Wellbore Integrity SOLUTIONS

K-Master

Section mill

APPLICATIONS

- Milling poorly cemented or corroded casing
- Plug and abandonment operations requiring rock-to-rock isolation

BENEFITS

- Single-trip milling when combined with high-ratio underreamer
- High-performance ROP and hole cleaning during milling operations
- Integration with Wellbore Integrity Solutions underreamer systems for virgin formation exposure
- Engineered milling technology based on lab analyses comparing cutter performance with casing metallurgy
- Optional titanium-based blade treatment for section milling of chrome alloy tubulars

MILLING INSERT OPTIONS

- **Millmaster (P5):** Standard grade offering for all milling applications
- **WavEdge*:** High-quality inserts with improved ROP
- **TruEdge*:** Premium grade with improved ROP, high durability, and wear resistance

Economical milling, sidetracking, and single-string pipe cutting

The K-Master section mill is a hydraulic downhole tool ideal for milling casing to set rock-to-rock well abandonment cement plugs. All cutter arms are dressed with tungsten carbide inserts that, along with the multiblade design, provide maximum footage and high ROP. When combined with the high-ratio underreamer, the K-Master mill provides a single-trip milling system to ensure that rock-to-rock isolation is attainable.

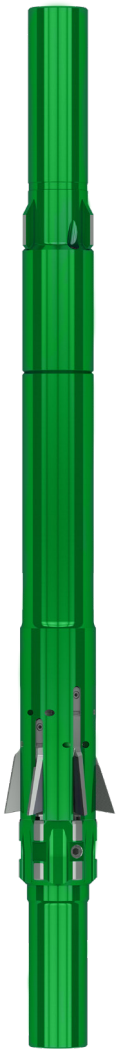
Multiple cutter arms for optimal milling performance

As pump pressure is applied, three cutter arms expand and begin the cutout. When the cutout arms are fully open, three additional cutter arms automatically expand into the milling position using a cam and ramp interface. The shorter lead arm opens slightly ahead of the longer follow arms, providing maximum force for the cutout. When all the arms are fully expanded, the cam reaches a flat interface, locking the knives open as long as a minimum pressure drop across the tool is maintained. All six cutting surfaces are then squarely sealed on top of the casing for optimum milling performance.

The optimized milling inserts technology covers a wide range of milling and cutting applications. The inserts are engineered based on extensive lab analyses and field history to provide good cutter durability and wear resistance.

Each cutter knife incorporates chip-breaker ridges, and the continuous chip-breaker design generates steel cuttings with a size and shape that will not accumulate and block flow. These cuttings can easily be circulated out of hole, requiring a minimum of specialized mud conditioning. The milled casing shavings are engineered to minimize the size for optimal hydraulics without sacrificing milling speed.

A database of casing material catalogs the cutter performance and casing metallurgy to provide a clearer understanding of optimal milling performance and parameters.



Three cutter arms automatically expand into the milling position when the K-Master mill cutout arms are fully open.

K-Master: Section Mill

Cutter position indicator

The K-Master mill is equipped with Flo-Tel* downhole mechanical position indicator that provides a surface signal to notify the operator when the cutout is completed. The signal indicates that the cutting arms have extended to full sweep to ensure that the mill in not skimming the pipe. Section milling can then begin for the required interval.

Integrated components

Section mills require a guide mill that is run below the tool. An integral bladed stabilizer is also run below the mill to further enhance stabilization. The guide mill and stabilizer are usually sized at the nearest ⅛ in under the drift diameter of the casing.

A float valve is recommended to run above the section mill. The float valve prevents cuttings from entering the section mill and blocking the piston orifice while making a connection or when the pumps have to be shut down.

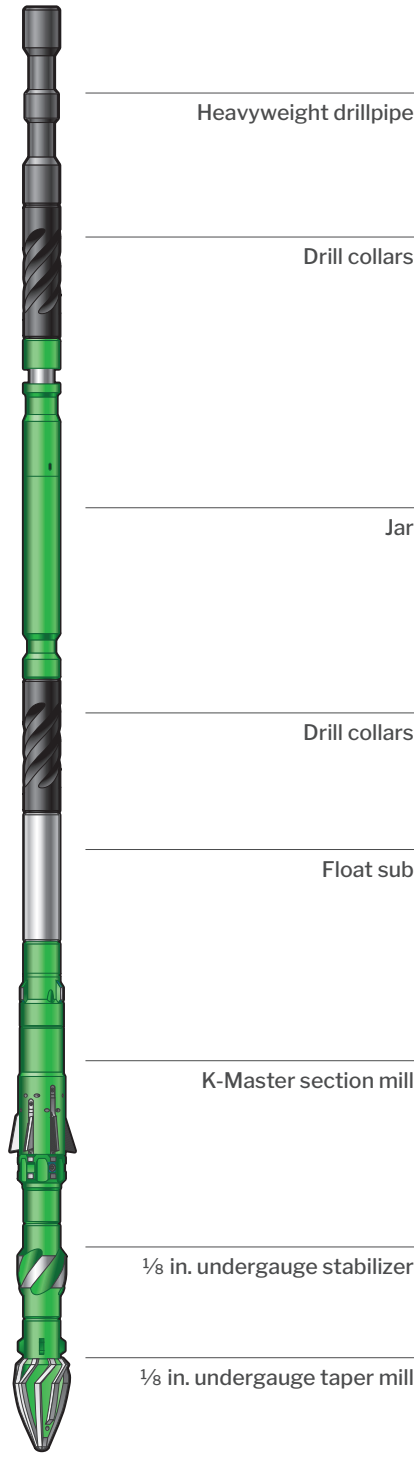
Shock tools, which are recommended for longer section milling intervals, help prolong the life of the section mill knife.

An optimized milling fluid provides maximum hole-cleaning performance.

K-MASTER SPECIFICATIONS

Tool Series	Casing Sizes, in.	System No.
Section Mill System 3600	4½	80027292
Section Mill System 4500	5½	80029847
Section Mill System 5500	6⅝ to 8⅝	80029848
Section Mill System 8200	9⅝ to 10¾	80027276
Section Mill System 11700*	13⅜ to 16	80029849

** Section Milling bigger casing sizes may also be possible, please contact your nearest WIS Engineering Resource to inquire about section milling bigger OD casings based on your application needs.*



BHA incorporating K-Master section mill, taper mill and stabilizer

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