

## EXPERT KNOWLEDGE SERIES

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### VOLUME 02

# PREPARATION FOR FLAT END MILLING

This technical manual provides comprehensive guidelines for the preparation of flat end milling before mounting of Flat Tops. Proper end milling of Bare Flat and mounting of Flat Tops are crucial for optimal performance and longevity of card clothing. This guide covers essential parameters and procedures for achieving precise flat end milling operation.

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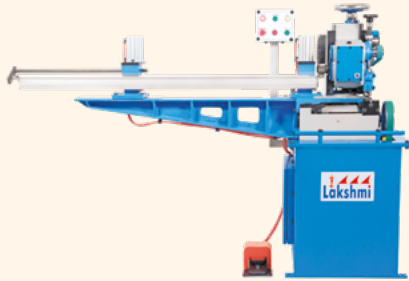
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#### 5 Rieter Card Plastic Shoe Milling Procedure

##### Inspection Chart

## 1. Importance of Flat End Milling



All makes of cards are designed with specific milling angles on flat bar end seating portion for effective carding action while the flat bar slides on flexible bend during card production.

Hence it is mandatory to maintain proper milling angle on flat bar seating area LH and RH sides to attain optimum carding action between Flat Tops and cylinder clothing to deliver the best quality of sliver. Free entry of fibres in the Heel and effective carding action can be ensured in the Toe area with the proper Heel and Toe angle in the bare flat.

When the flat bar continuously slides over the flexible bend, wear out over the end portion will not be in uniform manner. If

the new Flat Tops are mounted without flat milling operation, standard Heel and Toe angle will not be present in the flat seating area which leads to inferior output quality and fibre rupture may take place because of very low Heel and Toe height difference in flat bar.

Desired level of Heel and Toe angle can be achieved by using LAKSHMI FLAT END MILLING MACHINE for milling of all makes of flat bars as it is equipped with TEMPLATE arrangement which delivers accurate Heel and Toe angle during flat end milling operation with additional feature of pneumatic clamping for uniform and firm clamping of flat bars during milling.

## 2. The Three Types of Bare Flats Used in the Carding Machine

### a) Cast Iron Flat Bar

Flat End Milling Operation is required

### b) Aluminium Flat Bar with Plastic End Shoe

Flat End Milling Operation is required

### c) Aluminium Flat with Heel and Toe Pin\*

Flat End Milling not needed

\*If the pin gets worn out, flat bar must be replaced with new one.

### 2.1 Preparation for Flat End Milling

- Remove the flats from card and place it in the trolley and transport to card room.
- Remove the old tops with LAKSHMI - LFCM 100 with flat demounting option mode and clean bare surface with emery paper and end milling portion with compressed air and then with clean cloth.
- Check the flat end seating portion for required milling angle according to card manufacturer's recommendation.
- Milling angle varies for different makes of cards [Refer milling angle recommendation chart as per card manufacturer].

### 2.2 Heel & Toe Angle Checking



- Dial gauge must have 0.01 mm accuracy (Dial load 2 mm).
- Move the dial gauge pin probe from Heel to Toe area to check the angle.
- If end portion has abnormal wear and tear and if milling angle is not as per standard, the flat bar end portion must be milled to attain required angle by using Lakshmi Flat End Milling Machine.

### 3. Preparation for Cast Iron Flat End Milling

- Clean both ends of flat bar and inspect 20 flats for Heel and Toe readings. Select the maximum worn out flat for end milling setting.
- Select the correct template/cutter speeds according to required angle of flat bar.

#### 3.1 Milling Angle and Cutter Speed Details

Card Model	Flat Type	Process	Milling Angle	Cutter Type	Motor Pulley Diameter	Gear Box Pulley Diameter	Cutter Speed RPM
All Cast Iron Flats	Cast Iron (CI)	All process	0.50 to 0.60	HSS - CI 0.5mm land	63	160	260
Rieter C4-C51 Flats	Cast Iron (CI)	All process	0.60	Carbide	100	120	520

■ Table No: 01

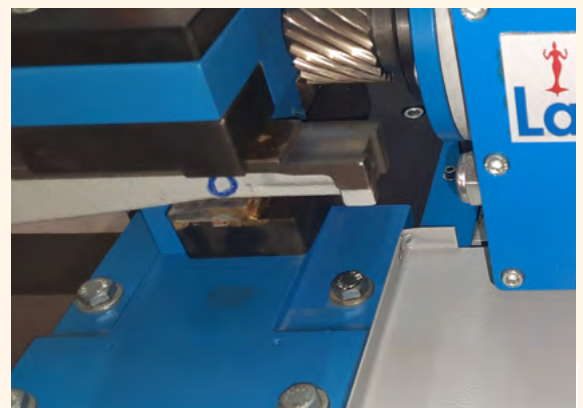
#### 3.2 Procedure for Cast Iron Flat Milling

1. Position the flat bar to carry out milling on LH side first.

2. After clamping the flat in the flat end milling machine, give depth of cut for 0.25 mm excess than the maximum worn out flat to attain the desired Heel and Toe angle in the entire set of bare flats.

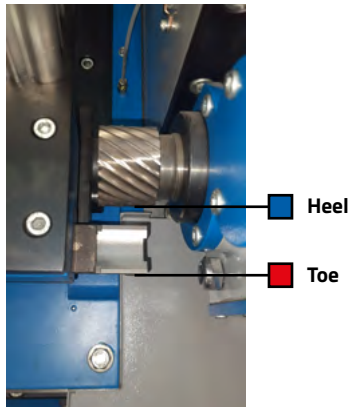


Cast Iron Flat Bar for LH side milling



- a. After Heel and Toe cutting, verify milling angle and center depth using the inspection fixture.
- b. Once required milling angle is achieved, proceed with next flat and record readings.
- c. After confirming milling angle on 2-3 flats, continue milling all flats on LH side.
- d. Center Depth Specifications:
  - Maintain 1.3 mm  $\pm$  0.10 mm at flat center.
  - Measure from Toe area as reference point.
  - Adjust depth using the large hand wheel without affecting milling angle.
- e. Seating Point Requirements:
  - Maintain 2.5 to 3.0 mm on both sides.
  - Adjust if needed by moving template inward or outward as shown.

- After milling, check for Heel and Toe. If necessary, adjust the copying milling template to attain accurate angle as the machine is designed for high accuracy of milling as this plays a major role in sliver quality.



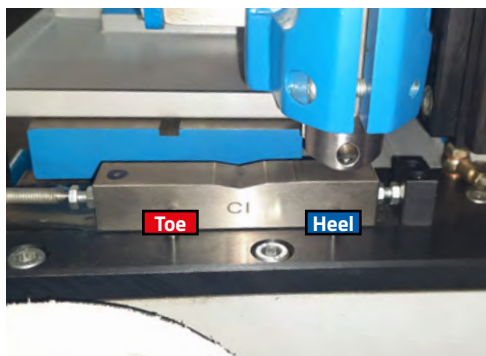
#### Center Depth Requirements:

- C1/1 to LC 300 AV4 and Rieter C4 to C51: 1.3mm  $\pm$  0.10mm.
- Other makes: 0.80mm  $\pm$  0.10mm

#### Cast Iron Flat Bars:

Seating portion at Heel and Toe area: 2.5 to 3.0mm

- After attaining the required angle, mill 2 to 3 flats and check for accuracy and repeatability. Make any minor adjustments if required. Ensure to attain 2.5 to 3.0 mm width of milling in both Heel and Toe area.



#### Seating Point Adjustment Procedure

##### Initial Adjustment:

- Rotate M6 bolt by 1/2 to 1 turn.
- Check after milling and make further adjustments as needed.

##### Secure Settings:

- Lock the nut after achieving required seating point.

##### Heel Side Adjustments:

- To reduce seating portion: Turn M6 bolt clockwise.
- To increase seating portion: Turn M6 bolt counterclockwise.

- Make MASTER FLAT for reference checking every 8 to 10 flats.
- After completing LH side milling, mill RH side by reversing the copying milling template by 180 degrees.
- During RHS milling, check LH and RH height difference after milling 2 to 3 flat bars. If necessary, match the height to  $\pm$ 0.01 mm accuracy using Lakshmi flat inspection beam supplied with LFCM or AFGM.
- After completing milling on both sides, ensure bare flat surface is within 0.05 mm accuracy for 40" width using the inspection beam.
- If any deviation exceeds 0.05 mm within flat or flat to flat, correct it using packing tape before clipping of tops.

### 3.3. Permissible Limit of Cast Iron Flat Dimensions for Milling

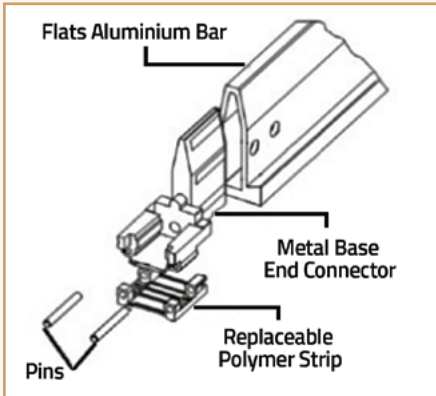
- If the thickness of Bare Flat measured at the TOE portion is less than 22.50 mm, we need to change the Bare Flat with new one.
- The desired level of depth of Cut and Heel & Toe angle cannot be achieved with the above dimensions of bare flat.



Flat Bar needs to be checked if the thickness goes below 22.50mm on Toe side

## 4. Procedure for Plastic End Shoe Type Flat Bar Milling for LMW Cards.

### 4.1 Plastic End Shoe Replacement [Polymer Strip]



Before starting the milling, we need to change the worn-out Plastic Side Shoe as below.

The diagram shows the parts of the Flats

assembly i.e., Metal Base End Connector inserted into the Flat Aluminium Bar; Replaceable Polymer Strip placed at the End Connector with pins.

### 4.2 Important Points To Note

- Replaceable Polymer Shoe Strip that runs on the flexible bend wears out over time. Polymer Strip needs to be changed and Heel & Toe milling must be done during new Flat Tops clipping.
- Replacing Polymer Shoe Strips in only a few flats of a set is not recommended, as this will cause height variation between flats and affect uniform flat setting in the carding machine.

### 4.3 Plastic Shoe Replacement Tools and Procedure

#### 4.3.1 Pin Removal Process

- Insert the Pin Ejector into the relief provided in the End Connector.
- Pull the Pin out using the Pin Ejector and use the Hand Plier or Gripper to remove the Pins completely.

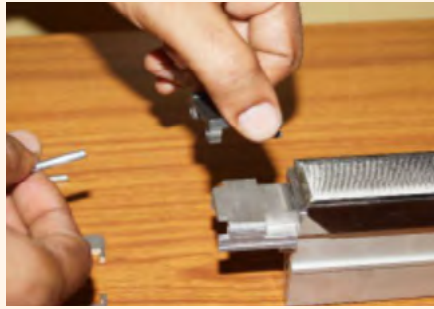


#### 4.3.2 Old Strip Removal

Remove the old replaceable Polymer Strip from the Metal Base End Connector.

**NOTE:** Clean the aluminium base with compressed air and ensure it is completely dust-free before fixing the new plastic strip.

#### 4.3.3 Fixing New Plastic Shoe



- Place the new replaceable Polymer Strip and secure it with a pair of Pins.
- Push the Pins in until they are fully inserted.
- After replacing the Shoe on complete set, select the required copying template and recommended speed as per chart below.

#### 4.4 Milling Angle Template and Speeds

Card Model	Flat Type	Process	Milling Angle with Tolerance (mm)	Cutter Type	Motor Pulley Diameter	Gear Box Pulley Diameter	Cutter Speed RPM
LC 333, LC 361, LC 363 & LC 636	Aluminium - Shoe type	Cotton medium & Fine counts	0.4-0.45	HSS Shoe Type -0.2 mm land	160	63	1600
LC 333, LC 361, LC 363 & LC 636	Aluminium - Shoe type	All processes except Cotton medium & Fine counts	0.55-0.6	HSS Shoe Type -0.2 mm land	160	63	1600
Rieter C 60 & C70	Aluminium - Shoe type	All processes	0.55-0.6	HSS Shoe Type -0.2 mm land	100	120	520

■ Table No: 02

- Cutter for cast iron flat bar
- Cutter for Aluminium flat bar with inserted plastic end connector



Wrong selection of cutter will lead to damage of cutting edge on cutter.

#### 4.5 Milling Procedure for Aluminium Flat with Polymer Strip

- Clamp the Flat Bar on the Flat End Milling Machine for milling LH side as first stage.



2. Measure readings of new Plastic Shoe before milling on 20 Flats, note the readings, and select the maximum minus flat for milling setting.
3. Mill the Plastic Shoe and check for required milling angle. If necessary, adjust the M6 screws to attain exact milling angle.
4. Mill 3 to 5 Flat Side Shoes and check for accuracy and repeatability.
5. Make Master Flat for reference checking every 8 to 10 Flats.
6. After completing LH side milling, reverse the copying milling template by 180 degrees for RH side milling.
7. Flat bar and template position to be changed as below:



8. Follow the same procedure as done for LH side and complete the full set milling for RH side.
9. During RHS milling, check LH and RH height difference after milling 2 to 3 flat bars. If necessary, match the height to  $\pm 0.01$  mm using Lakshmi Flat Inspection Beam.

### Preferable Flat Straightness Parameters:

#### For 40" Aluminium Flat Bar:

- Middle:  $-0.03$  to  $-0.05$  mm
- Both sides:  $0.00 \pm 0.01$  mm
- Variations can be levelled using packing tape

#### For 60" Flat Bar:

- Both sides:  $0.00 \pm 0.01$  mm
- Middle concave varies according to card model and type

## 5. Rieter Card Plastic Shoe Milling Procedure

1. Ensure correct settings before starting:
  - Milling angle copying template
  - Type of Milling Cutter
  - Speed (as mentioned in **Table No: 02**)
2. For milling the Plastic Side Shoe follow the same procedure as per the procedure 4.5.
3. Quality Requirements for Rieter C 60 & C 70 Flat Bar:
  - Both sides must be  $0.00 \pm 0.01$  mm
  - Middle concave varies according to CARD MODEL and VERSION
  - Verify specifications before clipping tops

## INSPECTION CHART

CUSTOMER: \_\_\_\_\_  
CARD MODEL: \_\_\_\_\_

DATE: \_\_\_\_\_

FLAT TOPS SPEC.: \_\_\_\_\_  
CONTROL NO: \_\_\_\_\_  
DIAL GUAGE USED: \_\_\_\_\_  
ACCURACY: \_\_\_\_\_

CHECKING  
PARAMETERS

1. Heel & Toe straightness; 2. Heel & Toe Taper; 3. Depth of cut (Checking in milling machine inspection beam after completing end milling with reference to bare flat surface).

Flat No.	RH				LH			
	Straightness		Taper	Depth	Straightness		Taper	Depth
	Heel (R1)	Toe(R2)			Heel (R1)	Toe(R2)		
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
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