

Thanks to Rob Stehlik for his help and hard work in bringing this to the community!

Nema 23 leadscrew actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 199.1 (see note)

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation
20	20.01	20.16	20.01	20.17	20.01	20.17	20.088	0.078	0.088
40	39.98	40.16	39.98	40.14	39.98	40.14	40.063	0.083	0.083
60	60.01	60.17	60.02	60.18	60.02	60.18	60.097	0.080	0.097
80	80	80.18	80	80.17	80.01	80.17	80.088	0.085	0.088
100	100.03	100.16	100.04	100.17	100.04	100.2	100.100	0.063	0.100
								Repeatability	Accuracy
								0.078	0.091

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 2000mm/min

Acceleration set to 50 mm/s²

Result: Motor stalls at approximately 26lb (115N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed distance tested was 250mm

Acceleration set to 200 mm/s²

Test done under no load

Max speed: 8000mm/min, beyond this motor stalls

Nema 23 high torque leadscrew actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 199.1 (see note)

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation
20	19.98	20.17	19.98	20.17	19.98	20.17	20.075	0.095	0.095
40	40.01	40.18	40.01	40.18	40.01	40.18	40.095	0.085	0.095
60	60.04	60.23	60.04	60.22	60.03	60.22	60.130	0.093	0.130
80	80.07	80.2	80.07	80.2	80.07	80.2	80.135	0.065	0.135
100	100.06	100.23	100.06	100.23	100.05	100.2	100.142	0.085	0.142
								Repeatability	Accuracy
								0.085	0.119

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 2000mm/min

Acceleration set to 50 mm/s²

Result: Motor stalls at approximately 66lb (294N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed
distance tested was 250mm

Acceleration set to 200 mm/s²

Test done under no load

Max speed: 5500mm/min, beyond this motor stalls

Nema 23 belt driven actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 26.667

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation
20	19.8	20.95	19.86	20.98	19.86	21.03	20.413	0.573	0.573
40	40.05	40.99	40.04	41.03	40.06	41.06	40.538	0.488	0.538
60	60.16	61.13	60.15	61.17	60.16	61.2	60.662	0.505	0.662
80	79.98	80.91	79.96	80.94	79.96	80.97	80.453	0.487	0.487
100	100.1	100.94	100.2	100.97	100.2	101	100.553	0.413	0.553
								Repeatability	Accuracy
								0.493	0.563

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 2000mm/min

Acceleration set to 50 mm/s²

Result: Belt skips at approximately 7.5lb (33N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed

distance tested was 250mm

Acceleration set to 7000 mm/s²

Test done under no load

Max speed: 75000mm/min, beyond this motor stalls

Nema 23 belt and pinion actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 26.667

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation	
20	19.76	21.11	19.78	21.12	19.79	21.12	20.447	0.670	0.670	
40	39.86	41.18	39.85	41.19	39.87	41.19	40.523	0.663	0.663	
60	59.99	61.29	59.98	61.28	60	61.28	60.637	0.647	0.647	
80	79.74	81.1	79.76	81.09	79.76	81.09	80.423	0.670	0.670	
100	99.85	101.18	99.85	101.16	99.82	101.2	100.505	0.665	0.665	
								Repeatability	Accuracy	
									0.663	0.663

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 2000mm/min

Acceleration set to 50 mm/s²

Result: Belt skips at approximately 7.5lb (33N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed
distance tested was 250mm

Acceleration set to 5000 mm/s²

Test done under no load

Max speed: 60000mm/min, beyond this motor stalls

Nema 17 leadscrew actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 199.1 (see note)

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation
20	19.95	20.11	19.95	20.12	19.95	20.1	20.030	0.080	0.080
40	39.96	40.1	39.98	40.1	39.97	40.1	40.035	0.065	0.065
60	59.98	60.14	59.98	60.14	59.98	60.12	60.057	0.077	0.077
80	79.97	80.14	79.98	80.13	79.98	80.13	80.055	0.078	0.078
100	99.97	100.12	99.96	100.12	99.96	100.1	100.038	0.075	0.075
								Repeatability	Accuracy
								0.075	0.075

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 2000mm/min

Acceleration set to 50 mm/s²

Result: Motor stalls at approximately 13.5lb (60N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed
distance tested was 250mm

Acceleration set to 200 mm/s²

Test done under no load

Max speed: 11000mm/min, beyond this motor stalls

Nema 17 belt driven actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 26.667

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation
20	20.04	20.51	20.06	20.52	20.06	20.51	20.283	0.230	0.283
40	39.85	40.31	39.86	40.32	39.87	40.31	40.087	0.227	0.227
60	59.96	60.44	59.98	60.43	59.99	60.42	60.203	0.227	0.227
80	80.03	80.54	80.06	80.53	80.07	80.53	80.293	0.240	0.293
100	99.83	100.39	99.84	100.37	99.85	100.4	100.108	0.268	0.268
								Repeatability	Accuracy
								0.238	0.260

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 2000mm/min

Acceleration set to 50 mm/s²

Result: Motor stalls at approximately 2.5lb (11N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed

distance tested was 250mm

Acceleration set to 200 mm/s²

Test done under no load

Max speed: 20000mm/min, beyond this motor stalls

Nema 17 belt and pinion actuator

Positioning Test: move forward and back to five setpoints, repeated 6 times

Motor driver set to 8X microstepping, approximately 1.25A current

Steps/mm set to 40

Test done under no load

Target distance	Test 1	Test 2	Test 3	Test 4	Test 5	Test 6	Average	Average Deviation	Actual Deviation
20	19.94	20.6	19.94	20.61	19.94	20.57	20.267	0.327	0.327
40	39.97	40.6	39.96	40.57	39.98	40.56	40.273	0.303	0.303
60	59.98	60.62	59.98	60.6	59.97	60.57	60.287	0.310	0.310
80	79.96	80.59	79.97	80.57	79.98	80.56	80.272	0.302	0.302
100	100	100.62	100	100.61	100	100.6	100.312	0.302	0.312
								Repeatability	Accuracy
								0.309	0.311

Force test: vary pressure in air cylinder until actuator can no longer move a set distance

Speed set to 4000mm/min

Acceleration set to 100 mm/s²

Result: Motor stalls at approximately 2.5lb (11N)

Speed test: increase speed and acceleration and test long enough movement to allow actuator to reach full speed

distance tested was 250mm

Acceleration set to 4000 mm/s²

Test done under no load

Max speed: 60000mm/min, beyond this motor stalls