

Hard Compound **KALCRET**

Cast or Trowelled
Wear Protection
for System Components
and Pipes



kalenborn

The Wear Protection People

KALCRET Hard Compound

Cast or Trowelled Wear Protection for System Components and Pipes

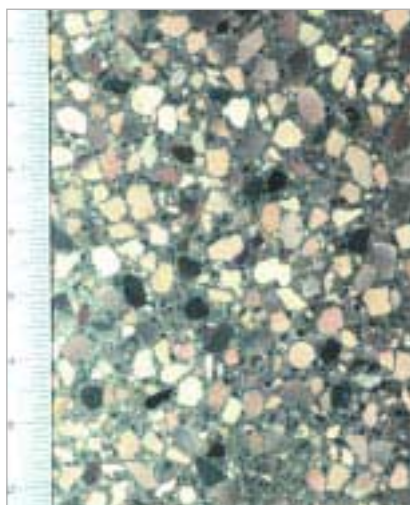
KALCRET hard compound is the general term for cement-bonded wear-protective materials. These are based on inorganic materials of high compressive strength and wear resistance.

The high density is attained by a well-balanced particle size distribution of the individual components. The pores between the cement particles are filled by the addition of superfine particles of micro silica.

High compressive strength of KALCRET is reached after only 8 hours, more than sufficient for repair work.

The mixture, which includes defined additives, is made up of:

- hard aggregate materials
- cement binder
- micro silica



Structure of KALCRET:
strong cement matrix,
hard aggregate materials 0 - 4 mm
(bauxite or corundum).

For improved structural strength defined amounts of steel fibres are added. Expansion joints are added when using KALCRET for higher temperatures.

With regard to chemical resistance, KALCRET is more stable than concrete. On the other hand KALCRET should not be used as acid protection.

KALCRET Trowelled Compound

This compound allows protection on vertical, inclined and curved surfaces.

KALCRET Cast Compound

This material is particularly useful for wear protection of flat surfaces. Normally, simple formwork will be adequate. Vertical and inclined surfaces require appropriate formwork.

Combinations with other Wear-Protecting Materials

KALCRET is very suitable for combination with other materials from the Kalenborn program such as

- ABRESIST
fused cast basalt
- KALCOR
fused cast corundum
- KALOCER
high alumina ceramics



Raw meal duct in a cement plant.



Hot gas cyclone at 1000 °C/1932 °F.



Lining of a vertical mill.

Technical Advice

Many varying factors determine which Kalenborn products will be suitable to solve the specific wear problem.

Our experts will give you comprehensive advice and submit proposals tailored to the particular requirements.

Advantages of KALCRET

- high strength and abrasion resistance to wear caused by sliding friction
- large-surface lining
- varying lining thickness depending on the stress due to wear
- setting time only 8 hours
- can be used at high temperatures up to 1200 °C/2192 °F
- high thermal shock resistance
- oxidation stability
- even complicated geometries feasible
- ideally suited for repairs
- can be installed at the site by the local available staff
- complete wear protection program
- optimal solution due to the combination with other wear resistant materials from Kalenborn



Typical Applications

Applications

- bunkers
- channels
- chutes
- cyclones
- deflector hoods
- dust collecting ducts
- gas purifying systems
- hoppers
- hydraulic conveying systems
- pipes
- pipe bends
- pneumatic conveying systems
- separators
- silos
- tanks

Industries

- aluminium plants
- cement industry
- coal fired power plants
- glass factories
- iron/steel production
- mineral wool production
- mining
- non-ferrous metal mining and beneficiation
- refuse incinerating plants

Working with KALCRET

Preparation

Packing and storage

Normally, KALCRET is packed in 25 kg plastic bags. The material has been protected against moisture. The steel fibres are delivered in 1 kg paper bags.

Provided KALCRET is stored in a dry environment, it can be kept at the site up to 12 month after production.

Working Temperature

KALCRET can best be worked at temperatures between 10 °C and 30 °C. Working at temperatures below 5 °C requires heating of the system to be lined.

When large surfaces have to be lined at temperatures below 5 °C we recommend the use of prefabricated KALCRET shapes.

Preparing the Surface to be Lined

The use of KALCRET hard compound necessitates careful preliminary treatment of the surfaces to be lined:

- A suitable metal wire mesh is fastened with corresponding accessories at a distance of approximately 5 mm from the wall to be lined. The fastening points should have a spacing of 250 mm. The wire mesh shall be fastened stiff and firm. Linings of more than 40 mm thickness require the use of spacers.
- Steel surfaces shall be cleaned. Sandblasting is not necessary.
- Concrete surfaces shall be cleaned as well (they shall be free of any oil or grease and loose particles) and be wetted prior to

application (identical to the method adopted when applying cement-bonded materials).

Setting Time

The final strength of KALCRET linings is achieved at temperatures of approximately 20 °C after some 28 days. After 8 hours the strength has reached 75 %. This is the setting time, e.g. for repairs.

Longer setting times will have to be expected for temperatures of less than 20 °C.



Welding of metal wire mesh: spacing approx. 250 mm.



Stiff and firm fastening, distance to surface to be lined approx. 5 mm.



KALCRET is wear protection in the bag.

Check List

- sufficient quantities of KALCRET and steel fibres
- clean water: potable water
- correct electrical supply for the mixer and vibrating trowel
- clean forced circulation mixer
- plastic bucket (20 liters) and glass measures (1 liter and 2 liters)
- precise working scale (5 kg)
- timer
- working tools
- protected mixer zone
- no direct sunlight
- surface sealing system
- personal protection (gloves, helmet, goggles, mask)
- observe safety data sheet precautions
- adhere to working instructions

Working Tools

Installation

KALCRET can either be applied at the Kalenborn works or at site. For installation on the site, a comprehensive range of tools and equipment is available.

Working Tools

Kalenborn has recommended tools approved for the working of KALCRET.

They have been widely applied and tested in practice. Various tools have been modified for this particular purpose and are not available from commercial dealers.



KALCRET forced circulation mixer.



Wear protected mixing tank.



Working tools for KALCRET.

Check List

- medium-sized forced circulation mixer, mixing capacity 50 liters with 1.5 kW motor, 33 rpm (other mixers on request)
- forced circulation mixer with wear-protected mixing tank
- mason's trowel, large
mason's trowel, small
- smoothing trowel
- spatula, 40 mm or 80 mm
- vibrating trowel, approx. 23.5 x 13.5 cm
- internal vibrator
- external vibrator
- measuring flask with graduation (1 liter or 2 liters)
- plastic bucket, 10 liters or 20 liters
- mortar bucket, 85 liters
- pre-profiled metal wire mesh (material to be chosen with due regard to specific requirements)
- tools for fastening the metal wire mesh as required
- rubber mallet for mounting the metal wire mesh
- device for deforming the metal wire mesh
- steel fibres (matched to the specific requirements)
- surface sealing spray (curing liquid)
- PE sheeting

Working with KALCRET

Preparing the Compound

- Place required KALCRET quantity in a forced circulation mixer. 1 bag of KALCRET (25 kg) yields about 9 liters of compound.

- Have hard compound mixed dry for about 30 seconds.

- The specified water/hard compound ratio must be observed.

- Carefully measure the required water quantity (either by measuring flask or by weighing) and slowly add it during mixing. Make sure only clean potable water of a maximum temperature of 25 °C and a minimum temperature of 15 °C is used.

- **CAUTION:**
Follow working instructions on the KALCRET bag.

- **Be patient!**
The mixing time shall at least be 10 minutes.

- We always recommend adding steel fibres at a rate of 1 kg/bag of KALCRET.

- The steel fibres should be added towards the end of the mixing time (after 8 to 9 minutes) making sure that no lumps are formed. Mixing time approx. 2 minutes.

- The working temperature range is 10 °C to 30 °C; direct sunlight should be avoided.

- The mixture can be worked for up to 1 hour at a temperature of 20 °C.

- The minimum setting time is 8 hours.



1. KALCRET and water to be mixed as specified in the working instructions.



2. Mix for 5 minutes as specified; check result.



3. Mixture too dry: gradually add up to 30 ml of water per 25 kg of KALCRET.



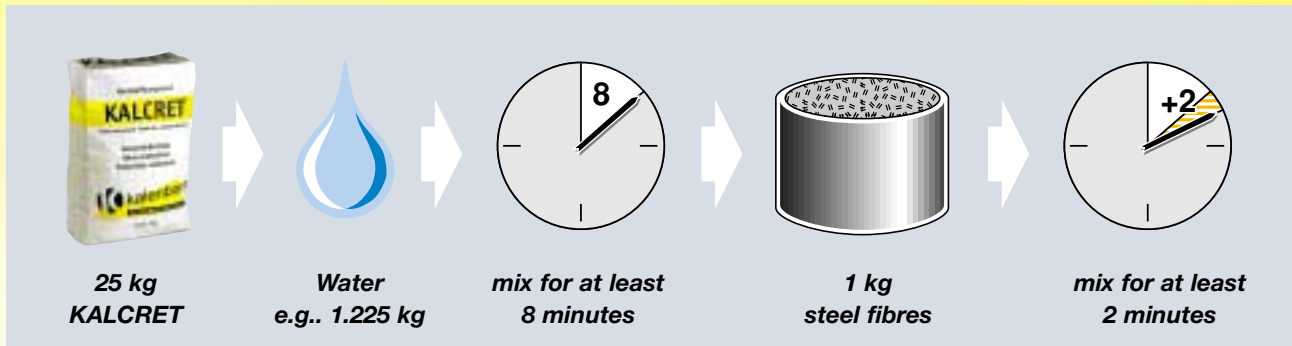
4. Continue mixing for at least 3 minutes. Check result.



5. Add steel fibres.



6. Continue mixing for at least 2 minutes. Check result.



Mixing of KALCRET



KALCRET compound must be sticky and allow plastic deformation.

Use of Steel Fibres



Kalenborn always recommends adding steel fibres.

Check List

- mixer and water should be clean
- use moderately warm water (15 to 25 °C)
- make sure the materials are free of lumps
- precisely measure water to be added
- mix for at least 10 minutes in the forced circulation mixer
- if the KALCRET compound is too dry, gradually add up to 30 ml of water each per 25 kg of KALCRET
- the KALCRET compound is ready for use when it is sticky and allows plastic deformation
- do not use at temperatures below 5 °C

Check List

- 1 kg of steel fibres per bag of KALCRET
- material of steel fibres depending on application
- carefully mix steel fibres and KALCRET in a forced circulation mixer: after 8 to 9 minutes for approx. 2 minutes
- steel fibres must not form lumps, therefore add them selectively and slowly

Working with KALCRET

Trowelled Compound

This compound allows protection on vertical, inclined and curved surfaces. KALCRET is homogeneously mixed, applied to the properly prepared sub-surface with suitable tools, compacted either manually or by means of vibrating trowels and smoothed. Standard thickness ranges between 20 and 80 mm.

A pre-profiled metal wire mesh has to be mounted on steel and/or concrete surfaces to ensure good adhesion.

The minimum setting time at an ambient temperature of 20°C is at least 8 hours.

The surfaces shall be protected against excessive evaporation of residual moisture. This can be done either by a suitable surface sealing spray or by covering with PE sheeting.

The use at operating temperatures above 50 °C requires selective provision of expansion joints. Moreover, when used at temperatures above 100 °C specific heat-up curves have to be observed.

We recommend the use of prefabricated KALCRET shapes for overhead linings.

Check List

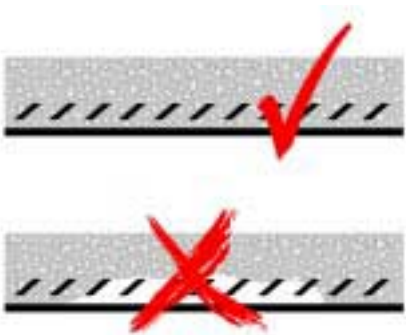
- prepare KALCRET compound that can be easily trowelled
- make sure the correct quantity of water is added
- mix for at least 10 minutes
- make sure no lumps are formed; (additional mixing, if necessary)
- add steel fibres (after 8 to 9 minutes)
- make sure the surfaces are clean
- make sure the metal wire mesh has been properly fastened
- apply sufficient KALCRET and compact it
- use external vibrator
- provide for complete backfilling of the metal wire mesh
- check thickness
- produce smooth surface
- have surface sealed or covered by PE sheeting



1. Prepare compound to be trowelled as specified.



2. Apply sufficient KALCRET and compact it.



3. Ensure complete backfilling of the metal wire mesh.



4. Check thickness and make it uniform, if necessary.

Cast Compound

This material will be particularly useful for wear protection of surfaces for which internal and external formwork can be made. Normally, simple formwork that is as smooth as possible on the KALCRET side will be adequate.

The casting compound is mixed as specified, cast into the prepared formwork and compacted with a vibrator. Slow casting and compaction of smaller quantities at a time result in uniform wear protection.

The formwork can be stripped after approximately 8 to 24 hours at 20 °C ambient temperature. The surfaces should be safeguarded against excessive evaporation of residual water. This can be ensured by a suitable surface sealing spray or by covering with PE sheeting.

The use of KALCRET at operating temperatures above 50 °C requires the selective provision of expansion joints. When used at temperatures of more than 100 °C specific heat-up curves have to be observed.

Check List

- prepare castable KALCRET compound
- make sure the correct quantity of water is added
- mix for at least 10 minutes
- make sure no lumps are formed; (additional mixing, if necessary)
- add steel fibres (after 8 to 9 minutes)
- carefully prepare the formwork
- make sure the surfaces are clean
- check correct placement of metal wire mesh
- cast and compact KALCRET
- use external vibrator
- check filling
- produce smooth surface
- have surface sealed when stripping the formwork or
- have surface covered by PE sheeting



1. Prepare formwork.



2. Prepare cast compound as specified.



3. Carefully fill formwork.



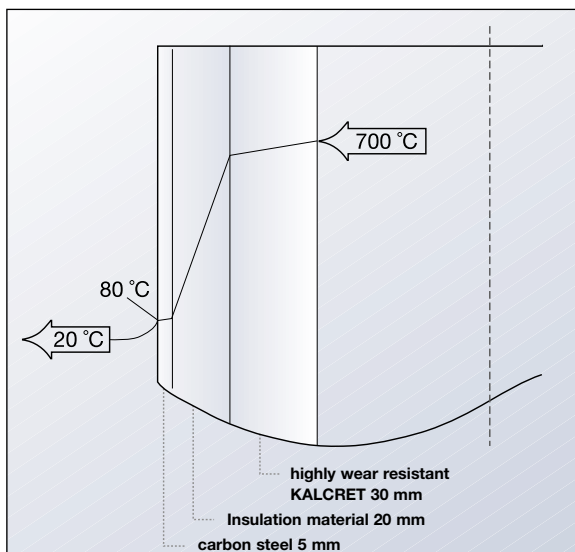
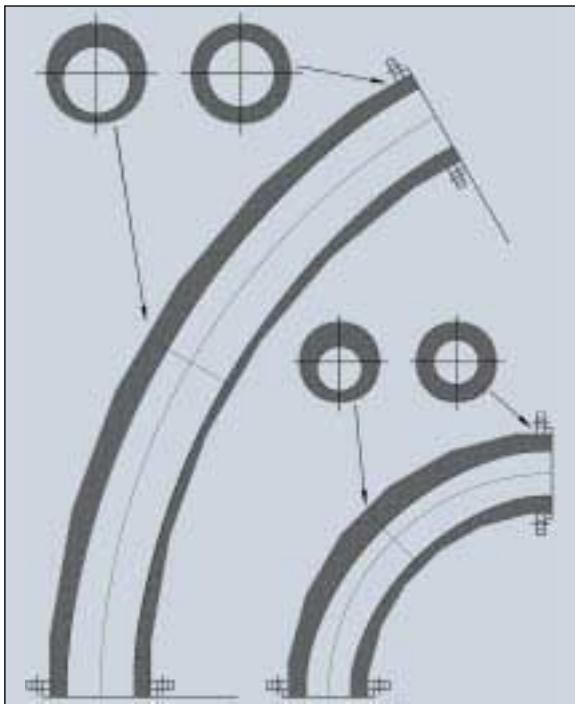
4. Use external vibrator for compacting.

Prefabricated Products

KALCRET Pipes and Bends

Pipes and bends with an inside diameter of more than 40 mm can be lined with KALCRET.

Pipes and bends up to 600 mm inside diameter are lined with KALCRET cast compound while lining with KALCRET trowelled com-



ound is more economical for pipes and bends of larger diameter.

The advantage of the KALCRET wear protection is that the lining can be made thicker in the outer radius of the bend where it is subject to higher wear (asymmetric cross section).

Thanks to the production process, the manufacture of radii is highly flexible. Even particularly small radii can be fabricated.

All pipe connections of the well-known Kalenborn program can be used. Wear can be monitored with the aid of KALDETECT.

Benefits:

- minimum inside diameter down to 40 mm
- radii of more than 500 mm (variable)
- pipe length up to 5,000 mm
- jointless lining with a minimum thickness of 20 mm
- asymmetric cross section possible
- connections as defined in standard specification Rd 6a
- wear monitoring by KALDETECT

Use at High Temperatures

Systems lined with KALCRET and characterized by a specific wall construction are offered for use at high temperatures. A particular insulation material has been mounted between the steel shell and the wear-resistant KALCRET hard compound.

Benefits:

- temperature difference up to 620 °C/1,148 °F at a wall thickness of 55 mm
- low weight thanks to minimized dimensions
- use of cost-effective carbon steel as structural material
- excellent wear protection at extremely high temperatures up to 1,000 °C/1,832 °F

Prefabricated Shapes of KALCRET

Prefabricated shapes of the KALCRET hard compound have performed well in actual practice. Tile shapes are prefabricated at Kalenborn from the cast compound and provided with fastening devices, such as weld-on bolts.

The shapes are compacted on a vibrating table. The size of the shaped elements is limited to one easily handled. Dimensions of 300 x 1,000 mm at a thickness of 30 mm are realistic.

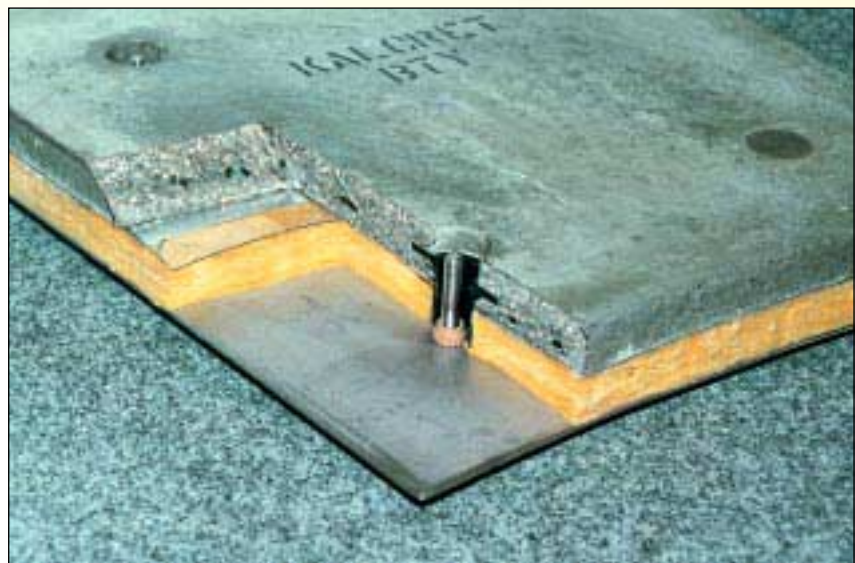
Benefits:

- Minimized engineering and minimum number of different shapes while achieving a „jointless“ lining.
- High density and thus high abrasion resistance of the prefabricated shapes. The consistent quality available in shop fabricated pieces reduces the „man factor“.
- Drastically reduced installation periods; prefabricated shapes allow quick and precise installation over large surfaces.
- Lining can be used immediately after installation, with no need for curing.
- Installation of linings of KALCRET prefabricated shapes is not a problem during the winter months at outside temperatures below 5 °C/41 °F. The costly heating of uncured components is not necessary.

Lining of Preheater Cyclones in a Cement Plant

Our Solution: KALCRET shapes prefabricated by Kalenborn, fitted with insulation and mechanically fastened to the steel plates.

That answer simultaneously offered high wear resistance, high thermal insulation and short installation periods. The complete installation of more than 200 m² was carried out in less than 2 weeks. The system was able to resume operation immediately.



Range of KALCRET Products

	KALCRET BN	KALCRET CN	KALCRET BT	KALCRET CT
All compounds can be installed either by trowelling (X) or casting (Y).				
hard aggregate	bauxite	corundum	bauxite	corundum
particle size mm	0...4	0...4	0...4	0...4
density g/cm ³	2.8	2.9	2.8	2.9
compressive strength - 28 days N/mm ²	190	185	180	175
bending tensile strength - 28 days N/mm ²	26	26	25	25
max. application temperature °C / °F	400 / 752	400 / 752	1,200 / 2,192	1,200 / 2,192
hard aggregate percentage	70 %	70 %	70 %	70 %

KALCRET



working procedure

X = applied by trowelling
Y = applied by casting

temperature stress

N = up to 400 °C / 752 °F
T = up to 1,200 °C / 2,192 °F

wear rate

B = bauxite aggregate
C = corundum aggregate

Example 1

KALCRET

B = bauxite aggregate
N = for temperatures up to
400 °C / 752 °F
X = can be applied by trowelling

Example 2

KALCRET

C = corundum aggregate
T = for temperatures up to
1,200 °C / 2,192 °F
Y = can be applied by casting



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