

COMFLEX® Wide Field of Applications

- **COMFLEX®** is multi-talented and supports different applications and products.
- **COMFLEX®** is suitable for new installations and upgrades of existing grinding plants.
- In new installations, **COMFLEX®** is an ideal single-stage grinding system for raw material, blast furnace slag and cement.
- For a number of grinding applications, **COMFLEX®** combined with a ball mill has turned out to be the best choice.
- For upgrades, **COMFLEX®** can be set up as a two-stage grinding system to meet or even exceed customer expectations in terms of product quality and capacity.

COMFLEX® Grinding System

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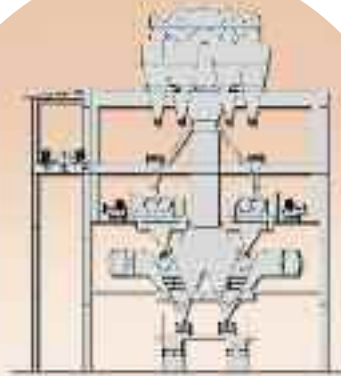
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COMFLEX® System

COMFLEX® is a modular, compact and multi-talented grinding solution for the cement and minerals industry. It is used for Finish- and Semi-Finish-Grinding of raw materials, cement and slag.

COMFLEX® combines several proven KHD technologies:

- Roller Press with Swing Frame for easy and fast roller service
- Tailor-made separating unit to separate, dry and convey materials
- Efficient product collection system



COMFLEX® is available with four basic production levels from small to highest capacity

- **COMFLEX® S** Single system for small to medium capacity
 - **COMFLEX® D** Double system for medium to high capacity
 - **COMFLEX® SC** Cement and/or slag
 - **COMFLEX® DR** Raw material
- | | | |
|------------------------------|------|--------------------------|
| • COMFLEX® DR-16/4500 | 16 | Roller Press size |
| | 4500 | Separator rotor diameter |

The system enables production rates of more than 800 t/h raw meal and 400 t/h cement – perfect as a single grinding unit serving large kilns.

COMFLEX® features high flexibility for a wide range of applications, product qualities and minimal energy consumption.

Process air, required for drying and separating is also used for material lifting, reducing mechanical material circulation.

One of COMFLEX®'s features is that the size of the system fan depends only on the separating and drying process and is almost independent from the grindability of the material.

Unlike other grinding systems, COMFLEX® D offers at least 50% of its grinding capacity during maintenance of grinding tools.



- 1 Product
- 2 Feed
- 3 Gas inlet
- 4 Waste gas

COMFLEX® D

COMFLEX® Separator

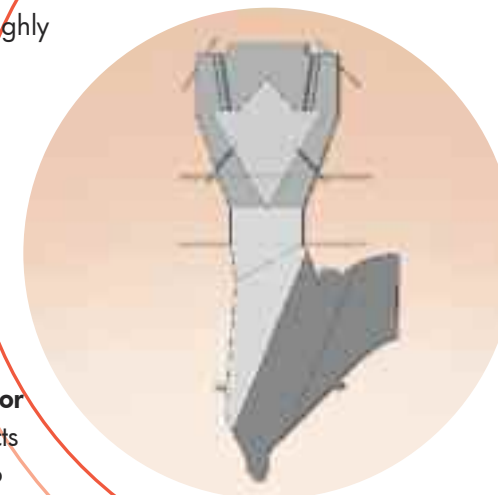
COMFLEX® consists of the robust designed **V-SEPARATOR** and the high-efficiency dynamic **SEPMASER LC**. **V-SEPARATOR** and **LC-Separator** are linked pneumatically to one unit – the **SEPMASER VLC**. The “**VLC**” minimizes the need for auxiliary equipment. Together with the upgraded Roller Press and various **COMFLEX®** arrangements the “**VLC**” offers everything to provide grinding from small to very large capacity.

The **V-SEPARATOR** location below Roller Press is ideal for grinding blast furnace slag. Leaving the Roller Press, ground slag becomes highly reactive. To avoid build-up in the vertical conveying system, ground slag is dried in the **V-SEPARATOR**, right after leaving the rollers. Only process air for separating and drying is used for vertically conveying of material. With the **V-SEPARATOR** located below and the **LC-Separator** above the Roller Press, **LC**-rejects are conveyed pneumatically to the Roller Press, reducing bucket elevator size, loading with fine material and eliminating dust handling problems. The same concept is used for grinding cement and raw materials, taking advantage of the slag arrangement. One standard arrangement is used throughout the cement plant.

Largest **VLC-Separators** reach air volumes of 600 m³/s to separate large product quantities and to dry raw materials with high feed moisture. With the compact **COMFLEX®** system, each Roller Press works with

its own **V-SEPARATOR**, which is linked to a dedicated **SEPMASER LC** offering quality control of one product only.

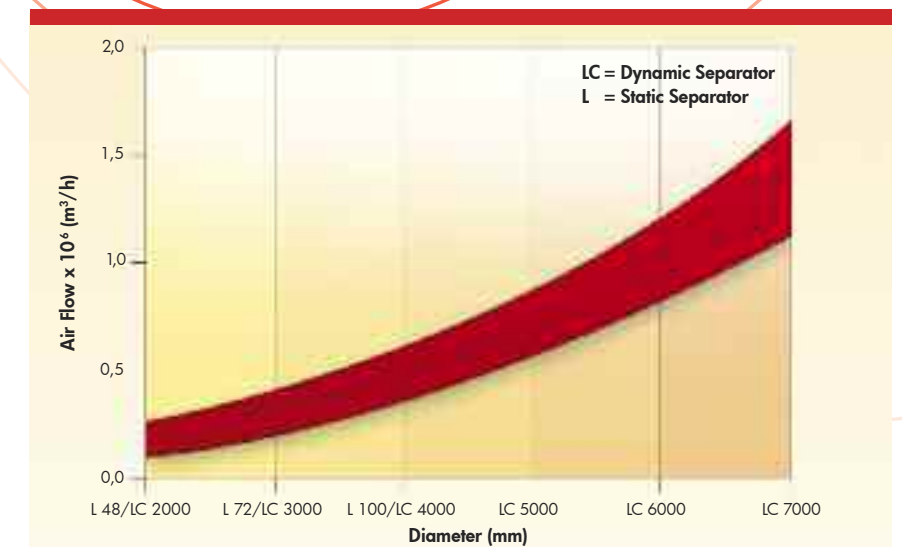
The conical rotor design of the **LC-Separator** and optimized cyclone arrangement offers a low pressure drop for the system fan. Together with reduced air flow, system fans for **COMFLEX®** require up to 50% less energy compared with competing grinding systems. For raw mills with low to medium capacity, the static **L-Separator** instead of the **SEPMASER LC** is an excellent choice.



SEPMASER® VLC-D

When designed with a fully static **VL-Separator (V-SEPARATOR plus L-Separator)**, **COMFLEX®** offers the lowest fan pressure drop and energy consumption that can be reached for mill systems in present market. Further reduction of moving parts and electrical consumers provide low maintenance and even higher availability.

Separator size range





Roller Press – view from drive end

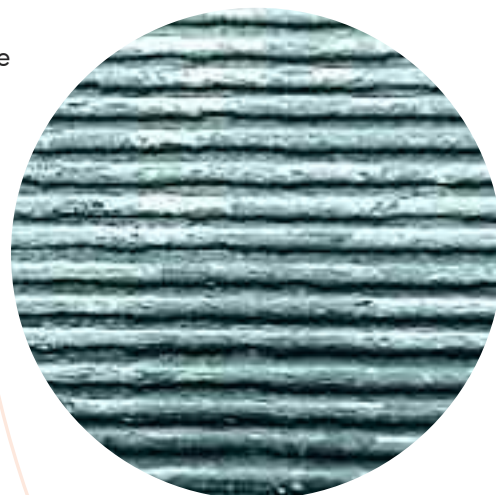
Roller Press Standard Sizes

Roller Press standard sizes

Mega-Newton	Diameter x width	Motor power
mn	(mm x mm)	(max kW)
7	1700 x 900	1600
10	1700 x 1100	2000
13	1700 x 1400	2600
16	1700 x 1800	4000

Roller Presses for **COMFLEX®** are available in four standard sizes, ranging from 7 to 16 mega-newton grinding force.

The roller diameter is standardized to 1.7 meters to allow common material feed size of up to 80 mm for raw material grinding. The roller width is related to the grinding force and ranges from 0.9 to 1.8 meters.



Roller Press Wear Protection

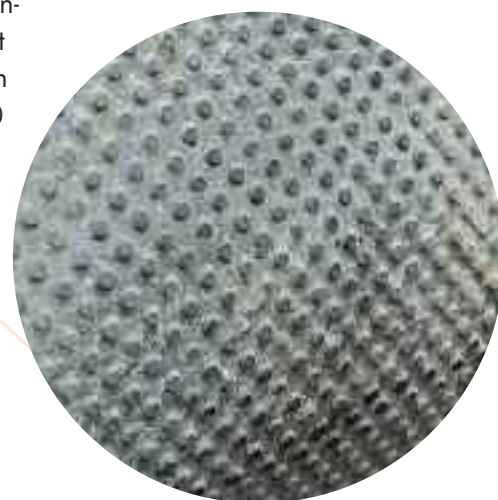
Lowest wear rates are achieved, if the ground material provides wear protection. This is reached by profiling the roller surface so it is partly covered with ground material during operation.

Besides low wear rates, this "autogenous wear protection" features excellent nipping properties, larger roller gap and low vibration – even when grinding products with high fineness.

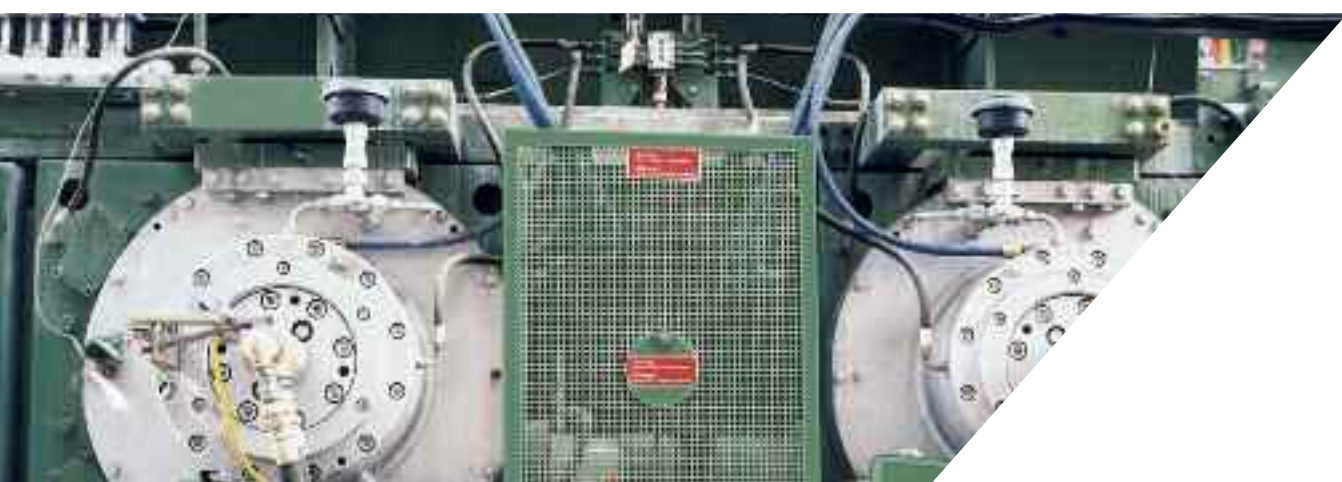
Two different concepts of wear protection are offered: the welded roller surface "CHF" (Complete Hard Facing) and KHD's patented STUD-Lining.

CHF-lined rollers are used for feed materials with normal wear characteristics. Roller surfaces can be renewed easy and quickly, either by rewelding only the profiles with the rollers in place, or by completely renewing the welded wear layer.

STUD-lined rollers offer maximum roller lifetimes with nearly no maintenance. Extremely wear resistant carbide cylinders are inserted in the roller surface. More than 70 % of the roller surface is covered with ground material, acting as autogenous wear protection. Even for extremely abrasive materials, such as blast furnace slag, STUD-Lining withstands much more than 20,000 hours of operation.



Roller Press – axial roller guide and bearing oil lubrication

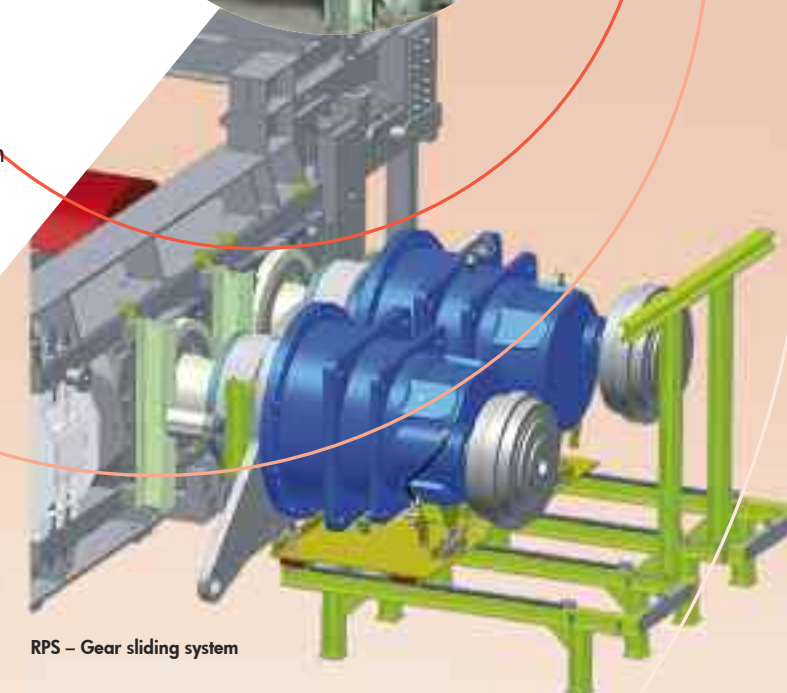
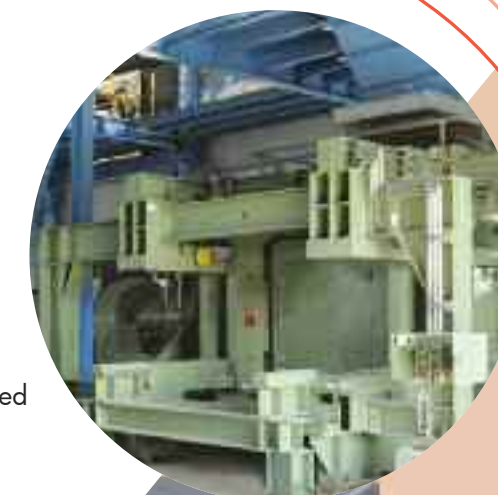


ROLLER PRESS RPS with Swing Frame

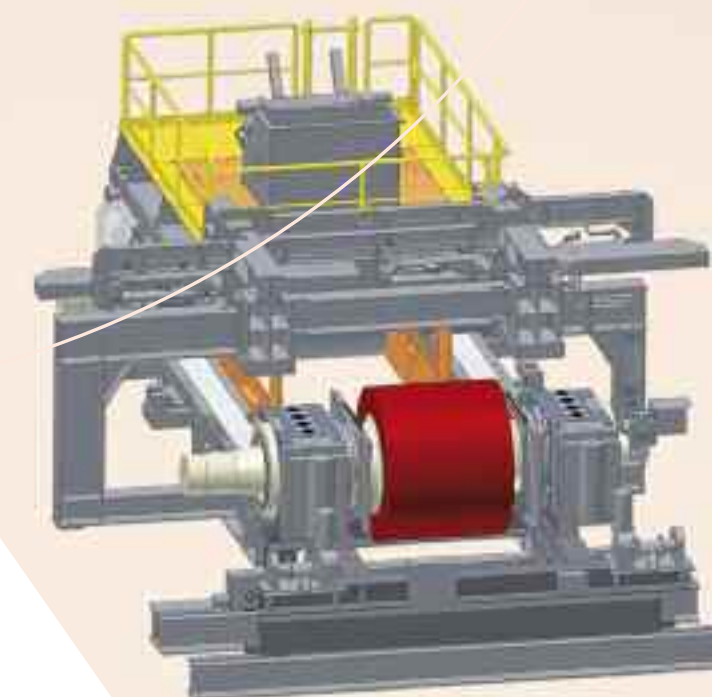
Good news for maintenance engineers: Roller replacement and maintaining welded rollers have become a time-saving and easy operation with the swing frame.

Both rollers can be dismantled to one side – no need for large overhead cranes. The Separator, Roller Press and feeding system are combined in a compact arrangement.

Optionally, with a special designed sliding system, gear boxes can be disassembled from the roller shaft, with precise vertical and horizontal alignment.



RPS – Gear sliding system



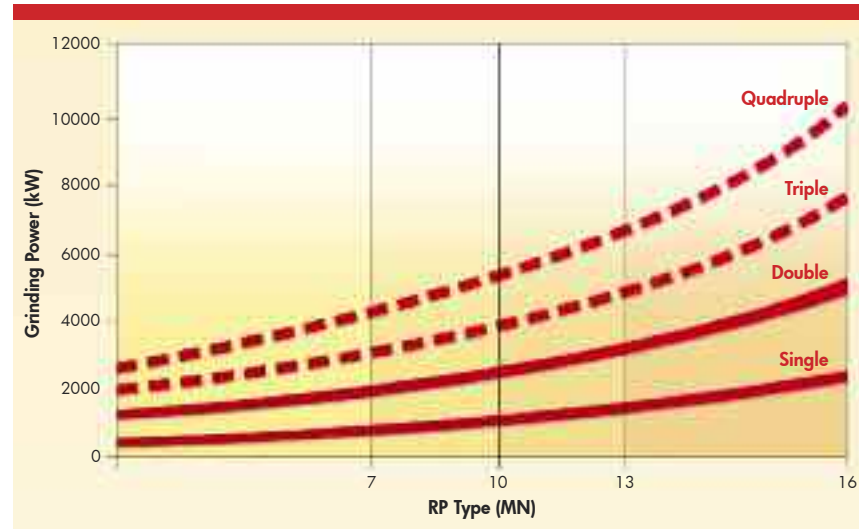
RPS – Swing frame

Outlook:

COMFLEX®

Our Future Way to Realize High Capacities

COMFLEX® stands for a "COMminution system, FLEXible in application, built in single or multiple modular set-up, with most identical equipments".



COMFLEX® – range of grinding power

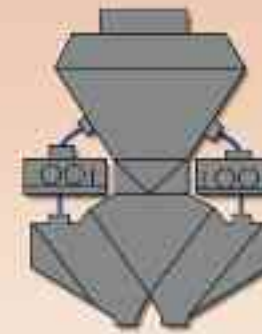
To reduce initial investment, cut operating cost and improve quality control, users generally prefer to produce products in one grinding unit. In the future **COMFLEX®** will essentially eliminate limits in production capacity by setting up multiple grinding modules leading into one product separation system. We are working on special arrangements and Separator designs to serve very large kilns of up to 15,000 tons of clinker per day.

COMFLEX® in single arrangement (**COMFLEX® S**) can grind up to 400t/h raw meal or 160t/h cement. Since the grinding energy for larger capacities cannot be transferred with only two rollers, our future task is to have **COMFLEX®** with multiple modules, in different arrangements, giving double, triple or even quadruple the capacities. Very large **SEPMASER LC**'s are designed for 600 m³/s to separate up to 1500t/h raw meal.

SEPMASER® VLC for COMFLEX® Q

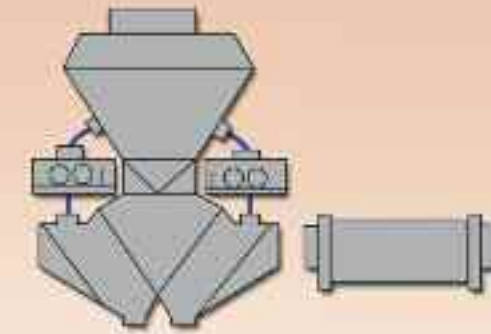


COMFLEX®
DR-16/4250



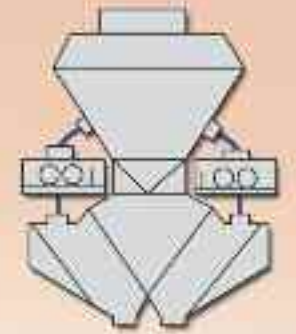
510t/h
RAW MEAL

COMFLEX®
DC-16/3750 / BM 38



350t/h
OPC

COMFLEX®
DC-16/3750



170t/h
4500 Blaine Slag

COMFLEX®

Grinding Package for Cement Plants

COMFLEX® consists of small modules that cover the whole range of grinding capacity in a cement plant. Even for very large grinding units, the key parts such as rollers, gear boxes, fans and motors are of common size.

With a complete **COMFLEX®** grinding package in a cement plant for raw material, cement and

even blast furnace slag, identical Roller Presses can be selected, reducing the necessary number of spare parts and replacement cost.

Raw- and cement mills basically follow the same arrangement, taking advantage of identical auxiliary equipment and savings in civil engineering and construction.