

FUNDAMENTAL MANUFACTURING PROCESSES

Milling & Machining Centers

SCENE 1.

ML14A, CGS: Milling Machine Basics
white text, centered on background

SCENE 2.

ML15A, **FMP015**, 15:05:37:00-15:05:54:00
zoom out, knee mill
ML15B, **FMP015**, 15:35:17:00-15:35:39:00
zoom out, knee mill in operation

NARRATION (VO) :

THE FUNDAMENTAL PARTS AND PRINCIPLES OF MILLING MACHINES ARE BEST ILLUSTRATED BY THE LIGHTWEIGHT, VERTICAL-SPINDLE, RAM-TYPE 'KNEE' MILL. ALTHOUGH IT IS RARELY USED FOR PRODUCTION MACHINING, IT IS USED IN TOOLMAKING, PROTOTYPE MACHINING, AND LOW-VOLUME MILLING.

SCENE 3.

ML16A, **FMP015**, 15:11:03:00-15:11:21:00
med, knee & column
ML16B, CGS: Column
ML16C, CGS: Knee
ML16D, **FMP015**, 15:11:32:00-15:11:48:00
med, table & saddle
ML16E, CGS: Table
ML16F, CGS: Saddle
ML16G, **FMP015**, 15:08:20:00-15:08:54:00
knee traveling vertically, saddle moving in and out, table moving side to side
ML16H, CGS: Vertical Traverse Crank
ML16I, CGS: Cross Traverse Handle
ML16J, CGS: Table Traverse Handle

NARRATION (VO) :

ITS DESIGN INCLUDES A COLUMN-AND-KNEE SUPPORT FOR THE MACHINE TABLE AND SADDLE. WORK CAN BE MOVED IN 3 AXES, RELATIVE TO THE CUTTER.

THE VERTICAL TRAVERSE CRANK MOVES THE KNEE VERTICALLY ON THE COLUMN..., THE CROSS TRAVERSE HANDLE MOVES THE SADDLE IN-AND-OUT FROM THE COLUMN..., AND THE TABLE TRAVERSE HANDLE MOVES THE TABLE SIDE-TO-SIDE.

SCENE 4.

ML17A, **FMP015**, 15:14:40:00-15:15:00:00
zoom out, ram, head moving in
ML17B, CGS: Ram
ML17C, **FMP015**, 15:19:08:00-15:19:23:00

NARRATION (VO) :

THE RAM, ON TOP OF THE COLUMN, SUPPORTS

tilt, milling head
ML17D, CGS: Head

THE HEAD AND PROVIDES HORIZONTAL MOTION
IN-AND-OUT FROM THE COLUMN -PARALLEL TO
THE SADDLE MOVEMENT...,
AT THE FRONT OF THE RAM IS THE MILLING
HEAD, WITH MOTOR, TOOLHEAD, SPEED AND
FEED CONTROLS, QUILL, AND SPINDLE.

SCENE 5.

ML18A, **FMP015**, **15:21:09:00-15:21:23:00**
zoom out, quill/spindle, tool rotating
ML18B, CGS: Quill
ML18C, CGS: Spindle
ML18D, **SME2502**, **01:20:32:00-01:20:52:00**
tilted spindle milling

NARRATION (VO) :

THE NON-ROTATING QUILL HOLDS THE
ROTATING SPINDLE, WHICH CAN BE MOVED ON
ITS OWN AXIS. THE SPINDLE AXIS MAY ALSO
BE TILTED TO MILL OR DRILL AT AN ANGLE
TO THE TABLE.

SCENE 6.

ML19A, **SME2504**, **04:04:02:00-04:04:12:00**
c.u. tool in chuck
ML19B, **FMP015**, **15:27:19:00-15:27:29:00**
c.u. tool placed in chuck, alternate shot
ML19C, **SME2504**, **04:06:19:00-04:06:43:00**
c.u. end mill secured in collet
ML19D, **SME2504**, **04:10:05:00-04:10:30:00**
small face mill mounted in spindle
ML19AE, **FMP015**, **15:23:44:00-15:23:52:00**
small face mill mounted in spindle,
alternate shot

NARRATION (VO) :

CUTTING TOOLS ARE HELD IN DRILL CHUCKS,
COLLETS, OR OTHER TOOLHOLDERS, WHICH ARE
HELD IN THE SPINDLE. OR TOOLS CAN BE
MOUNTED DIRECTLY IN THE SPINDLE.

SCENE 7.

ML20A, **FMP015**, **15:40:00:00-15:40:38:00**
operator setting of mill, zoom in, milling
operation

NARRATION (VO) :

WITH MANUAL MILLS, THE OPERATOR SETS THE
MACHINE PARAMETERS FOR EACH CUT,
POSITIONS THE TOOL FOR THE START OF THE
CUT, DIRECTS ALL OF THE MACHINE'S

MOTIONS MANUALLY, AND CHANGES THE
SETTINGS AND TOOLS AFTER EACH OPERATION.

SCENE 8.

ML21A, FMP015, 15:31:35:00-15:31:52:00
zoom out, part bolted directly to table
with clamps
ML21B, FMP015, 15:29:40:00-15:29:50:00
zoom out, part held by vise to table
ML21C, FMP015, 15:28:30:00-15:28:42:00
zoom out, round part in chuck, bolted to
table

NARRATION (VO) :

WORKHOLDING MUST LOCATE THE PART AND
HOLD IT WITHOUT DISTORTION. THIS CAN BE
ACCOMPLISHED BY BOLTING THE WORK TO THE
TABLE USING CLAMPS...,
VISES...,
AND OTHER FIXTURES. ROUND PARTS MAY BE
HELD IN A CHUCK.

SCENE 9.

ML22A, FMP015, 15:33:55:00-15:34:20:00
zoom out, c.u. knee mill with powered feed
ML22B, FMP015, 15:34:46:00-15:35:02:00
zoom out, c.u. knee mill with powered
feed, alternate take
ML22C, FMP015, 15:37:12:00-15:37:38:00
zoom out, digital readout

NARRATION (VO) :

TO REDUCE OPERATOR EXERTION AND ACHIEVE
A MORE UNIFORM CUT, KNEE MILLS ARE
COMMONLY EQUIPPED WITH POWERED TABLE AND
SADDLE FEED UNITS. THEY ALSO HAVE
DIGITAL READOUT DISPLAYS THAT TELL THE
MACHINIST THE PRECISE LOCATION OF THE
TOOL RELATIVE TO THE WORK.

SCENE 10.

ML23A, FMP018, 18:08:34:00-18:09:07:00
zoom in, cnc knee mill, cutting

NARRATION (VO) :

'CNC' KNEE MILLS ARE ALSO AVAILABLE,
OFTEN GIVING THE OPERATOR THE OPTION OF
AUTOMATIC OR MANUAL CONTROL. THIS
FLEXIBILITY PLACES THEM BETWEEN THE
CAPABILITIES OF TRADITIONAL MANUAL KNEE
MILLS AND MODERN 'CNC' MACHINING
CENTERS.

--- FADE TO BLACK ---