Ruffler Foot Reduction Ratio

Licca's Dollhouse Cosplay Studio

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1 Introduction

This document will cover a method to calculate a reduction ratio based on the stitch length. This method involves taking two identical lengths of fabric, and putting them through the ruffler foot at different stitch lengths. We will then take several measurements and then use algebra to come up with a formula to determine a reduction ratio based on the stitch length.

2 Reduction Ratio

For the purposes of this document, the reduction ratio is defined by the length of the fabric after being pleated by the ruffler foot versus the length of the fabric before being pleated by the ruffler foot.

$$\text{reduction ratio} = \frac{\text{length of fabric after being pleated}}{\text{length of fabric before being pleated}} \tag{1}$$

3 Assumptions

- The screw that controls the pleat depth is not changed. Typically the screw is very stiff on the foot, and unscrewing it runs the risk of damage to the foot.
- The number of stitches per pleat (the lever that says 0, 1, 6, and 12) is kept constant.
- The reduction ratio varies linearly relative to the stitch length.

4 Procedure

1. Set the number of stitches per pleat (the lever that says 0, 1, 6, and 12) to your desired setting.
2. Cut two strips of fabric of the same length. Designate the strips as "Fabric 1" and "Fabric 2". Measure the length of each of the strips, and write them down.

3. Set your machine to a relatively short straight stitch (around 1.5 to 2.5mm). For this procedure, I will assign this as x_1, the stitch length of Fabric 1.

4. Put Fabric 1 through the ruffler foot all the way down the length of the fabric strip.

5. Measure the length of the ruffled side of Fabric 1.

6. Set your machine to a relatively long straight stitch (around 4.0 to 6.0mm). For this procedure, I will assign this as x_2, the stitch length of Fabric 2.

7. Put Fabric 2 through the ruffler foot all the way down the length of the fabric strip.

8. Measure the length of the ruffled side of Fabric 2.

9. Calculate the reduction ratios for each strip.

$$y_1 = \text{reduction ratio of Fabric 1} = \frac{\text{length of Fabric 1 after being pleated}}{\text{length of Fabric 1 before being pleated}} \tag{2}$$

$$y_2 = \text{reduction ratio of Fabric 2} = \frac{\text{length of Fabric 2 after being pleated}}{\text{length of Fabric 2 before being pleated}} \tag{3}$$

10. Calculate a slope, based on the stitch length being the independent variable and the reduction ratio being the dependent variable.

$$m = \text{slope of reduction ratio} = \frac{y_2 - y_1}{x_2 - x_1} \tag{4}$$

11. Using the point-slope form of a line, we can get a general formula for the reduction ratio based on the stitch length.

$$y - y_1 = m(x - x_1) \tag{5}$$

$$y = m(x - x_1) + y_1 \tag{6}$$

From this, you can use equation (6) to calculate a reduction ratio for any stitch length.