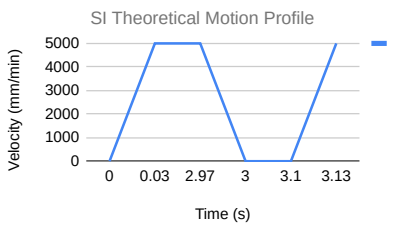
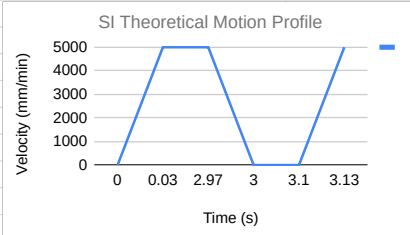
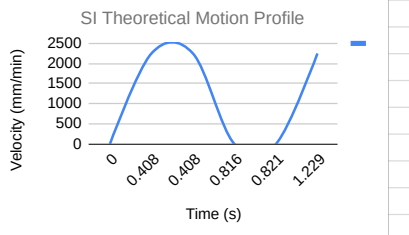


Y Axis		X Axis		Z Axis	
					
White Paper		White Paper		White Paper	
Description	SI Value	Description	SI Value	Description	SI Value
System Inputs		System Inputs		System Inputs	
Gantry mass (kg)	25	Gantry mass (kg)	2	Gantry mass (kg)	30
Book cut velocity (mm/min)	5000	Book cut velocity (mm/min)	37000	Book cut velocity (mm/min)	2250
Cut time (s)	3	Cut time (s)	3	Cut time (s)	0.816
Cut acceleration (m/s^2)	2.78	Cut acceleration (m/s^2)	20.56	Cut acceleration (m/s^2)	0.09
Dwell (s)	0.1	Dwell (s)	0.1	Dwell (s)	0.005
Motion Profile accel (%)	1.00%	Motion Profile accel (%)	1.00%	Motion Profile accel (%)	50%
Num Motors (int)	1	Num Motors (int)	1	Num Motors (int)	1
Pinion Pitch Diameter (m)	0.045	Pinion Pitch Diameter (m)	0.060	Leadscrew Max RPM (RPM)	1,500
Calculate Horizontal Load (N)	69.44	Calculate Horizontal Load (N)	41.11	Leadscrew Minimum Pitch (mm)	5.00
Calculate Constant Velocity Motion	0.250	Calculate Constant Velocity Motion	1.850	Leadscrew Diameter (mm)	16.00
Power (W)	2.08	Power (W)	1.23	Leadscrew Length (mm)	300.0
Peak Linear Velocity (m/s)	0.08	Peak Linear Velocity (m/s)	0.62	16 mm Leadscrew Actual Pitch (mm)	5.0
				Leadscrew Starts (int)	1
Rev. Distance (m)	0.141	Rev. Distance (m)	0.188	Leadscrew Lead (mm)	1.27
				Peak Leadscrew Velocity (rad/s)	4.70
Peak Angular Velocity (rad/s)	3.72	Peak Angular Velocity (rad/s)	20.66	Leadscrew Inertia (kg-m^2)	0.00004
Total Reflected Inertia (kg-m^2)	0.013	Total Reflected Inertia (kg-m^2)	0.002	Total Reflected Inertia (kg-m^2)	0.00100
Determine Pinion Input Torque		Determine Pinion Input Torque		Determine Leadscrew Input Torque	
Rack/Pinion Efficiency	94%	Rack/Pinion Efficiency	94%	Leadscrew Efficiency	94%
Bearing Friction Constant	0.003	Bearing Friction Constant	0.003	Bearing Friction Constant	0.050
Drive Reduction Ratio	5	Drive Reduction Ratio	2	Drive Reduction Ratio	1
Reduction Efficiency (%)	97%	Reduction Efficiency (%)	97%	Reduction Efficiency (%)	100%
Pinion Pulley Pitch Diameter (m)	0.045	Pinion Pulley Pitch Diameter (m)	0.06	Pinion Pulley Pitch Diameter (m)	0
Pinion Pulley Mass (kg)	0	Pinion Pulley Mass (kg)	0	Pinion Pulley Mass (kg)	0
Motor Pulley Pitch Diameter (m)	0.032	Motor Pulley Pitch Diameter (m)	0.060	Motor Pulley Pitch Diameter (m)	0
Motor Pulley Mass (kg)	0	Motor Pulley Mass (kg)	0	Motor Pulley Mass (kg)	0
Cutting forces (N)	150	Cutting forces (N)	0	Cutting forces (N)	
Belt Drive Inertia (kg-m^2)	0.00E+00	Belt Drive Inertia (kg-m^2)	0.00E+00	Belt Drive Inertia (kg-m^2)	0.00E+00
Gearbox Inertia (kg-m^2)	0.000044	Gearbox Inertia (kg-m^2)	0.000013	Gearbox Inertia (kg-m^2)	0
ang. acceleration (rad/s^2)	123.46	ang. acceleration (rad/s^2)	685.19	ang. acceleration (rad/s^2)	454.72
Net efficiency (%)	91.18%	Net efficiency (%)	91.18%	Net efficiency (%)	0.94
Cutting torque (Nm)	1.48	Cutting torque (Nm)	0.00	Cutting torque (Nm)	0.00
Acceleration Torque (Nm)	1.57	Acceleration Torque (Nm)	1.24	Acceleration Torque (Nm)	0.46
Gravity Torque (Nm)	0.00	Gravity Torque (Nm)	0.00	Gravity Torque (Nm)	0.06
Pinion Shaft Speed (rev/s)	0.59	Pinion Shaft Speed (rev/s)	3.29		
Friction Torque (Nm)	0.006	Total Pinion Torque (Nm)	2.721	Friction Torque (Nm)	0.10
EffectiveTotal Pinion Torque (Nm)	3.149	Total Pinion Torque (Nm)	4.086		
rms Torque (Nm)	1.478	rms Torque (Nm)	2.682	rms Torque (Nm)	0.466
Peak Torque (Nm)	3.05	Peak Torque (Nm)	3.96	Peak Torque (Nm)	0.61
Peak Power (W)	11.37	Peak Power (W)	81.88	Peak Power (W)	0.00
Avg Power (W)	5.70	Avg Power (W)	57.95	Avg Power (W)	0.00
Calculate Motor Data		Calculate Motor Data		Calculate Motor Data	
Manufacturer	Sanyo Denki	Manufacturer	Lichuan	Manufacturer	Sanyo Denki
Model	103H7823-5740	Model	LC60HS112	Model	103H7823-5740
Motor Phase Qty. (int)	1	Motor Phase Qty. (int)	2	Motor Phase Qty. (int)	2
Motor Rotation/Step (deg)	1.8	Motor Rotation/Step (deg)	1.8	Motor Rotation/Step (deg)	1.8
Motor Step to Step Accuracy (%)	0.09%	Motor Step to Step Accuracy (%)	0.0009	Motor Step to Step Accuracy (%)	0.09%
Input Motor Phase Amps (A)	2	Input Motor Phase Amps (A)	4	Input Motor Phase Amps (A)	2
Input Drive voltage (V)	48	Input Drive voltage (V)	48	Input Drive voltage (V)	48
Motor Volts (low power state) (V)	2.3	Motor Volts (low power state) (V)	2.3	Motor Volts (low power state) (V)	2.3
Motor Peak Hold Torque (Nm)	2.70	Motor Peak Hold Torque (Nm)	4	Motor Peak Hold Torque (Nm)	2.70
Coil Resistance (ohms)	2.4	Coil Resistance (ohms)	1.56	Coil Resistance (ohms)	2.4
Coil Inductance(mH)	9.5	Coil Inductance(mH)	3.9	Coil Inductance(mH)	9.5
Rotor Inertia (g-cm^2)	840	Rotor Inertia (g-cm^2)	1200	Rotor Inertia (g-cm^2)	840

Motor Wiring Scheme	Parallel	Motor Wiring Scheme	Parallel	Motor Wiring Scheme	Parallel
Motor RPM (rev/min)	178	Motor RPM (rev/min)	395	Motor RPM (rev/min)	1772
Motor Rotation to Linear Travel (mm)	28.3	Motor Rotation to Linear Travel (mm)	94.2	Motor Rotation to Linear Travel (mm)	1.3
System to Rotor Inertia Ratio (int)	0.6 : 1	System to Rotor Inertia Ratio (int)	0 : 1	System to Rotor Inertia Ratio (int)	1.2 : 1
Torque Peak Gearbox input (Nm)	0.63	Torque Peak Gearbox input (Nm)	2.04	Torque Peak Gearbox input (Nm)	0.61
Torque rms Gearbox input (Nm)	0.30	Torque rms Gearbox input (Nm)	1.38	Torque rms Gearbox input (Nm)	0.47
Motor angular velocity (rad/s)	18.61	Motor angular velocity (rad/s)	41.32	Motor angular velocity (rad/s)	4.70
Motor linear acceleration (m/s^2)	13.89	Motor linear acceleration (m/s^2)	41.11	Motor linear acceleration (m/s^2)	0.09
Motor Average power (W)	59	Motor Average power (W)	169	Motor Average power (W)	
Motor RMS power (W)	28	Motor RMS power (W)	111	Motor RMS power (W)	
Motor Resonance Frequency (rev/min)	756	Motor Resonance Frequency (rev/min)	1088	Motor Resonance Frequency (rev/min)	1069
Calculate Drive Parameters		Calculate Drive Parameters		Calculate Drive Parameters	
Microstep Setting (int)	2	Steps/Rev (int)	2	Steps/Rev (int)	2
Drive Voltage (V)	48	Drive Voltage (V)	48	Drive Voltage (V)	48
Drive Output Current (A)	2	Drive Output Current (A)	2	Drive Output Current (A)	2
Step/Linear mm (int)	11,310	Step/Linear Distance (mm)	37,699	Step/Linear Distance (mm)	3.18E-03
Linear Distance/Step (mm)	0.0000884	Linear Distance/Step (mm)	0.0000265	Linear Distance/Step (mm)	3.15E+02
Positional Error (%/step)	0.13%	Linear Positional Error (%/step)	0.13%	Linear Positional Error (%/step)	
Positional Error/Step Range (mm)	+/- 0.0000885	Linear Positional Error Range (mm)	+/- 0.0000266	Linear Positional Error Range (mm)	
Calculate Power Supply Loads		Calculate Power Supply Loads		Calculate Power Supply Loads	
Io (A)	0.96	Io (A)	1.47	Io (A)	0.96
Motor Power available (W)	96	Motor Power available (W)	192	Motor Power available (W)	96
Kt (V*s)	1.35	Kt	1.00	Kt	1.35
I peak (A)	1.4	I peak (A)	3.5	I peak (A)	1.4
I rms (A)	1.2	I rms (A)	2.9	I rms (A)	1.3
Vrms_min (V)	29	Vrms_min (V)	47	Vrms_min (V)	10
Total Ideal PSU RMS Power (W)	41	Total Ideal PSU RMS Power (W)	165	Total Ideal PSU RMS Power (W)	14
Total Actual PSU Peak Power (W)	57	Total Actual PSU Peak Power (W)	94	Total Actual PSU Peak Power (W)	19
PSU De-Rate Percent (int)	100%	PSU De-Rate Percent (int)	100%	PSU De-Rate Percent (int)	100%
Total De-Rated PSU Current (A)				6	
Input Test Voltage (V)	48		48		
Motor_Red Radial Velocity (rad/s)	33.02		42.51		
System_Red Radial Velocity (rad/s)	6.60		21.26		
% System Reduction (int)	0.0%		0.0%		
Linear Accel. mm/min^2	5676.17				
Linear Accel. mm/sec^2	94.60				
Calculate Heat		Calculate Heat		Calculate Heat	
Ambient Temp (deg C)	35	Ambient Temp (deg C)	35	Ambient Temp (deg C)	35
Heat rise Coefficient (W/C)	2.2	Heat rise Coefficient (W/C)	2.2	Heat rise Coefficient (W/C)	2.2
Theta (deg C)	8	Theta (deg C)	31	Theta (deg C)	9
Theta max (deg C)	8	Theta max (deg C)	31	Theta max (deg C)	9
	43		66		44
Controller Inputs		Controller Inputs		Controller Inputs	