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SP25M

The world's most compact and versatile scanning probe system

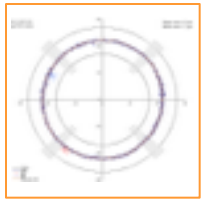
RENSCAN technology

SP25M - the world's most compact and versatile scanning probe system

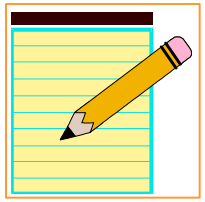
SP25M brings exciting new benefits

SP25M encompasses RENSCAN™ technology

System components - a highly modular concept



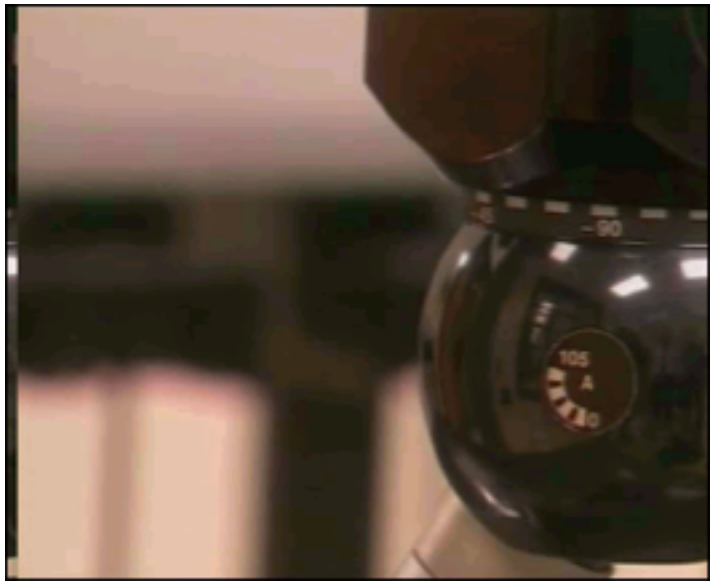
Design characteristics, performance & specification



Ordering information

SP25M brings exciting new benefits

- **Two sensors in one!**
  - a **SCANNING** probe for form measurement and reverse engineering applications, capable of high-accuracy scanning across a stylus length range of 20 mm to 200 mm
  - a **TOUCH TRIGGER** probe, using the versatile **TP20** range of stylus modules

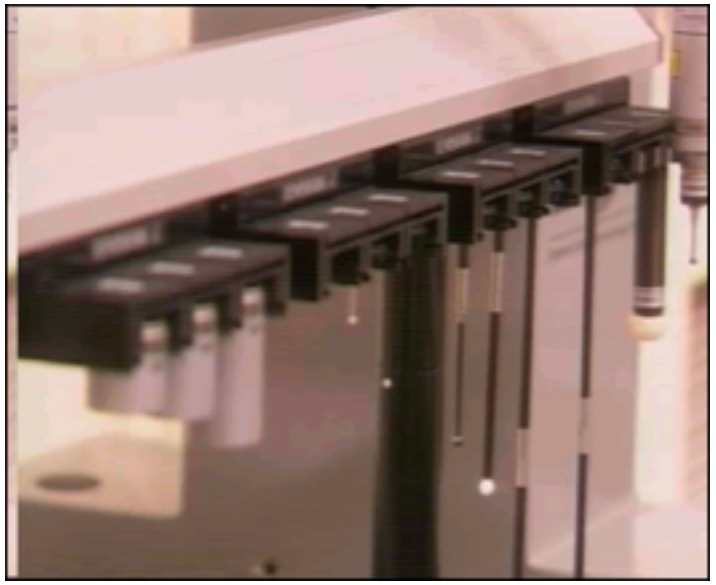


Scanning with SP25M is fast, accurate and flexible

Flexibility through modular design

SP25M brings exciting new benefits

- **Unmatched flexibility**
  - highly modular design permits the perfect measurement solution to suit the application
  - the most flexible change rack system ever!
- **Cost effectiveness**
  - low priced entry-level scanning kits with easy upgrade to include other system elements

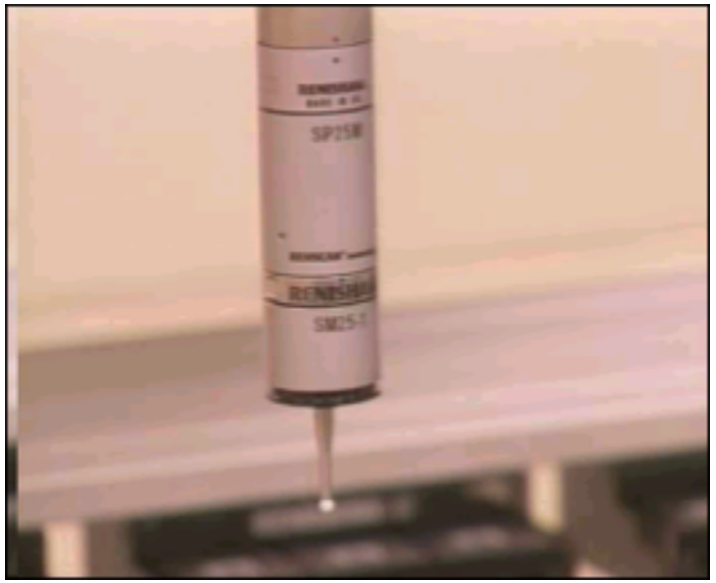


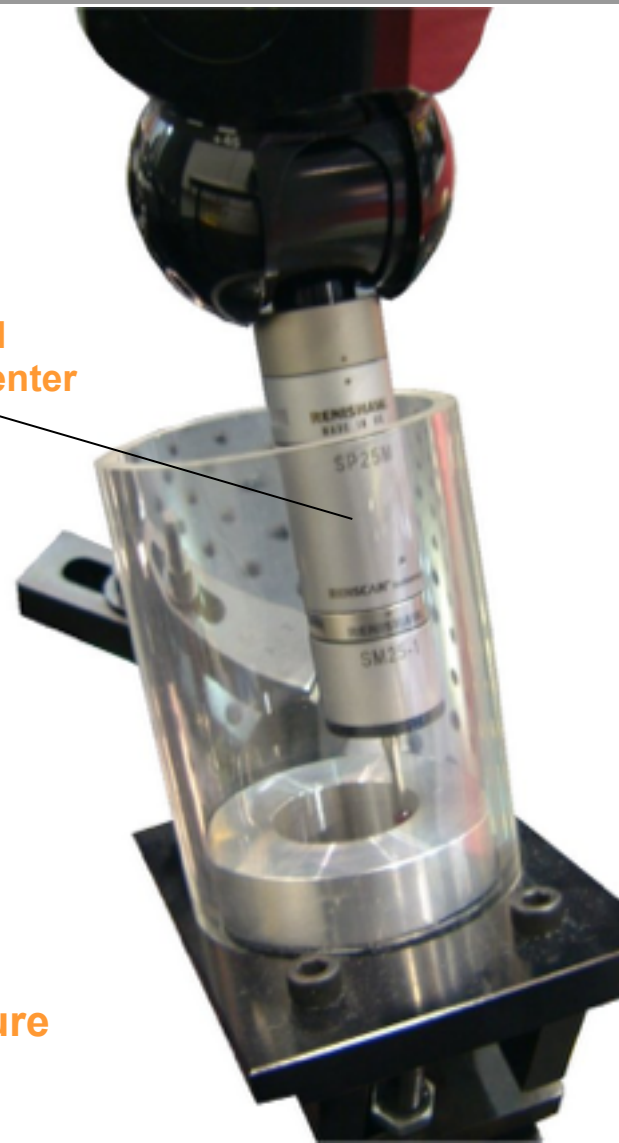
Flexible module and stylus changing

Flexibility through modular design

SP25M brings exciting new benefits

- **Feature access**
  - **ultra-compact at Ø25 mm** for superior part accessibility (small enough to be inserted into many features)

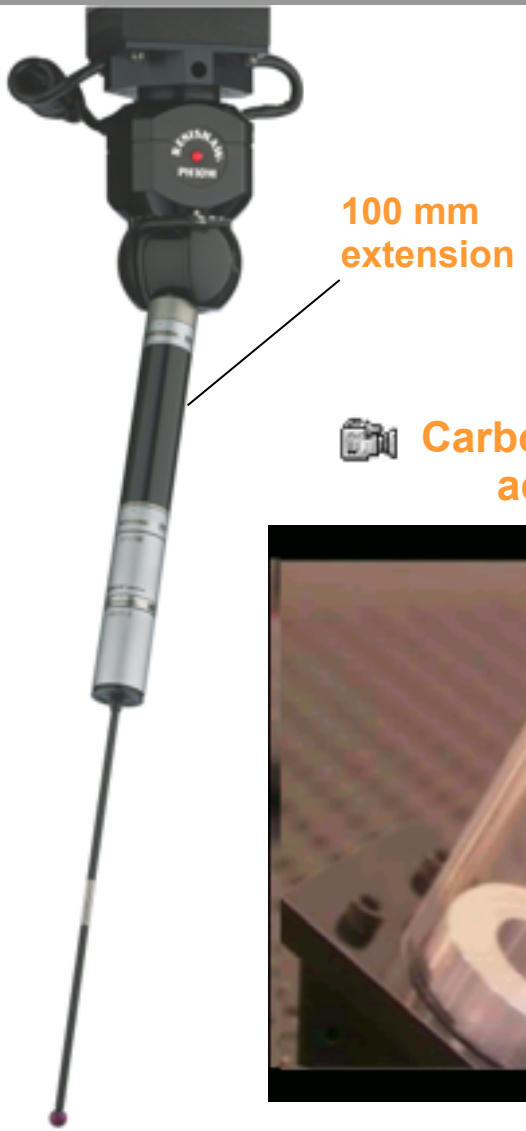




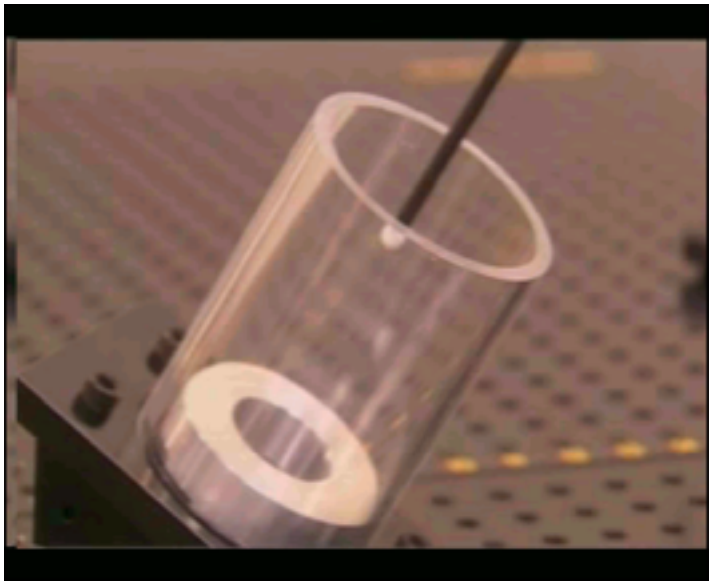
Compact size enhances feature access

SP25M brings exciting new benefits

- **Feature access**
  - total **reach of nearly 400 mm** (15.7 in) is possible by using a probe extension bar
  - **three scanning modules** each optimised for a specific range of stylus lengths
  - stiff **carbon fibre stylus extensions** for excellent effective working length
  - uses **M3 styli** up to **200 mm** (7.9 in)



Carbon fibre extensions for accuracy and long EWL



SP25M brings exciting new benefits

Feature access - SP25M

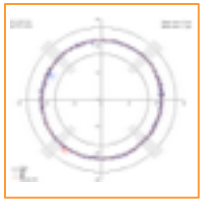
- probe can be mounted on an articulating head means that many features can be accessed with fewer styli
- lower stylus costs
- shorter cycle times

SP25M - the world's most compact and versatile scanning probe system

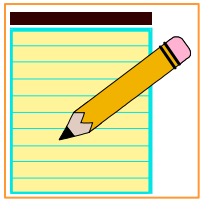
SP25M brings exciting new benefits

SP25M encompasses RENSCAN™ technology

System components - a highly modular concept



Design characteristics, performance & specification



Ordering information

SP25M encompasses RENSCAN technology

Our innovative RENSCAN™ technology scanning philosophy is encompassed by the SP25M probe system ...

- **Speed and accuracy**
  - sensors with high dynamic response to provide high accuracy data at high speed
  - accuracy through sophisticated probe calibration
  - match styli materials to applications for best results
- **Flexibility**
  - probe changing, stylus changing, articulation
- **Cost effectiveness**
  - innovative hardware and scanning techniques reduce complexity
  - robust designs and responsive service for lower lifetime costs

SP25M encompasses RENSCAN technology

SP25M's specific design objectives have been met ...

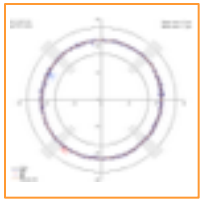
- the **most compact scanning** and **touch trigger** probe available
- innovative pivoting sensor design optimised for **high accuracy across 20mm to 200 mm stylus range**
- system modularity to provide **unmatched user flexibility**
- **passive design** to avoid unnecessary system complexity
- **isolated optical metrology** to avoid stacked axis errors
- **compact and light**, with excellent dynamic response

SP25M - the world's most compact and versatile scanning probe system

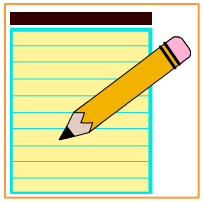
SP25M brings exciting new benefits

SP25M encompasses RENSCAN™ technology

System components - a highly modular concept



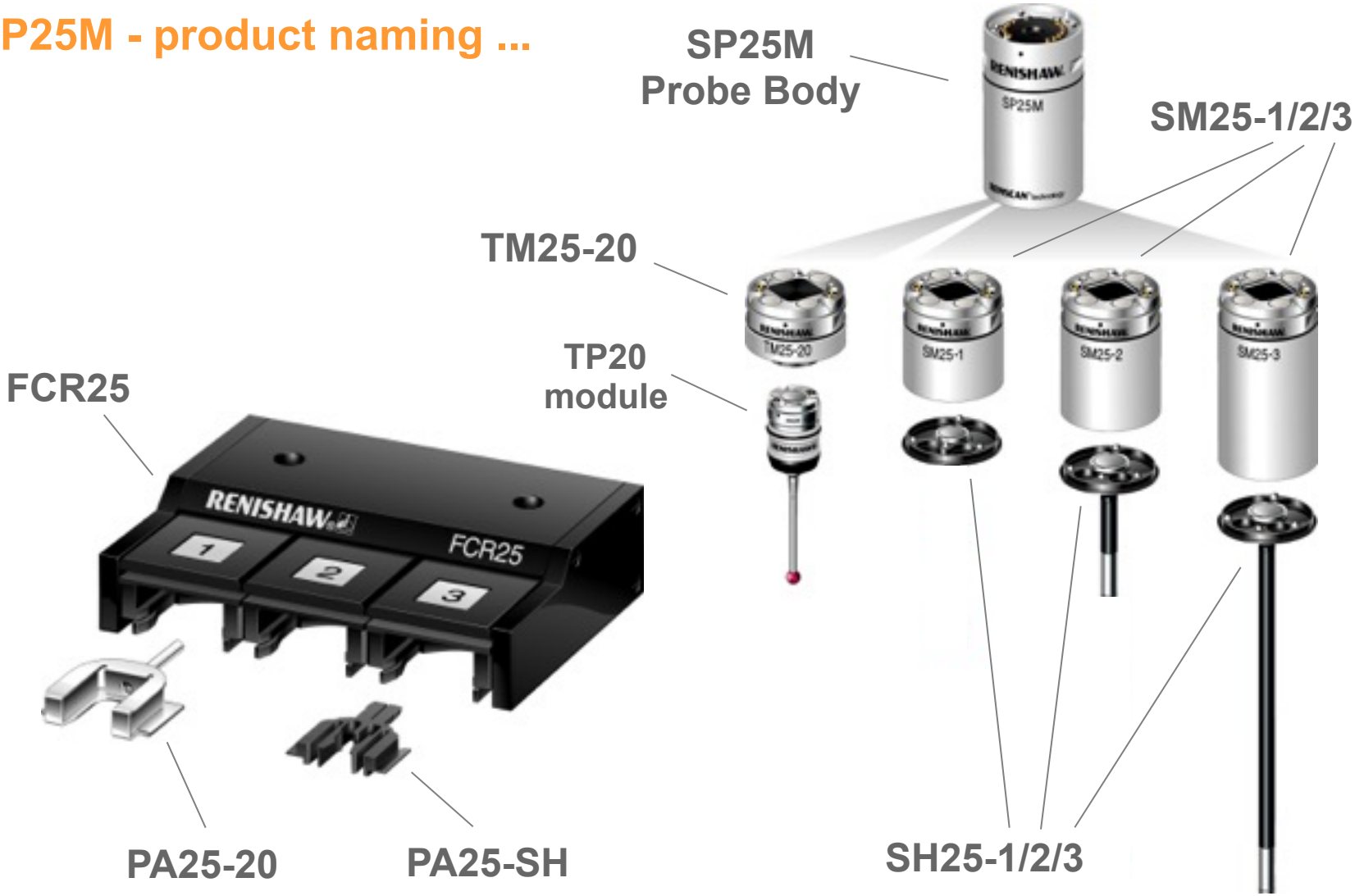
Design characteristics, performance & specification



Ordering information

System components - a highly modular concept

SP25M - product naming ...



System components - a highly modular concept

SP25M - as a SCANNING PROBE ...

- the **probe body** has Autojoint mounting for compatibility with PH10M/Q, PM6M and PHS1 heads, extensions bars and ACR1/2 sensor changers
- there are three **scanning modules (SM25-1/2/3)**, which have matching **stylus holders (SH25-1/2/3)**
  - each has a design optimised to maintain high accuracy and low contact forces over the following dedicated range of stylus lengths:

    SM25-1 + SH25-1 (20mm - 50mm)

    SM25-2 + SH25-2 (50mm - 105mm)

    SM25-3 + SH25-3 (120mm -

System components - a highly modular concept

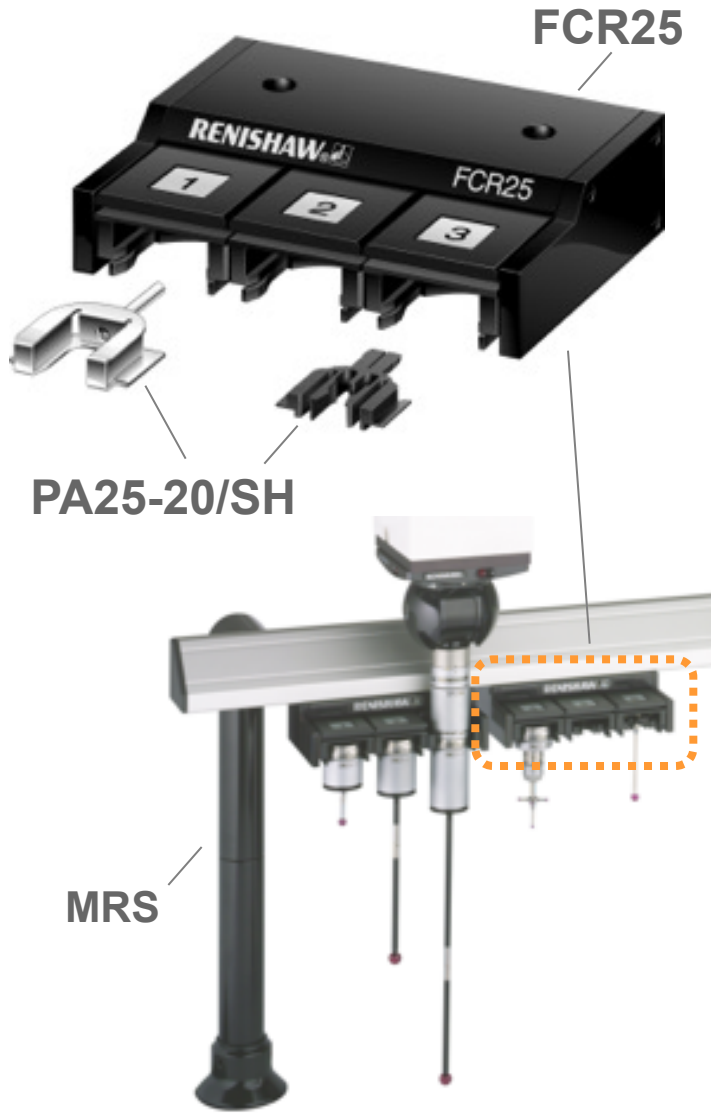
SP25M - as a TOUCH TRIGGER PROBE ...

- the **probe body** - would have the SM25-# scanning module replaced by the...
- **TTP module adaptor (TM25-20)** which directly carries any of Renishaw's TP20 range of stylus modules:
  - **TP20 LF/SF/MF/EF**
  - **TP20 EM1/EM2**
  - **TP20-6W**

System components - a highly modular concept

FCR25 - the most flexible change rack ever from Renishaw …

- rapidly **change between scanning and touch trigger mode** to match the ideal solution to the application
- **FCR25** is a triple-port unit, each port is **easily configured to carry any system element** of the system:
  - ✓ SM25-1/2/3
  - ✓ SH25-1/2/3
  - ✓ TM25-20
  - ✓ TP20 modules
- **FCR25's** are **mounted to the MRS** to thus provide 3, 6, 9, 12, 15 etc port systems
- **provides unmatched versatility !!!**



System components - a highly modular concept

FCR25 - will also be used with an integral leg to provide compact 3/6 port standalone racks…

FCR25-L6 - the 6 port version

FCR25-L3 - the 3 port version

- ideally **suited to vision CMM's** and smaller traditional CMM's where working volume is restricted
- lowest possible height
- can hold SM25-2 + SH25-2 (with 100 mm stylus length)
- overtravel protection (as for MCR20)
- **provides unmatched versatility !!!**

FCR25-L6

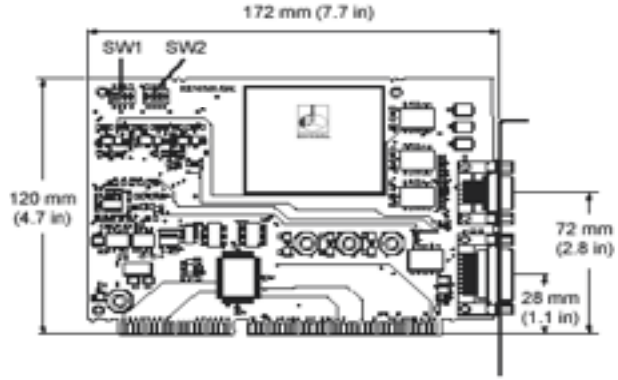
FCR25-L3

System components - a highly modular concept

Interfacing options - SP25M can be integrated by different methods...

- **OEM's controller**
  - **AC3 interface card** (ISA Bus) is provided

- **Renishaw's UCC1 controller**
  - UCC1 with full scanning upgrade is required plus a **daughter card for the SP25M**



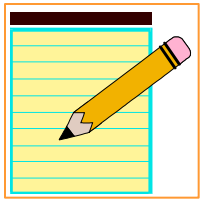
SP25M - the world's most compact and versatile scanning probe system

SP25M brings exciting new benefits

SP25M encompasses RENSCAN™ technology

System components - a highly modular concept

Design characteristics, performance & specification

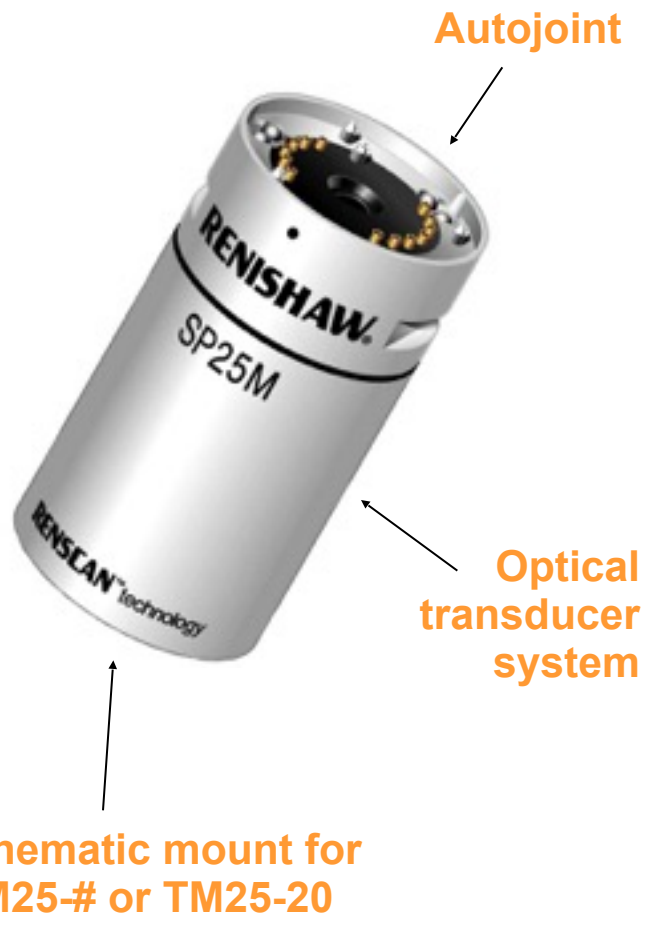


Ordering information

Design characteristics, performance and specification

SP25M probe body houses the optical transducer ...

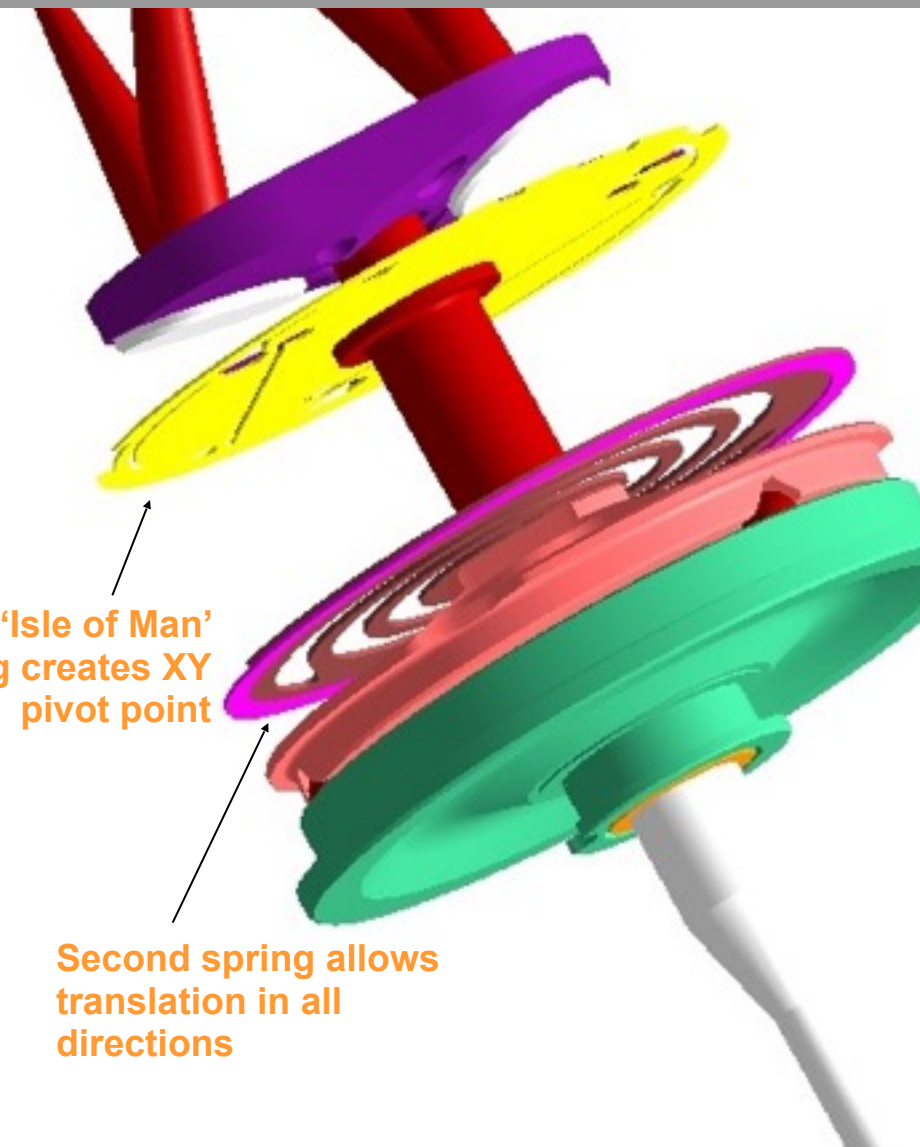
- isolated optical transducer uses proven IRED beams and PSD sensor technology (see later slide)
- **Autojoint** provides compatibility with all Renishaw's multiwired heads and extension bars
- The SM25-1/2/3 scanning modules and TM25-20 touch trigger adaptor mount directly to the body via repeatable kinematic joint
- ultra-compact mechanism - fits inside Ø25 mm (Ø1 in) probe



Design characteristics, performance and specification

SM25-1/2/3 scanning modules house the motion system ...

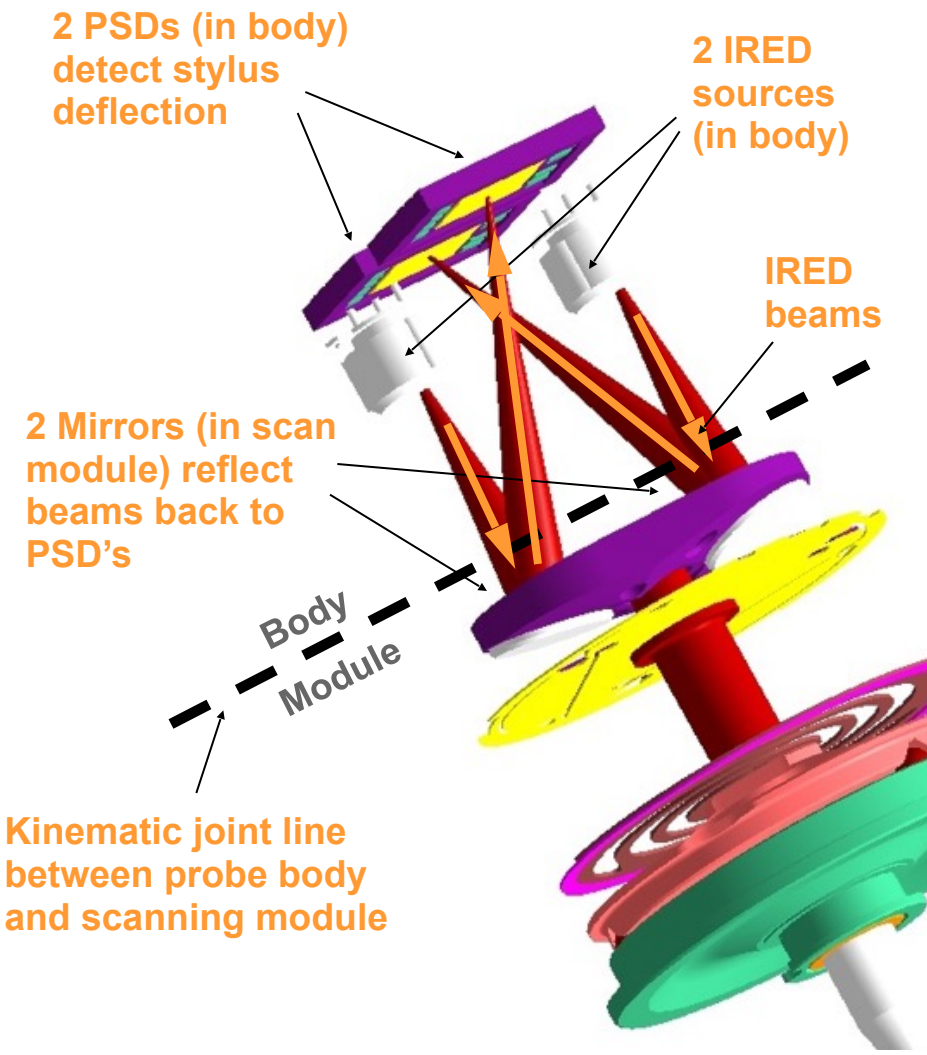
- patented, pivoting mechanism featuring two diaphragm springs
- **optimised to give** very low inertia, low spring rates of < 0.6 N/mm and **high accuracy over dedicated stylus range**
- high natural frequency (rigid member) when in contact with the component
- ultra-compact mechanism - fits inside Ø25 mm (Ø1 in) probe
- **0.5 mm spherical radius measuring range**



Design characteristics, performance and specification

SP25M designed for “isolated optical metrology”

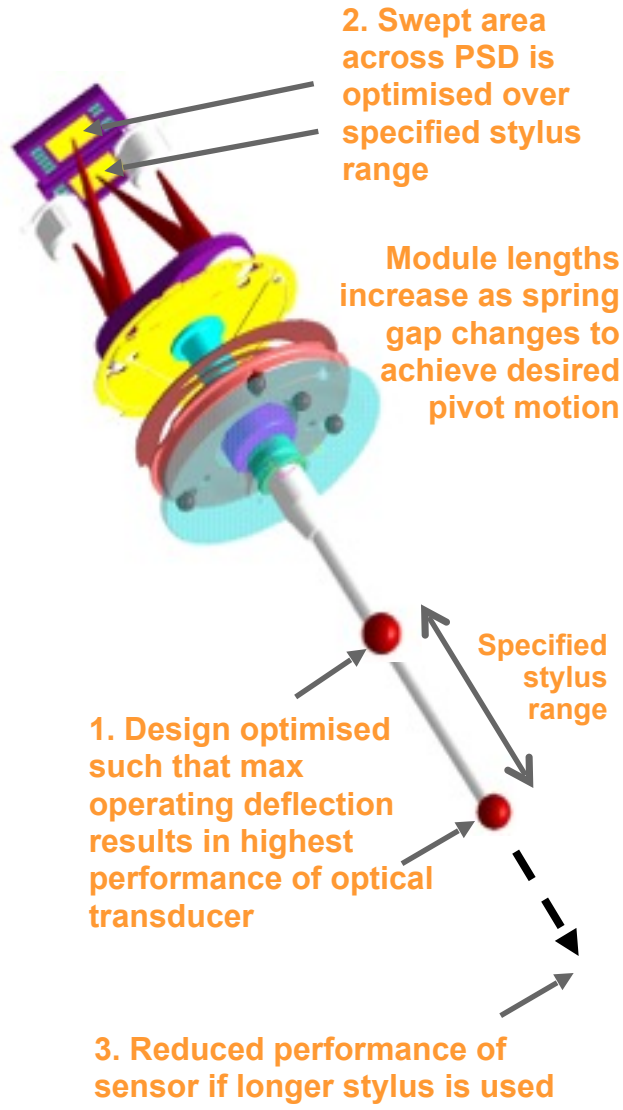
- IREDs in probe body reflect light off mirrors in scanning module back onto PSDs
- highly integrity performance - motion is faithfully translated to PSD’s
- non-linear outputs are compensated by sophisticated 3rd order polynomial algorithms
- no moving wires



Design characteristics, performance and specification

Why are there 3 scan modules to cover the stylus range? - traditionally, increasing stylus length leads to reducing accuracy **SP25M addresses this characteristic …**

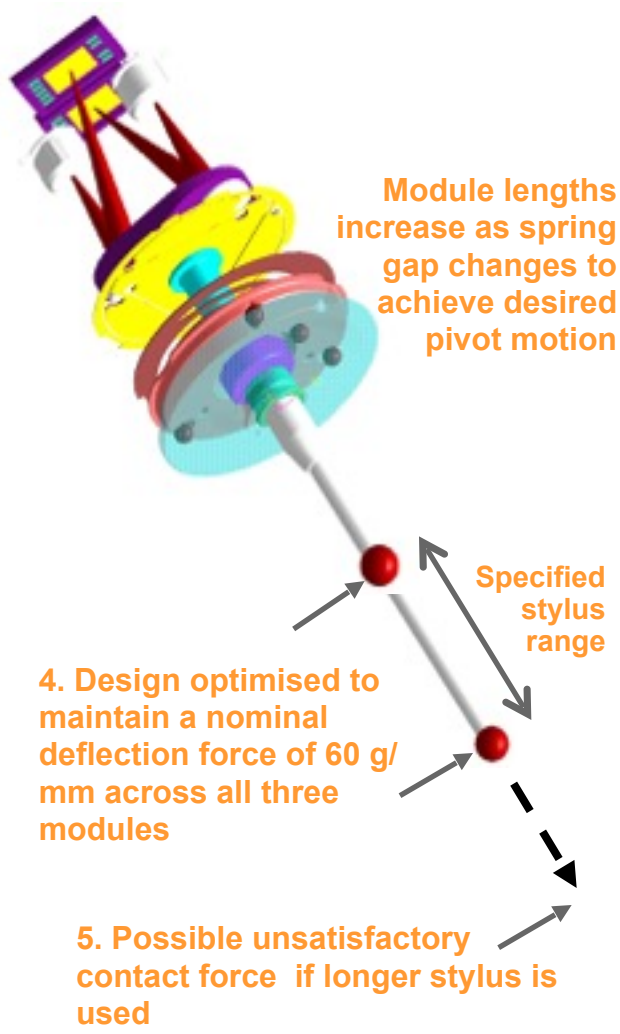
- scan modules designed for optimum output from PSD sensors when using shortest stylus at max operating deflection (resulting in largest pivot motion/swept area over PSD's by IRED beams - so giving best gain, resolution and highest accuracy metrology) whilst restricting loss of performance as longer stylus is used (by ensuring sufficient coverage of sensor is maintained resulting in low degradation of accuracy performance)
- if excessive stylus length is used, the pivot motion angle rapidly reduces (resulting in less swept area over PSD's and non optimised transducer performance giving reduced accuracy)



Design characteristics, performance and specification

Why are there 3 scan modules to cover the stylus range? - traditionally, increasing stylus length leads to reducing accuracy **SP25M addresses this characteristic …**

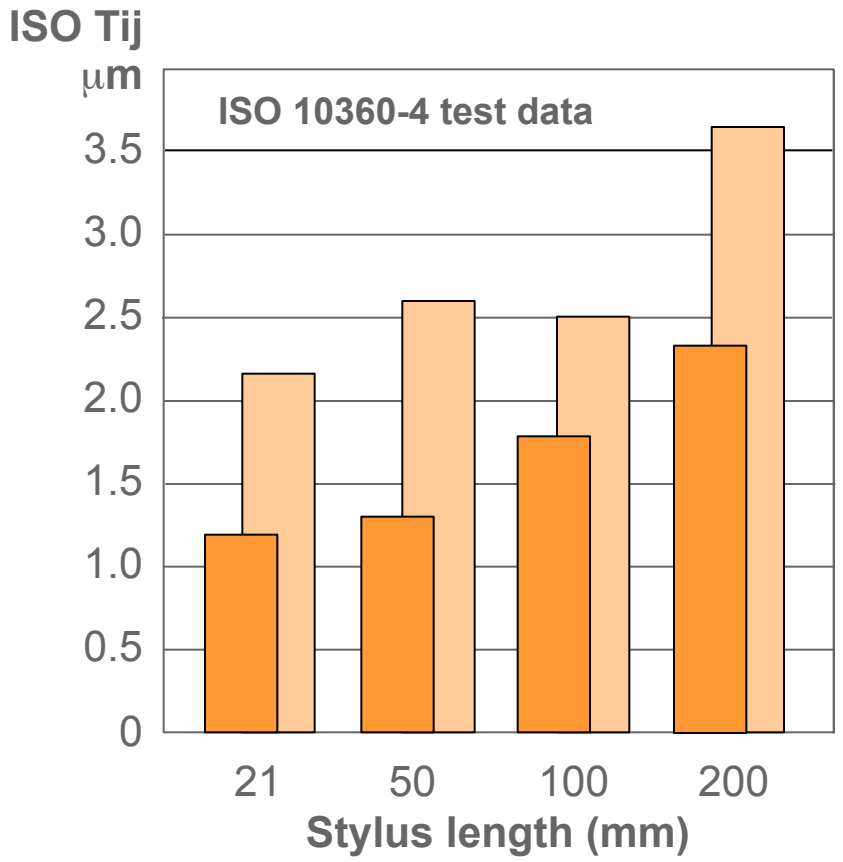
- the dedicated range for each stylus module also means that contact forces at the tip can be closely maintained (if we were to use excessive stylus lengths the force would reduce, reducing stability and accuracy)
- the fixed extension design of SH25-2/3 prevents use of illegally short stylus
- high accuracy data maintained as stylus length increases (see next slide)
- unique design of SP25M can result in 2-3 times better accuracy than SP600



Design characteristics, performance and specification

Superior scanning performance ...

- accurate form measurement, **even with long styli**
- excellent reach capability



Test conditions:

CMM spec:	0.5 + L / 1000
Test speed:	5 mm/sec
Controller:	UCC1
Filter:	None / 60 Hz
Values:	Unknown path

Filtered (60 Hz harmonic)

No filter (raw data)

Module/Stylus used:

21 = SM25-1 with 21 x ∅3 mm, SS stem

50 = SM25-1 with 50 x ∅5 mm, Ceramic stem

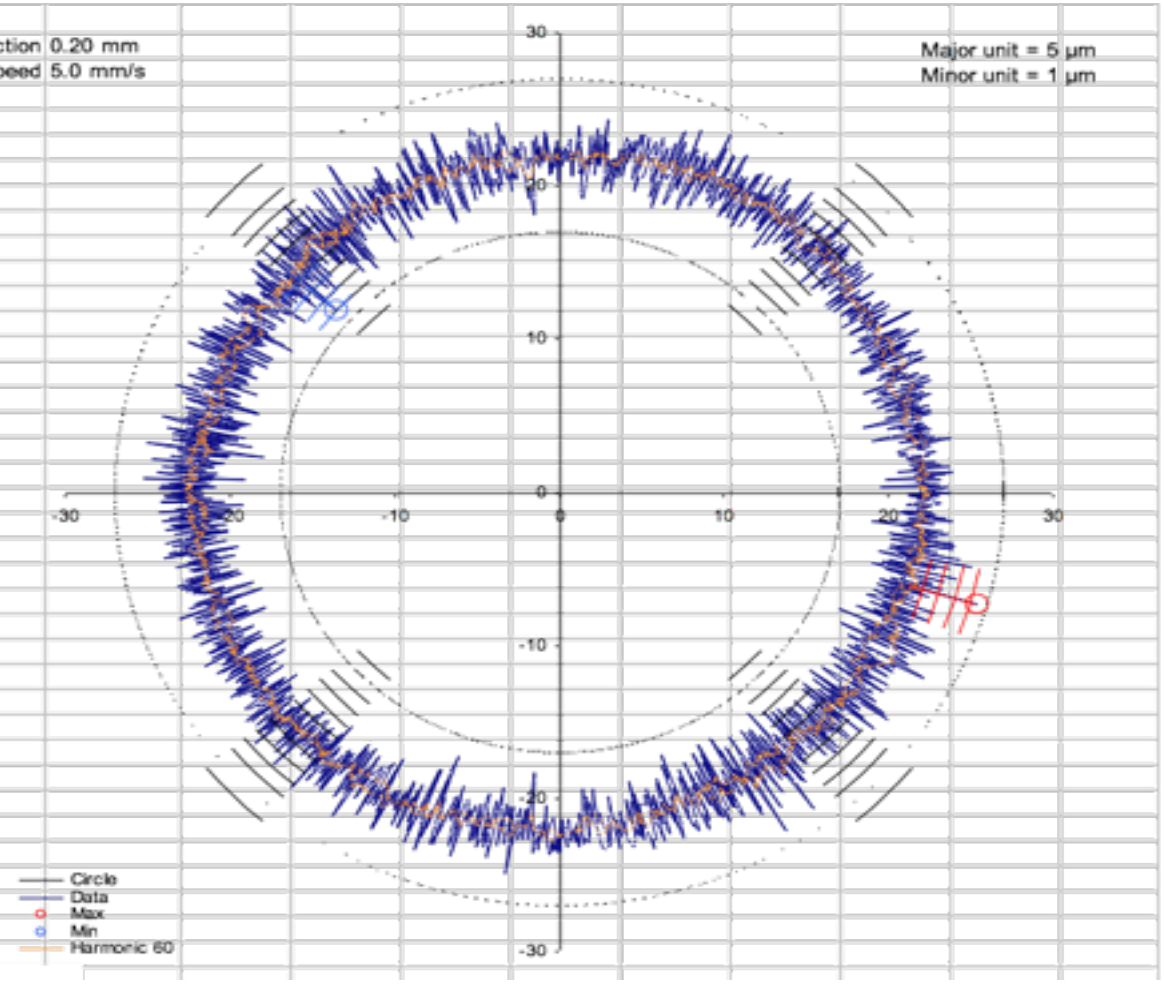
100 = SM25-2 with 100 x ∅6 mm, GF stem

200 = SM25-3 with 200 x ∅6 mm, GF stem

Design characteristics, performance and specification

Noise comparison - SP600M typical plot

Date Time :	11-Oct-01	9:45			
Ring Gauge Ø	49.9982	mm	Deflection	0.20 mm	
Stylus ball Ø	6.0000	mm	Speed	5.0 mm/s	
Theorical Radius	21.9991	mm			
Best Fitted Circle					
x	264.2450	mm			
y	341.6805	mm			
z	-62.8915	mm			
Radius	21.9974	mm			
Radius Error					
	1.72	µm			
Normal errors (µm)					
RMS	1.25	0.43			
Max	4.4	1.4			
Min	-4.0	-1.5			
Span	8.5	2.9			
Harmonic filter	Order = 60 upr				
Cut off	wc = 376.99 rad				
(upr = Undulation Per Revolution)					
Form identification					
Ellipse	0.28 µm	356.85 °			
Tri lobe	0.05 µm	208.54 °			
Circle Plane Normal					
nx	0				
ny	0				
nz	1				
Data collected with	2673	*points*			
	2	*turns*			



Design characteristics, performance and specification

Noise comparison - SP25M has lower noise and better gain

Date Time :	19-Sep-02	14:44
Ring Gauge Ø	49.9995	mm
Stylus ball Ø	6.0010	mm
Theorical Radius	21.9993	mm

Best Fitted Circle

Open File / Analysis

x	346.8979	mm
y	301.0396	mm
z	317.0860	mm
Radius	22.0002	mm

Radius Error

-0.98 µm

Normal errors (µm)

RMS	**0.40**	0.24
Max	**1.4**	0.6
Min	**-1.8**	-0.7
Span	**3.2**	1.3

Harmonic filter Order = 60 upr
Cut off wc = 376.99 rad
(upr = Undulation Per Revolution)

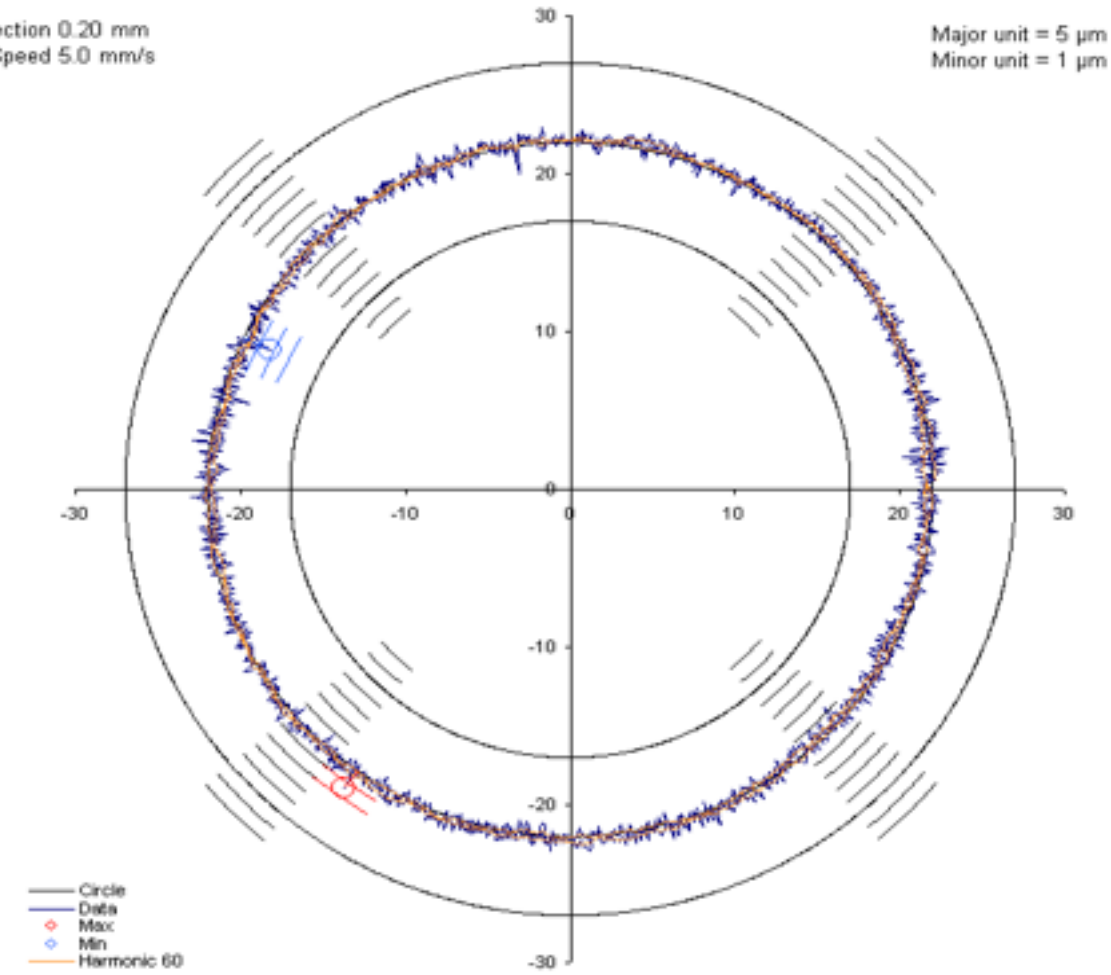
Form identification

Ellipse	0.24 µm	308.74 °
Tri lobe	0.01 µm	333.66 °

Circle Plane Normal

nx	0
ny	0
nz	1

Data collected with 2647 *points*
2 *turns*



Design characteristics, performance and specification

SP25M specification:

Mounting	Autojoint mount (compatible with PH10M, PH6M, PHS1) - may also be mounted using an extension bar	
Probe physical size	∅25mm - length variable (see dimensional slide)	
Probe mass	SP25M probe body	65g
	SM25-1 + SH25-1	35g (excl stylus)
	SM25-2 + SH25-2	40g (excl stylus)
	SM25-3 + SH25-3	49g (excl stylus)
	TM25-20	40g (excl TP20 module)
Measurement range	±0.5mm spherical radius in all orientations	
Overtravel range	X,Y = ±2.0mm (min)	+Z = 1.7mm -Z = 1.2mm

Design characteristics, performance and specification

SP25M specification:

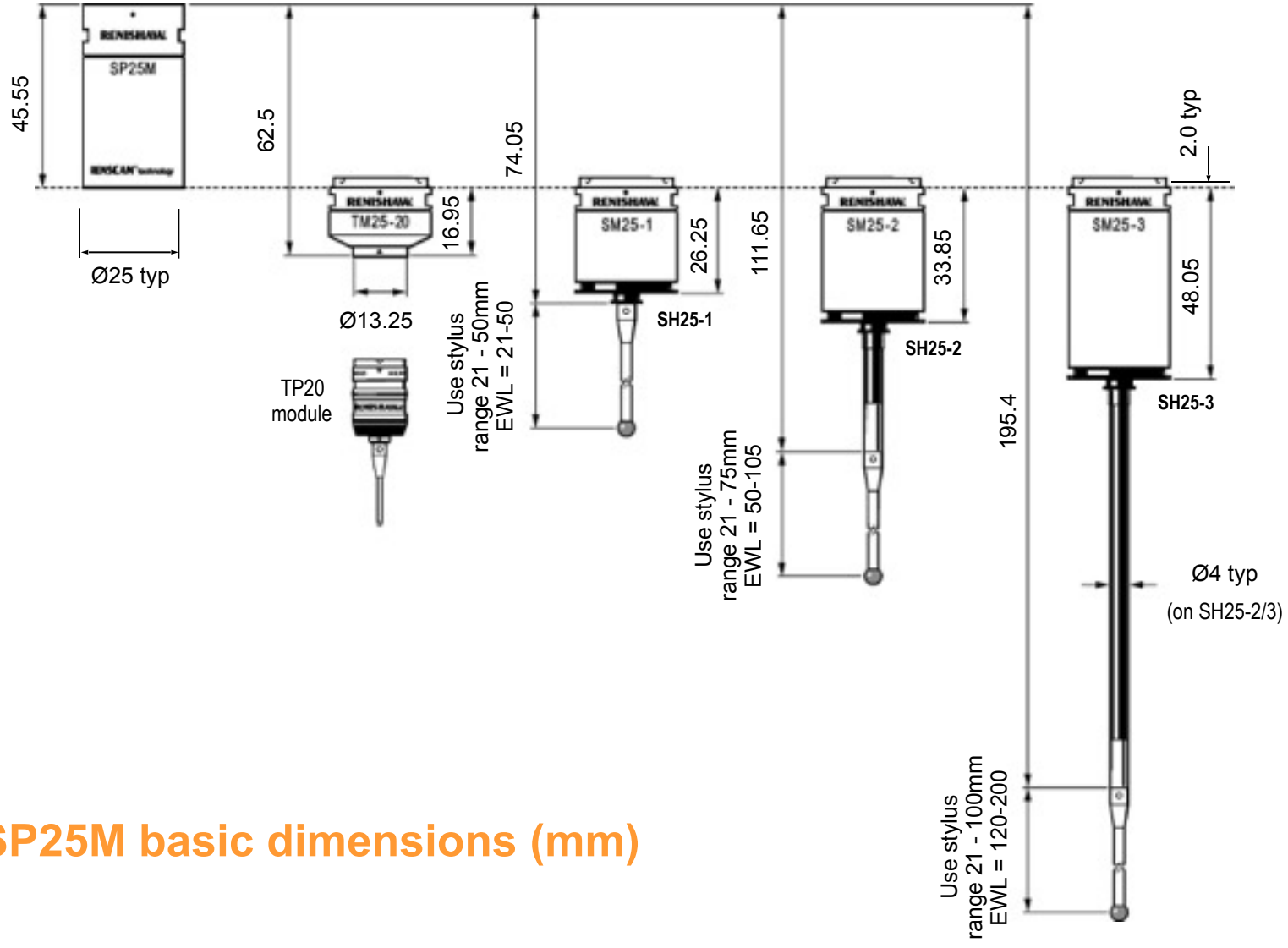
Spring rate	60 - 20 g/mm nominal (dependant on stylus length)	
Stylus range	M3, standard range - new GF styli available	
Stylus carrying range	SM25-1 + SH25-1	Use 21-50mm stylus (EWL = 21-50mm)
	SM25-1 + SH25-1	Use 21-75mm stylus (EWL = 50-105mm)
	SM25-1 + SH25-1	Use 21-100mm stylus (EWL = 120-200mm)
Crash protection	X & Y	via break-off of module/stylus holder
	Z	via bumpstop design

Design characteristics, performance and specification

SP25M specification:

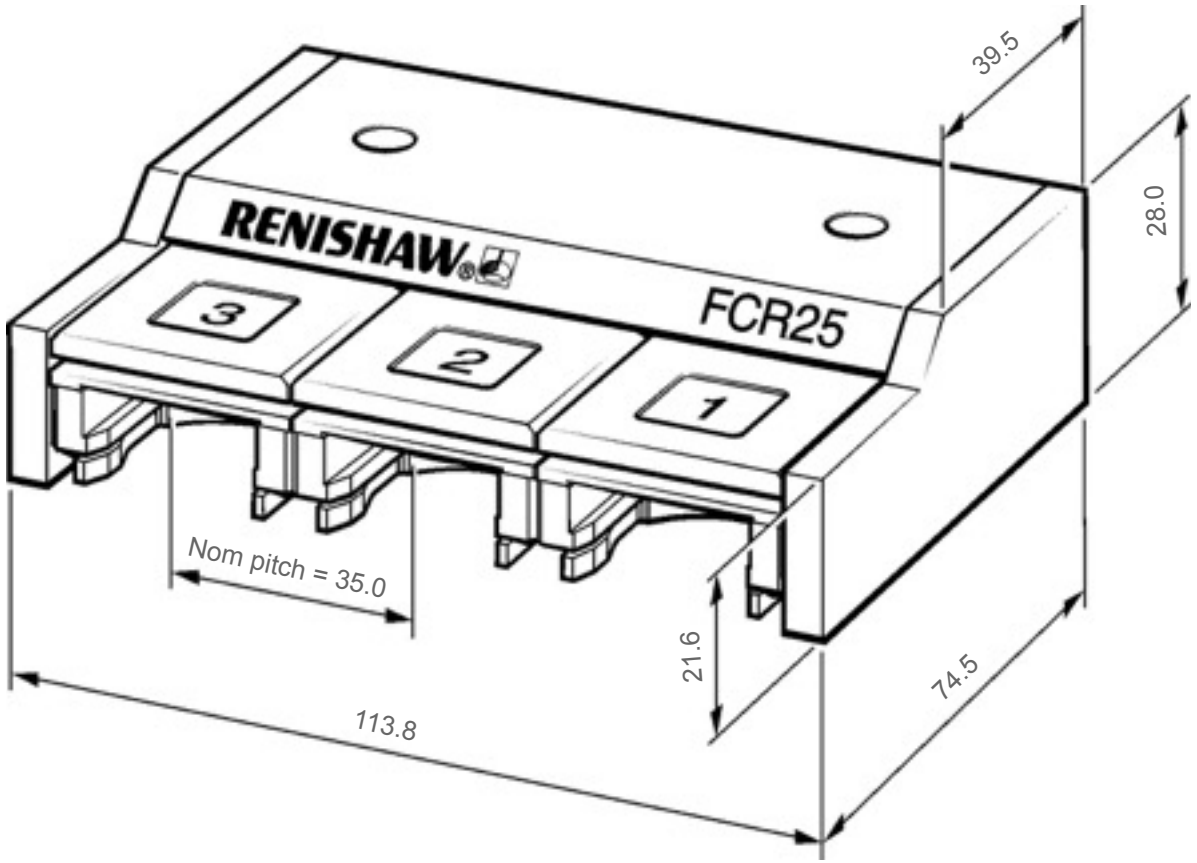
Power supply	+12V to -12V, 5V (±5%) DC
Signal outputs	Non-linear and non-orthogonal analogue outputs. Rate, gain and resolution are not fixed
Calibration method	Non-linear, 3rd order polynomial method is required
Automatic changer(s)	FCR25 (triple ported unit for mounting to MRS - each port can be configured to accept any system element) FCR25-L3 (3 port standalone rack with single leg) FCR25-L6 (6 port standalone rack with single leg)

Design characteristics, performance and specification



SP25M basic dimensions (mm)

Design characteristics, performance and specification



FCR25 basic dimensions (mm)

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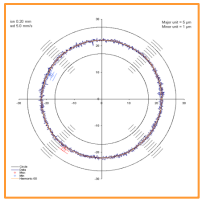
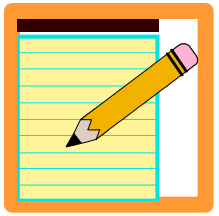
SP25M brings exciting new benefits

SP25M encompasses RENSCAN™ technology

System components - a highly modular concept



Design characteristics, performance & specification



Ordering information

Ordering information

Please contact your local Renishaw supplier for pricing details

Part No.	Description
A-2237-1015	**SP25M special SCAN/TTP full combination kit** The full scanning system plus the capability to use TP20 modules - this kit includes all the equipment in these separate kits (see later slide) and is supplied as one complete kit: **- 1 x A-2237-1001 SP25M scanning kit #1** - includes SM25-1/SH25-1 **- 1 x A-2237-1102 SM25-2 scanning module kit** **- 1 x A-2237-1103 SM25-3 scanning module kit** **- 1 x A-2237-1200 TM25-20 TTP module adaptor only** - to directly carry any TP20 module

Ordering information

Please contact your local Renishaw supplier for pricing details

Part No.	Description
A-2237-1001	**SP25M scanning probe kit #1** 1 x SP25M body, 1 x SM25-1 scanning module kit (see later slide)
A-2237-1002	**SP25M scanning probe kit #2** 1 x SP25M body, 1 x SM25-2 scanning module kit (see later slide)
A-2237-1003	**SP25M scanning probe kit #3** 1 x SP25M body, 1 x SM25-3 scanning module kit (see later slide)

Ordering information

Please contact your local Renishaw supplier for pricing details

Part No.	Description
A-2237-1101	**SM25-1 scanning module kit** 1 x SM25-1, 2 x SH25-1
A-2237-1102	**SM25-2 scanning module kit** 1 x SM25-2, 2 x SH25-2
A-2237-1103	**SP25M scanning probe kit #3** 1 x SM25-3, 2 x SH25-3

Note - SH25-1/2/3 stylus holders are also available separately

Ordering information

Please contact your local Renishaw supplier for pricing details

Part No.	Description
A-2237-1200	**TM25-20 TTP module adaptor only** 1 x TM25-20
A-2237-1201	**TM25-20 TTP module adaptor kit #1** 1 x TM25-20, 2 x TP20 'STD' modules

Ordering information

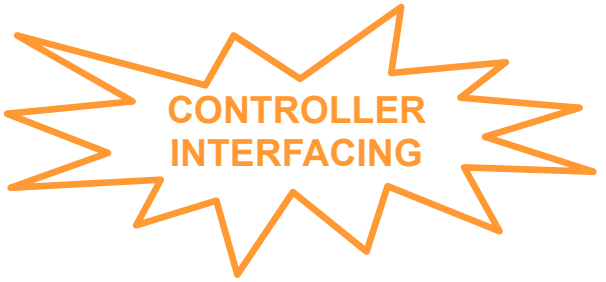
Please contact your local Renishaw supplier for pricing details

Part No.	Description
A-2237-1401	**FCR25 flexible change rack** (mounts to MRS) 1 x FCR25, 3 x PA25-SH, 3 x PA25-20 (PA25-SH/20 are Port Adaptor inserts for SH25-1/2/3 stylus holders and TP20 modules)
A-2237-tbc	**3 port FCR25 rack with leg (standalone rack)** 1 x FCR25 with integral leg, 3 x PA25-SH, 3 x PA25-20
A-2237-tbc	**6 port FCR25 rack with leg (standalone rack)** 2 x FCR25 with integral leg, 3 x PA25-SH, 3 x PA25-20

Note - the standalone racks will be available later

Ordering information

Please contact your local Renishaw supplier for pricing details



Part No.	Description
A-2237-1601	AC3 interface card
A-1333-0022	UCC1 SP25M daughter card

Note - the AC3 is not compatible with Renishaw's SP600 scanning probe (uses AC2)

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