

**FULLER**<sup>®</sup>



# ATOX<sup>®</sup> COAL MILL

# SMALL SIZE, BIG ENERGY SAVINGS

## KEY BENEFITS

**Handles all types and capacities of coal**

**Reliable, long-lasting operation**

**Simple, flexible operation**

**Superior separation efficiency**

**Low specific energy consumption**

**Low installation costs**

**Easy maintenance**

### Proven technology

Today the air-swept vertical roller mill is the standard solution for coal grinding installations. And thanks to our continuous refinement of the ATOX coal mill over the years, today's leading air-swept vertical roller mill is the compact ATOX. Offering high reliability, low installation costs and a wide range of sizes, the ATOX grinds and dries all types of coal – while providing excellent economy in terms of specific energy consumption.

### Versatile system

The ATOX coal mill is suited for various installation types, whether inert or non-inert, and direct or indirect firing systems. An inert system designed for indirect firing is the most common solution for cement plants.

Equipped with the high-efficiency RAKM dynamic separator, the ATOX coal mill will grind any type of coal to the required fineness at the highest efficiency. When provided with a variable speed mill motor, the ATOX will also grind petcoke and anthracite down to a fineness below 5% +90 µm. Furthermore, it is designed to stand up to rugged outdoor conditions.

### Built-in economy

The separator and nozzle ring are sized independently of the mill itself, which makes it possible to select them according to the amount of gas needed for drying and conveying and separating the material – ensuring you invest only in equipment that matches your specific situation, and you don't pay for more than you need. The ATOX mill will grind and dry coal containing more than 20% moisture in one operation.

The possibility of customer-supplied parts, along with the low civil costs that accompany compact mill installation, add to the excellent economy of the ATOX coal mill.

### Working principles

The raw coal enters the mill via a rotary sluice and feed chute and is discharged onto the rotating grinding table. The rotation of the table accelerates the flow of material towards the grinding track, where the coal is ground between the table and the three rollers. The coal then continues over the dam ring and is entrained in the hot drying gas that enters the mill house through the nozzle ring.

The gas lifts the coarser particles back onto the grinding table and sweeps the finer particles up to the separator. The separator lets the final product proceed to the mill outlet while returning the coarse fraction to the table for further grinding.

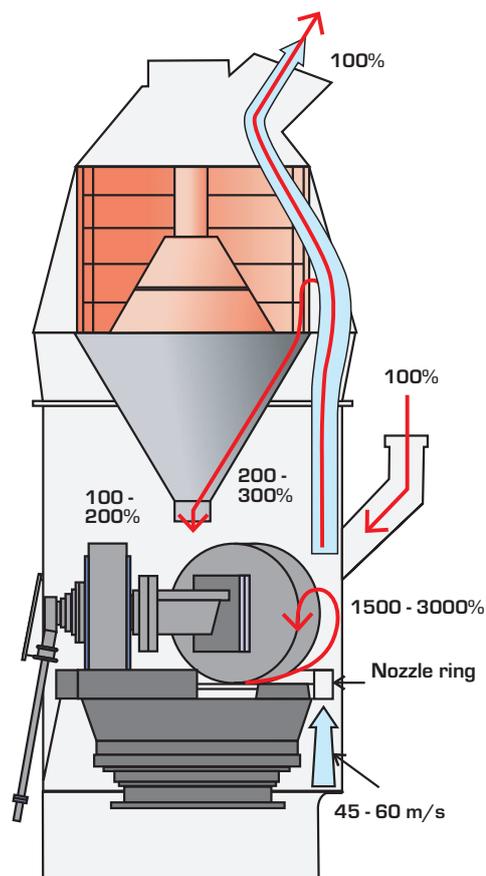
Having left the mill at the top, the final product continues with the gas to the filter or cyclone, where it is collected.

### Tailor-made layout

The layout of your coal grinding system must take into account the available heat sources for drying the raw coal as well as the fire and explosion hazards of coal and coal dust. The entire grinding plant must therefore be shock-resistant and equipped with a number of explosion relief valves.

From the raw coal silo, the feed is extracted and conveyed in enclosed equipment. Both the mill and separator as well as the feeding equipment are shock resistant up to 3.5 bar.

### Material circulation inside the mill.



The coal grinding installation fulfils the requirements according to the ATEX directive. The requirements are based on the zone classification specified for the individual plants.

**NON-INERT OPERATION**

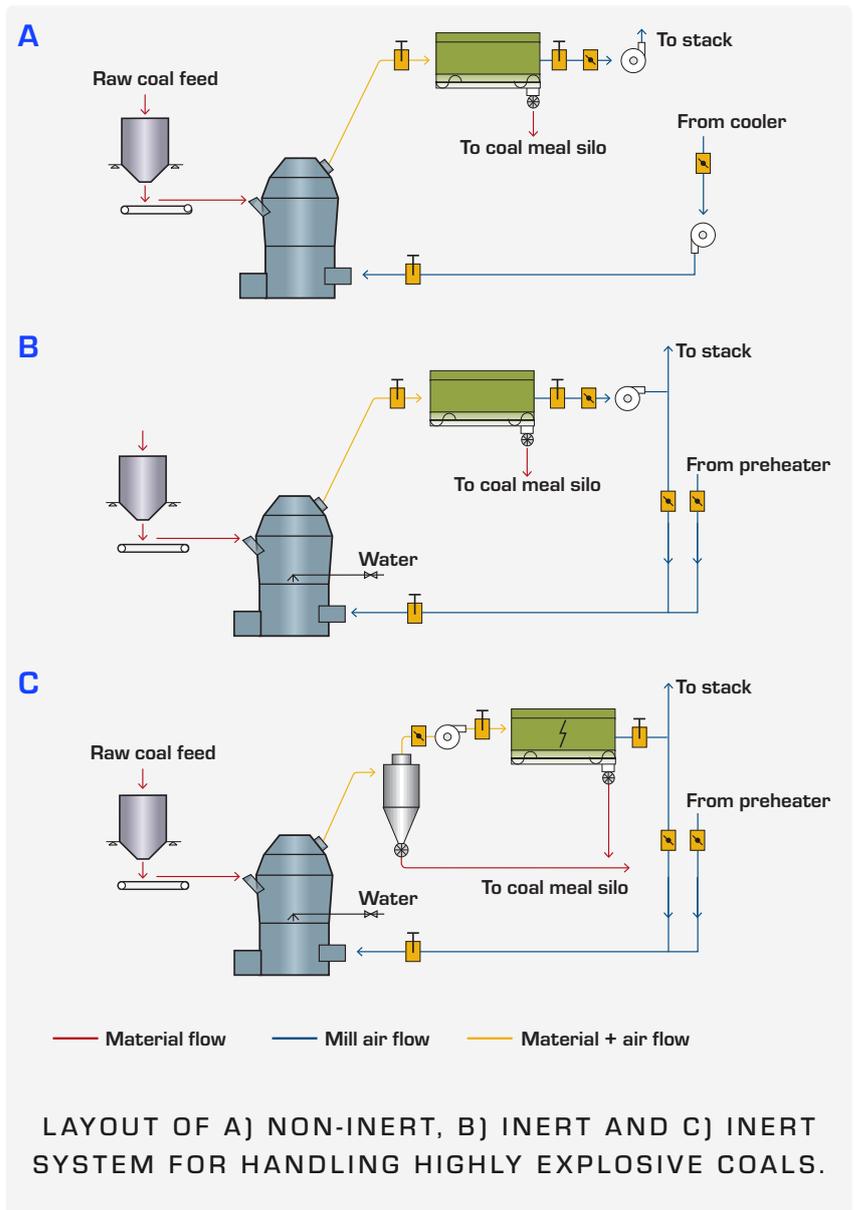
When grinding low-explosive to moderately explosive coal types, the system may operate under non-inert conditions. Non-inert operation allows using excess air from the clinker cooler or from the heat generator for drying and conveying. Neither recirculation of air nor water injection for the purpose of inertisation in the mill is required. This is because atmospheric air can be used to any extent to maintain the necessary flow for drying, transportation and separation without risk of explosion.

**INERT OPERATION**

A common safety precaution is to operate the coal grinding system under inert conditions. This can be achieved at a cement plant by using exit gases from the kiln preheater to dry and convey the material through the mill. A variable amount of cleaned gas can be recycled from the grinding system filter to maintain the required flow for separation and conveying through the mill, independent of the amount of hot gas needed for drying.

The ATOX coal mill has a water injection system to compensate for low water content in the raw coal, which allows increasing the amount of hot gas instead of recirculating gas at a level that would invalidate the inert condition of the grinding system. For most types of coal, the grinding system is arranged so that finish ground coal meal is collected in a bag filter or a cyclone followed by an electrostatic precipitator, before the cleaned air enters the mill fan.

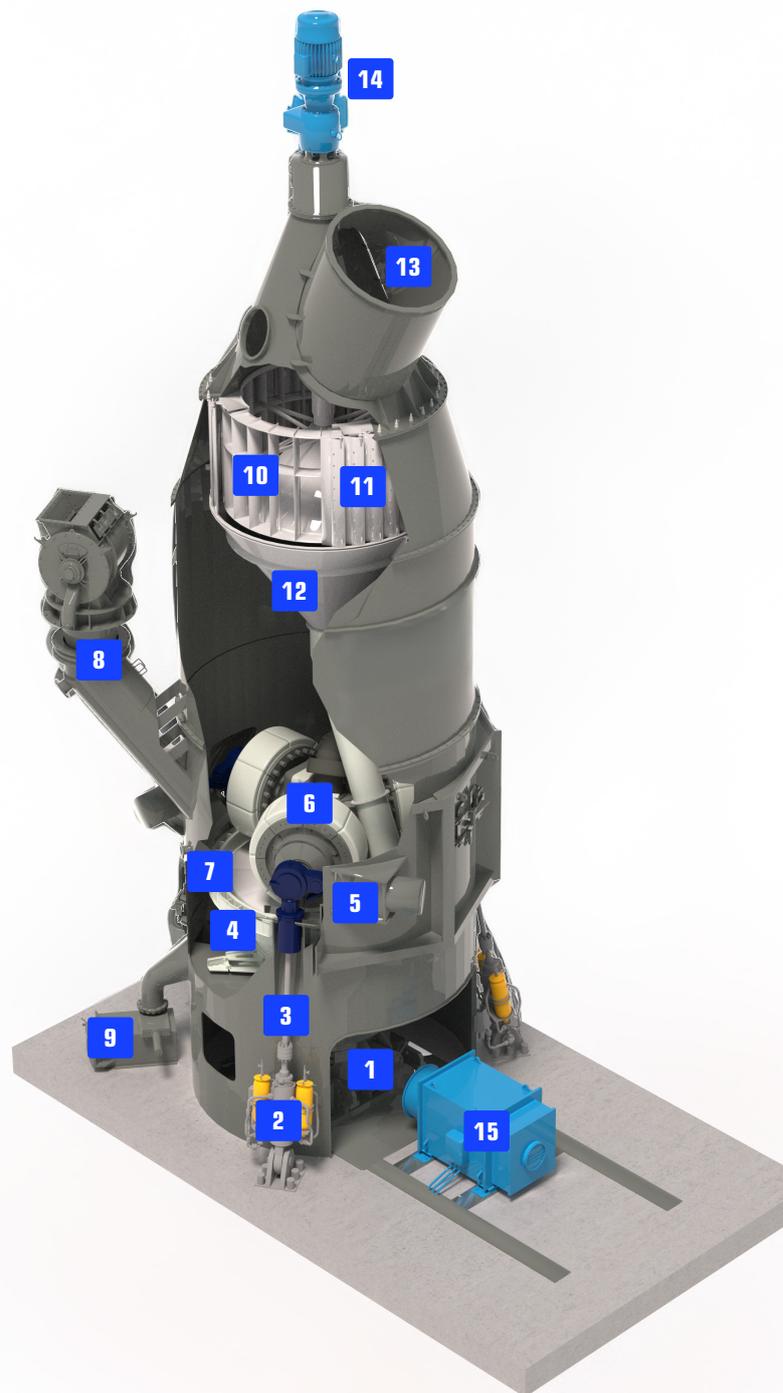
For more explosive types of coal such as lignite, the filter may be installed on the pressure side of the fan. This eliminates ingress of false air into the filter and keeps the level of oxygen in the filter and the recirculated gas at a minimum.



# LONG LIFE, SIMPLE OPERATION BUILT INTO MILL DESIGN

FULLER ATOX COAL MILL

- 1** MAIN GEAR UNIT
- 2** HYDRAULIC CYLINDER, INCL. ACCUMULATORS
- 3** TENSION ROD
- 4** GRINDING TABLE WITH SCRAPES
- 5** TORQUE ROD CONNECTION
- 6** GRINDING ROLLER ASSEMBLY
- 7** WATER INJECTION
- 8** HEATED ROTARY SLUICE AND FEED CHUTE
- 9** REJECT BIN
- 10** CAGE ROTOR
- 11** LOUVRES WITH WEAR PLATES
- 12** REJECT CONE WITH RETURN PIPE
- 13** SEPARATOR OUTLET
- 14** VARIABLE SPEED DRIVE
- 15** VARIABLE OR FIXED SPEED DRIVE



### **Wear-resistant grinding segments**

Both the grinding table and rollers are fitted with segmented wear parts. Segmentation allows the use of very hard and wear-resistant material without running the risk of thermal cracks occurring in the wear segments. The cylindrical shape of the rollers makes it possible to reverse the segments, enabling a high degree of material utilisation even in the case of uneven wear. Using wear-resistant, high-chromium white cast iron, high-chromium white cast iron with ceramic inserts or hardfacing ensures long life of the grinding segments.

### **Resists fatigue**

Hydraulic cylinders anchored in the foundation block generate the grinding force for the individual rollers. The hydraulic force is transferred to the ends of the roller shafts via tension rods. The joints of these rods are designed as pre-stressed bolted flanges which offer high resistance against fatigue failure.

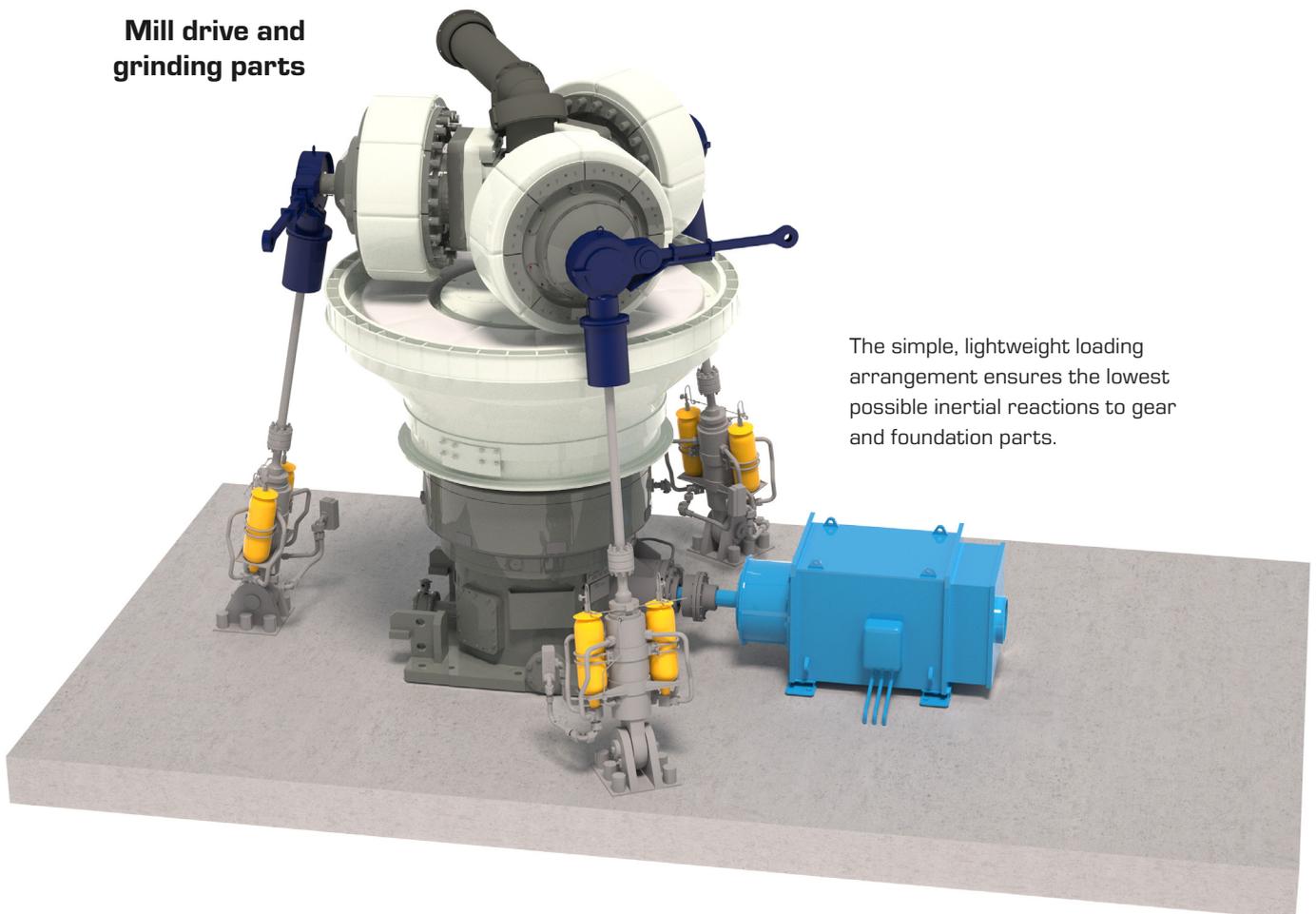
The roller assembly is kept concentric with the table by means of horizontal torque rods connecting each roller shaft end to buffer houses in the mill casing.

Before starting the mill motor, the rollers are lifted off the grinding track. When the mill fan has been running for a short while, mill feed is started and the rollers are lowered onto the grinding bed.

### **Effective lubrication**

An oil circulation system effectively lubricates the bearings of the grinding rollers. Each roller is fed individually with conditioned oil from a common supply station in which a separate circulation system provides filtration and temperature conditioning.

### **Mill drive and grinding parts**



The simple, lightweight loading arrangement ensures the lowest possible inertial reactions to gear and foundation parts.

# HIGH PERFORMANCE, LOW WEAR

## Robust RAKM rotary air separator

The rotary air separator is flanged to the top of the mill housing. The rotor shaft is driven by a variable-speed AC motor via a gear unit. The rotor runs inside a ring of guide vanes. The material entrained in the air from the mill enters the rotor through the guide vanes. The rotor rejects the coarse particles to be collected by the guide vanes and returned via the reject cone to the grinding table for further grinding, while the air and the finished material leave the separator via the outlet duct. The fineness of the ground product can be adjusted by varying the speed of the rotor.

To ensure long life, the separator is heavily wear protected. The inside of the reject cone and outlet top section are all lined with Densit, while the wear plates for the louvers are in hardfaced plate.

SEPARATOR



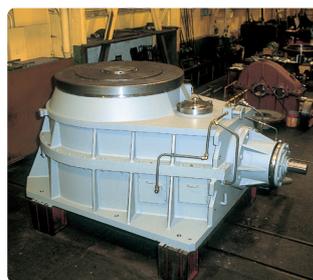
## High-performance gear unit

The standard main gear unit for an ATOX mill is the sturdy bevel-helical or more compact bevel-planetary type gear. The gears are designed for high dynamic loads with a generous service factor. The axial thrust bearing supporting the grinding table and the grinding force is of a segmented design in which all thrust pads are immersed in an oil bath. The lubricant for the thrust pads and for the internal gearings/bearings is conditioned and filtered in a separate pump station.

## Easy changing of wear segments

In the case of larger mills, changing of roller and table segments is easily carried out inside the mill, which has a small hoist for that purpose.

Changing of roller wear segments for smaller mills can alternatively take place outside the mill. For the ATOX 30 and smaller, the whole roller assembly can be pulled out on a special trolley and serviced on the platform in front of the mill.



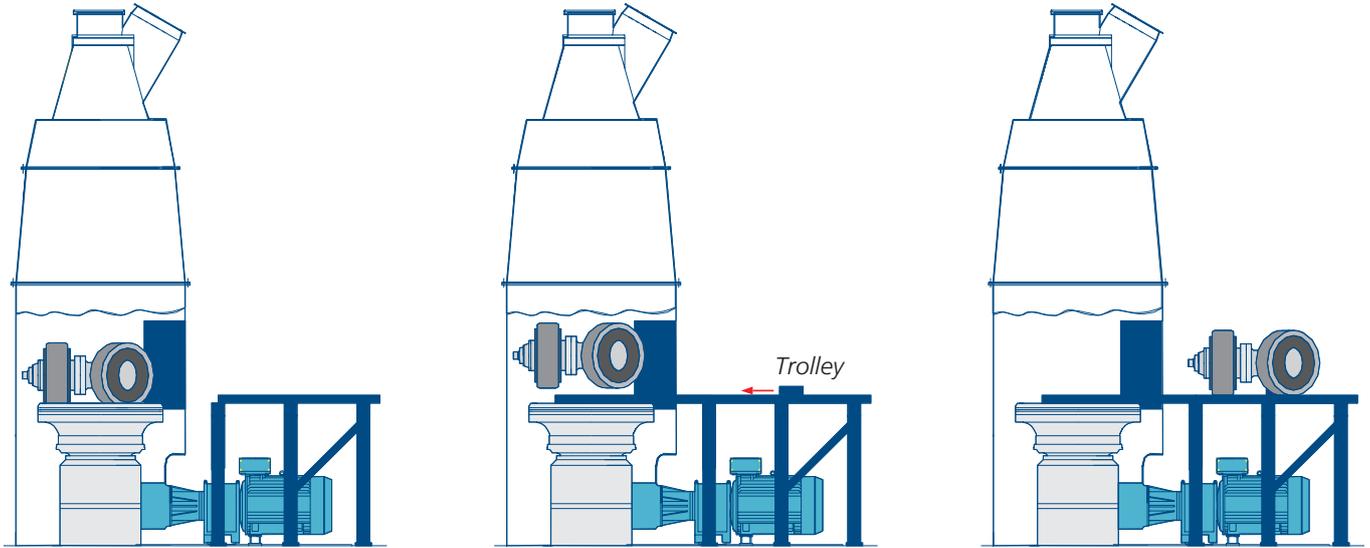
Bevel-helical gear type.



Easy changing of the wear segments in larger mills.



Bevel-planetary gear type.



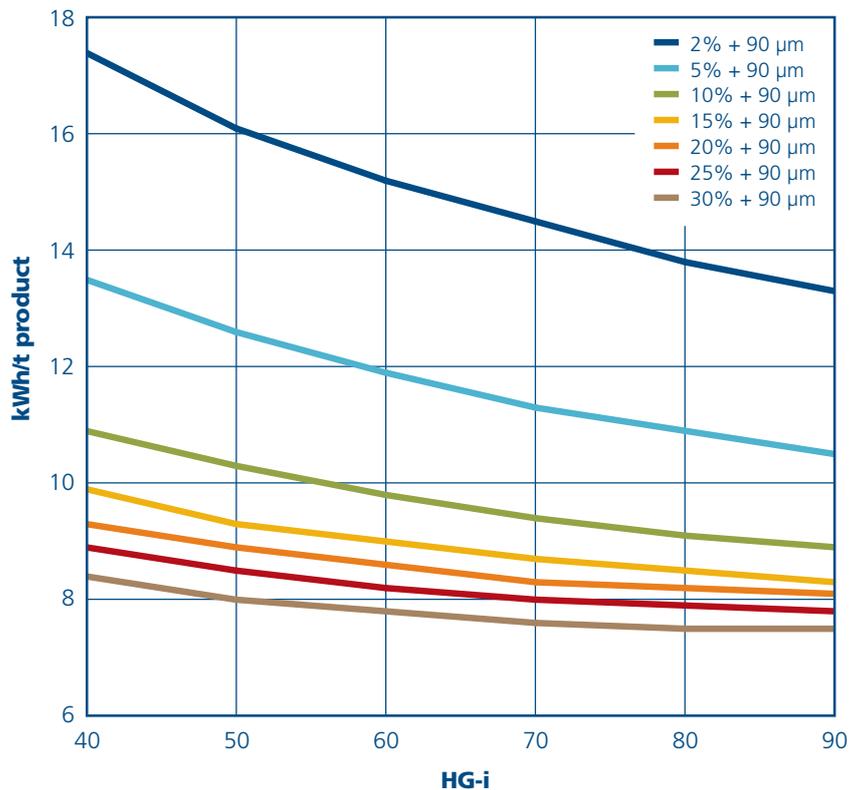
Easy removal of roller assembly in smaller mills before changing segments.

### Sizing the ATOX mill

The specific energy consumption depends on the grindability of the raw coal and the coal meal fineness required.

The grindability is usually specified according to the Hardgrove Grindability Index (HGI). The specific energy consumption of an ATOX coal mill based on the Hardgrove index is shown in the grindability diagram.

The specific energy consumption stated in the grindability diagram is based on the capacity, including residual moisture in the coal meal. This is an important consideration for coal types such as lignite that are often produced with 8-12% residual moisture.

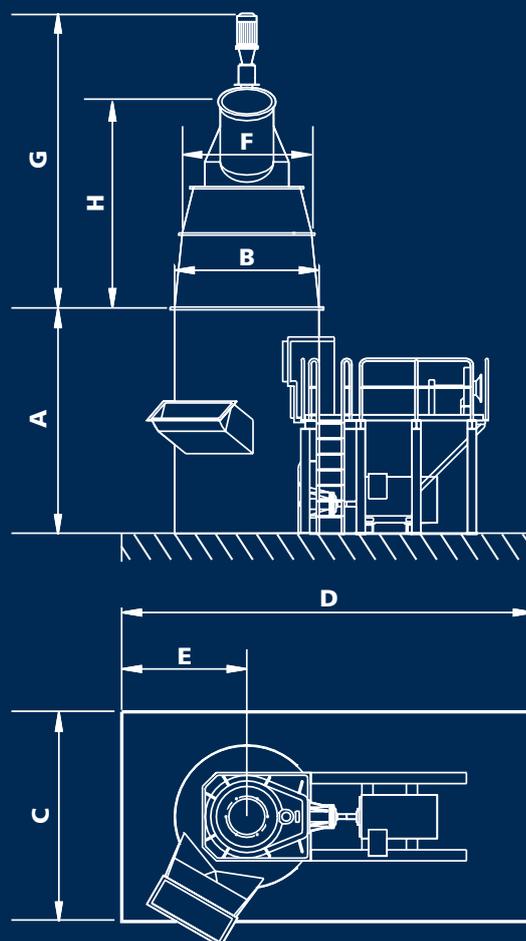


**MILL DIMENSIONS AND CHARACTERISTICS**

Size	A mm	B mm	C mm	D mm	E mm	Installed power, KW	Table speed r/min
12.5	2800	1900	2800	5500	1600	109	50.1
13.5	3265	2100	3100	6100	1800	132	48.2
15.5	3610	2400	3450	6800	2000	177	45.0
17.5	4095	2600	3800	7400	2250	239	42.3
20.0	4450	2900	5000	7500	2500	334	39.6
22.5	4950	3250	5600	8600	3000	449	37.3
25.0	5335	3550	6000	9200	3000	584	35.4
27.5	5600	3900	6000	10000	3500	741	33.8
30.0	7500	4360	6600	10500	3500	921	32.3
32.5	8420	4694	7600	11300	3800	1123	31.1

**SEPARATOR DIMENSIONS AND CHARACTERISTICS**

Size	F mm	G mm	H mm	Max. speed r/min	Installed power, kW
12.5	1850	4820	3050	436	10
13.5	1970	5140	3310	406	12
15.5	2200	6030	3880	356	16
17.5	2450	6410	4160	136	22
20.0	2920	7240	4550	250	31
22.5	3260	8110	5170	223	41
25.0	3600	8940	5750	201	54
27.5	3950	9610	6320	183	69
30.0	4510	10210	6960	160	95
32.5	4900	11090	7570	147	116
35.0	5200	12000	8390	141	140
37.5	5580	13230	9120	132	166



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## TECHNOLOGIES

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