



SmartScope SP

High Performance Multisensor Metrology Systems

SmartScope® SP

System Specifications

	SmartScope SP 332	SmartScope SP 463	SmartScope SP 663
XYZ travel	300 mm x 300 mm x 250 mm	450 mm x 610 mm x 300 mm	650 mm x 660 mm x 300 mm
XYZ measuring range with standard lens	300 mm x 300 mm x 200 mm	450 mm x 610 mm x 250 mm	650 mm x 660 mm x 250 mm
Machine dimensions	870 mm x 850 mm x 800 mm	1650 mm x 1085 mm x 1900 mm	1830 mm x 1560 mm x 1960 mm
Drive system & controls	4-axis DC servo drive (X,Y,Z and zoom) with dual drive, air bearing Z axis	4-axis DC servo drives (X,Y,Z and zoom)	4-axis DC servo drive (X,Y,Z and zoom) with dual Y-axis drive
XYZ scale resolution	Standard: 0.1 µm; Optional: 0.05 µm	Standard: 0.1 µm; Optional: 0.05 µm	Standard: 0.1 µm; Optional: 0.05 µm
Machine weight	160 kg	1400 kg	1800 kg
Shipping weight	220 kg	1640 kg	2300 kg
Worktable	Hardcoat worksurface with tapped fixture holes and removable glass insert		
Worktable payload	30 kg	75 kg	130 kg
Rotary axis	Optional Miniature Servo rotary, or MicroTheta rotary	Optional Miniature Servo rotary, MicroTheta rotary, HPR High Precision Rotary or Heavy Duty rotary and Dual Rotary indexers. Consult the factory for complete information about available rotary indexer combinations.	
Power requirements	100-120 VAC or 200-240 VAC, 50/60 Hz, 1 phase, 600 W	100-120 VAC or 200-240 VAC, 50/60 Hz, 1 phase, 800 W	100-120 VAC or 200-240 VAC, 50/60 Hz, 1 phase, 850 W
Compressed air requirements (332 model only)	Std: 120 liters/min @ 3.0 - 5.0 bar Opt: Air dryer kit		
Rated environment	Temperature: 18-22 °C, stable to ±1 °C; Maximum rate of temperature change: 1 °C / hour, maximum vertical thermal gradient: 1 °C / meter. Humidity: 30-80%; Vibration <0.001g below 15 Hz		
Operating environment, safe operation	Temperature: 15-30 °C		

SmartScope SP Optics

SP optics are designed for maximum imaging performance and flexibility over a wide range of applications. The front objective lens offers the convenience of a larger field of view, while the 5.5X zoom lens offers a range of higher magnifications to handle small features. An optional high magnification objective is easily interchanged when feature sizes require it. A 5.0 megapixel metrology camera and dedicated monochromatic illuminators ensure sharp imaging at all zoom positions.

The telecentric lens system enables use of the optional TeleStar® Plus TTL interferometric laser. The TeleStar Plus offers extra long working distance and sub-micron resolution for high precision surface profile and depth measurements.

SmartScope SP Optics & Sensor Specifications

	Standard	Optional	
Optics	QVI® SP zoom optics with AccuCentric® auto-compensation, one standard front lens and 5.5x optical zoom offer up to 60:1 digital/optical magnification range with maximum 90 mm WD	High magnification lens	
Illumination	All monochromatic LED: substage profile, coaxial surface, SmartRing™ ring light	LED focus grid illuminator	
Camera	5 MP monochrome digital metrology camera		
Field of view size	Standard objective lens: Low optical zoom 12.1 mm x 10.1 mm High optical zoom 2.2 mm x 1.8 mm Max digital zoom 0.20 mm x 0.16 mm	High magnification lens: 2X: 4.7 mm x 3.9 mm 0.9 mm x 0.7 mm 0.08 mm x 0.06 mm	5X: 0.9 mm x 0.7 mm 0.43 mm x 0.35 mm 0.04 mm x 0.03 mm
Image processing	256 level grayscale processing with 10:1 subpixel resolution		
Scanning sensors	Scanning probe controller, SP25 scanning probe body, SM25-2 module and 3 mm dia. x 21 mm stylus. 3 position change rack. Calibration kit including kinematic mount and certified 25 mm sphere	Additional SM25-1, SM25-3, SM25-4, SM25-5, TM25 scanning and touch modules, stylus holders, and styli	
Laser sensors		TeleStar® Plus interferometric TTL laser	
Controller	Windows® based, with up-to-date processor, on board networking/communication ports and integral QVI scanning controller for laser and tactile scanning; multifunction handheld controller for operator control		
Controller accessory package	24" flat panel monitor, keyboard, 3-button mouse. Ergonomic sit-stand operator workstation for 463 and 663 models.	Dual 24" flat panel monitors, keyboard, 3-button mouse; granite / laminate operator workstation for benchtop 332 model.	
Software	ZONE3® Express 3D coordinate metrology software, includes QVI Portal configuration and calibration utility	ZONE3 Prime, ZONE3 Pro and ZONE3 Offline editions SmartProfile®, SmartFit® 3D, SmartReport® Powered by QC-CALC, E-SPC	

Performance and Accuracy Specifications

SmartScope SP Model		332	463	663
Optical (per ISO 10360-7:2011)				
Unidirectional X or Y length measurement errors	$E_{UX(Y), MPE^*}$	$(1.5 + 5L/1000) \mu\text{m}^{1,2,3,4}$	$(1.5 + 5L/1000)\mu\text{m}^{1,2,3,4}$	$(2.0 + 5L/1000)\mu\text{m}^{1,2,3,4}$
Unidirectional XY length measurement errors	E_{UXY, MPE^*}	$(1.9 + 5L/1000) \mu\text{m}^{1,2,3,4}$	$(1.9 + 5L/1000)\mu\text{m}^{1,2,3,4}$	$(2.4 + 5L/1000)\mu\text{m}^{1,2,3,4}$
Unidirectional length measurement errors	E_{U, MPE^*}	$(3.9 + 5L/1000) \mu\text{m}^{1,2,4,6}$	$(3.4 + 5L/1000) \mu\text{m}^{1,2,4,6}$	$(4.4 + 5L/1000) \mu\text{m}^{1,2,4,6}$
Repeatability of XY length measurement errors	R_{UXY, MPL^*}	$1.5 \mu\text{m}^{2,3,4}$	$1.5 \mu\text{m}^{2,3,4}$	$2.0 \mu\text{m}^{2,3,4}$
Probing error (High zoom / low zoom)	$P_{F2D, MPE}$	$1.9 \mu\text{m} / 10 \mu\text{m}^{2,4}$	$1.9 \mu\text{m} / 10 \mu\text{m}^{2,4}$	$1.9 \mu\text{m} / 10 \mu\text{m}^{2,4}$
Probing error of imaging probe (High zoom / low zoom)	$P_{FV2D, MPE}$	$1.2 \mu\text{m} / 5 \mu\text{m}^{2,4}$	$1.2 \mu\text{m} / 5 \mu\text{m}^{2,4}$	$1.2 \mu\text{m} / 5 \mu\text{m}^{2,4}$

Autofocus Performance (per QVI #790218)				
Z-linear autofocus accuracy	E_Z	$(3.8 + 5L/1000) \mu\text{m}^{1,2,4}$	$(3.8 + 5L/1000) \mu\text{m}^{1,2,4}$	$(3.8 + 5L/1000) \mu\text{m}^{1,2,4}$

SP25 Tactile Probe Performance (per ISO 10360-4:2000)				
Scanning probe errors	MPE_{THP}	$4.9 \mu\text{m}^{2,5,7}$	$4.9 \mu\text{m}^{2,5,7}$	$4.9 \mu\text{m}^{2,5,7}$
Time for scanning probe errors	MPT_{τ_c}	$70 \text{ sec}^{2,5,7}$	$70 \text{ sec}^{2,5,7}$	$75 \text{ sec}^{2,5,7}$

SP25 Tactile Probe Performance (per ISO 10360-5:2010)				
Single stylus form errors	$P_{FTU, MPE}$	$3.9 \mu\text{m}^{2,5}$	$3.9 \mu\text{m}^{2,5}$	$3.9 \mu\text{m}^{2,5}$

TeleStar® Plus Laser Performance (per ISO 10360-8:2013)				
Probing size error All	$P_{[Size, Sph, All, Tr, ODS], MPE}$	$3.5 \mu\text{m}^2$	$3.5 \mu\text{m}^2$	$3.5 \mu\text{m}^2$

TeleStar® Plus Laser Accuracy				
Z-axis laser measurement accuracy with standard lens		$1.0 \mu\text{m}^{2,8}$	$1.0 \mu\text{m}^{2,8}$	$1.0 \mu\text{m}^{2,8}$

NOTES				
1. Where L = measuring length in mm				
2. Applies to a thermally stable system in the rated environment and in accordance with the operating manual. Maximum rate of temperature change: 1 °C / hour, maximum vertical thermal gradient: 1 °C / meter. With evenly distributed load of up to 5 kg. Depending on load distribution, accuracy at maximum rated load may be less than standard accuracy. The system shall be operated using the procedures given in the operating manual when conducting tests.				
3. Measured in the standard measuring plane, defined as a plane within 25 mm of the worktable surface				
4. All optical accuracy specifications at maximum optical magnification, unless otherwise stated				
5. Using SP25 with SM25-2 module with 3.0 mm x 21 mm A-5000-3553 stylus				
6. On-site verification optional				
7. Target tip deflection 0.35 mm				
8. Accuracy on horizontal specular surfaces within the measuring range				
*Artifact may be low expansion with a CTE no greater than $1 \times 10^{-6} / ^\circ\text{C}$ and with a CTE expanded uncertainty ($k = 2$) no greater than $1 \times 10^{-6} / ^\circ\text{C}$, and will have calibrated values adjusted to the CTE of steel per ISO 10360-7:2011. Linear, area and volumetric accuracy standards are described in QVI publication number 790762.				

SmartScope SP

System Configurations



SmartScope SP 332

SmartScope SP 332 offers high performance in a convenient bench-top package. The patented elevating-bridge design provides machine-in squareness and a large work envelope that uses very little floor space. An air-bearing Z-axis motion system provides the friction free motion and stiffness necessary for excellent scanning probe performance.



SmartScope SP 463

SmartScope SP 463 is a rugged, floor model system of proven design to handle larger, heavier parts in a workshop environment. The fixed bridge design separates the primary axis motions so they are completely independent, with no influence on each other. Rigidity and stiffness give this transport superb volumetric accuracy.



SmartScope SP 663

SmartScope SP 663 offers a large measuring volume and high payload capacity in compact footprint. The moving bridge design provides an open work envelope allowing heavy parts to be loaded by a conveyor or overhead crane if needed. Granite base and granite bridge with heavy duty cast uprights ensure thermal stability and vibration isolation for excellent scanning performance, even under adverse conditions.