

Find top Δ between limits
 #21.64
 Expect 16.57+512 = 21.653

16.5711mm
 $(-38475 - 12767) \times 10^4 = -5.1242\text{mm}$

Limit Switch set up. (Checks the operation of the limits and records the relative set position).

	Top Blade		Bottom Blade		Pass/Fail
	Positive	Negative	Positive	Negative	
Manual check	Pass	Pass	Pass	Pass	Pass/Fail
Position	178478	-38475	55676	-162075	Encoder Cts
Motor Stops	Pass	Pass	Pass	Pass	Pass/Fail

table 2

	Right Blade		Left Blade		Pass/Fail
	Positive	Negative	Positive	Negative	
Manual check	Pass	Pass	Pass	Pass	Pass/Fail
Position	43390	-161886	146971	-61206	Encoder Cts
Motor Stops	Pass	Pass	Pass	Pass	Pass/Fail

55676 + 1825
 10⁴
 5.75mm
 5.7501

Vertical Blades
 Parallelism of Blades (Measured +/-10.00mm) from the centre of the blade
 Measured with a Vernier Height Gauge & 2μm DTI

Position	Position mm	Upper Blade		Lower Blade		Parallelism μm
		Point A μm	Point B μm	Point A μm	Point B μm	
1	15	0	6			6.0
2	12.5	0	0			0.0
3	10	0	0			0.0
4	7.5	0	0			0.0
5	5	0	0	0	6	-6.0
6	2.5	0	2	0	8	-6.0
7	0	0	0	0	8	-8.0
8	-2.5	0	-2	0	5	-7.0
9	-5	0	-1	0	2	-3.0
10	-7.5			0	3	-3.0
11	-10			0	1	-1.0
12	-12.5			0	-1	1.0
13	-15			0	-2	2.0
Parallelism Specification		<20μm	Actual			-8.0

The limit switches are quite reproducible.

9/13/17 Issue = bottom blade braid hit by top blade
 top blade low limit Δ = 4.35mm - moved to 6.35 (2mm)
 Now limit @ -2916.7 μm from -5124.2 μm.
 Repeated (-2939.2 μm, -2934.2)

Check motor directions of each blade actuator, when driving positive the slit blade should move positive. The encoder counts should also increase in a positive direction.

Drive each blade actuator individually in a positive move

	Motor shaft rotates clockwise		Enc. cts increase in a +ve direction		
	Pass	Pass/Fail	Top Blade	Pass	Pass/Fail
Top Blade	Pass	Pass/Fail	Top Blade	Pass	Pass/Fail
Bottom Blade	Pass	Pass/Fail	Bottom Blade	Pass	Pass/Fail
Right Blade	Pass	Pass/Fail	Right Blade	Pass	Pass/Fail
Left Blade	Pass	Pass/Fail	Left Blade	Pass	Pass/Fail

Range Measurements.

Checks that the Specified Range of motions can be achieved from the designed Nominal Operating Position
 Operating Centre is located at the center of the CF flange

table 1

	Range Specification					
	Counts	Nominal Operating Position	0	Actual	Tolerance +/-	
Top Blade	12767	Counts	Nominal Operating Position	0	Actual	Tolerance +/-
	162767	Counts	Range +	15.00	15.00	0.1
	-37233	Counts	Range -	-5.00	-5.00	0.1
Bottom Blade	-1825	Counts	Nominal Operating Position	0	Actual	Tolerance +/-
	48178	Counts	Range +	5.00	5.00	0.1
	-151826	Counts	Range -	-15.00	-15.00	0.1
Right Blade	-7117	Counts	Nominal Operating Position	0	Actual	Tolerance +/-
	42883	Counts	Range +	5.00	5.00	0.1
	-157117	Counts	Range -	-15.00	-15.00	0.1
Left Blade	-11207	Counts	Nominal Operating Position	0	Actual	Tolerance +/-
	138793	Counts	Range +	15.00	15.00	0.1
	-61200	Counts	Range -	-5.00	-5.00	0.1
Resolution of Encoder		0.1	μm	10000	cts = 1mm	

VERTICAL ALIGN

w/ top slit @ limit - bottom @ 3mm from limit
 clears collision w/ 0.5mm - consistent w/ Mike drawing
 3-0.5 ~ 2.5mm

9/13/17 bottom blade at top limit - set to 5.75mm / repeats (5.76, 5.75)
 Go negative limit next - hit @ -16.1mm (consistent w/ table 2 i.e. (-16.025mm))

At top limit, distance Δ = 27.94mm moved limit to 25.09mm - too much, not trivial as angle of switch matters a lot.
 Now motor record at + 3.165mm @ limit (repeats, 3.192, 3.172, 3.175)

Tested w/ bottom @ limit, top limit stop safe manner - 2912 μm

Horizontal realignment

Limit Switch set up. (Checks the operation of the limits and records the relative set position).

	Top Blade		Bottom Blade		
	Positive	Negative	Positive	Negative	
Manual check	Pass	Pass	Pass	Pass	Pass/Fail
Position	178478	-38475	55676	-162075	Encoder Cts
Motor Stops	Pass	Pass	Pass	Pass	Pass/Fail

$\Delta_{right} = 20.5276$ mm
Table 2

	Right Blade		Left Blade		
	Positive	Negative	Positive	Negative	
Manual check	Pass	Pass	Pass	Pass	Pass/Fail
Position	43390	-161886	146971	-61206	Encoder Cts
Motor Stops	Pass	Pass	Pass	Pass	Pass/Fail

$5.0507 = 43390 + 7117$
 10^4
 $-15.4769 = -161886 + 7117$
 10^4
 $15.8178 = 146971 + 11207$
 10^4
 $-4.9999 = -61206 + 11207$
 10^4
 $\Delta_{right} = 20.8177$

Vertical Blades

Parallelism of Blades (Measured +/-10.00mm) from the centre of the blade
Measured with a Vernier Height Gauge & 2µm DTI

Position	Position mm	Upper Blade		Lower Blade		Parallelism µm
		Point A µm	Point B µm	Point A µm	Point B µm	
1	15	0	6			6.0
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3	10	0	0			0.0
4	7.5	0	0			0.0
5	5	0	0	0	6	-6.0
6	2.5	0	2	0	8	-6.0
7	0	0	0	0	8	-8.0
8	-2.5	0	-2	0	5	-7.0
9	-5	0	-1	0	2	-3.0
10	-7.5			0	3	-3.0
11	-10			0	1	-1.0
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13	-15			0	-2	2.0
Parallelism Specification		<20µm	Actual			-8.0

9/15/17
(uncalibrated)

What is left/right? Use $\Delta_{left}/\Delta_{right}$ to see any difference.
Xp range limit @ 10.38 and -0.285mm $\Delta = 10.665$ mm? Not enough.
MADE mistake microstepping @ $\frac{1}{20}$ means 4000 step/rev not 8000.

Check motor directions of each blade actuator, when driving positive the slit blade should move positive. The encoder counts should also increase in a positive direction. OK. $\Delta X_p = [-5$ to 16.304 mm]

Drive each blade actuator individually in a positive move

Motor shaft rotates clockwise			Enc. cts increase in a +ve direction		
Top Blade	Pass	Pass/Fail	Top Blade	Pass	Pass/Fail
Bottom Blade	Pass	Pass/Fail	Bottom Blade	Pass	Pass/Fail
Right Blade	Pass	Pass/Fail	Right Blade	Pass	Pass/Fail
Left Blade	Pass	Pass/Fail	Left Blade	Pass	Pass/Fail

$\Delta X_m = [-15$ to 5.764 mm
 $= 20.764$ mm
N.B. X_p is outboard
 X_m is inboard.

Range Measurements. Table 1
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Operating Centre is located at the center of the CF flange

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	138793	Counts	Range +	15.00	15.00	0.1
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Resolution of Encoder		0.1	µm	10000	cts = 1mm	

With X_p @ -5.00mm, lock at collision. Set X_m to 5.00mm @ top limit.
 X_m low limit = -15.8122mm. Go to $X_p = -5$ mm. Go to $X_m = 2.5 \rightarrow 0.5$ mm left to hit
Go to $X_m = 5.00$ mm, X_p @ -2.5mm w/ 0.5mm to collide.
Adjusting X_m , switch 4mm from edge Adjusted to 3.44mm. (3.42, 3.49)
Adjusting X_p , switch 28.6mm from edge.
Moved to (-3.00mm, -2.982, -3.014) Added 3.56mm motion.
Checked X_p negative limit (-3.044, -3.128, -3.079, -3.100, -3.083)
changed a bit... -3.087mm