MACH KO-GA-ME

AGILE MEASUREMENT SOLUTIONS
Rapid Near-Line/In-Line Measurement Solutions

A unique and compact CMM for automated measurements.

The MACH Ko-ga-me — a fast, compact, lightweight and easy-to-mount CMM — is the ideal solution for automated cells. The guaranteed accuracy temperature of 10°C to 35°C provides flexibility and performance in your production environment. Mounted on any rigid frame, including machine tools, the MACH Ko-ga-me will provide CMM capabilities without the space requirements of a full-sized machine and in-process measurement without setup and breakdown.

The small-sized 3-axis CNC measuring head incorporates high accuracy and high speed with the flexibility to implement numerous configurations for inspection applications in the quality lab or directly within the manufacturing process. The MACH Ko-ga-me's flexible design allows implementation to meet specific or multiple manufacturing applications:

• As a stand-alone inspection system in the quality lab or in the manufacturing environment, the MACH Ko-ga-me functions like any other CMM - parts can be placed in the measuring volume and measured individually or with a part program.

• As process inspection within computer-integrated manufacturing (CIM), the MACH Ko-ga-me can be implemented near line with operator part loading or in-line with robotic part loading for an automated closed-loop control process.
Features & Benefits

Versatility
Versatility of the MACH Ko-ga-me allows for quick and easy setup of applications. Modifications can be made on the fly and when critical features in the manufacturing process change. Without expensive masters to maintain, once the A2LA certified calibration is complete, only a simple master ball style probe calibration is necessary to achieve the continuous rated accuracy.

Flexibility
Because the MACH Ko-ga-me is a compact CMM, it offers flexibility when production or manufacturing requirements change. It can be easily moved, reconfigured to handle a completely different part family or even used for general lab inspection. The MACH Ko-ga-me supports touch probe (TP200) or scanning probe (SP25) technology.

Speed
With a maximum drive speed of 13.3"/sec (340mm/s), and an acceleration of 6,750mm/s² (0.68g), these high-speed capabilities provide the MACH Ko-ga-me the ability to rapidly acquire critical features, allowing for a quicker feedback and compensation of the manufacturing process, reducing scrap and increasing throughput.

Minimal Site Preparation
With only a 120V 15A power requirement, no requirement for compressed air and a small footprint, the MACH Ko-ga-me can be used almost anywhere a need exists. The lightweight design allows for the unit to mount easily anywhere within the manufacturing process.

Automation Ready
Using standard features of MCOSMOS, the world’s standard in metrology software, MACH Ko-ga-me easily interfaces into factory automation and manufacturing cells. With extended I/O capability, interface to robots, conveyors, clamps and sensors is seamless.

Guide Method
By utilizing a linear motion bearing design instead of air bearings, the MACH Ko-ga-me performs high-speed measuring without sacrificing accuracy.

Environment
Designed to be used on the shop floor, using a sealed design and built-in thermal compensation, the MACH Ko-ga-me is accurate within a temperature range of 50~95º F (10~35º C).
Applications

<table>
<thead>
<tr>
<th>Automotive/ATV/Marine</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Pump Housings</td>
<td>Rocker Arms</td>
</tr>
<tr>
<td>Motors</td>
<td>Alternator Housings</td>
</tr>
<tr>
<td>Pistons</td>
<td>Bearing Races</td>
</tr>
<tr>
<td>Filter Assemblies</td>
<td>Piston Rods</td>
</tr>
<tr>
<td>Brake Components</td>
<td>Wheel Hubs</td>
</tr>
<tr>
<td>Fuel Lines</td>
<td>Throttle Body</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Aerospace</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Implants</td>
<td>Impellers</td>
</tr>
<tr>
<td>Pumps</td>
<td>Surgical Instruments</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy (Oil/Gas/Solar/Wind/Nuclear)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Triangles</td>
<td>Fittings</td>
</tr>
<tr>
<td>Pumps</td>
<td>Housings</td>
</tr>
<tr>
<td>Couplings/Connections</td>
<td>Hardware</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Injection Molding</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Molds</td>
<td>Bottles/Caps</td>
</tr>
<tr>
<td>Housings/Cases</td>
<td>Moldings</td>
</tr>
</tbody>
</table>

Probe Systems

**TP200 Specifications**

- **Measuring direction**: ±X, ±Y, ±Z
- **Repeatability (2σ)**: 0.3μm or less (with 10mm stylus), 0.4μm or less (with the 50mm stylus)
- **Directionality (XY: 2D)**: ±0.4μm or less (with 10mm stylus), ±0.8μm or less (with the 50mm stylus)
- **Directionality (XYZ: 3D)**: ±0.65μm or less (with 10mm stylus), ±1μm or less (with the 50mm stylus)
- **Required force to generate trigger signal**: XY 0.02N (STANDARD/LOW FORCE), where a 50mm stylus is used
  - Z 0.07N (STANDARD/LOW FORCE), where a 50mm stylus is used
- **Amount of over-travel**: XY ±14º
  - Z +4.5mm (with 0.07N), +3mm (with 0.15N)
- **Required force to achieve over-travel**: XY 0.39N (STANDARD FORCE), 0.1N (LOW FORCE)
  - Z 4N (STANDARD FORCE), 1N (LOW FORCE)
- **Maximum stylus length**: 50mm (STANDARD FORCE)
- **Maximum stylus mass**: 8g (STANDARD FORCE), 3g (LOW FORCE)
- **Stylus mounting method**: M2 screw

**SP25M Specifications**

- **Measurement range**: ±0.5mm
- **Spring rate**: 0.4N/mm
- **Amount of over-travel**: ±2.0mm (XY) ±1.7mm (Z)
- **Stylus mount**: M3
- **Max. scanning speed**: 120mm/s (at a known geometry scanning)
### Specifications

<table>
<thead>
<tr>
<th>Model No.</th>
<th>KGM 12128-B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Probe System</td>
<td>TP200 / SP25M</td>
</tr>
<tr>
<td>Measuring Range</td>
<td>4.72 x 4.7 x 3.14&quot; (120mm x 120mm x 80mm)</td>
</tr>
<tr>
<td>Mass of Main Unit</td>
<td>62.0 lbs. (28kg)</td>
</tr>
<tr>
<td>Scale Resolution</td>
<td>0.00000078&quot; (0.00002mm)</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
</tr>
</tbody>
</table>
| (E<sub>λ,avg</sub>) | 66.2 – 69.8°F (19 – 21°C): 2.4 + 5.7L/1000  
59.0 – 77.0°F (15 – 25°C): 2.7 + 6.4L/1000  
50.0 – 86.0°F (10 – 30°C): 3.1 + 7.2L/1000  
50.0 – 95.0°F (10 – 35°C): 3.4 + 7.9L/1000  
3 + 0.72L/100 (Temperature range 10°C - 35°C) |
| (R<sub>λ,avg</sub>) | TP200: 1.9μm  
SP25: 1.3μm |
| (P<sub>λ,avg</sub>) | 2.2μm |
| (MPE<sub>λ</sub>) | 2.7μm/30sec |
| Max. Driving Speed | 13.3"/s (340mm/s) |
| Acceleration | 0.68G (6,750mm/s²) |
| Guiding Method | Linear motion bearing |

![UC-400-K](image-url)
Mitutoyo Sales Solutions

Mitutoyo Sales Solutions is a group of highly skilled engineers specializing in the advanced application of Mitutoyo quality tools and CNC metrology equipment. With decades of combined experience in mechanical/electrical engineering and design, material handling and advanced metrology, their skills show in the many satisfied customers that utilize these services.

In the late 90s, through acquisition and merger of a well-established OEM gage builder, the Mitutoyo Sales Solutions Group was created, bringing decades of design and build of custom measurement systems and applications into the fold of Mitutoyo America Corporation’s broad spectrum of metrology products and services. It was a natural fit and this new-found capability allowed Mitutoyo America Corporation to offer turnkey products and services to its’ clients.

Mitutoyo Sales Solutions’ mission is to bring value-added solutions to our customers, helping them to realize the maximum potential of their Mitutoyo investment. From turnkey application of our line of CNC machines to the most basic of indicators, Mitutoyo America Corporation and Mitutoyo Sales Solutions have resolutions for almost every measurement need. We are here to assist with your unique applications.

Services:
- Fixture design/build
- 3D CAD concepts/renderings
- Reach & feasibility studies
- Turnkey capital projects
- Product implementation
- Custom stylus/accessories
- Inline/near line gaging
- Custom software interfaces/patches
- “Green button” technology

Contact Information:
888-648-8869 • www.Mitutoyo.com • Solutions@Mitutoyo.com

Software

MCOSMOS - GEOPAK CNC
The MACH Ko-ga-me is easily programmed using the standard MCOSMOS software. Programs can be made with the easy-to-use learn mode or from CAD model with CAT1000 via point and click.

GEOPAK provides visual tools, completely eliminating the use of difficult codes or abbreviated commands. A graphically enhanced display provides step-by-step, on-screen wizards that prompt the operator, allowing even inexperienced users to create routines to measure parts.

MiCAT Planner
For fully automated part programming, the MACH Ko-ga-me can be programmed with MiCAT Planner, Mitutoyo’s latest software development for fast and efficient CMM part programming. Programs are made with a few mouse clicks in minutes instead of hours or days.

WORKFLOW:
1) Load design model
2) Select target CMM
3) Part placement via virtual alignment
4) Measurement program creation
5) Translate to Geopak MCOSMOS

Design Model Support:
- Siemens NX w/PMI
- CATIA v5 w/PMI
- PRO/E w/PMI
- ACIS (SAT)
MACH SERIES
Solutions For Every Production Process

MACH Ko-ga-me
1. Compact design for easy integration
2. High-speed measurements
3. Designed for production environment 50.0 ~ 95.0 °F (10 ~ 35 °C)
4. Extremely small footprint - perfect for automated cells and stand-alone solutions
5. Ideal for single-feature inspection and usable with scanning and point-to-point probes
6. Measuring range up to 120 mm
7. Resolution of 0.02μm and a measuring accuracy of (2.4 + 5.7L/1000)μm

MACH-3A
1. High-speed (47.7'' [1,212mm]/sec) and acceleration (1.2G [11,882mm/S²])
2. Small footprint minimizing production space requirements
3. Designed for production environment 41.0 ~ 104.0 °F (5 ~ 40 °C)
4. Optional index table
5. Probe changing capable
6. Measuring range up to 23.6'' (600mm)
7. Resolution of 0.1μm and a measuring accuracy of (2.2 + 3.5L/1000)μm

MACH-V
1. High-speed (34.0'' [866mm]/sec) and acceleration (0.86G [8,480mm/S²])
2. Ideal for in-line integration
3. Designed for production environment 41.0 ~ 95.0 °F (5 ~ 35 °C)
4. Barycentric (center-of-mass) drive system for high speed and accuracy
5. Probe changing capable
6. Measuring range up to 39.3'' (1000mm)
7. Resolution of 0.1μm and a measuring accuracy of (2.5 + 3.5L/1000)μm

Thermal compensation - essential for in-line measurement
During production the temperature of a workpiece may differ from that of the measuring equipment due to the manufacturing processes. The MACH series of CMMs incorporate temperature compensation for both the CMM and workpiece.

To support in-line operations, the machine must continue accurate measurement (reference to 20°C) even while the size of a workpiece is changing due to this temperature difference.

The graph to the right shows the high degree of compensation resulting when a MACH-V series machine (at 20°C) measured a workpiece cooled from 40°C to 20°C.
Whatever your challenges are, Mitutoyo supports you from start to finish.

Mitutoyo is not only a manufacturer of top-quality measuring products but one that also offers qualified support for the lifetime of the equipment, backed by comprehensive services that ensure your staff can make the very best use of the investment.

Apart from the basics of calibration and repair, Mitutoyo offers product and metrology training, as well as IT support for the sophisticated software used in modern measuring technology. We can also design, build, test and deliver measuring solutions and even, if deemed cost-effective, take your critical measurement challenges in-house on a sub-contract basis.

Find additional product literature and our product catalog
www.mitutoyo.com

Note: All information regarding our products, and in particular the illustrations, drawings, dimensional and performance data contained in this printed matter as well as other technical data are to be regarded as approximate average values. We therefore reserve the right to make changes to the corresponding designs. The stated standards, similar technical regulations, descriptions and illustrations of the products were valid at the time of printing. In addition, the latest applicable version of our General Trading Conditions will apply. Only quotations submitted by ourselves may be regarded as definitive. Specifications are subject to change without notice.

Mitutoyo products are subject to US Export Administration Regulations (EAR). Re-export or relocation of our products may require prior approval by an appropriate governing authority.

Trademarks and Registrations
Designations used by companies to distinguish their products are often claimed as trademarks. In all instances where Mitutoyo America Corporation is aware of a claim, the product names appear in initial capital or all capital letters. The appropriate companies should be contacted for more complete trademark and registration information.

Note: MACH KO-GA-ME incorporates a main unit Startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.