

Scope of Supply

In response to your recent inquiry, we are pleased to offer our proposal for the following FLSmidth Kubria® series Cone Crushers:

- **Cone Crusher:**
 - **Qty (1) Kubria® FM 130**
 - **Qty (2) Kubria® G 130**
 - **Qty (1) Kubria® FM 90**
 - **Qty (1) Kubria® G 90**

Scope of Supply

ITEM	DESCRIPTION	QTY
C-1, C-2, C-3, C-4	Cone Crusher - FLSmidth Kubria®	5
	Each Cone Crusher including:	
	Hydraulic/ Lubrication system	5
	Dust Seal Blower	5
	Special Tools	5
	Oil-to-Air Heat Exchangers (Coolers)	5
	Electronic Control System KUBRIAMATIC®	5
	Drive system	5
	Mounting frame	5

Battery limits

- Underside of Crusher base plates
- Inlet and outlet of Crusher
- Underside of packaged lubrication & HPU system mounting base
- Lubrication connections on crusher, lubrication, HPU and Cooler packages
- Motor and instrument terminal connections
- Terminal connections of crusher control system

Detailed Basis of Design

Site Location and Climatic Condition

DESCRIPTION	DETAILS
Site Location	Germany
Altitude, mASL	< 1,000 m a.s.l. (assumed)
Temperature, °C (Min / Max)	-20°C to +35°C (assumed)

Design Data

DESCRIPTION	DETAILS	
Material Type	Unknown	
Material feed Description	Free flowing (assumed)	
Ore specific gravity (minimum)	2.5 t/m ³ (assumed)	
Ore Bulk Density (minimum)	1.6 t/m ³ (assumed)	
Moisture content	< 5% (assumed)	
Clay Content (maximum):	Nil (assumed)	
Feed Material Screened (Yes / No)	Yes (assumed)	
Bond Crushing Work Index (CWi)	10 kWh/t (assumed)	
Compressive Strength	120 MPa (assumed)	
Feed Size F100*	Kubria FM 130-18	140 mm
	Kubria G 130-50	400 mm
	Kubria FM 90-08	60 mm
	Kubria G 90-33	264 mm

Electrical and Instrumentation

DESCRIPTION	DETAILS
Standards	IEC
HT Voltage	N/A
LT Voltage	400 V (assumed)
Frequency	50 Hz (assumed)
Control Voltage	24 V DC
Analog Signals	Analogue: 4-20 mA; Digital: 24 V DC

Sizing basis:

Seller reserves the the right to adjust the sizing after material samples are made accessible and tested acc. to Sellers standard procedure.

Please note, that the Kubria® cone crusher are designed to be operated under choke feed condition.

Technical Description

Equipment Description

Cone Crusher - FLSmith Kubria®

Main Frame Shells (Upper Shell with Spider, Bottom Shell)

The crusher shells are of multi-section design consisting of the upper shell with the spider and the bottom shell.

The heat-treated, cast steel constructions are strengthened by circumferential ribs located between the top and bottom flange of each section and additionally reinforced by vertical stiffeners providing the rigidity needed in a primary crushing application. The flanges are of tapered and fully machined design ensuring rigid assembly and solid fit of the crusher shells.

The upper shell incorporates the heavy-duty spider made of cast steel which consists of two (2) heavy-duty spider arms, which are cast integrally with the central hub. A replaceable spider arm liner made of high wear-resistant cast manganese steel protects each arm.

The central hub of the spider is machined to match the replaceable spider bush with hourglass shaped central bore. The spider cap made of cast steel covers the central hub and prevents contaminants from entering the upper main shaft bearing, reducing maintenance down-times and providing extended life.

The bottom shell with its three discharge spider arms is machined at the inner hub, at the bearing surface for the hydraulic cylinder and at the counter shaft bore.

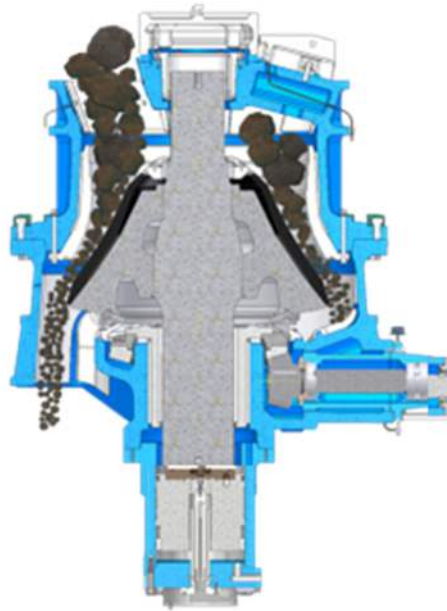
Inspection holes in the bottom shell allow visual inspection of the dust seal. Replaceable wear plates made of high wear resistant steel are attached to those areas of the bottom shell, which are exposed to wear. Permanent lifting lugs are cast on each individual shell.

Shell Fasteners

Heavy Hexagon Head type Bolts are used for fastening of the individual shell sections.

Main Shaft Assembly

The main shaft is of fully machined design and made of heat-treated alloy steel forged in one piece. The shaft is manufactured with a thread at the top end of the core suitable for the ring nut, which secures the crushing mantle to the main shaft. A replaceable alloy steel sleeve is fitted to the top section to match the replaceable spider bush with hourglass shaped central bore. An eyebolt can be attached to the top section of the shaft allowing ease connection to a crane hook to lift the shaft for maintenance purposes.



Working Principle Cone Crusher

Crushing Mantle

The crushing cone is manufactured of manganese steel. The lower section of the cone is machined with tapered bore to mate with the main-shaft core and secured by means of a shrink fit. Epoxy grout is used for grouting the crushing mantle and the entire assembly is secured to the main-shaft by a ring nut. A burnout ring installed below the head nut ensures easy removal of the nut.

Crushing Ring

The crushing ring is manufactured of manganese steel. An adapter supports the ring and epoxy grout is used for grouting the ring.

The crushing chamber can be converted into another feed opening and geometry simply by changing the crushing ring and the appropriate adapters.

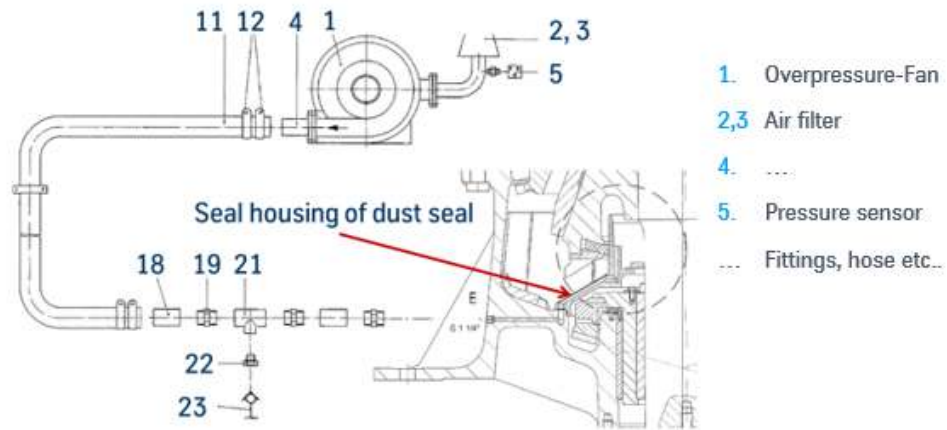
A costly replacement of the top shell is not necessary.

Dust Seal Assembly

The lower part of the main-shaft is fitted with a dust seal. A floating dust seal, contained in a multi-part dust housing is fastened to the main shaft core and an external air blower delivers constant air supply to the dust seal chamber. This provides a positive internal pressure in the chamber to keep dust out of the eccentric and drive, increasing the crusher bearing life.

Kubria® Cone Crusher - Dust Sealing System

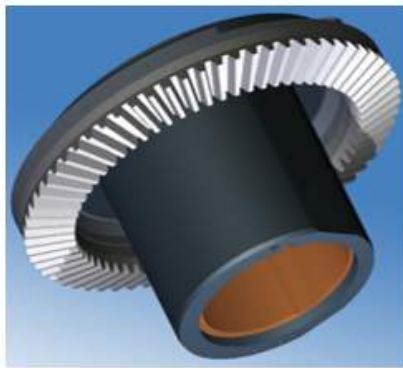
- Lubrication area protected against dust by seal ring mounted on the main shaft
 - Especially during start-up and shut-down, the oil is protected against pollution
- Overpressure is generated in the chamber between the seal ring and the seal housing



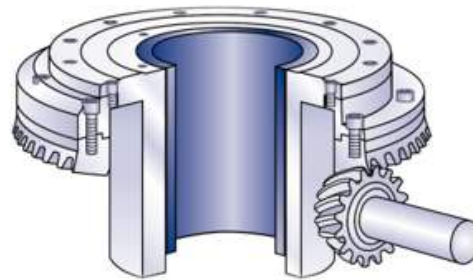
Eccentric Bushing Assembly

The eccentric bushing manufactured from cast steel with the replaceable inner bush (eccentric insert), which determines the crusher throw, is rotating in the outer bush, which is mounted into the machined hub of the bottom shell. The inner bush has four positions and is able to change the crusher throw by turning the bush to the following position. Both the outer bush and the inner bush are replaceable, machined, high lead bronze components. The bevel gear wheel is press fitted onto the eccentric bushing and secured by a key. The entire assembly is rotating onto a replaceable bronze wear ring and is lubricated from the external oil lubrication system.

Kubria® Cone Crusher - Eccentric Bushing



- Generates tumbling motion of the main shaft
- Bevel gear shrunk on eccentric bushing
- Combined lubrication of eccentric assembly and bevel gear
- Cycloidal gears for high power transmission



Kubria® Cone Crusher - Eccentric Bushing - Inner eccentric bushing

Adjustable stroke by turning inner eccentric bushing

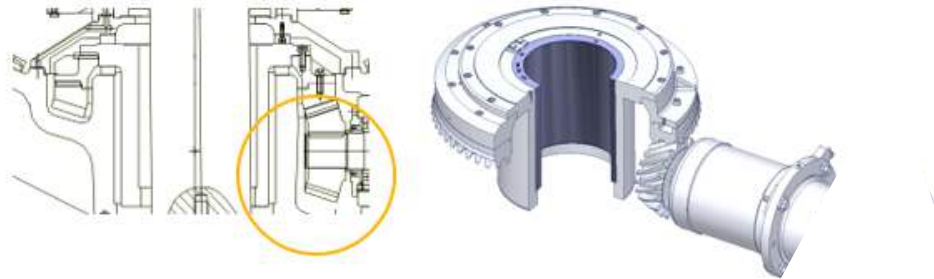


Bevel Gear

The bevel gear, a spiral toothed gear is manufactured from steel forgings with hardened gear teeth.

Kubria® Cone Crusher - Pinion Shaft and Drive Assembly - Bevel gear

Proven cyclo palloid spiral bevel gear



Pinion Shaft

The pinion shaft is mounted in self-aligning roller bearings, installed in a fully enclosed cartridge with oil splash lubrication. The pinion is fitted onto the shaft with a key and secured by bolted type end plate. The cartridge is installed with an oil level gauge.

Drive System with guard

The motor and crusher are mounted on a common base frame, the drive of the drive is executed by a V-Belt drive arrangement. The motor is mounted on tensioning rails to allow for belt tensioning during.

Hydraulic Cylinder

The hydraulic cylinder is precision machined and design for remote controlled shaft adjustment. Replaceable piston rings are fitted onto the piston.

The main-shaft is supported on a three-piece type step bearing. A bronze disc is fitted to the top of the piston. A convex type disc is bolted to the lower end of the main-shaft. The discs are precision machined to ensure matching contact areas. A high-pressure-pump forces lubrication oil between the discs providing a constant lubricant film to prevent contact between the discs even under extreme loads.

Lubrication/ Hydraulic System

The lubrication and hydraulic systems are of modular, skid-mounted, self-contained design and will be mounted onto a commonly fabricated base frame.

- The lubrication oil reserve has a capacity of approximately 1,000 l.
- The hydro-set oil reservoir has a capacity of approximately 120 l.
- Both reservoirs are fitted with inspection and maintenance covers.

The oil-air coolers are installed separately from the lubrication system and designed with independent oil flow circuit. The coolers are fitted with thermostatic control.

All internal piping integral to the lubrication/ hydraulic power unit is included, terminal limits are the piping ports on the units.

All electrical items and field instruments integral to the lubrication/ hydraulic power unit are wired back to a junction box located on the side panel of the units.

Note: Components of the lubrication/ hydraulic power unit such as heat exchanger are of standard aluminum design but treated with special coating.

For the lubrication/ hydraulic power unit the simulation under operating conditions is not practicable and therefore excluded. The unit will be fully assembled and all motors and instrumentation will be workshop-tested as it is common practice for this type of equipment.

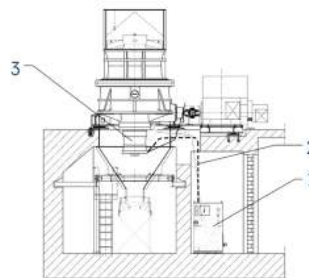
The initial oil charge for the lubrication/ hydraulic system is excluded from the scope of supply.

Oil lubrication and hydraulic system



- Combined oil lubrication-, hydraulic and hydrostatic (optional) unit
- Low space requirement and easy assembly
- Cooling is done in the lubrication circuit (no separate cooling circuit required)

- ① Hydraulic unit
- ② Connection tube
- ③ Hydraulic cylinder with position measuring system



Lubrication System:

The oil lubrication system comprises two circuits. One circuit, inserted via the center of the hydraulic cylinder, will flood the thrust bearing. The other circuit supplies oil to the bearing. Oil from the system will flow over the bevel gear to the common return line.

The lubrication system consists mainly of the following:

- Oil reservoir with drain valves and immersion heaters
- 1 off gear pumps with one common motor (duty only) for the lubrication circuit
- Oil supply system with valves, strainer, breathers.
- Instrumentation for control and monitoring of oil level, oil pressure, oil temperature, oil flow including internal wiring to the terminal boxes/ marshalling or junction boxes on the power unit.
- Internal piping to the piping ports on the power unit, flexible pipe mountings are provided on all suction, pressure and drain lines.

Hydraulic System/ Hydraulic Gap Setting:

Adjustment of the crusher gap is done by lifting and lowering the main shaft, which is controlled by the hydraulic gap setting system.

A pump unit supplies oil at controlled pressure and flow to the hydraulic cylinder. The crusher control system monitors excessive loads caused by tramp metal and choking and the main shaft is quickly lowered when foreign matter is fed to the crusher.

The hydraulic system consists mainly of the following:

- Oil reservoir with drain valves and immersion heater.
- 1 off gear pump with motor (duty only)
- Oil supply system with filter, valves, breathers etc.
- Instrumentation for control and monitoring of oil level, oil pressure, oil temperature, oil flow including internal wiring to the terminal boxes/ marshalling or junction boxes on the power unit.
- Internal piping to the piping ports on the power unit, flexible pipe mountings are provided on all suction, pressure and drain lines.

Cooling System:

The cooling system consists mainly of the following:

- Oil supply system with valves, filter etc.
- Instrumentation for control and monitoring of oil level, oil pressure, oil temperature, oil flow including internal wiring to the terminal boxes/ marshalling or junction boxes on the power unit.
- Internal piping to the piping ports on the power unit, flexible pipe mountings are provided on all suction, pressure and drain lines.
- 1 off air blast heat exchangers of aluminum alloy design with fans (1 duty and 1 standby))

Mantle Position Monitoring

The mantle vertical position is monitored by sensor mounted into the hydraulic cylinder. The unit provides a 4 – 20 mA output signal that gives direct indication of the main-shaft position, allowing interface with the KUBRIAMATIC control system to maintain crusher gap setting.

Grease Lubrication System for the Upper Main Shaft Bearing

The upper main shaft bearing (spider bearing) is supplied with an Automatic central grease lubrication system mounted on skids.

The automatic grease lubrication system consists mainly of the following:

- The grease pump with electric motor and 15 l grease reservoir
- Pipes and hoses
- Level control

Set of Special Tools

In generally the maintenance work can be performed with tools commonly available in the workshop on site, however the following tools and devices required for the erection/ maintenance of the secondary cone crusher are included in the scope of supply:

- 1 ring spanner for ring nut of main shaft
- Threaded rods for lowering the hydraulic cylinder

Electronic Control System KUBRIAMATIC

The KUBRIAMATIC is a compact and reliable control and monitoring system especially designed for the Kubria® series Cone Crushers. The system provides all operating, adjustment and overload monitoring functions required for reliable, trouble-free operation of the gyratory crusher. The unit is designed with 12" touch-screen terminal and features control and interlocking of all motors related to the crusher and monitors all related measuring values from the crusher instrumentation.

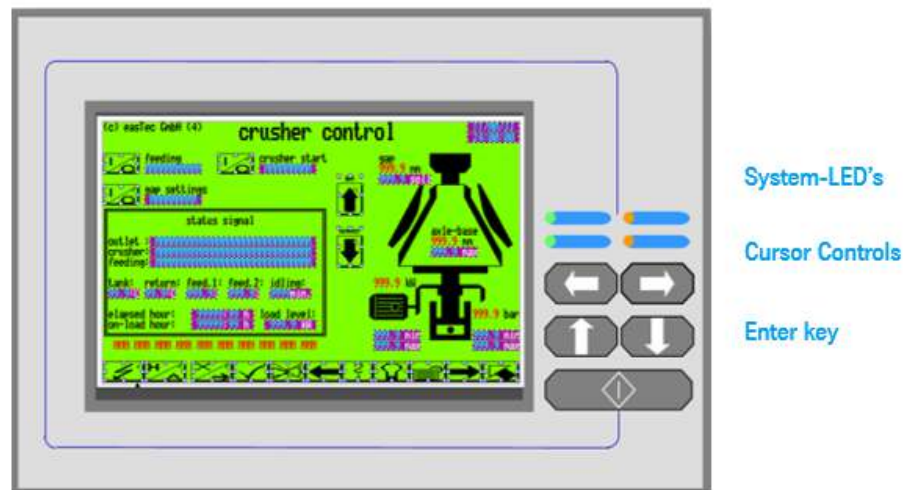
The features of the KUBRIAMATIC control system are:

- Control device: SIEMENS S7-1500
- Control and interlocking of all motors related to the crusher (signal converter for power measurement not included)
- Monitoring of pressure, temperature and oil flow of the lubrication/ hydraulic system.
- Monitoring of crusher speed, main shaft position, overload conditions
- Automatic operation with individual motor control
- Automatic gap setting by adjustable pressure and power limits.
- Zero gap measurement for fully automatic gap setting or adjustment and wear compensation preventing the gap, which ensures constant gap and product quality.

- The main shaft position is automatically constant and the crusher is automatically operated within the limits for power preventing the gap from dropping below a minimum value.
- Effective overload protection when adjustable power and pressure limits are exceeded. Large shaft lowering stroke in case of overload, rapid increase of gap allowing foreign matter to pass.
- Menu driven terminal, input of all operating data via touch-screen, visual display of the crusher status as picture and in plain text
- Input of main limit values password protected via PIN code, such as maximum power draw, maximum hydraulic pressure, limits for main shaft position, maximum temperatures etc.
- Comfortable warm-up system
- Permanent display of all critical operation parameters
- Registration of operating/ load hours and of load/ pressure peaks
- Fault indication archives for current and historic signals (ring buffer memory)
- Integrated long time data logging system to archive analogue and digital signals (LAI)
- Optional: Remote data transmission via modem (Teleservice) for remote servicing (GPS connection necessary or TCP/IP connection to be provided by client)
- Bus connection to central PLC via Industrial Ethernet, Profibus-DP (optional) or Modbus TCP (optional)

Kubria® Cone Crusher – Kubriamatic

Terminal



Typical control panel of the KUBRIAMATIC®

Mounting Frame

Base frame for the crusher and drive motor made of sectional steel in welded/ bolted design.

Main Drive Motor Data (not included in scope)

Kubria® FM / G 130:

Motor Type:	Squirrel Cage induction
Kilowatts:	250 kW rated Power
Voltage:	400 V
Degree of Protection:	IP 55
Mounting Type:	Horizontal Foot
Insulation:	Class F/B (max. temp. raise 80° C)
Temperature rise:	Class B
Cooling:	IC611: Fan Cooled with Built-in-Air Cooler
Service Factor:	1.0 P.U. at Class B rise
Bearing Type:	Anti-friction
Bearing Lubrication:	Grease
Starter:	VFD / Softstarter (by others)
Drive type:	V-Belt

Kubria® FM 90:

Motor Type:	Squirrel Cage induction
Kilowatts:	132 kW rated Power
Voltage:	400 V
Degree of Protection:	IP 55
Mounting Type:	Horizontal Foot
Insulation:	Class F/B (max. temp. raise 80° C)
Temperature rise:	Class B
Cooling:	IC611: Fan Cooled with Built-in-Air Cooler
Service Factor:	1.0 P.U. at Class B rise
Bearing Type:	Anti-friction
Bearing Lubrication:	Grease
Starter:	VFD / Softstarter (by others)
Drive type:	V-Belt

Kubria® G 90:

Motor Type:	Squirrel Cage induction
Kilowatts:	132 kW rated Power
Voltage:	400 V
Degree of Protection:	IP 55
Mounting Type:	Horizontal Foot
Insulation:	Class F/B (max. temp. raise 80° C)
Temperature rise:	Class B
Cooling:	IC611: Fan Cooled with Built-in-Air Cooler
Service Factor:	1.0 P.U. at Class B rise
Bearing Type:	Anti-friction
Bearing Lubrication:	Grease
Starter:	VFD / Softstarter (by others)
Drive type:	V-Belt