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Technical note

The testing of a Renishaw SP600M scanning probe to determine three key performance characteristics

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Date: 12th December 2001

Test 1

Objectives

To evaluate the performance of the SP600M in relation to scanning with different deflections, without re-calibrating the probe for those deflections.

Method

ISO 10360-4 test.

Three different SP600 probes were tested with a stylus length of 50 mm, performing the ISO 10360-4 test at different nominal deflections (using just one calibration).

Scan speed: 5 mm/s
Machine specification: 5+L/250 µm
Controller: Renishaw UCC controller
Stylus material: Ceramic

Results

(NOTE: Raw data, i.e. no filters, have been utilised.)

Probe serial no.	Result	Deflection (mm)				
		0.2	**0.3**	**0.4**	**0.5**	**0.6**
T37931	RMS	0.91	0.69	0.55	0.61	0.89
	Min	-2.9	-2.0	-1.9	-2.2	-2.4
	Max	2.5	2.0	1.8	1.9	3.1
	Radius Error	0.0010	0.0010	0.0008	0.0006	0.0001
T70366	RMS	0.96	0.8	0.7	0.76	1.08
	Min	-2.3	-2.1	-2.2	-2.6	-3.3
	Max	2.9	2.7	2.2	2.0	2.9
	Radius Error	0.0006	0.0009	0.0008	0.0006	0.0005
T74786	RMS	0.85	0.61	0.51	0.56	0.77
	Min	-2.2	-1.8	-1.8	-2.0	-2.8
	Max	2.3	1.8	1.4	2.2	3.0
	Radius Error	0.0009	0.0009	0.0009	0.0009	0.0006

Conclusion

Changing the deflection of the probe, causing varying probing force, has no discernible affect upon the quality of the measurement data.

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Test 2

Objectives

To confirm that increasing the stylus length on an SP600M does not introduce sensitivity to deflection.

Method

ISO 10360-4 test.

An SP600 probe (serial no. T74786) was tested using different stylus lengths, performing the ISO 10360-4 test at different nominal deflections (using just one calibration).

Scan speed: 5 mm/s
Machine specification: 5+L/250 µm
Controller: Renishaw UCC controller
Stylus material: Ceramic

Results *(NOTE: Raw data, i.e. no filters, have been utilised.)*

Stylus length	Result	Deflection (mm)			
		0.2	**0.3**	**0.4**	**0.5**
50 mm	RMS	0.85	0.61	0.51	0.56
	Min	-2.2	-1.8	-1.8	-2.0
	Max	2.3	1.8	1.4	2.2
	Radius Error	0.0009	0.0009	0.0009	0.0009
100 mm	RMS	1.10	0.86	0.83	1.03
	Min	-2.9	-2.4	-2.5	-2.8
	Max	3.6	2.6	3.2	2.8
	Radius Error	0.0006	0.0008	0.0006	0.0004
200 mm	RMS	1.29	1.23	1.49	1.93
	Min	-6.8	-4.3	-4.2	-5.3
	Max	6.1	4.3	8.0	8.1
	Radius Error	0.0014	0.0016	0.0015	0.0009

Conclusion

Even with increasing stylus length, the varying deflection of the probe has no discernible affect upon the quality of the measurement data.

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Test 3

Objectives

Investigate the SP600M's performance with increased stylus lengths.

Method

An SP600M probe (serial no. P37381) was calibrated using different stylus lengths.

For each stylus, an ISO 10360-4 scanning test and a ring gauge test was performed.

Scan speed:	5 mm/s
Machine specification:	5+L/250 µm
Controller:	Renishaw UCC controller
Stylus material:	Ceramic
Data filter:	Harmonic filter with a cut-off order of 60 cycles per revolution (ω_c=377rad/s)

Results

	ISO scanning test		Ring gauge scans	
Stylus length	Raw data span (µm)	Filtered data span (µm)	Raw data span (µm)	Filtered data span (µm)
20 mm	3.5	**2.2**	3.7	**1.9**
50 mm	2.9	**1.9**	4.3	**2.2**
100 mm	3.8	**2.5**	4.8	**2.6**
150 mm	5.1	**3.7**	6.1	**2.9**
200 mm	9.0	**3.7**	8.5	**3.1**

Conclusion

Whilst there is a deterioration of measurement accuracy with an increase in length, the deformation is small, especially when filtered data is considered.

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