixes ensures a dense packing and low rebound of the material when sprayed onto the ceiling.

In our product range we also have a pumpable castable for wet gunning/shotcrete, which also can be pumped directly into moulds where it levels without vibration.

HASLE insulating castables

Insulating castables differ from other castables due to two factors: That the grog is composed of high-porosity components or that the castable forms a porous structure when heated. For utilisation purposes, insulating castables are a competitive alternative to insulating (porous) bricks. An insulating castable is a suitable filling material between a hot face lining and block insulation. The insulating castable flows into all corners and cracks leaving no cavities.

Mortars

Mortars were developed to bind bricks together in bricked linings. Refractory mortars are made from fire clay, refractory clay and cement, with the particle size and quality adapted to the desired application.



HASLE precast elements

The most efficient solution



Part of Precast Feed Pipe installation



Precast Smoke Chamber



Precast Grate Cooler



Precast Kiln Hood

■ An excellent alternative to casting is the installation of a HASLE precast solution

HASLE manufactures precast modular elements developed by our own technicians. We also offer to design and manufacture customer-specific element for linings or functional furnace parts. The design process takes place in close collaboration with the customer and is based on requirements like ease of assembly, durability and thermal conduction.

The combination of a high-quality low-cement castable with a controlled manufacturing process ensures a very durable, precise and uniform element. Thanks to innovative mould-building techniques, precast elements can be manufactured in all sorts of shapes and sizes.

There are many advantages of choosing a refractory lining made of precast modular elements. The elements are easy to install, and the user avoids the drying-out problems that can be experienced by using castables. The process can be restarted very quickly without a risk of explosion due to vapour pressure inside the lining. If an operating kiln system needs to be renovated, the repair process is short: the precast elements can quickly be placed and replaced as no formwork is required.

A precast refractory lining is denser and thus less vulnerable to chemical attack and build-up formation. The lining will also have greater mechanical strength than a lining cast in situ.

HASLE offers modular systems suitable for floors, walls and roofs, regardless of whether the surfaces are flat or curved. The solution may also be used to increase cross-sectional areas, where possible, in bottle-neck areas.

For pipelines we offer a precast cylindrical lining that is installed without anchors. This solution is very fast and safe to install and is combined with insulation material to reduce heat loss from feed pipes etc.



HASLE precast elements – unsurpassed quality

■ **HASLE's precast elements are manufactured under highly controlled conditions**

Nothing is left to chance. The freshness of the castable, the addition of water, vibration, curing and subsequent firing to more than 1,000°C are carefully controlled for every single production run.

To control the process, samples of each batch are taken after curing. The samples are dried in a dry-

ing cabinet, after which their bending and compressive strength are tested. A batch is only allowed to continue in the manufacturing process if it complies with our high quality requirements. Each element is inspected both at the time of formwork removal and after firing to ensure that only perfect elements are delivered to our customers.



Choosing the right castable



Alkali-test with K_2CO_3 at 1100°C CEN/TS15418



Determination of cold modulus of rupture. EN1402-6



Determination of resistance to thermal shock. EN993-11



Determination of cold crushing strength. EN1402-6

■ Choosing the right castable

A castable that works well and has a long service life in one area can be unsatisfactory in another. Therefore, it is crucial to know which properties you are looking for.

In the following, we briefly explain the most important technical data for all HASLE castables. The actual values are to be found on our data sheets.

Compressive and bending strength: MPa (CCS and MOR)

These strengths must be high in order to resist the physical contact to which the castable is exposed and to ensure the lining's long service life. HASLE's castables are more uniform and stronger than similar castables from other manufacturers.

Abrasion resistance: Cm^3

This property is important in areas with great wear, typically caused by airborne particles. The lower the value the higher the abrasion resistance, and all HASLE low-cement castables are highly resistant to abrasion.

Al_2O_3 content

Together with the castable's other ingredients, the Al_2O_3 content indicates the castable's structure. By contrast with conventional castables whose price and refractoriness increase concurrent with the content of Al_2O_3 , HASLE's low-cement castables are renowned for having a more flexible chemical structure where the most important properties are not solely related to the content of Al_2O_3 . In HASLE low-cement castables, the castable's binding system is crucial, regardless of the details of the chemical structure.

The relatively low Al_2O_3 content gives the castable low bulk density, compared to similar high-quality castables. In addition, the reduced Al_2O_3 content also improves its chemical resistance and insulation.

Bulk density: Kg/m^3

This property is important in calculating the amount of castable to be used for casting in a specific area. Low bulk density is good because it means that less (weight) is required to cover the desired area. The bulk density of HASLE castables is low compared to many other castables. This means that HASLE castables often cost less, after adjusting for their lower bulk density, as a smaller volume is required for casting the same area.

Thermal conductivity: W/mK

This property is important as it indicates whether a castable has insulating capacity. Low thermal conductivity ensures that the heat remains in the area cast, thereby contributing to the process desired. By contrast, a castable with high thermal conductivity can transport lots of heat, which is useful for steam-generating facilities. HASLE provides castables with both high and low thermal conductivity, thereby covering all areas of utilisation.

Alkali resistance is indicated on a scale of 0 to 10

This property is very important if the fuels – such as wood chips, bark, straw and waste – emit alkaline gasses. Alkaline gases substantially reduce the castable's service life. The figure 0 indicates that a castable has maximum resistance against alkaline attack.

HASLE Research and Development

HASLE has its own R&D facilities where specific slag testing can be carried out using a customer's own fuel. This means we will gladly assist with testing to optimise the refractory lining in your system and thus achieve longer service life, fewer repairs and less maintenance. We are constantly focused on optimization and development of castables to meet the challenges of new technologies and alternative fuels.

Refractory commodities

■ To supplement our own manufactured products, HASLE offers a wide range of ceramic fibres, insulating bricks and fireplace bricks

Ceramic fibres

Ceramic fibre products are used wherever a high insulating capacity is required. If mechanical wear is not present, ceramic fibres can be used as the only refractory material which is in contact with the process.

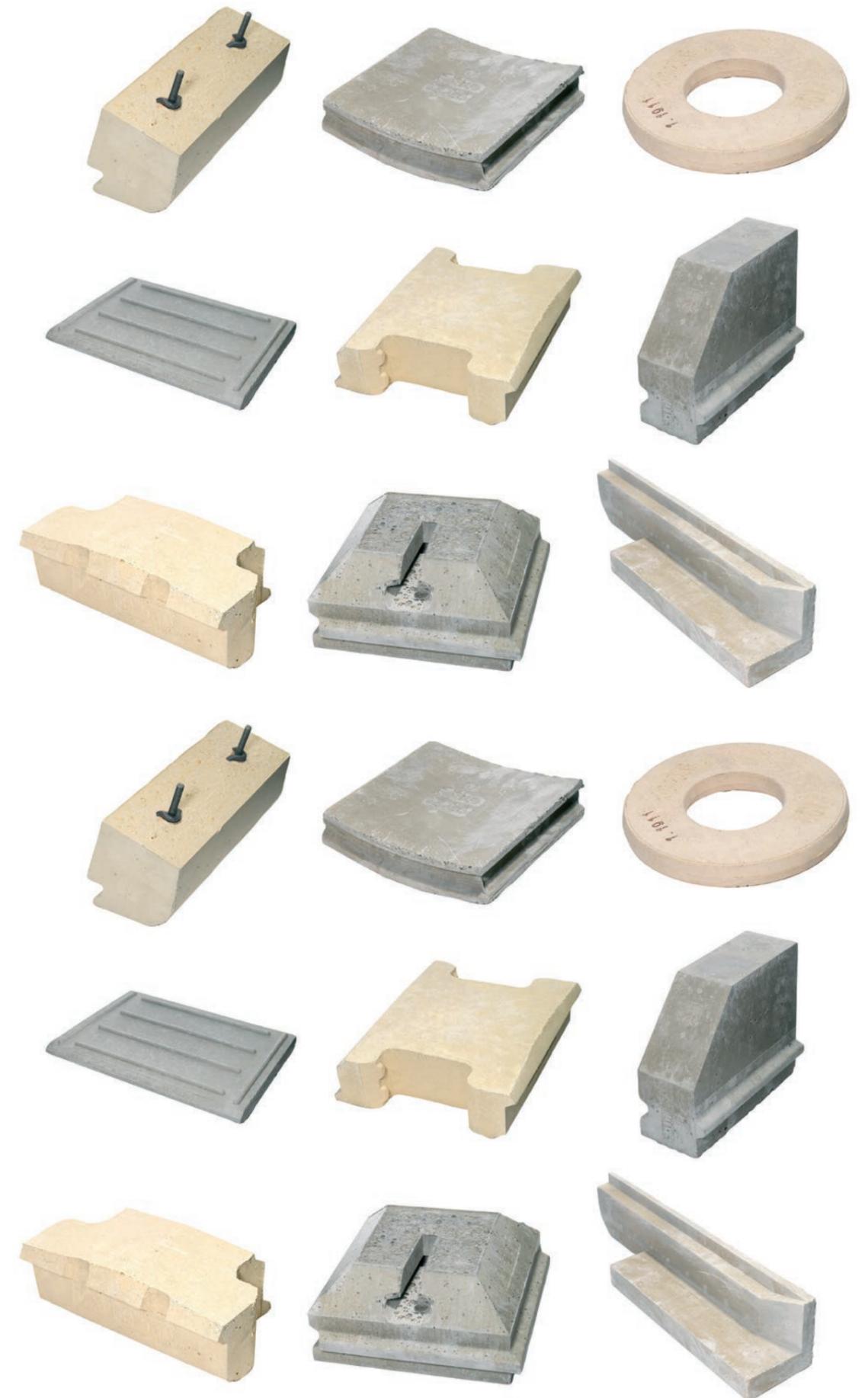
HASLE sells only synthetic bio-soluble fibres. The fibre is water soluble and therefore less harmful to human health than traditional ceramic fibres.

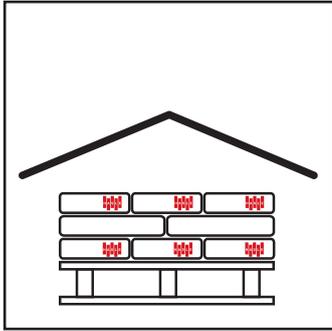
Insulating bricks

Insulating bricks are distinguished from other bricks by their high porosity and, thus, lower compressive strength. The advantage of insulating bricks is that they can be used for both primary lining and insulation backing. They have good insulating capacity, good thermal resistance and provide a lightweight refractory structure.

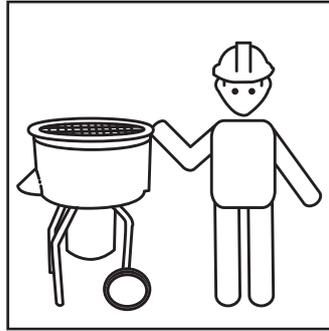
Fireplace bricks

Used for building wood-burning stoves, small stoves and ceilings, etc. The bricks are made of chamotte and fire clay.

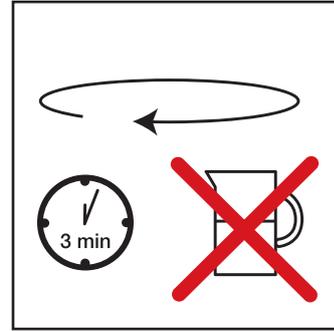




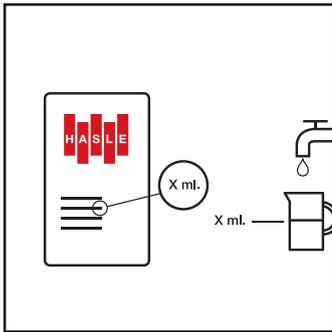
Store bags in dry conditions, sheltered against rain, wind and direct sunshine.



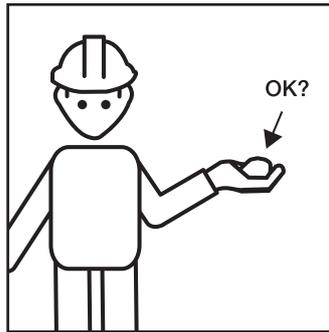
Use clean pan mixer.



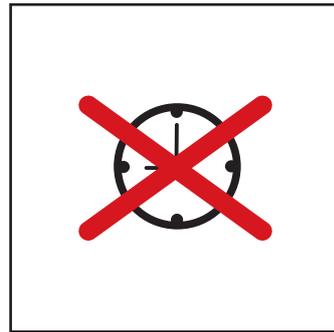
Mix dry material for 3 minutes.



Add water according to prescriptions on bag. Use clean tap water only.



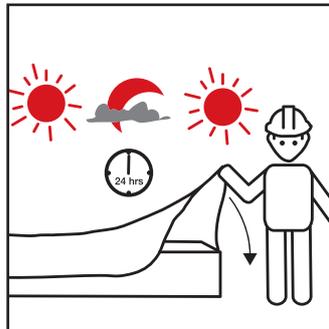
Mix for 4 minutes with water. Add more water if too dry and mix for 4 minutes.



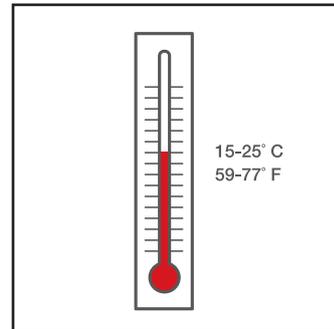
The material should be installed immediately after mixing. Please note: PU- versions are for pumpcasting.



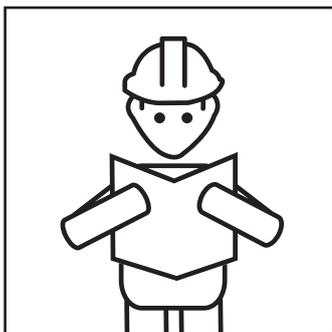
Vibrate thoroughly until castable flows together. Please note: PU- and EF-versions need less vibration.



Allow curing for a minimum of 24 hours. Protect surface from drying out.



Ideal casting temperature is 15-25°C / 59-77° Fahrenheit. Under very cold or warm weather, hardening of the castable can be significantly prolonged or accelerated respectively.



Follow HASLEs instructions for drying out and firing.

HASLE REFRACTORIES

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