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SP80 and SP80H

SP80 and SP80H design principles

Renishaw's design brief for SP80 and SP80H:

- Very accurate position sensing
- Long reach into parts
- Passive design to avoid unnecessary system complexity
- Designed to avoid stacked axis errors
- Stylus changing capability for reduced cycle times
- Both probe types use the same design principles

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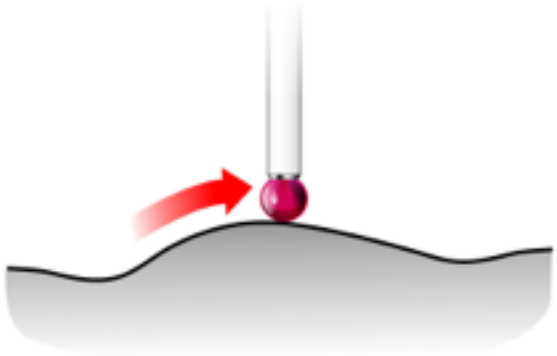
SP80 and SP80H design principles

SP80 is a **PASSIVE** sensor (as opposed to an ACTIVE sensor type) so its features are:

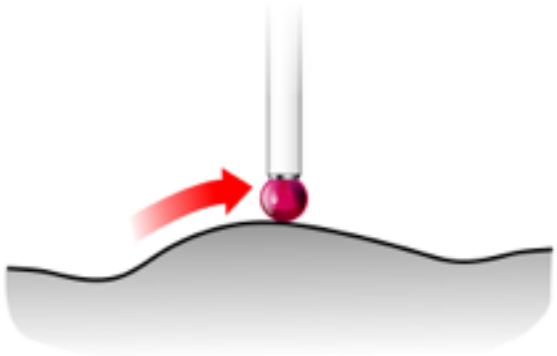
- Simple, accurate and high-performance design
- Robustness and high resistance to most collision damage
- Use of long, heavy, complex and rapidly interchangeable styli
- Long service life, reliability and low cost of ownership



SP80 and SP80H design principles

SP80 is an **ANALOGUE** scanning probe:

- Giving a continuous reading at any time while in contact with the part
- An integral part of the CMMs motion control system - real time X, Y and Z outputs
- A probe whose output is proportional to its deflection



SP80 and SP80H design principles

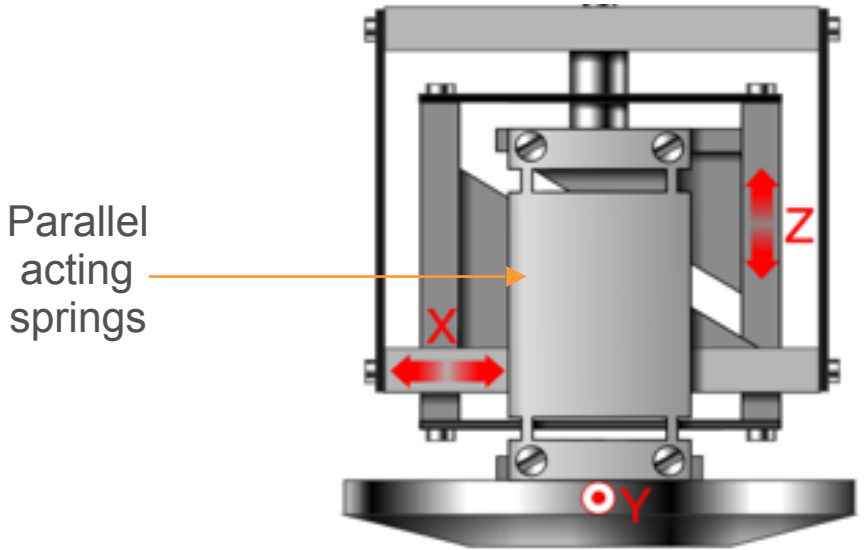
Passive sensor - no motors

- Minimal heat source for greater stability
- No electro-mechanical wear
- Reduced vibration during discrete point measurement

SP80 and SP80H design principles

Box spring mechanism

- Unique design
- Compact and robust mechanism
- Low inertia
- Rapid dynamic response
- Low spring rates
- Single 3D ferro-fluid damper
- Avoids stacked axis errors



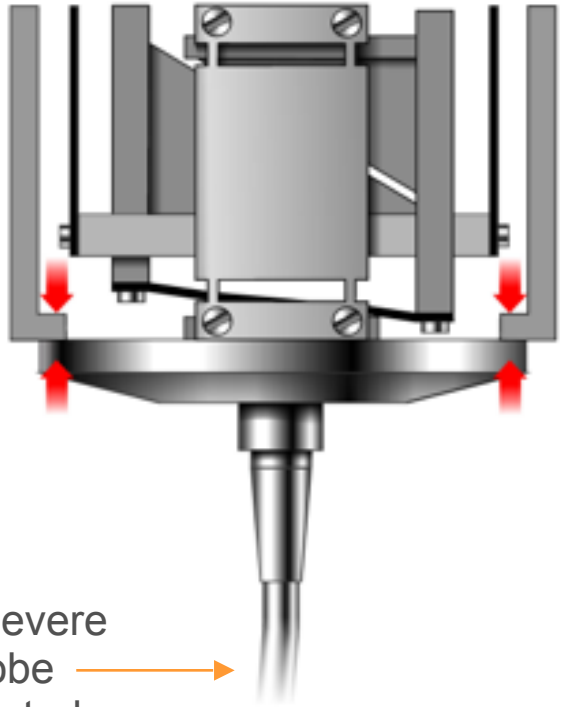
SP80 and SP80H design principles

XY crash protection

- Stylus holder joint has low release force
- Over-travel in XY causes stylus holder to detach

Z crash protection

- Outer housing provides a ‘bump stop’ to prevent damage to probe mechanism and readhead

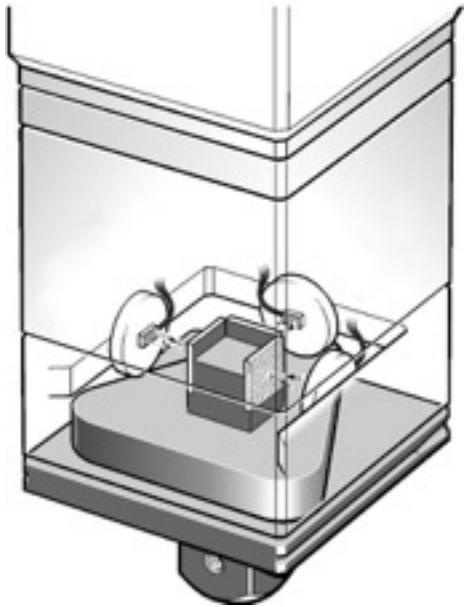


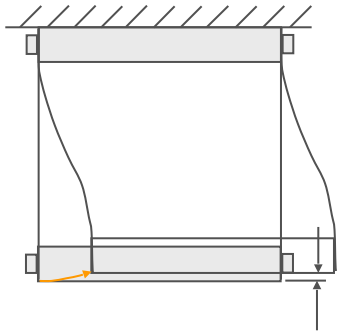
Stylus deforms in a severe Z crash, whilst probe mechanism is protected

SP80 and SP80H design principles

Isolated optical metrology

- Readheads attached to probe housing
- Measures deflection of whole mechanism, not just one axis:
  - Eliminates inter-axis errors
  - Picks up thermal and dynamic effects





SP80 avoids inter-axis error

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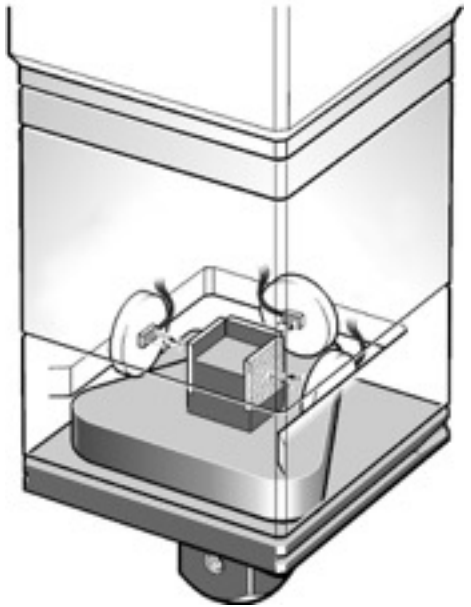
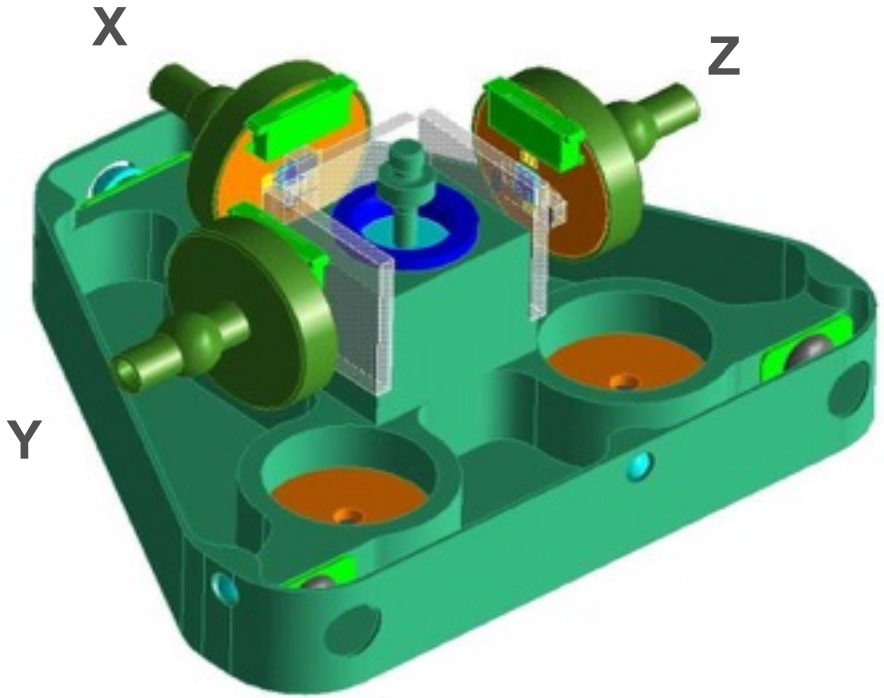
SP80 and SP80H design principles

- Probes with stacked axes cannot measure inter-axis errors directly
- SP80 features digital readheads with 0.02 μm resolution reading precision gratings
- accuracy defined by straightness of lines on each grating and calibrated squareness of gratings, not by probe mechanical design



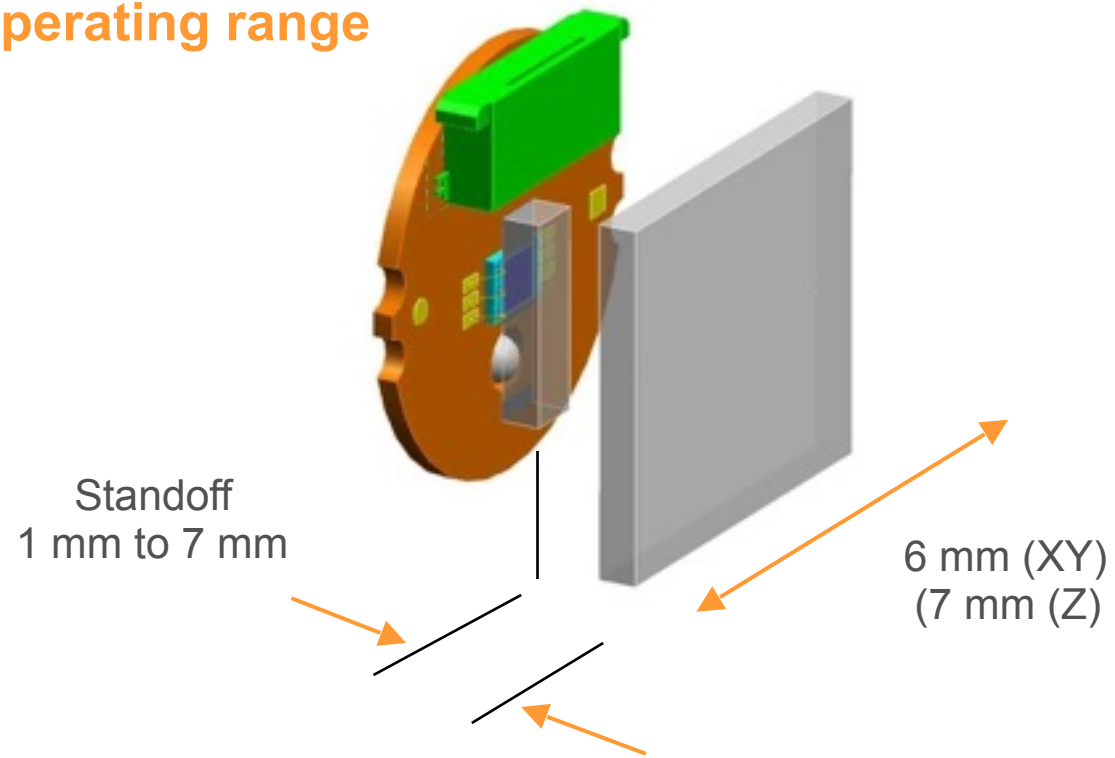
SP80 and SP80H design principles

Readhead arrangement



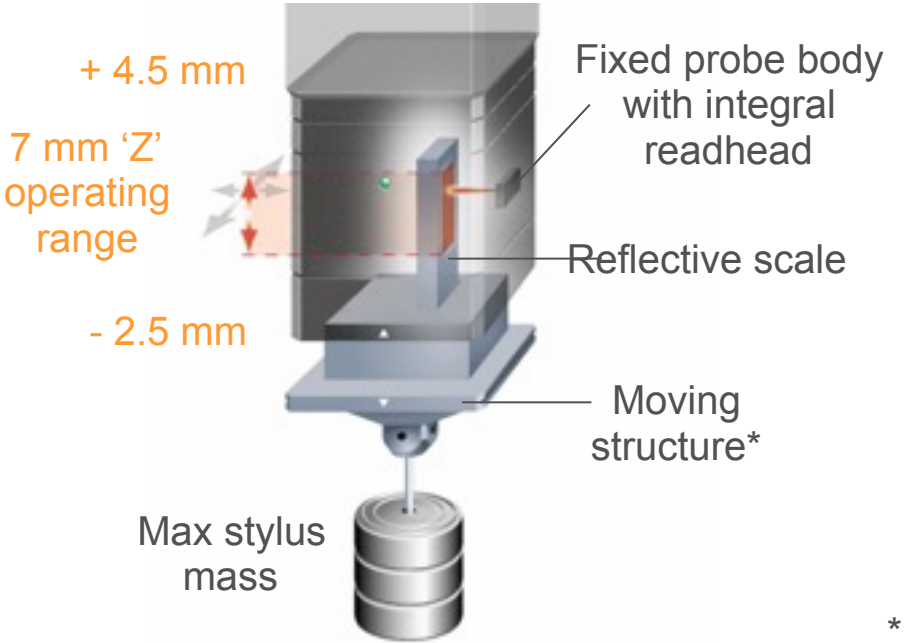
SP80 and SP80H design principles

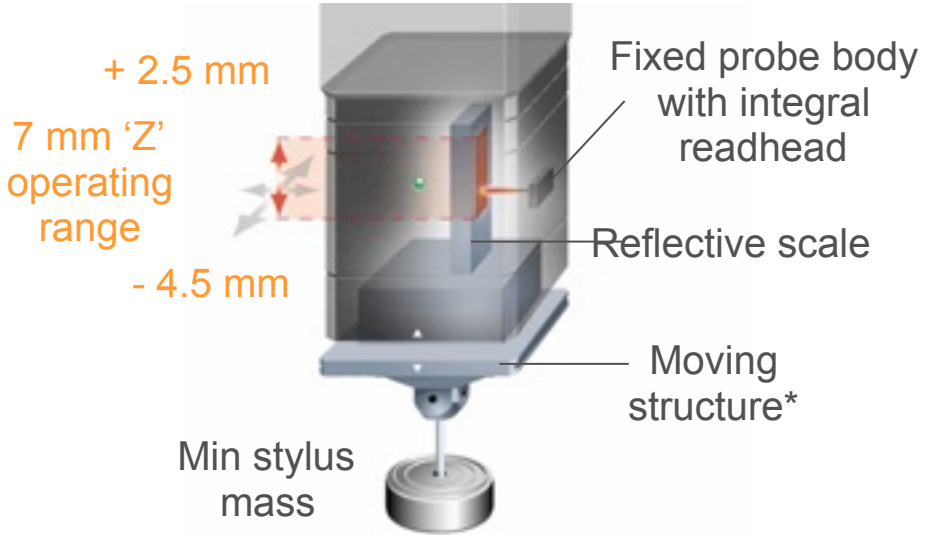
SP80 readhead operating range



SP80 and SP80H design principles

Readheads permit a large operating range on SP80…

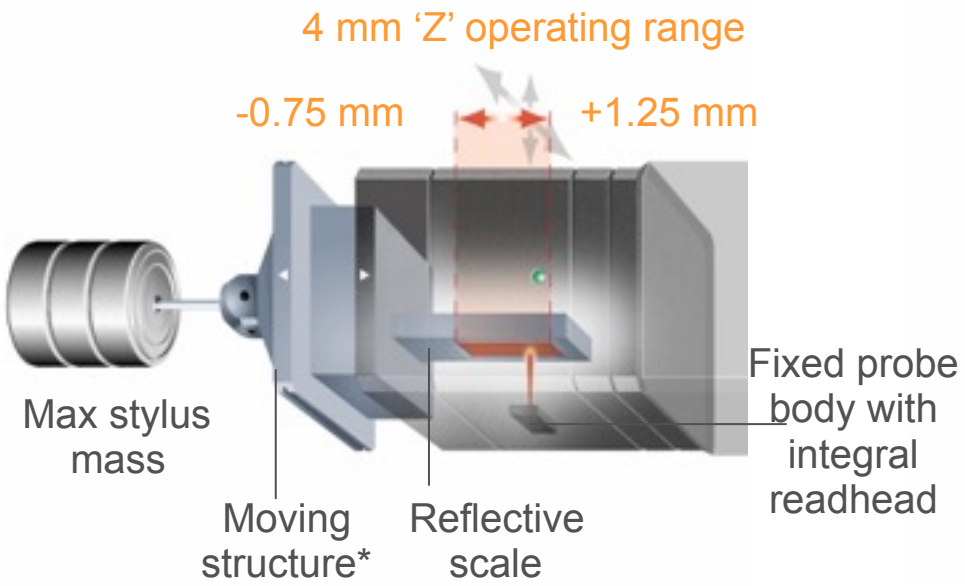


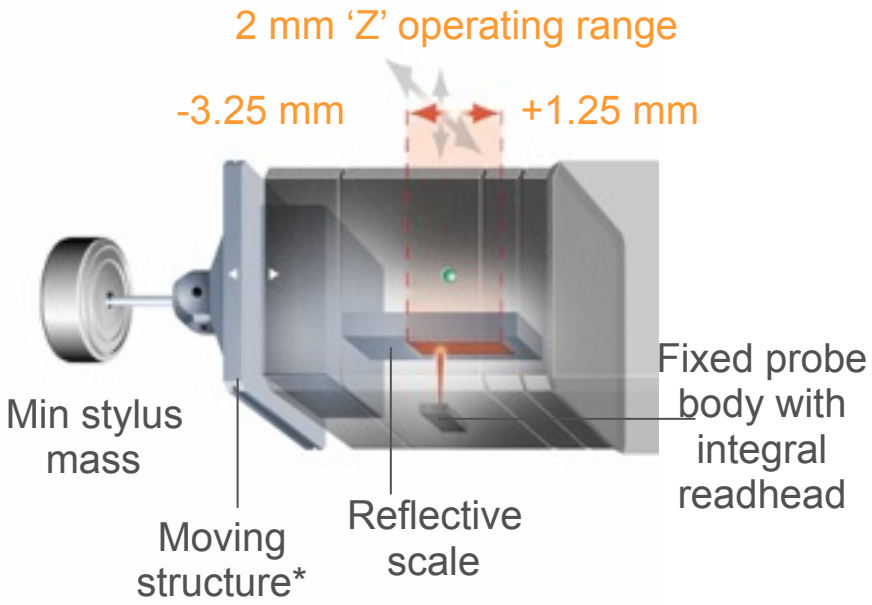


* Stylus holder and reflective scale move together

SP80 and SP80H design principles

…and on SP80H



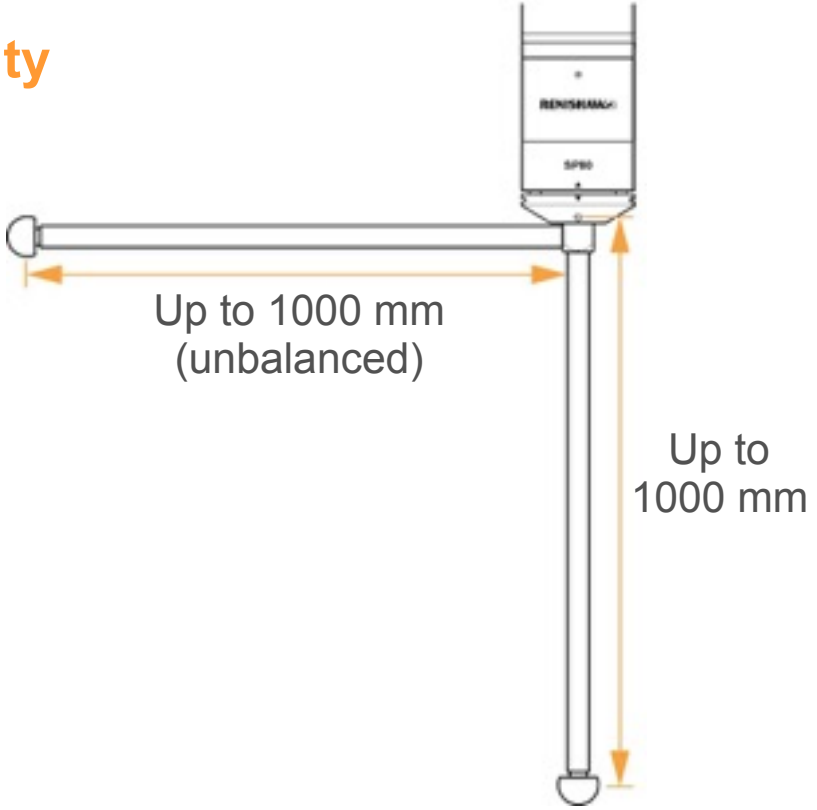


* Stylus holder and reflective scale move together

SP80 and SP80H design principles

SP80 maximum stylus carrying capability

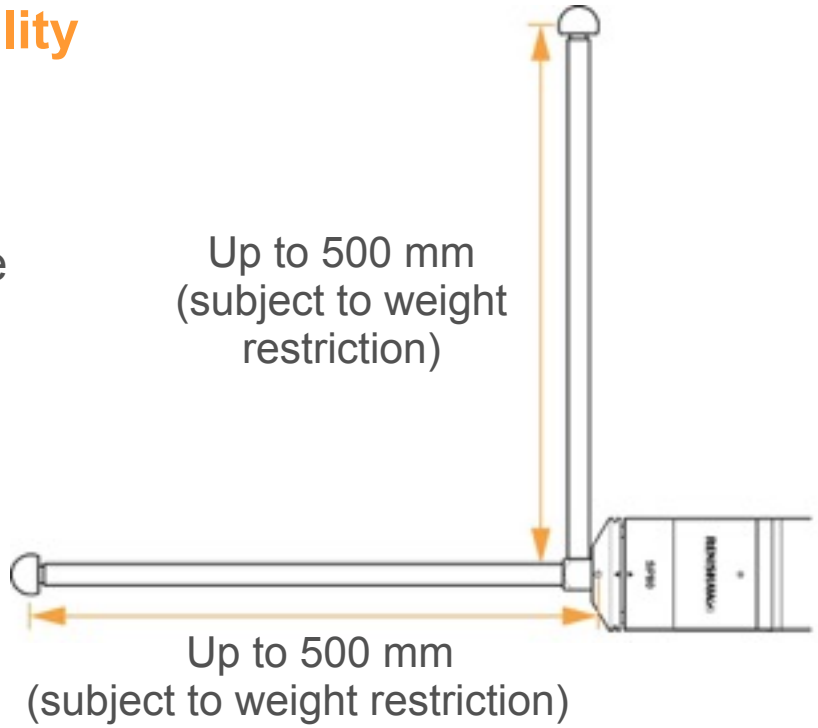
- Maximum unidirectional length 1000 mm (using SH80 EXT)
- Maximum load 500 g with no -Z range compromise
- >500 g reduces -Z range
- Styli thread M5



SP80 and SP80H design principles

SP80H maximum stylus carrying capability

- Maximum unidirectional length 500 mm
- Maximum stylus weight 200 g with centre of gravity 100 mm max from stylus holder cube
- Styli thread M5



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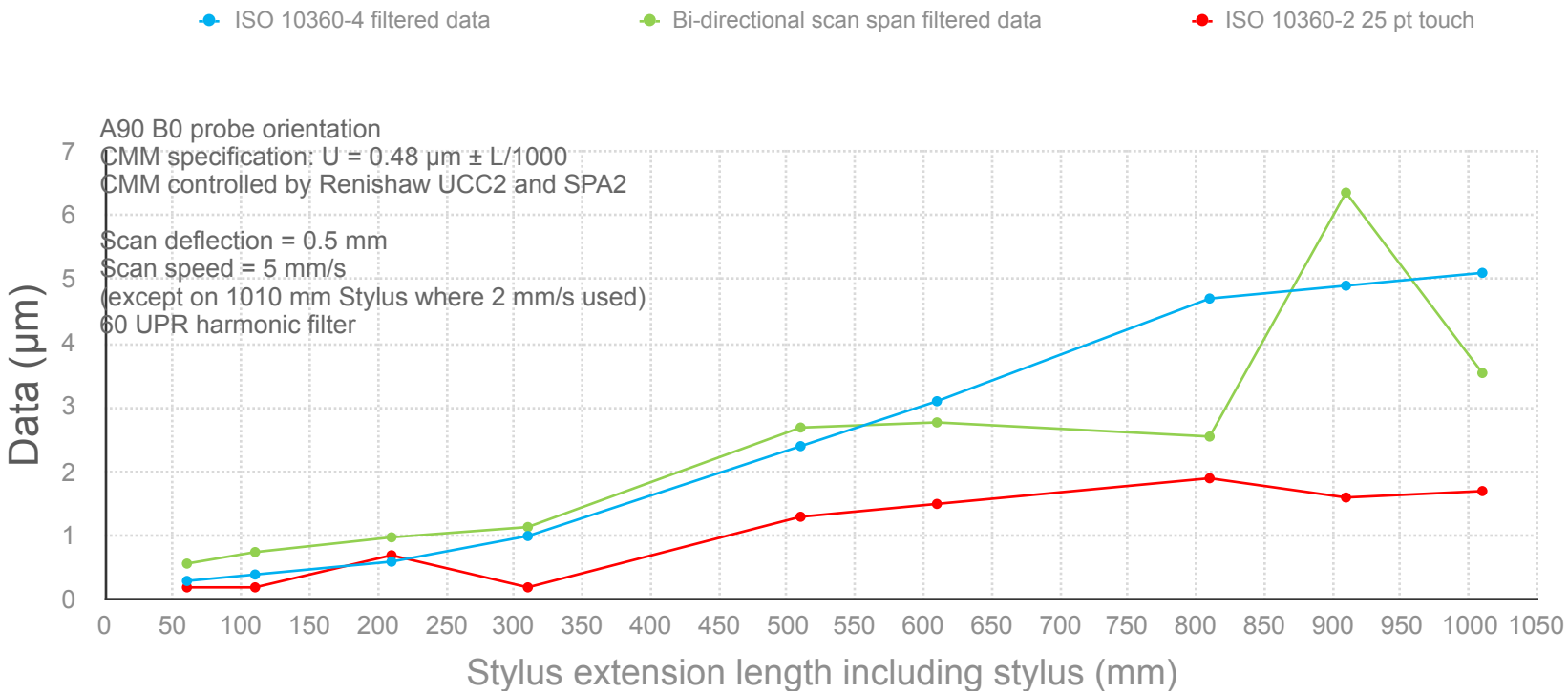
SP80 - scanning performance (up to 1000 mm stylus)



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SP80 and SP80H specification summary

Mounting	Vertical fixed quill mount with options:	
	KM80	standard mount method
	KM6080	adapts down to 60 mm × 60 mm quill
	SM80	shank mount - non-preferred
Probe physical size	80 mm square body	
	105 mm long including SH80	
Probe mass	SP80 probe body	860 g (incl. 160 g moving structure)
	SH80 stylus holder	170 g (excl. stylus)
	KM80 quill mount	110 g

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SP80 and SP80H specification summary

Calibration method	Simple 1st order polynomial (3 × 3 matrix)
SP80 nominal spring rate	2 N/mm X,Y,Z
SP80H nominal spring rate	1.8 N/mm X,Y
	2.5 N/mm Z
Readhead resolution	Digital scales capable of 0.02 µm
SP80 measurement range	±2.5 mm X,Y,Z (even with up to 500 g styli mass)
SP80H measurement range	±2.5 mm X,Y
	±1.25 mm Z (stylus limitations apply)

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