m&h
PART OF HEXAGON METROLOGY

PROBING SYSTEMS AND SOFTWARE
Technical innovation, products focused towards the production requirements of our customers and absolute user satisfaction – these are our principal goals for developing high-quality touch probe systems. The requirements of our customers form the focus of our activities in each and every process of our company.

• Innovative touch probes and tool measuring systems – state-of-the-art technology and highest quality

• User-friendly software solutions

• Application-oriented measuring solutions

• Customer-oriented service worldwide

With a worldwide sales and service network through Hexagon Metrology subsidiaries and m&h representations we support our OEM customers and end users on site.
m&h designs and manufactures precision made, high-quality, dependable probe systems for use in machine tools. Technical innovation focused on our customer’s manufacturing processes lies at the heart of our development process. As a part of Hexagon Metrology, m&h stands for innovative metrology for machine tools.

m&h – Part of Hexagon Metrology
Worldwide more than 70 precision centers for your support
The new bidirectional probe IRP25.50 and RWP20.50 are characterized by its modular structure. This makes it possible to optimally adjust the probe to future requirements and applications in the machine tool at any time.

**Modular touch probe systems**

IRP25.50 and RWP20.50 – Different measuring units for various touch probes offer maximum flexibility and reliability for the future. One system each for various applications.

- Can be modified simply by screwing in
- Different measuring units
- Extensions up to 400 mm can be used
- System basis for additional measuring units

**Current m&h measuring units**

PP41.00 Measuring unit with three-leg system
- The safe standard
- For universal use and complex measuring tasks
- Cross probe use possible

MY21.00 Measuring units with hemisphere system
- Patented hemisphere system
- Optimum, stable zero position
- Recommended for machines without spindle reversal

TP44.10 Temperature measuring unit
- Workpiece temperature detection
- Patented technology
m&h
INFRARED-PROBING SYSTEMS

• Reliable HDR+ infrared transmission
• ITE technology – pre-positioning with high-speed
• Safe, reliable activation methods
• Robust, flexible and future-proof

m&h IRP25.50
The bidirectional probe m&h IRP 25.50 is characterized by its modular structure. Various measuring units, different extensions and cross-probes can be used. This makes it possible to optimally adjust the probe to future requirements and applications in the machine tool at any time.

The m&h probes of the new generation allow to operate two IRP25.50 at the same time with only one IRR91.50 receiver. For example, this is suitable for simultaneous measurements on both spindles of double-spindle machines.

m&h IRP25.50-TP
Measures fully automatically the workpiece temperature both before as well as during machining (patented). This allows the control of production processes and the adaptation of machining parameters during production.
m&h INFRARED-PROBING SYSTEMS

• HDR (High Data Rate) transmission excludes interference of measuring from ambient light
• Large transmitting and receiving angles guarantee reliable transmission and enable a large working area

m&h IRP40.01
Compact probe with bi-directional transmission used on HSC machines with small shanks and small tool changers as well as on lathes. Shanks equipped with THERMOLOCK® technology prevent heat transfer from the spindle to the probe.

m&h IRP40.50
The ultra-small IRP40.50 infrared probe is designed for the most compact machining centres. It is ideal for measuring in the machine tool with the smallest tool holders. Naturally, the m&h IRP40.50 is also equipped with the proven HDR infrared transmission.

m&h IRP40.40-LF
The IRP40.40-LF has been specially developed for delicate materials and measuring tasks on thin, fragile workpiece geometries. Even at higher probing velocity and greater stylus deflection the probing forces on the touch probe remain constantly low – this characteristic protects your highly sensitive workpieces against damage.
m&h IRT35.70
Tool measurement system for milling machines and machining centers. Mounting directly on the machine table at different locations is made possible by magnetic clamping (patented).

m&h IRR91.50
The bidirectional infrared receiver IRR91.50 is able to simultaneously communicate with two probing systems on the same machine. It has large transmission and receiving angles and can be used for all m&h infrared probes and tool setters.

m&h IRR91.40
The Infrared Receiver IRR91.40 reliably transmits and receives measurement and temperature data. It can communicate with all m&h Infrared Probes and Infrared Tool Setters. The receiver can communicate with two different probing systems on the same machine.
m&h RADIO-WAVE PROBING SYSTEMS

- m&h radio-wave touch probes are available in two different frequency ranges. Proven SCS radio-wave transmission in the 433 MHz range. Reliable radio-wave transmission by MDR and AFS in the 2.4 GHz range.
- ITE-Technologie (Intelligent Trigger Evaluation)

m&h RWP20.50
The new modular radio-wave touch probe is still compatible with previous devices in the 433 MHz frequency range. Alternatively, the m&h RWP20.50 is also available with the new radio-wave transmission system in frequency ranges from 2.4 to 2.4835 GHz.

m&h RWP20.50-TP
Measures fully automatically the workpiece temperature both before as well as during machining (patented). This allows the control of production processes and the adaptation of machining parameters during production.

m&h RWR95.50
The compact radio-wave receiver RWR95.50 communicates with m&h radio-wave touch probes in the 2.4 GHz range and can be easily mounted in the machine room. The spread spectrum transmission and a multiple transfer of the records ensure transmission reliability and a fast and trouble-free measurement process.
m&h RWP38.41
Compact, modular probe with adjustable trigger force used on machine tools with limited tool diameters and limited Z-Axis height. Ideal for complex measurement tasks.

m&h RWT35.50
Freely positionable tool measurement system with radio transmission for vertical lathes, large mills and machining centers. Held in place with magnetic force, it can be placed anywhere in the machining area without tools. Wireless operation and minimum footprint ensure maximum use of the machining area.

m&h RWR95.40
The compact radio-wave receiver RWR95.40 communicates with all m&h radio-wave probes, including the temperature probe. While in operation, the environment is continuously checked for interference from transmitters (SCS).
m&h PROBING SYSTEMS AND SOFTWARE

m&h LASER TOOL SETTERS

- TCS technology (True Cutting Scan) - for highest precision
- Tool cleaning using Laval nozzle with supersonic pressure
- Optimal protection of the optics by means of pneumatic shutter unit

m&h LTS35.60
Premium laser tool setter for dynamic tool measurement in the high-end sector. The non-contact precision measurement makes it possible to check the dynamic length and diameter on almost every tool from Ø 0.008 mm.

m&h LTS35.65
Cost-efficient standard laser tool setter for everyday measuring tasks on the machine tool for tools from Ø 0.030 mm. Integrated m&h cleaning nozzles and air curtain during measuring prevents pollution. Simple measuring cycles ensure high functional reliability and easy handling.

m&h LTS35.65-23
This compact laser tool setter is designed for usage in machines with a limited amount of space for the measurement of particularly small tools. With a length of 123 mm and a height of only 66 mm, the system even fits in small machines.
m&h LTS35.65-TC
The laser tool setter TC for non-contact tool measurement and efficient control of tool wear or tool breakage. Thanks to the integrated tool setter, the third axis can be determined precisely. Thus, quick temperature compensation can be carried out at any time.

m&h LTS35.66
The laser tool measurement system LTS35.66 is characterised by the greatest degree of flexibility during installation and a simple commissioning procedure. Different assembly aids support the integration into the most varied types of machines. This compact, robust system is absolutely immersion-proof in accordance with IP68.
m&h TOOL SETTERS

- Fast m&h measuring cycles
- Compact design
- Sturdy and absolutely waterproof
- Simple alignment of the measuring surface

m&h TS35.20
The tool setter TS35.20 is designed for use on milling and machining centres and is used to determine tool geometries. The precision measuring mechanism reliably measures tool lengths and tool radii. It also measures individual cutting edges and detects tool breakage.

m&h TS35.30
The tool setter TS35.30 is designed for use on milling and machining centres. It is suitable for tool length measurement and tool breakage detection on stationary tools.

m&h RWT35.50
Freely positionable tool measurement system with radio transmission for vertical lathes, large mills and machining centers. Held in place with magnetic force, it can be placed anywhere in the machining area without tools. Wireless operation and minimum footprint ensure maximum use of the machining area.
m&h IRT35.70
Tool measurement system for milling machines and machining centers. Mounting directly on the machine table at different locations is made possible by magnetic clamping (patented).

m&h PRODUCTION TOUCH PROBE

m&h PP41.00
A very compact probe which is completely compatible with existing systems on the market, used on tool grinders, cylindrical grinders, rotary transfer machines, and for special measurement tasks.
As a technological leader in the on-machine probing and tool checking markets, m&h Inprocess Messtechnik GmbH understands the importance of software in delivering high-productivity solutions for in-process measurement. Only through applying cost-effective, easy to use, capable software, the demands of today’s manufacturing processes can be met.

**PC-DMIS NC**

PC-DMIS NC brings the proven technologies of PC-DMIS to on-machine part setup and validation. It allows manufacturers to make on-machine metrology an integral part of their advanced manufacturing and quality assurance systems. PC-DMIS NC develops inspection programs in a sophisticated and easy-to-use programming environment and uses PTB-certified algorithms to evaluate measurement data.

**PC-DMIS NC Gage**

Developed for easy, quick and safe application of touch probes without requiring the operator to have programming skills or special knowledge of measuring technology. The unique “teach-in method” in manual operation enables a dialogue-based procedure. This process will immediately deliver the desired result. Setup operation of the machine, manual measuring cycles as well as automatic measuring and logging – it is a child’s play.
m&h
3D FORM INSPECT-SOFTWARE
... the original, since 2002 a leader in the market!

m&h 3D Form Inspect - the proven solution for your success. This software enables quick, easy measuring and logging of important geometries and shapes on all sides and with all axes directly on the machine tool. This saves time, provides safety, and enhances quality.

- Intuitive handling and creation of complex measuring tasks without prior programming knowledge required
- Reliable measuring results thanks to RTC – Real Time Calibration
- Easy, safe control of free-form surfaces and ruled geometries on 3 to 5-axis machines
- Smooth post-processing of critical surfaces using Best Fit adjustment on completed workpieces
- Optimal measurement plotting on complex forged parts or cast workpieces using Best Fit adjustment
m&h
3D FORM INSPECT SOFTWARE
IT DOESN'T GET ANY SIMPLER THAN THIS
Measurement and quality control on machine tools are playing an increasingly important role in modern production. The intuitive user interface allows the operator of a machine tool to quickly and easily measure and log ruled geometries and shapes on all sides and axes.

HOW DO I GET THE DESIRED RESULT?
3D Form Inspect supports a wide range of CAD formats and machine post-processors.

➢ Import workpiece data

➢ Define measuring points with the click of a mouse or load a saved measuring programme

➢ Run collision control and simulation of the measuring programme on screen, plus data transfer to the CNC controls
› Carry out fully automatic calibration and measurement on the machine

› Import measuring results

› Analyse measuring results; immediate reworking is possible without wasting time

› Create a measuring log and documentation of the quality achieved
m&h
3D FORM INSPECT SOFTWARE
RTC – REAL TIME CALIBRATION
m&h 3D Form Inspect offers the option of adapting the calibration strategy to its requirements, depending on the production or positioning precision of the machine and the required workpiece tolerance.

WHAT IS CALIBRATION STRATEGY? WHAT ARE THE ADVANTAGES OF THIS?
The following strategies are available:

HIGHEST PRECISION – PATENTED
The patented calibration strategy “Highest precision” is the most important feature and is recommended by m&h. After each axis movement, the probing vectors are calibrated on the calibration sphere. This process is patented by m&h. Exactly those points and probing vectors are calibrated which were set as measuring points on the 3D model. Measuring points with the same probing vectors are only calibrated and then calculated for the vector, which saves time.
> For highly precise parts for which any sources of error should be eliminated as far as possible.

WORKPIECE-RELATED
The points and probing vectors are calibrated which were set as measuring points on the 3D model. The vectors for measurements by axis movements are also applied at this time. The workpiece is then measured.
> The „Workpiece-related“ calibration strategy is used for series production or palletising systems.

ONE-TIME
Here, 161 calibration probings are recorded „one time“ on the calibration ball. These probings are recorded on 3 axes.
> The “One-time” calibration strategy is used only rarely. For example, it is used for parts that have a relatively large tolerance.
WHICH UNCERTAINTIES AND ERRORS ARE ELIMINATED BY THE RTC – REAL TIME CALIBRATION?

- Compensate measuring errors occurring at the spindle interface (SK/BAT)
- Automatically detect and compensate kinematic changes while measuring
- Identify thermal displacements in the working area and apply to evaluations
- Remove the effects of Axis Lag-errors from measuring procedures
- Eliminate pre-travel variation of probing systems using vector calibration

3D FORM INSPECT
WITH PATENTED CALIBRATION STRATEGY FOR MAXIMUM PRECISION
m&h
3D FORM INSPECT SOFTWARE
FUNCTIONS, OPTIONS AND ENHANCEMENTS
The m&h 3D Form Inspect software can be used to quickly and easily measure ruled geometries and shapes on all sides and with all axes directly on the machine tool. This saves time, provides additional safety and improves quality.

› Check free-form surfaces
› Check ruled geometries such as spheres, drill holes, cylinders, etc.
› Determine angled positions for surfaces and ruled geometries
› Analyse shape and position tolerances
› Cross probes are supported

COMPLETE SUPPORT OF 4TH AND 5TH AXIS (OPTION)
• Measuring on all sides of the workpiece and at undercuts or inclined geometries in free space
• Collection of kinematic errors of the 4th and 5th axes through calibration or actual workpiece
• Detected deviations are compensated during the measuring process

BEST-FIT FUNCTION (OPTIONAL)
• Optimization of deviations in position and location by turning and shifting the workpiece
• Can be used for quick fitting of the blank into the best machining position
• Quick re-clamping of moulds for necessary rework, determination of position and zero point defining after measuring
LOGGING AND DOCUMENTATION
Clear, understandable measuring reports can be shown in Excel, Word, OpenOffice, PDF, or HTML as well as in the CAD view. For the complete workpiece or for partial measurements.

ADDITIONAL DESIGN FEATURES
The reporting function enables the integration of
- company name
- tool name
- series or drawing number
- clamping number
- machine designation
- stamp
This saves time, gives safety, and enhances quality – for many years leading companies from the following fields have been relying on it:

- Aerospace
- Automotive
- Mould & Die
- Mechanical Engineering
- Power Generation
- Precision Industry
- Medical Technology
- Domestic Appliances

3D Form Inspect has become accepted on the market and has proven its worth, both for large-sized global players and small-sized companies.

Please see excerpts from some customer case studies about our Touch Trigger systems and the software 3D Form Inspect on the following sides.
Excerpt from
Case Study Volkswagen, Braunschweig

... The workpieces machined here are mostly on the machine tool for many hours and days. The tools and moulds manufactured in Braunschweig are complex and may contain up to 30 slides. In those workpieces a lot of critical areas appear, such like narrow tolerated guideways and clearances.

“The so-called hundreds of insecurity are seldom, nowadays”, Dirk Strümpfeler describes. “Target is the zero-line machining in order to shorten the total manufacturing time. This is only possible by direct measuring while still clamped in the machine tool”

“Now we only put off the workpiece when we know the precision required is given”, Dirk Strümpfeler comments. „We compared the result in benchmark with CMM machines. Now we can be sure that the quality is reliably given and documented”, Oliver Schütze describes the experience at Volkswagen.

Measuring with 3D Form Inspect brought a step forward for the mould makers.”

Oliver Schütze (left) and Dirk Strümpfeler, VW
m&h
3D FORM INSPECT SOFTWARE
Satisfied customers worldwide!

Volkswagen AG | RUAG Aerospace, CH
Hofmann, Lichtenfels | M.C.S. Facchetti S.r.l., IT
Geberit Mapress GmbH | MTU-München
H&H Machines Pty. Ltd., Australia
Daimler AG, Sindelfingen | Rapp, Bruchsal
Glaroform, CH | SM3D, Chateau Gonthier, FR
Pfaff, Röthenbach | Caterpillar Inc., USA
Rejlek, GmbH | Chastagnere, La Ferte Bernard, FR
Daimler AG, Untertürkheim | quattro-form, Ettenheim
AUDI AG, Ingolstadt | Rolls Royce, Derby, UK
Meik, Lindlar | ACTech GmbH, Freiberg
IWC, Schaffhausen | Messier Dowty, Ajax Canada
Andreas Stihl AG & Co. Kg | AKO, Sinsheim
Deutsche Edelstahlwerke GmbH, Witten
Lehmann, Neustadt | Deharde Maschinenbau
EDAG, Fulda | Atlas Copco Airpower, Wilrijk, BE
Herriegel, Neckarsulm | Schaeffler KG, Schweinfurt
Excerpt from
Case Study RUAG Aerospace

... At RUAG the machining of the fan housings of passenger-jet-engines is done on 2 machining centres with pallet changers. The main problem is to re-fix this thin-walled part in a way guaranteeing the Zero-point and with correct roundness after putting it down from the machine-tool. “Measuring by 3D Form Inspect from m&h while still clamped on the machine tool was the only way to do the job”, Markus Graber explains.

“The measuring results from 3D Form Inspect allow decisions to continue or stop machining of the parts at any time during the process,” Markus Graber confirms their good experience. “This is possible thanks to the ingenious calibration strategy of m&h”.

This simply gives us the certainty in production we need. And it pays in short time, definitely.”

Markus Graber explains
Excerpt from
Case Study Geberit

... Geberit is a European market leader in sanitary technics and well known as a brand for in-house water systems.

In three different plants they manufacture dies for metal forming, moulds for sanitary systems made from different plastics or tools for the production of formed tubes as well as shiny actuator plates for water boxes.

“Measuring with m&h saves enormous time”, Daniel Wilhelm tells. “In former times we machined the parts, did spark erosion and measured manually; often with especially manufactured measuring instruments. In 50% of all cases we had to re-work once again. Nowadays we save up to 3 days per manufactured cavity!”.

This software pays within shortest time.”

Jürg Huber is convinced
Excerpt from
Case Study Hofmann Lichtenfels

... “We wanted to eliminate what we called “the see-saw” in the workshop,” explains Günter Hofmann. Since then, work-pieces have been measured directly on machines at Hofmann. Werner Mäusbacher, milling group leader at Hofmann, explains: “Our goal is not to do any diespotting since machine finished quality is much better.”

With these close tolerances this can only be achieved by measuring on the machine. “Good parting surfaces with a long lifetime, in almost every case, can only be achieved by finish milling.”

“We can rework immediately in the same clamping if it doesn’t fit by two hundredths,” confirms Werner Mäusbacher. “There’s no other way to do it more efficiently.”

Today, measuring on the machine is absolutely normal and is of prime importance.”
Günter Hofmanns final comment
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3D FORM INSPECT SOFTWARE
Satisfied customers worldwide!

K&M, Lüdenscheid | Krones AG, Neutraubling
ZF Sachs, Bielefeld | Präwema, Eschwege
Hofmann & Engel | PSA Peugeot-Citroen, FR
Kostal, Lüdenscheid | Siemens, Mülheim
Metzeler GmbH & Co. KG, Rankweil | Dätwyler, CH
Engesser, Geisingen | Federal Mogul, Nürnberg
FKT Formenbau und Kunststofftechnik GmbH
Müller Production SA, CH | Laro NC-Technik
Dedienne Sonte, Montpellier, FR | Gewiss S.p.A., IT
Formentechnik, Bayreuth | Marle Maurice, FR
Siemens, Bad Neustadt | Bueschl GmbH, Schwaig
Lauer Harz, Lüdenscheid | Hack Formenbau
C.M. s.n.c di Menegazzi, IT | Probst&Hunziker, CH
GWS Werkzeug und Sonderfertigung, Elsterberg
Maier Formenbau, Bissingen | ThyssenKrupp, CH
Präzisions Werkzeug & Formenbau Havlat
Wiener Linien GmbH & Co KG | Inglass S.r.l., IT
CASE STUDY

Burr-free, first time!

Excerpt from
Case Study Vorwerk

... Mould maker Vorwerk checks mould inserts and slides while still clamped on the machine tool using m&h’s touch probes and 3D Form Inspect software. A mould manufactured this way, with two sets of ten slides, was burr-free first time and released for volume production after the very first sample.

"In mould making, we have the opportunity to react early when measuring part contours on the machines. This is not only important for new tools but for spare parts and repair work as well." Many plastic materials being machined at Vorwerk are very abrasive since they have considerable fibre content to ensure longer service life. The most important things are constant fitting and contour accuracies of mould inserts since they are repeatedly manufactured during the lifetime of a mould. “Now we machine to finished sizes and our die spotting surfaces look entirely different,” he reports.

Die spotting was reduced by 70 – 80%.

Dipl.-Ing. Marc Alexander Popov is glad
... An Italian manufacturer of injection moulds provides for clear vision in production through measuring workpieces while still clamped on the machining centres. This is achieved by using German m&h touch probes and software on Japanese machine tools.

All in all, at Cosmac there are no surprises and uncertainties any more the field of metal-cutting that previously postponed delivery dates. Right from the beginning of order processing, the manufacturing time needed is clearly determined and can be adhered to. “We have completely eliminated non-productive machining,” Alessandro Maccagnan gladly reports. The two brothers answer the question whether they would invest in m&h touch probes and testing software again in unison: “Straightaway again!”. The customers accept the m&h protocols, and this facilitates our work decisively”.

Stefano (left) and Alessandro Maccagnan gladly report
Anywhere in the world our field engineers install probing systems and software solutions. Do you have questions about the products or do you need application assistance on your machine tool? We will advise and support you until your problem is solved. We offer trainings in order to give confidence to the machine tool operators. Our quick repair & exchange service for damaged probes avoids downtime. The Hexagon Metrology worldwide sales and service network offers qualified advice and local service, quickly and effectively.

- Field Service Technicians
- Technical Support
- Training and Demo
- Repair and Exchange Service
- Spare Parts

Worldwide more than 70 precision centers for your support
m&h offers a wide range of training courses, workshops and demonstrations for beginners as well as for experienced operators. These are designed so that your employees can achieve optimal performance in your production. Target-group oriented and practical in small groups directly at the machine tool.

At our new training and demonstration centre in Waldburg, we offer a fully equipped training environment. Our instructors are highly trained and have a comprehensive understanding of their applications thanks to years of experience.

Your employees can be trained in a particularly concentrated and sustainable manner outside their daily work environment. If a training course should be required directly at your machine on-site, this can be realised by our trainers, too.

Use the potential of your machine tools. Through improved workpiece and tool checking, you quickly and efficiently achieve maximum productivity – we will be glad to help you do this.
Our training and demo centre provides the following services:

- Regular free-of-charge workshops for end customers (1 day)
- Comprehensive training programme for using and operating m&h touch probes, tool setters and software solutions
- Customised demos using your own applications, such as with our premium measuring software 3D Form Inspect

All training and demos can be booked for small groups or individuals; alternatively we also offer training on site. For advice and to register, contact: training.mh@hexagonmetrology.com
WORKSHOP MEASURING ON MACHINE TOOLS
Workpiece and Tool measurement with probing systems from m&h. Basic course for Heidenhain and Siemens controls / 1 day.

Topics:
Overview of probing systems and tool setters | Correct handling and calibration | Application-oriented measuring functions | Integration in the work process

WORKSHOP 3D FORM INSPECT BASIC
Get the perfect measurement result in a few steps with 3D Form Inspect from m&h. Basic course for Heidenhain and Siemens controls / 1 day.

Topics:
Correct calibration | Defining measuring points | Collision control on screen | Creation of the measuring program with automatic transfer to the CNC control | Measuring on the machine and evaluation of measurement results

WORKSHOP 3D FORM INSPECT ADVANCED
Measuring and finish machining with 3D Form Inspect from m&h. Advanced course for Heidenhain and Siemens controls / 1 day.

Topics:
Correct calibration | Measuring on 5-axis machines | Best-fit - make use of the options | Evaluation of the measurement results | Demo of specific measuring tasks
Expertise in production measuring technology is about consistent quality and productivity. Benefit from our extensive knowledge in the field of measurement with tool machines and prevent unnecessary machine downtimes or rejected products.

Get to know the full potential of your m&h product. Our experts will be happy to extensively familiarise you with the details of our products and show you new ways to use them.
Hexagon Metrology offers a comprehensive range of products and services for all industrial metrology applications in sectors such as automotive, aerospace, energy and medical. We support our customers with actionable measurement information along the complete life cycle of a product – from development and design to production, assembly and final inspection.

With more than 20 production facilities and 70 Precision Centers for service and demonstrations, and a network of over 100 distribution partners on five continents, we empower our customers to fully control their manufacturing processes, enhancing the quality of products and increasing efficiency in manufacturing plants around the world.

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More than 70 precision centers for your support!

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