Danaher Precision Systems
Specifications and Final Inspection Report
100 Series Controllers

Order Information

COMPFIR100.DOC Rev. 1

Customer: UWF & Cal at San Diego	Tested By: Gary Lindsey	Part No. 1122363HR
Sales Order No. 20611031	Date: 1/25/07 W.O.#	Serial No. 58334

Assembly Check List: End of Job

Certified By: Cr

Feature:	Acceptable
Anodizing	✓
Scratches	✓

Unit Settings:

Certified By: Cr

Parameter	Specification/Setting
Input Voltage	Tested at: 115VAC (✓) 230VAC (✓) Shipped at: 115 VAC
Drive Module Type	( )SDM7 ( )MDM7 (✓)CNO-165 Other______
Check Remote Clock Speed Response	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Check Switch Step	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Check Switch Direction	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Check Switch Idle	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Check Power Supply Voltage	+ 28 VDC + 56 VDC
(101 & 102) Supply # 1	( ) (✓) 49.2 VDC
(103 & 104) Supply # 2	( ) (✓) 49.9 VDC
(105 & 106) Supply # 3	( ) ( )

Pre Run-in Testing:

Certified By: Cr

Axis	Micro Stepper	Motor Current	Idle Current
X	(✓)	(✓) 1.45 A 8.2K	(✓) 1.23A 6.8K
Y	(✓)	(✓) 1.45A 8.2K	(✓) 1.22A 6.8K
Z	(✓)	(✓) 1.50 A 8.2K	(✓) 1.27 A 6.8K
T	( )	( )	( )
U	( )	( )	( )
V	( )	( )	( )
Fan Operation	(✓) Properly Functioning		
System Test	(✓) Complete		

Post Run-in Testing:

Certified By: Cr

Run-in to be 8 Hr. min. (Run-In Time,Date) IN 5pm 1/25 OUT 7am 1/26 HR's 14

Parameter	Specification/Setting
Check Remote Input Clock Speed Response	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Check Switch Step	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Check Switch Direction	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V

New England Affiliated Technologies
Specifications and Final Inspection Report
100 Series Controllers

Post Run-in Testing: **Certified By:** CR

Check Switch Idle	(✓)X (✓)Y (✓)Z ( )T ( )U ( )V
Fan Operation	(✓)Properly Functioning

Dip Switch Settings As Shipped (On/Off): **Certified By:** CR

Axis	Switch 1	Switch 2	Switch 3	Switch4	Switch 5	Switch 6
X	on	off	off	on	off	off
Y	on	off	off	on	off	off
Z	on	off	off	on	off	off
T						
U						
V						

CUSTOMER UNIVERSITY OF CALIFORNIA	PART NO. [redacted] 12-0923	MODEL: FM-400 W/ BRAKE
SALES ORDER NO. 20611031	WORK ORDER NO.20611031.1	
COMMERCIAL or PRECISION	SERIAL NO.58287	

WAY CHARACTERISTICS: **PERFORMED BY:JIM M**

PARAMETER	SPECIFICATION – BY STAGE SIZE				LOWER AXIS	UPPER AXIS
	400	600	800	1200		
FLATNESS (um)	4	6	8	12	3	
STRAIGHTNESS (um)	4	6	8	12	4	
PITCH (arc-seconds)	4	6	8	12	3	
YAW (arc-seconds)	4	6	8	12	5	
ORTHOGANALITY (arc-sec)	Commercial: <= 50 arc-sec Precision: <= 20 arc-seconds				N/A	

ORTHOGANALITY CALCULATIONS (IF APPLICABLE) **PERFORMED BY:N/A**

TEST AXIS	NULL AXIS			
	+	CENTER	-	MAX. CHANGE
+				
CENTER				
-				

Linear Error: (Max change +) plus (Max change -)
Orthoganality = 200,000 x Linear Error / travel = _____ arc-sec

SCREW CHARACTERISTICS: **PERFORMED BY:**

PARAMETER	SPECIFICATION – BY STAGE SIZE				LOWER	UPPER
	400	600	800	1200		
Bidirectional Repeatability (um)	3	3	3	3	SEE LASER	
Accuracy (um)*	8	12	16	24	TEST	

- If system has an encoder, leave this section blank and complete positional accuracy portion for encoder on page 2

PARAMETER	SPECIFICATION – BY SCREW DIA.			LOWER	UPPER
		.5 inch	.75 inch		
Screw Torque	Plus End	4 – 8 oz-in	8 – 12 oz-in	12	
	Center	4 – 8 oz-in	8 – 12 oz-in	12	
	Minus End	4 – 8 oz-in	8 – 12 oz-in	12	

TRAVEL LIMIT DATA **PERFORMED BY:**

PARAMETER	SPECIFICATION – ALL STAGES	LOWER AXIS	UPPER AXIS
Mechanical travel + direction	Nominal Travel + .06" (minimum)	1.329	
Mechanical travel - direction	Nominal Travel - .06" (minimum)	1.286	
Travel to limit + direction	Nominal Travel + .015" - .035"	1.027	
Travel to limit - direction	Nominal Travel - .015" - .035"	1.021	

VELOCITY TESTS (tests performed over full travel in both + and – directions with payload) **PERFORMED BY:**

PARAMETER	REQUIREMENT	LOWER AXIS		UPPER AXIS	
PAYLOAD	installed on stage	50			
INITIAL VELOCITY	inches per second	4000			
MAXIMUM VELOCITY	inches per second	30000			
MAXIMUM ACCELERATION	inches per sec^2	100000			
8 HOUR RUN	completed	Yes	No	Yes	No
COLD START	completed	Yes	No	Yes	No

ENCODER INFORMATION (IF APPLICABLE) **PERFORMED BY:**

PARAMETER	LOWER AXIS	UPPER AXIS
MODEL NO.	RENISHAW RGH22	
SERIAL NUMBER		
OUTPUT (DIFF/SINGLE)		
RESOLUTION	0.1 UM	

ENCODER REPEATABILITY: performed at customer required velocity			
Counts - Full Length		LOWER AXIS	UPPER AXIS
Trial 1	+ / - 1 ENCODER COUNT	509954	
Trial 2		509954	
Trial 3		509954	
Counts – Limit to index			
Trial 1	+ / - 1 ENCODER COUNT	-257582	
Trial 2		-257582	
Trial 3		-257582	
Counts – Nominal travel		520659	

POSITIONAL ACCURACY	SPECIFICATION – BY STAGE SIZE				UPPER	LOWER
	400	600	800	1200		
Positional Accuracy (um)	5	6	8	10		

SERVO TUNING **PERFORMED BY:N/A**

Axis	Proportional	Integral	Derivative	Bandwidth
Lower				
Upper				

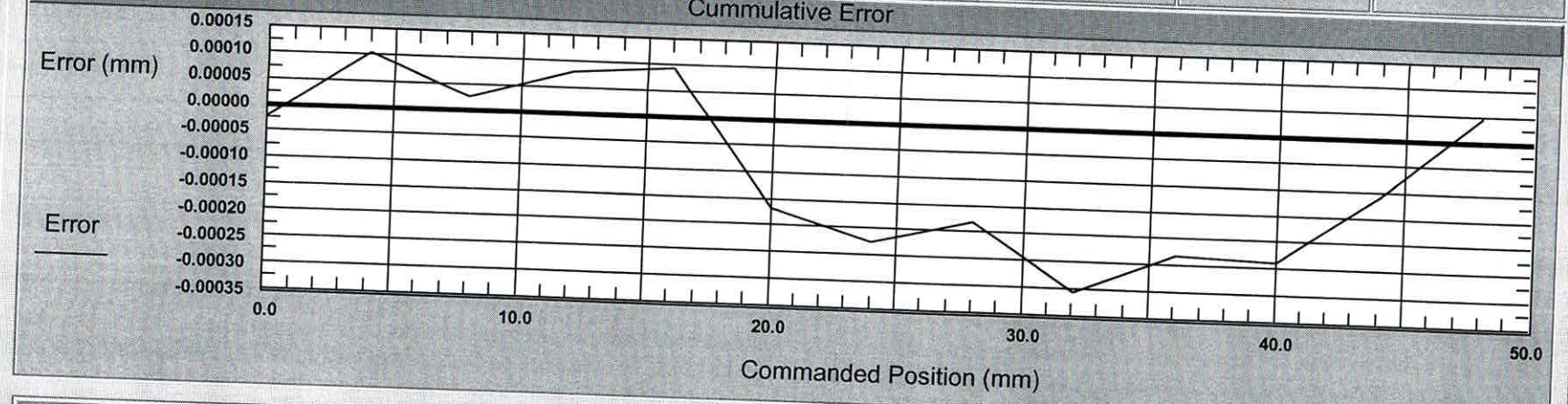
ASSEMBLY CHECKLIST **PERFORMED BY:**

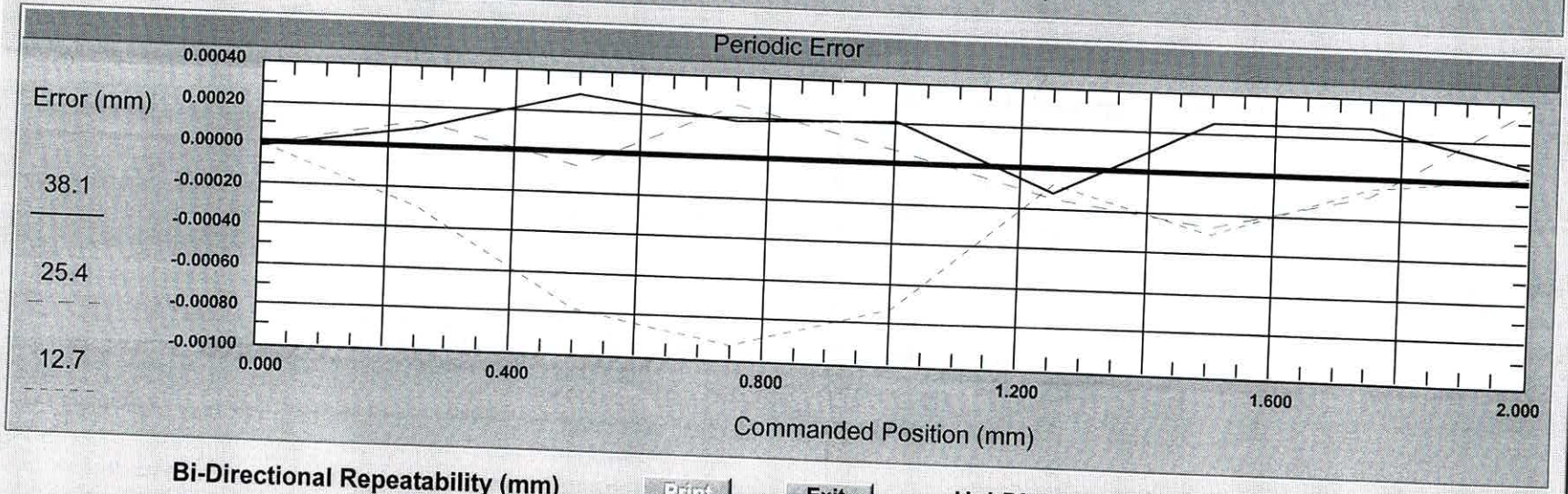
Feature	Completed	Feature	Completed
Anodizing is acceptable		Stage has been cleaned	
Surface is free of scratches		Preload sticker is attached	
Shipping stop is installed		Logo / Serial Number are attached	

REV	DESCRIPTION OF CHANGE	DATE
4	Updated specs to match newest catalog updates	12/17/01
5	Changed format of sheet back to original standard.	2/11/02

Danaher Precision Systems Accuracy Test

Serial Number	Travel (in)	Axis	Screw Type	Screw Pitch	Motor Step/Rev	Technician	Scale Factor
58287	2	Single	Metric	2	400	RAY L	1.00000





Bi-Directional Repeatability (mm)

Print Exit

Uni-Directional Repeatability (mm)

38.1	25.4	12.7
0.00028	0.00021	0.00014

38.1	25.4	12.7
0.00001	-0.00004	-0.00002

RMA 26653

DanaherMotion
www.DanaherMotion.com
Kollmorgen • Pacific Scientific • Portescap • Superior Electric
7C Raymond Avenue Salem, New Hampshire 03079 TEL: 603.893.0588 FAX: 603.893.8711

Customer Service Repair Report

UNIV. OF CALIF.,SAN DIEGO 92093UCS
DISBURSEMENTS DIVISION, 0955
9500 GILMAN DRIVE

LA JOLLA CA 92093-095

Type	REPAIR
Contact	
Phone	
Fax	
Email	
PO No.	0

Returned Item

Part Number	12-0923	Serial Number	58286	Date Received	3/5/2007
Part Description	FM-400 2mm W/BRAKE	Warranty	YES	Date Complete	3/9/2007
Cust Ref Num				Date Shipped	3/9/2007

Customer Concern / Request

Mechanical travel needs to be reduced to 2" of travel

Diagnosis

Stage not built to mechanical travel specs.

Repairs Completed Repair By:

Installed longer linear bearings to reduce mech. travel to spec.

RMA **26653**

DanaherMotion
www.DanaherMotion.com
7C Raymond Avenue Salem, New Hampshire 03079 TEL: 603.893.0588 FAX: 603.893.8711

Customer Service Repair Report

UNIV. OF CALIF.,SAN DIEGO 92093UCS
DISBURSEMENTS DIVISION, 0955
9500 GILMAN DRIVE

LA JOLLA CA 92093-095

Type	REPAIR
Contact	
Phone	
Fax	
Email	
PO No.	0

Returned Item

Part Number	12-0936	Serial Number	58285	Date Received	3/5/2007
Part Description	FM-400 2mm W/BRAKE	Warranty	YES	Date Complete	3/9/2007
Cust Ref Num				Date Shipped	3/9/2007

Customer Concern / Request

Mechanical travel needs to be reduced to 1" of travel

Diagnosis

Stage not built to mechanical travel specs.

Repairs Completed Repair By:

Installed longer linear bearings to reduce mech. travel to spec.

CUSTOMER UNIVERSITY OF CALIFORNIA	PART NO.12-0936	MODEL: FM-400 W BRAKE
SALES ORDER NO.20611031	WORK ORDER NO.20611031.2	
COMMERCIAL or PRECISION PRECISION	SERIAL NO.58285	

WAY CHARACTERISTICS: **PERFORMED BY:JIM M**

PARAMETER	SPECIFICATION – BY STAGE SIZE				LOWER AXIS	UPPER AXIS
	400	600	800	1200		
FLATNESS (um)	4	6	8	12	4	
STRAIGHTNESS (um)	4	6	8	12	4	
PITCH (arc-seconds)	4	6	8	12	5	
YAW (arc-seconds)	4	6	8	12	3	
ORTHOGANALITY (arc-sec)	Commercial: <= 50 arc-sec Precision: <= 20 arc-seconds				N/A	

ORTHOGANALITY CALCULATIONS (IF APPLICABLE) **PERFORMED BY:N/A**

TEST AXIS	NULL AXIS			
	+	CENTER	-	MAX. CHANGE
+				
CENTER				
-				

Linear Error: (Max change +) plus (Max change -)
Orthoganality = 200,000 x Linear Error / travel = _____ arc-sec

SCREW CHARACTERISTICS: **PERFORMED BY:**JIM M

PARAMETER	SPECIFICATION – BY STAGE SIZE				LOWER	UPPER
	400	600	800	1200		
Bidirectional Repeatability (um)	3	3	3	3	SEE LASER	
Accuracy (um)*	8	12	16	24	TEST	

- If system has an encoder, leave this section blank and complete positional accuracy portion for encoder on page 2

PARAMETER	SPECIFICATION – BY SCREW DIA.			LOWER	UPPER
		.5 inch	.75 inch		
Screw Torque	Plus End	4 – 8 oz-in	8 – 12 oz-in	12	
	Center	4 – 8 oz-in	8 – 12 oz-in	12	
	Minus End	4 – 8 oz-in	8 – 12 oz-in	12	

TRAVEL LIMIT DATA **PERFORMED BY:JIM M**

PARAMETER	SPECIFICATION – ALL STAGES	LOWER AXIS	UPPER AXIS
Mechanical travel + direction	Nominal Travel + .06" (minimum)	.610	
Mechanical travel - direction	Nominal Travel - .06" (minimum)	.615	
Travel to limit + direction	Nominal Travel + .015" - .035"	.518	
Travel to limit - direction	Nominal Travel - .015" - .035"	.523	

VELOCITY TESTS (tests performed over full travel in both + and – directions with payload) **PERFORMED BY:JIM M**

PARAMETER	REQUIREMENT	LOWER AXIS		UPPER AXIS	
PAYLOAD	installed on stage	30			
INITIAL VELOCITY	inches per second	4000			
MAXIMUM VELOCITY	inches per second	30000			
MAXIMUM ACCELERATION	inches per sec^2	100000			
8 HOUR RUN	completed	Yes	No	Yes	No
COLD START	completed	Yes	No	Yes	No

ENCODER INFORMATION (IF APPLICABLE) **PERFORMED BY:JIM M**

PARAMETER	LOWER AXIS	UPPER AXIS
MODEL NO.	RENISHAW RGH22	
SERIAL NUMBER		
OUTPUT (DIFF/SINGLE)		
RESOLUTION	0.1 UM	

ENCODER REPEATABILITY: performed at customer required velocity			
Counts - Full Length		LOWER AXIS	UPPER AXIS
Trial 1	+ / - 1 ENCODER COUNT	254996	
Trial 2		254998	
Trial 3		254997	
Counts – Limit to index			
Trial 1	+ / - 1 ENCODER COUNT	-125025	
Trial 2		-125025	
Trial 3		-125025	
Counts – Nominal travel		263967	

POSITIONAL ACCURACY	SPECIFICATION – BY STAGE SIZE				UPPER	LOWER
	400	600	800	1200		
Positional Accuracy (um)	5	6	8	10	SEE LASER TEST	

SERVO TUNING **PERFORMED BY:N/A**

Axis	Proportional	Integral	Derivative	Bandwidth
Lower				
Upper				

ASSEMBLY CHECKLIST **PERFORMED BY:**

Feature	Completed	Feature	Completed
Anodizing is acceptable		Stage has been cleaned	
Surface is free of scratches		Preload sticker is attached	
Shipping stop is installed		Logo / Serial Number are attached	

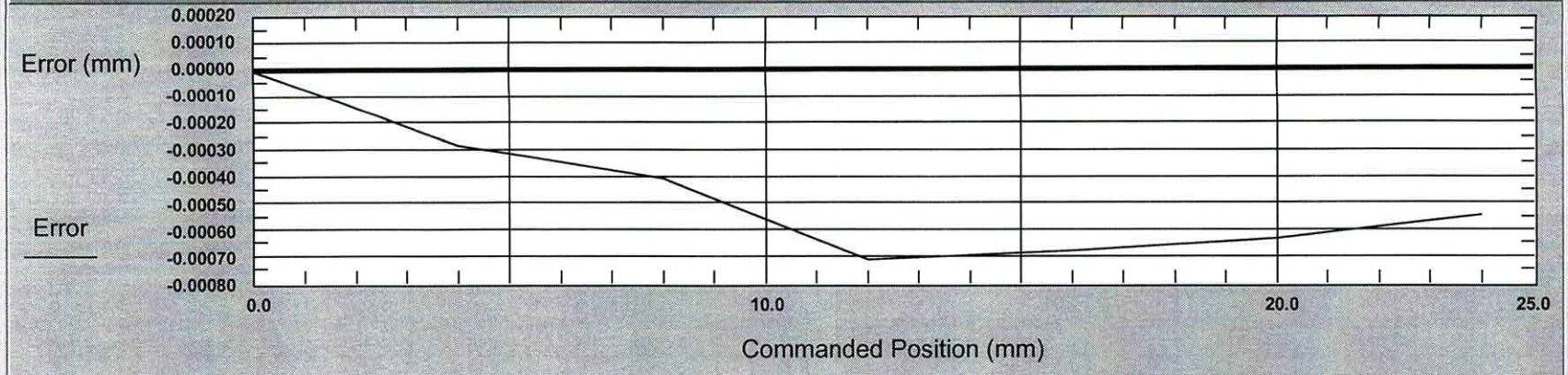
REV	DESCRIPTION OF CHANGE	DATE
4	Updated specs to match newest catalog updates	12/17/01
5	Changed format of sheet back to original standard.	2/11/02

Fri 12/Jan/2007 12:13:10

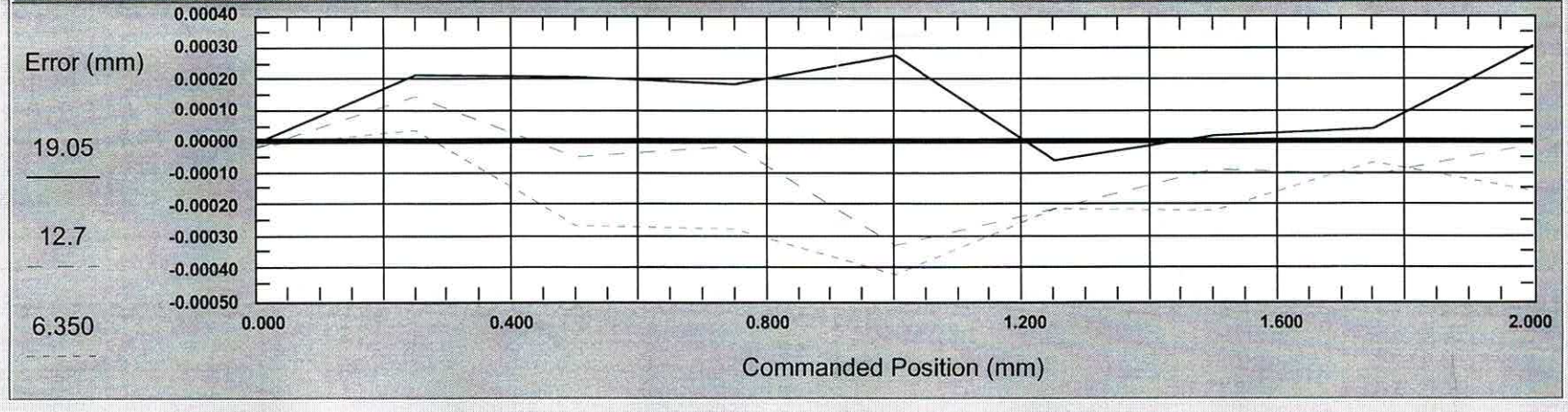
Danaher Precision Systems Accuracy Test

Serial Number	Travel (in)	Axis	Screw Type	Screw Pitch	Motor Step/Rev	Technician	Scale Factor
58285	1	Single	Metric	2	400	RAY L	1.00000

Cummulative Error



Periodic Error



Print Exit

Bi-Directional Repeatability (mm)			Uni-Directional Repeatability (mm)		
19.05	12.7	6.350	19.05	12.7	6.350
0.00028	0.00020	0.00027	-0.00007	-0.00011	-0.00005

CUSTOMER University of california	PART NO.12-0923	MODEL: FM-400 W/ BRAKE
SALES ORDER NO. 20611031	WORK ORDER NO. 20611031.1	
COMMERCIAL or PRECISION PRECISION	SERIAL NO .58286	

WAY CHARACTERISTICS: **PERFORMED BY: JIM M**

PARAMETER	SPECIFICATION – BY STAGE SIZE				LOWER AXIS	UPPER AXIS
	400	600	800	1200		
FLATNESS (um)	4	6	8	12	3	
STRAIGHTNESS (um)	4	6	8	12	3	
PITCH (arc-seconds)	4	6	8	12	5	
YAW (arc-seconds)	4	6	8	12	1	
ORTHOGANALITY (arc-sec)	Commercial: <= 50 arc-sec Precision: <= 20 arc-seconds				N/A	

ORTHOGANALITY CALCULATIONS (IF APPLICABLE) **PERFORMED BY: N/A**

TEST AXIS	NULL AXIS			
	+	CENTER	-	MAX. CHANGE
+				
CENTER				
-				

Linear Error: (Max change +) plus (Max change -)
Orthoganality = 200,000 x Linear Error / travel = _____ arc-sec

SCREW CHARACTERISTICS: **PERFORMED BY:**

PARAMETER	SPECIFICATION – BY STAGE SIZE				LOWER	UPPER
	400	600	800	1200		
Bidirectional Repeatability (um)	3	3	3	3	SEE LASER	
Accuracy (um)*	8	12	16	24	TEST	

- If system has an encoder, leave this section blank and complete positional accuracy portion for encoder on page 2

PARAMETER	SPECIFICATION – BY SCREW DIA.			LOWER	UPPER
		.5 inch	.75 inch		
Screw Torque	Plus End	4 – 8 oz-in	8 – 12 oz-in	12	
	Center	4 – 8 oz-in	8 – 12 oz-in	12	
	Minus End	4 – 8 oz-in	8 – 12 oz-in	12	

TRAVEL LIMIT DATA **PERFORMED BY:JIM M**

PARAMETER	SPECIFICATION – ALL STAGES	LOWER AXIS	UPPER AXIS
Mechanical travel + direction	Nominal Travel + .06" (minimum)	1.309	
Mechanical travel - direction	Nominal Travel - .06" (minimum)	1.289	
Travel to limit + direction	Nominal Travel + .015" - .035"	1.022	
Travel to limit - direction	Nominal Travel - .015" - .035"	1.028	

VELOCITY TESTS (tests performed over full travel in both + and – directions with payload) **PERFORMED BY:**

PARAMETER	REQUIREMENT	LOWER AXIS		UPPER AXIS	
PAYLOAD	installed on stage	50			
INITIAL VELOCITY	inches per second	4000			
MAXIMUM VELOCITY	inches per second	30000			
MAXIMUM ACCELERATION	inches per sec^2	100000			
8 HOUR RUN	completed	Yes	No	Yes	No
COLD START	completed	Yes	No	Yes	No

ENCODER INFORMATION (IF APPLICABLE) **PERFORMED BY:**

PARAMETER	LOWER AXIS	UPPER AXIS
MODEL NO.		
SERIAL NUMBER		
OUTPUT (DIFF/SINGLE)		
RESOLUTION		

ENCODER REPEATABILITY: performed at customer required velocity			
Counts - Full Length		LOWER AXIS	UPPER AXIS
Trial 1	+ / - 1 ENCODER COUNT	50995	
Trial 2		50995	
Trial 3		50995	
Counts – Limit to index			
Trial 1	+ / - 1 ENCODER COUNT	-267162	
Trial 2		-267162	
Trial 3		-267162	
Counts – Nominal travel		520973	

POSITIONAL ACCURACY	SPECIFICATION – BY STAGE SIZE				UPPER	LOWER
	400	600	800	1200		
Positional Accuracy (um)	5	6	8	10	SEE LASER	TEST

SERVO TUNING **PERFORMED BY:N/A**

Axis	Proportional	Integral	Derivative	Bandwidth
Lower				
Upper				

ASSEMBLY CHECKLIST **PERFORMED BY:**

Feature	Completed	Feature	Completed
Anodizing is acceptable		Stage has been cleaned	
Surface is free of scratches		Preload sticker is attached	
Shipping stop is installed		Logo / Serial Number are attached	

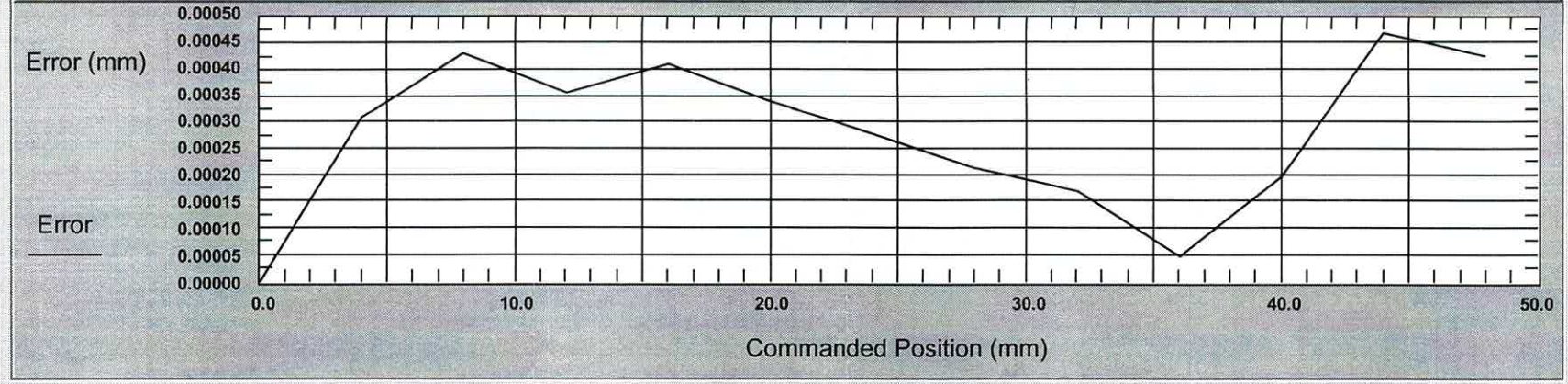
REV	DESCRIPTION OF CHANGE	DATE
4	Updated specs to match newest catalog updates	12/17/01
5	Changed format of sheet back to original standard.	2/11/02

Fri 12/Jan/2007 12:20:43

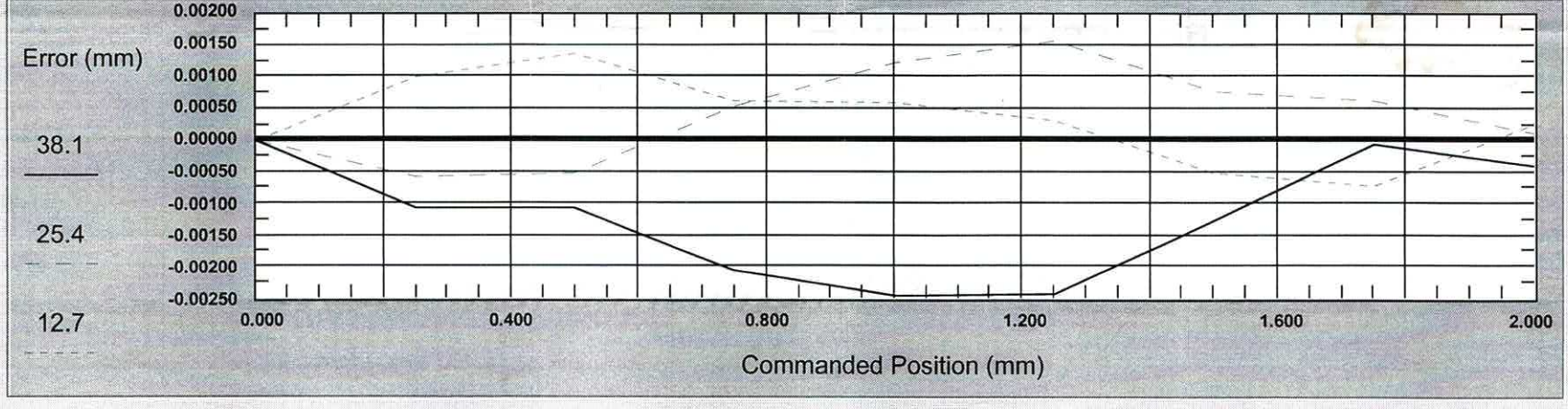
Danaher Precision Systems Accuracy Test

Serial Number	Travel (in)	Axis	Screw Type	Screw Pitch	Motor Step/Rev	Technician	Scale Factor
58286	2	Single	Metric	2	400	RAY L	1.00000

Cummulative Error



Periodic Error



Print Exit

Bi-Directional Repeatability (mm)			Uni-Directional Repeatability (mm)		
38.1	25.4	12.7	38.1	25.4	12.7
0.00040	0.00077	0.00036	0.00034	0.00038	0.00022