



Premium portable metrology

## ModelMaker

Handheld scanners

## MCAx

Articulated arms



# MODELMAKER H120

## Ultra-fast high-definition 3D scanning

More than two decades since the inception of the ModelMaker product line, the cutting-edge ModelMaker H120 firmly pushes the ever-exacting boundaries of handheld laser scanning. Incorporating blue laser technology, ultra-fast frame rate, specially developed Nikon optics and the ability to measure the most challenging materials this represents the next generation of portable laser scanning. The H120 makes no compromises in addressing the market needs by efficiently delivering the most detailed and accurate data in a fraction of the time of competing technologies.



## UNCOMPROMISING PERFORMANCE

By combining a frame rate of 450 Hz, a stripe width of 120 mm and a resolution of 35  $\mu\text{m}$ , users benefit from high productivity and detailed measurements with a single sensor. Without relying on interpolation techniques to artificially boost data density, the ModelMaker H120 guarantees fast data collection over a large area without compromising on small details – offering great flexibility in a single solution even when cycle time is critical, no matter the type of parts measured. Furthermore, the superior accuracy of the ModelMaker H120 ensures it stands far apart from similar technology, further pushing the traditionally accepted boundaries of handheld laser scanners.

## MEASURE THE MOST CHALLENGING MATERIALS

The 4<sup>th</sup> generation of Nikon's patented Enhanced Sensor Performance (ESP4) provides faster-then-ever real-time dynamic adjustment of the laser intensity for every point. Users can confidently scan across parts with strong colour transitions and varying reflectivity from any direction with no loss in scanner speed and no need for prior part preparation. ModelMaker scanners also benefit from intelligent reflection control which allows users to measure very shiny or polished materials while unwanted reflections are filtered out.

## IMMEDIATE PRODUCTIVITY

Simple system set-up, immediate boot-up and no need for scanner warm-up combined with the structural rigidity, thermal stability and absolute encoder technology of the MCAx arms allows users to switch on and start confidently collecting accurate data straightaway.

## EXTREMELY LOW NOISE DATA

By combining specially-developed Nikon optics and low-speckle blue laser technology, the ModelMaker H120 achieves super low-noise measurements and can cleanly resolve details such as sharp edges and even surface scratches and abrasions which other scanners simply cannot.

## ENHANCED USER EXPERIENCE

Innovative features such as thermal compensation, an integrated locking connector, contrasting full field of view projector, excellent touch probe clearance and a compact size give the user all the feedback and assurance he needs to concentrate purely on the measurement task.



# MODELMAKER MMDx

## Scanning technology optimized for your application

The ModelMaker MMDx range of handheld laser scanners is ideally suited for portable 3D inspection and reverse engineering applications. With choices of scanner models for high detail, all-round scanning or high productivity, users can select the best hardware for their needs.

MMDx incorporates 3rd generation Enhanced Sensor Performance (ESP3) to scan almost any sample materials and surface finishes without user interaction.

The digital camera technology offers a measuring accuracy down to 7 microns and benefits from a true non-interpolated resolution of more than a thousand points per stripe, allowing freeform surfaces and features to be scanned accurately and efficiently.

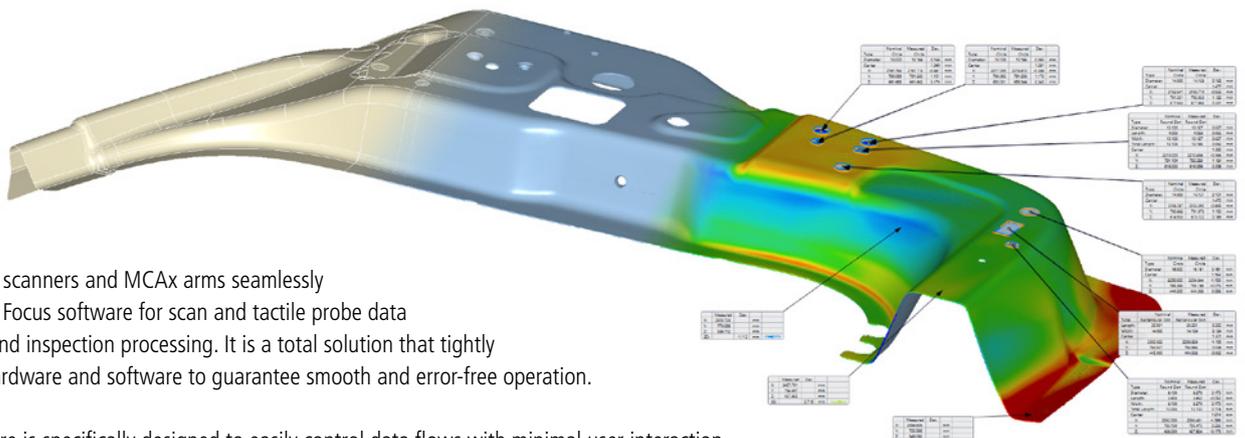
Featuring high frame rates and laser stripes up to 200 mm, the MMDx range provides the ultimate in scanning productivity. The scanner's digital cameras benefit from a true (non-interpolated) resolution of over 1000 points per stripe, providing optimum resolution for scanning freeform surfaces and features efficiently.

Weighing around 400 g and featuring an angled laser plane for comfort while scanning, MMDx scanners are optimized for ergonomic use. Set-up time and portability is optimized through the use of isolated thermal zones, temperature compensation and on-board processing – which means no external controller or extraneous cabling.



	Scan rate	Productivity	Resolution	Accuracy
H120	●●●●●	●●●●●●	●●●●●	●●●●●
MMDx50	●●	●●	●●●●	●●●●
MMDx100	●●	●●	●●	●●
MMDx200	●●	●●●●	●	●

## INTUITIVE SCANNING AND INSPECTION SOFTWARE



ModelMaker scanners and MCAx arms seamlessly interact with Focus software for scan and tactile probe data acquisition and inspection processing. It is a total solution that tightly integrates hardware and software to guarantee smooth and error-free operation.

Focus software is specifically designed to easily control data flows with minimal user interaction. Users can complete handheld data acquisition and inspection jobs in Focus without compromising performance.

Alternatively, through the Nikon Metrology API, the ModelMaker scanners and MCAx arms can be used directly in many 3rd party inspection and reverse engineering software applications, including PolyWorks®, Metrolog® and Geomagic®.

# APPLICATIONS

The combined solution of ModelMaker scanners and MCAx arms delivers high-productivity and precise non-contact and contact metrology. Used to optimise production workflow through rapid, reliable and accurate analysis of product dimensions – both freeform and geometric – it has proven to be an invaluable tool across many industries and workplaces from the shop floor to the metrology lab.

Able to robustly measure almost any material and with the flexibility to inspect parts of sizes ranging from a few millimetres to several metres and more allows the solution to span many industries including Automotive, Aerospace, Power Generation and Consumer products, and well as Universities, Research Institutes and scanning service providers – especially for components such as tools and dies, body-in-white / sheet metal parts, castings, injection moulded, soft or fragile materials and additive manufactured parts.

The ModelMaker handheld laser scanners paired with MCAx portable articulated co-ordinate measuring arms and Focus software allow you to reduce measurement times by rapidly diagnosing production issues in all areas of manufacture. This enables delivery of your products faster and with greater confidence by meeting the highest quality standards.

## Key benefits for your application

- High accuracy and fast data throughput saves time and money
- Optimized for hard-to-scan surfaces
- Designed for use under all shop floor or field conditions
- Extreme temperature stability and zero warm-up time
- Quick and easy plug-and-play setup
- Enhanced ergonomics for stress-free usage
- Short learning curve
- Seamless transition between scanning and touch-probing
- Compatible with all major brands of point cloud software

## Uses within your process

- Fast & accurate multi-sensor 3D inspection
- Part-to-CAD inspection: First article inspection against CAD model
- Inspection of geometric features
- Gap-and-flush inspection
- Reverse engineering: from concept studio clay to class A surfaces
- Digitizing for additive manufacturing



# MCAx

## Accurate and portable multi-sensor measurement

The MCAx Manual Coordinate measuring Arm is a precise, reliable and easy-to-use portable 7-axis measuring arm. It is the perfect partner for the ModelMaker H120 and MMDx laser scanners and Focus Handheld scanning and inspection software due to its high precision, repeatability and stability. This total solution's accuracy, capability and portability make it feel perfectly at home in the metrology lab, on the shop floor and in-the-field.

The arm can be equipped with a wide range of probing systems aside from laser scanning, such as a large choice of probes for a variety of tasks including touch-trigger measurements and continuous scanning. Its flexibility makes this measurement arm the perfect solution for the widest range of measurement tasks. The MCAx range of 7-axis articulated arms is available in six different sizes and in three accuracy levels giving users the ability to specify the best system for their needs.

- Tactile probing performance from 0.023 mm and scanning system accuracy from 0.028 mm ensures the highest standard of measurement results
- Available in six lengths between 2.0 m and 4.5 m to suit small to large measurement tasks
- Absolute encoder technology means no referencing or warm-up period is required
- Advanced carbon fiber construction for strength and thermally stability in all environments
- Automatic probe recognition and repeatable probe and scanner mounting allows immediate switching between measurement tools
- The ergonomic wrist features haptic feedback whilst the arm provides audio and visual notifications
- Low friction handling positions for reduced user stress and fatigue
- Counterbalance for effortless control infinite rotation of all principle axes for unrestricted use
- Integrated lock secures the arm easily and safely
- Quickly and easily attaches to a variety of stands / tripods or vacuum mount
- Supports a wide variety of fixed and touch-trigger probes in many lengths and stylus configurations
- MCAx++ and MCAx+ include a certified length standard for performance verification in the field
- Certified performance according to ASME B89.4.22. VDI/VDE 2617-9 certification is also available



# SPECIFICATIONS

	ModelMaker H120	ModelMaker MMDx50	ModelMaker MMDx100	ModelMaker MMDx200
Accuracy (1 $\sigma$ ) <sup>1,2</sup>	7 $\mu$ m	7 $\mu$ m	10 $\mu$ m	16 $\mu$ m
Stripe width	120 mm	50 mm	100 mm	200 mm
Measuring range	100 mm	50 mm	100 mm	150 mm
Stand-off	80 mm	95 mm	100 mm	110 mm
Min. point resolution	35 $\mu$ m	40 $\mu$ m	65 $\mu$ m	115 $\mu$ m
Max. frame rate	450 Hz	150 Hz		
Max. points per stripe	2,000	1,000		
Laser power adjustment	ESP4 real-time per point	ESP3 real-time per point		
Warm up time	0 s	0 s		
Weight (approx.)	500 g	400 g		
Laser power	Class 2, 450 nm	Class 2, 660 nm		
Field of View indicator	Full FoV	Dot		
Arm attachment	Integrated	External		



Complies with 21 CFR 1040.10 and 1040.11, Laser Notice No. 50 dated June 24, 2007



**LASER RADIATION**  
DO NOT STARE INTO BEAM  
CLASS 2 LASER PRODUCT  
Max output = 2.01 mW 450nm  
1 mW 650nm  
IEC 60825-1 Edition 3.0 2014  
Read instruction manual before use

Max output = 5 mW & 1.0 mW  
Emitted wavelength:  
660 nm & 635 nm  
IEC60825-1 edition 2.0 2007-03  
CLASS 2 Laser Product  
Read manual before use

## System Scanning Performance <sup>3</sup>

## System Probing Performance

Arm model	Measuring range	Weight	System Scanning Performance <sup>3</sup>				System Probing Performance	
			With H120	With MMDx50	With MMDx100	With MMDx200	Point repeatability <sup>4</sup>	Volumetric accuracy <sup>5</sup>
MCAx25++	2.5 m	8.5 kg	0.028 mm	0.042 mm	0.046 mm	0.060 mm	0.023 mm	$\pm 0.034$ mm
MCAx30++	3.0 m	8.8 kg	0.032 mm	0.046 mm	0.052 mm	0.066 mm	0.036 mm	$\pm 0.052$ mm
MCAx35++	3.5 m	9.1 kg	0.042 mm	0.062 mm	0.066 mm	0.084 mm	0.047 mm	$\pm 0.073$ mm
MCAx40++	4.0 m	9.4 kg	0.052 mm	0.080 mm	0.082 mm	0.098 mm	0.057 mm	$\pm 0.088$ mm
MCAx45++	4.5 m	9.7 kg	0.068 mm	0.100 mm	0.102 mm	0.116 mm	0.071 mm	$\pm 0.107$ mm
MCAx20+	2.0 m	8.2 kg	0.028 mm	0.042 mm	0.048 mm	0.066 mm	0.023 mm	$\pm 0.033$ mm
MCAx25+	2.5 m	8.5 kg	0.032 mm	0.048 mm	0.054 mm	0.070 mm	0.027 mm	$\pm 0.038$ mm
MCAx30+	3.0 m	8.8 kg	0.038 mm	0.054 mm	0.060 mm	0.078 mm	0.042 mm	$\pm 0.058$ mm
MCAx35+	3.5 m	9.1 kg	0.048 mm	0.072 mm	0.076 mm	0.098 mm	0.055 mm	$\pm 0.081$ mm
MCAx40+	4.0 m	9.4 kg	0.060 mm	0.094 mm	0.096 mm	0.114 mm	0.067 mm	$\pm 0.098$ mm
MCAx45+	4.5 m	9.7 kg	0.080 mm	0.116 mm	0.120 mm	0.136 mm	0.084 mm	$\pm 0.119$ mm
MCAx20	2.0 m	7.9 kg	0.036 mm	0.050 mm	0.056 mm	0.074 mm	0.044 mm	$\pm 0.061$ mm
MCAx25	2.5 m	8.2 kg	0.040 mm	0.056 mm	0.062 mm	0.078 mm	0.049 mm	$\pm 0.069$ mm
MCAx30	3.0 m	8.5 kg	0.052 mm	0.078 mm	0.082 mm	0.100 mm	0.079 mm	$\pm 0.100$ mm
MCAx35	3.5 m	8.8 kg	0.070 mm	0.102 mm	0.106 mm	0.128 mm	0.099 mm	$\pm 0.125$ mm
MCAx40	4.0 m	9.1 kg	0.092 mm	0.128 mm	0.136 mm	0.154 mm	0.115 mm	$\pm 0.151$ mm
MCAx45	4.5 m	9.4 kg	0.122 mm	0.162 mm	0.168 mm	0.190 mm	0.141 mm	$\pm 0.179$ mm

Working temperature 0 – 50° C  
Storage temperature -30 – 70° C

Relative humidity 10 – 90% non-condensing  
Operational elevation 0 – 2000 m

Universal worldwide voltage 110 – 240 V AC (50 – 60 Hz)  
CE Compliance Yes

<sup>1</sup> Typical values are 30% better than published values.

<sup>2</sup> Laser scanner **Accuracy** is determined by scanning a plane from various directions, each time using the entire scanner field of view. The result is the maximum 1 $\sigma$  deviation of the scan data to fitted plane features.

<sup>3</sup> The **Scanning performance** test indicates the performance of the laser scanner combined with a MCAx arm. The test is performed by scanning a highly accurate reference plate in 5 different orientations of the articulated arm and laser scanner. The 5 resulting point clouds are merged together and a best-fit plane is constructed through this combined point cloud. For each of the points, the deviation distance to the best-fit plane is calculated. The result of the test is the 2 $\sigma$  value of all of the deviations.

<sup>4</sup> The **Point repeatability** test (or SPAT) is the reference test to determine measurement arm repeatability with a ball probe. The probe is placed in a conical socket and points are measured from multiple approach directions and is tested different zones of the arm measurement volume. The result is the maximum of the X, Y or Z range divided by two.

<sup>5</sup> The **Volumetric accuracy** test most accurately represents the reasonable expectations for probing performance in practical measuring applications since it involves measuring a certified length standard many times in several locations and orientations and compares the resulting measurements to the actual length. It is the most appropriate test for determining machine accuracy and repeatability. The result is the maximum deviation of the measuring distance less the theoretical length.

Probing and scanning specifications are achieved under stable environmental conditions with the MCAx arm mounted on a base plate or magnetic base. A 15 mm diameter, 50 mm long, steel ball probe connected to both probe ports is used for the probing performance tests. Probing specifications are based on a subset of ASME B89.4.22:2004. Probing certification to VDI/VDE 2617-9 is also available.



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