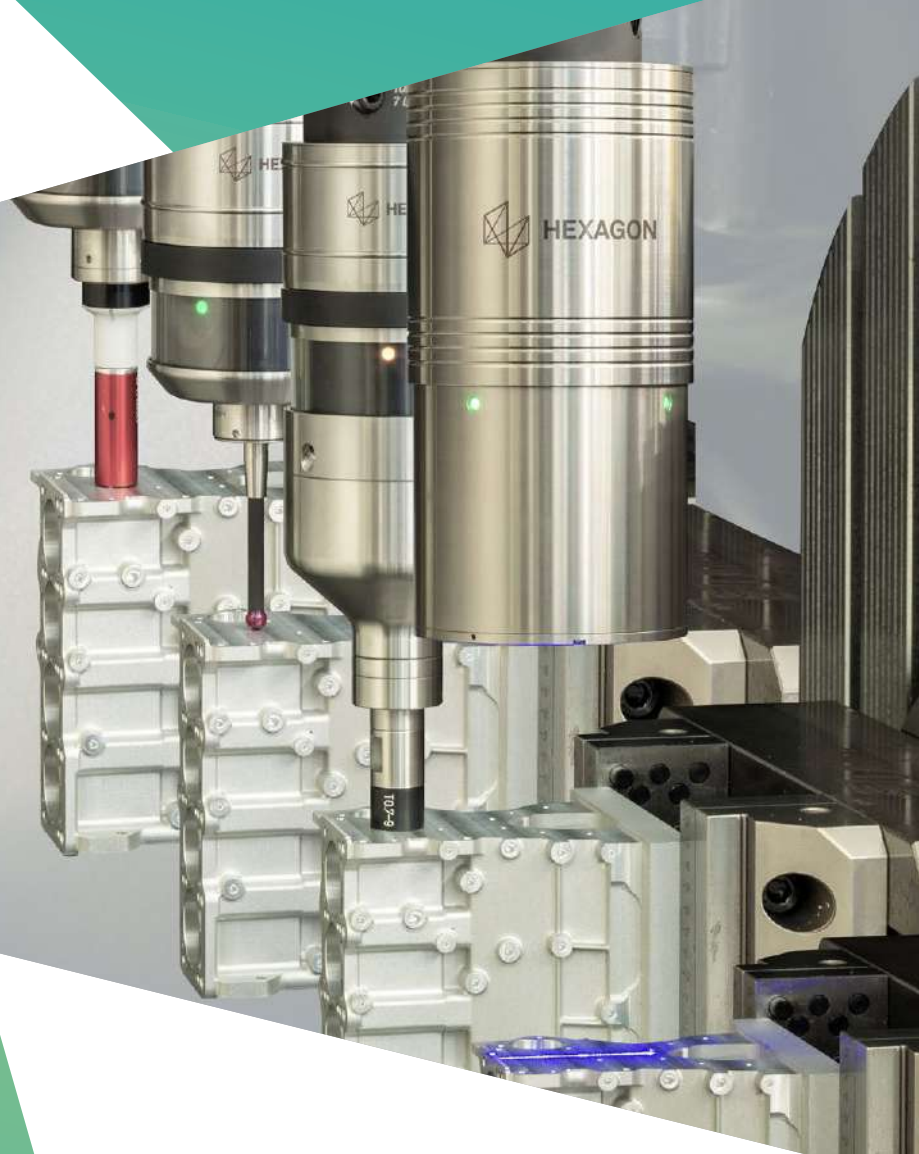# HEXAGON

Probing systems with radio-wave transmission

Multisensor technology for the machine tool

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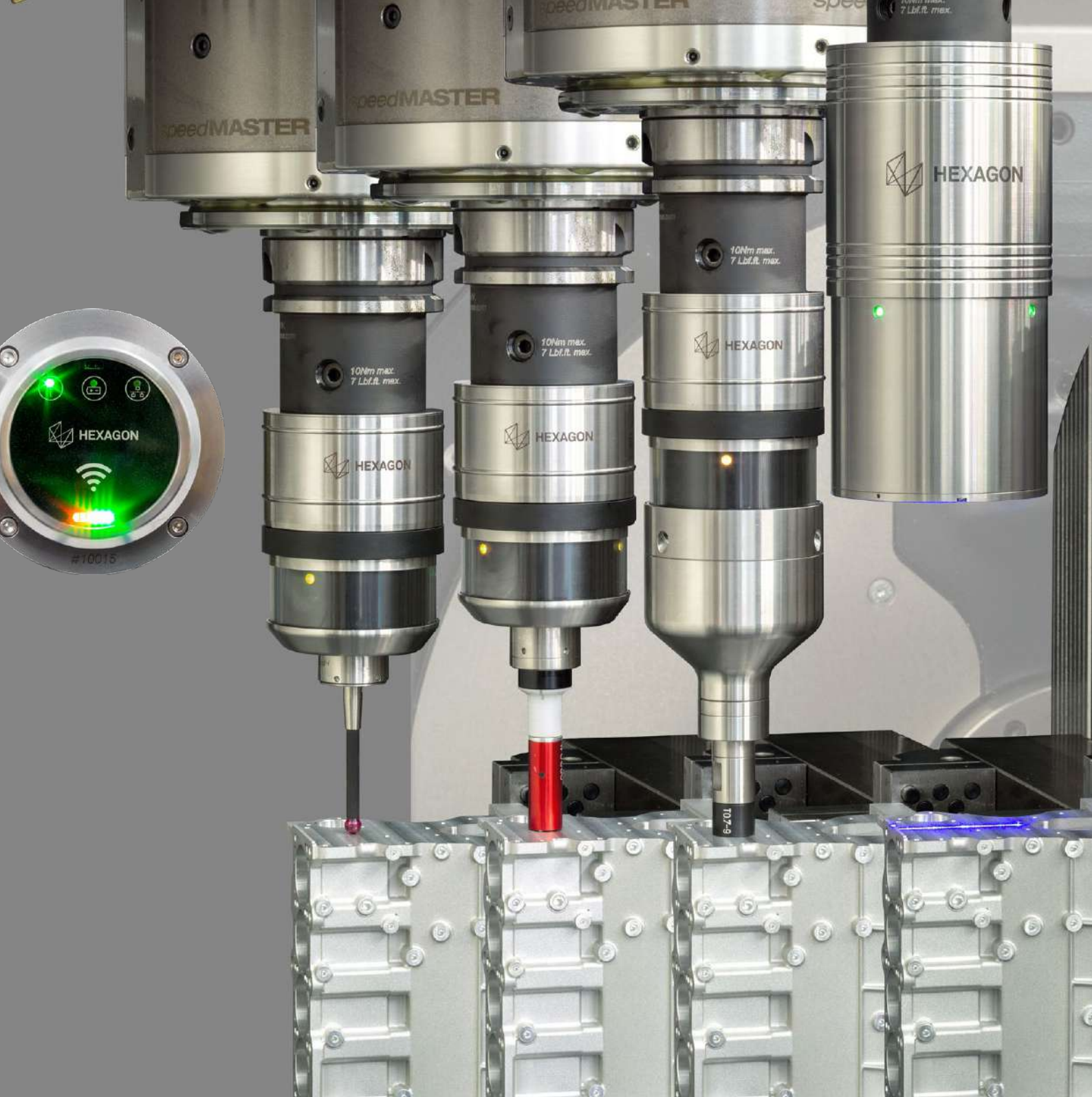
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Open up the future right from the beginning

Hexagon multisensor technology for machine tools enables you to

- more process reliability

- a greater degree of automation

- a larger data base

- more efficiency in the production process

Hexagon machine tool multisensor technology

As a committed, innovative partner for ground-breaking measuring solutions, Hexagon has developed a cutting-edge modular probing systems to enhance productivity and quality through rapid and accurate data transmission.

The m&h RC-R-100 is the multifunctional radio receiver for the complete machine tool multisensor portfolio. The receiver supports bidirectional communication for up to eight probes on the same machine. It can communicate with all kinds of Hexagon probing systems and sensors, including tactile probes, temperature probing systems, ultrasonic probes and laser scanners.

Hexagon's modular probes are suitable for a wide range of applications, making them the perfect foundation for machine tool measurement. They are designed for ease of use, versatility and cost efficiency.

Supplemented by the radio wave laser scanner and ultrasonic probes the possibilities for new areas of application have been expanded.

m&h RC-R-100 is the cornerstone of Hexagon's machine tool multisensor technology, enabling the use of more than one sensing technology on the same machine tool for maximum inspection efficiency.
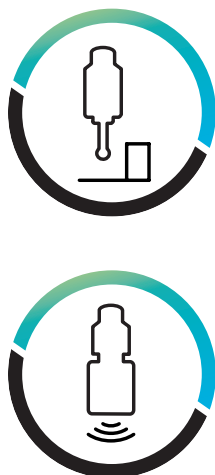
Choose the right measuring device for your application

m&h TS-R-400

The tool measuring systems is used to determine tool geometries such as tool length and radius in the machine. It also measures individual cutting edges and detects tool breakage. The system offers different mounting options for flexible installation in the machine room.

m&h RWP20.50-PP
m&h TP-R-400-PP

The PP version is equipped with the PP41.00 measuring unit, with tripod system. The safe standard for universal use is ideally suited for the majority of measuring tasks. It can be used with cross-probes and has an adjustable trigger force.

m&h RWP20.50-MY
m&h TP-R-400-MY

The MY version is equipped with the MY21.00 measuring unit, with patented hemisphere system.
Its optimal and stable zero position makes it particularly recommendable for machines without rotation spindles.

m&h RWP20.50-HPP
m&h TP-R-400-HPP

The HPP is a high precision measuring unit that deploys a patent-pending laser-triangulation technique, also used on coordinate measuring machines.
It ensures the greatest levels of precision when capturing data measurement points.

m&h RC-R-100 Multisensor Receiver

RC-R-100 is the core of Hexagon's multi-sensor technology for machine tools, enabling the use of multiple sensor technologies on the same machine, such as tactile probes, temperature probes, ultrasonic probes and laser scanners. The receiver supports bidirectional communication for up to eight devices on the same machine.

m&h RC-R-100 Core Receiver

The radio receiver radio receiver communicates with radio-wave touch probes and tool setters in the 2.4 GHz range and can be easily mounted in the machine room. The receiver supports bidirectional communication for up to 8 tactile probes or tool setters on the same machine. Thanks to innovative pairing functions, new or additional probes can be easily integrated.

m&h RWP20.50-G-TP

The TP version is equipped with the TP44.10 temperature sensor, with patented temperature measuring technology. It is the perfect solution for consistent production quality or cost-intensive workpieces.

m&h RWP20.50-G-UTP

The UTP47.10 ultrasonic measuring unit makes it simple to automatically measure the wall thickness of larger parts directly in the machine tool installation, resulting in significantly faster inspection and enhanced data capture. A selection of sensors is available, wet or dry coupled, which can be specified to suit the requirement and application.

m&h LS-R-4.8

The wireless laser scanner for the machine tool. The data is transmitted to the machine control and software using radio transmission, which is why the laser scanner can be changed in and out by the tool magazine without manual intervention.

A versatile system for varied demands

m&h R-400 – for workpiece and tool measurement

Series production places the highest demands on the production process. The radio system base m&h R-400 fulfils these requirements in the machine tool. The R-400 radio system base can be used as a (m&h TP-R-400) as well as a tool measuring system (m&h TS-R-400).

m&h TP-R-400

The TP-R-400 is characterised by its modular design. Different measuring units, diverse extensions as well as styli crosses can be used. This allows the TP-R-400 to be optimally adapted to future requirements and applications in the machine tool.

- Modular design

- Transmission free of interference signals - thanks to AFS technology

- Cost-effective for different requirements

m&h TS-R-400

The TS-R-400 radio tool measuring system is used to determine tool geometries such as tool length and radius in the machine. It also measures individual cutting edges and detects tool breakage. The measurement can be carried out both statically and dynamically. Through radio transmission, the measuring signals from the tool measuring system are transmitted over long distances to the receiver. Different mounting types are available for installation in the machine room, such as quick mounting on a pre-mounted base plate or directly on the machine table.

All-round visible status through illumination ring

m&h R-400 is the first system base on the market that uses an illumination ring to display the status of the machine tool for operators and service staff, thus providing full visual control.

Unique operation

The m&h R-400 system base is the first touch probe on the market that can be operated via a touch sensor. The clear display and icons enable intuitive operation. Safety functions such as "lock settings" protect the unit from unwanted adjustments. This increases process reliability. Other devices, such as smartphones, are not neccessary.

Ground-breaking measuring solutions for different applications

Rapid, high-quality series production requires flexible and effective measurement solutions. As experienced developer of measuring technology for machine tools, Hexagon integrates customers' requirements into its developments.

Ultrasonic probe
m&h RWP20.50-G-UTP

Automated wall thickness measurements

The RWP20.50-G-UTP ultrasonic touch probe makes it simple to automatically measure the thickness of walls on larger parts directly in the machine tool installation, resulting in significantly faster inspection and enhanced data capture.

The RWP20.50-G-UTP can work with or without coupling medium, depending on the requirements. The version with wet coupling can record data in two different measuring ranges 0.7 - 9 mm (47.00-UTP-W-0.7/9) and 1.5 - 30 mm (47.00-UTP-W-1.5/30).

For dry couplings without the use of liquids, measurements can be taken in the range of 0.7 - 9 mm (47.00-UTP-D-0.7/9).

- **Fully automated data capture, documentation and traceability**

- **Significant reduction of process times thanks to replacement of time-consuming manual wall thickness checks**

- **Higher process reliability through consistent data without manual intervention**

Laser scanner with radio transmission
# m&h LS-R-4.8

The wireless laser scanner from the tool magazine

With a laser scanner integrated in the machine, users can quickly capture data and analyse and evaluate the complete, data-rich image. Discrepancies can be corrected during the clamping process.

The data is transmitted to the control and software by radio transmission, which is why the laser scanner can be set up and reset without manual intervention and exchanged via the tool magazine without manual intervention.

The m&h LS-R-4.8 is designed for a wide range of applications and surface types thanks to the fixed blue laser line and delivers precise measurement results on shiny and dark surfaces. In combination with the receiver m&h RC-R-100, it can be used flexibly and automatically in the machine, and other Hexagon sensors and probes can also be integrated into the production process.

- **Creation of colour maps directly inside the machine**

- **Best measurements of complete freeform surfaces**

- **Exact alignment and overstock checks before reworking**

- **Fast data creation for reverse engineering**
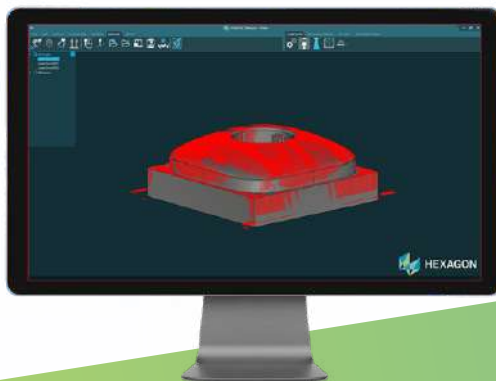
Temperature probe
m&h RWP20.50-G-TP

Automated temperature measurement

The RWP20.50-G-TP temperature sensor detects the workpiece temperature automatically both before and after machining. This leads to high production quality by ensuring that workpieces are only machined within predefined temperature ranges. This enables the control of manufacturing processes and the adjustment of machining parameters during production.

- **Patented technology delivers fast measurement of part temperature for precise production results**

- **Reliable determination of temperature-dependent parameters enables greater control of production processes**

Highly accurate radio-wave touch probe
m&h RWP20.50-G-HPP and m&h TP-R-400-HPP

The HPP measuring unit is Hexagons's most accurate on-machine touch sensor. It can be used with m&h RWP20.50-G and m&h TP-R-400 probes and deploys laser-triangulation to achieve extremely high repeatability, low pre-travel variation and low 3D form error.

Many applications, for example the measurement of freeform shapes or checking of machine kinematics, need extremely precise measurement results in 2D and 3D. These are best achieved by deploying Hexagon's patent-pending laser-triangulation technology in the HPP measuring unit.

- **Highly accurate results**

- **Low trigger force**

- **Extremely precise in 2D and 3D**

- **Robust and durable**

- **Workshop-oriented handling**

State of the Art

Reliable radio-wave transmission by MDR and AFS in the 2.4 GHz range

The MDR (Multi Data Rate) technology enables the transmission of high data rates and large data sets in the shortest possible time. The spread spectrum transmission and a multiple transfer of records ensure transmission reliability and a fast and trouble-free measurement process.

In AFS (Automatic Frequency Select) technology, the frequency ranges of the radio bandwidth are continuously scanned and partial frequencies free from interference are automatically selected. This technology not only ensures fast and interference-free independent transmission, but also prevents interference from WLAN systems or other radio sources. Measurement signals are transmitted extremely quickly to the machine controller upon contact of the probe at the measurement point, in order to achieve the shortest possible delay and ensure consistent measurement accuracy.

Innovative pairing options

- Pairing via NC control allows the machine manufacturer to provide an NC program for automatic pairing; the user merely has to start the NC program.

- Pairing via serial number and radio signal enables entry of the receiver's serial number on the touch probe radio transmissaion of the settings to the receiver.

- Pairing via infrared (IR) interface is standard for many products and can be done by visual contact between the probe and receiver.

ITE-Technology

ITE (Intelligent Trigger Evaluation) technology allows pre-positioning at high speed (up to 50 000 mm/min). Fast, precise, one-touch probing (up to 2000 mm/min) maximises precision. The radio wave probe RWP20.50 moves at top speed to the measuring point, so that it can reliably probe at constant measuring speeds with only one touch. This considerably accelerates the measuring process and saves valuable production time.

Reliable and unique probe activation methods

In addition to the proven, reliable mechanical activation options, Hexagon radio probes also offer the option of bidirectional activation. This is done using separately coded signals and is as reliable as mechanical methods.

Other activation options:

- Patented pull stud activation

- Patented water-switch activation

- Mechanical HSK activation

Technical data

	Description	Measuring unit PP41.00	Measuring unit MY21.00	Measuring unit HPP41.10
m&h RWP20.50-G	Repeatability (probing from one direction)	Max. 1 µm (2 Sigma) with 50 mm stylus and 254 mm/min probing feedrates	Max. 1 µm (2 Sigma) with 50 mm stylus and 254 mm/min probing feedrates	Max. 0,25 µm (2 Sigma) with 50 mm stylus and 254 mm/min probing feedrates
	Recommended probing feedrates	Max. 2000 mm/min	Max. 2000 mm/min	100 - 500 mm/min
	Sensing directions	±X, ±Y, -Z	±X, ±Y, -Z	±X, ±Y, -Z
	Maximum stylus overtravel	XY = ±12,5°; Z −6 mm	XY = ±14°; Z = −4,5 mm	XY = ±12°; Z = −5mm
	Trigger force with 50 mm stylus	XY = 0,3 - 1,4 N (Factory settings = 1 N) Z = 2,5 - 12,5 N (Factory settings = 8,5 N)	XY = 1 N Z = 6 N	XY = 0,75 ±0,25 N Z = 7N ±10% (probing feedrate 254mm/min)
	Battery lifetime with lithium battery	Operation: 500h Standby: 1 Year	Operation: 500h Standby: 1 Year	Operation: 180h Standby: 1 Year
	Signal transmission	2400-2483,5 MHz (2.4 GHz)	2400-2483,5 MHz (2.4 GHz)	2400-2483,5 MHz (2.4 GHz)
	Transmission/reception range	Up to 18m	Up to 18m	Up to 18m
	Power supply	1 x 9 V battery, block, 6LR61, Lithium 1200 mAh Alkaline: 550 mAh	1 x 9 V battery, block, 6LR61, Lithium 1200 mAh Alkaline: 550 mAh	1 x 9 V battery, block, 6LR61, Lithium 1200 mAh Alkaline: 550 mAh
	Material	Stainless steel, POM	Stainless steel, POM	Stainless steel, POM
	Weight without shank	Approx. 940g	Approx. 980g	Approx. 940g
	Temperature range	Operation: 10° C – 50° C, Storage: 5° C – 70° C	Operation: 10° C – 50° C, Storage: 5° C – 70° C	Operation: 10° C – 50° C, Storage: 5° C – 70° C
	Protection class	IP68: EN60529	IP68: EN60529	IP68: EN60529

	Description	Measuring unit TP44.10	Measuring unit UTP47.10
m&h RWP20.50-G	Sensing directions	-Z	-Z
	Maximum stylus overtravel	-6,9 mm	-6 mm
	Trigger force	13 N	12 N
	Recommended probing feedrate	500 mm/min	500 mm/min
	Measuring accuracy*	±1° C	±10 µm
	Battery lifetime with lithium battery	Operation: 440 h Standby: 1 year	Operation: 200 h Standby: 1 year
	Measuring range	-	0,7 - 9 mm (47.00-UTP-D-0.7/9) 0,7 - 9 mm (47.00-UTP-W-0.7/9) 1,5 - 30 mm (47.00-UTP-W-1.5/30)
	Accuracy Z measurement	-	5 µm (2 Sigma)

* The measuring accuracy depends on the condition (surface finish, surface parallelism) and calibration of the workpiece.
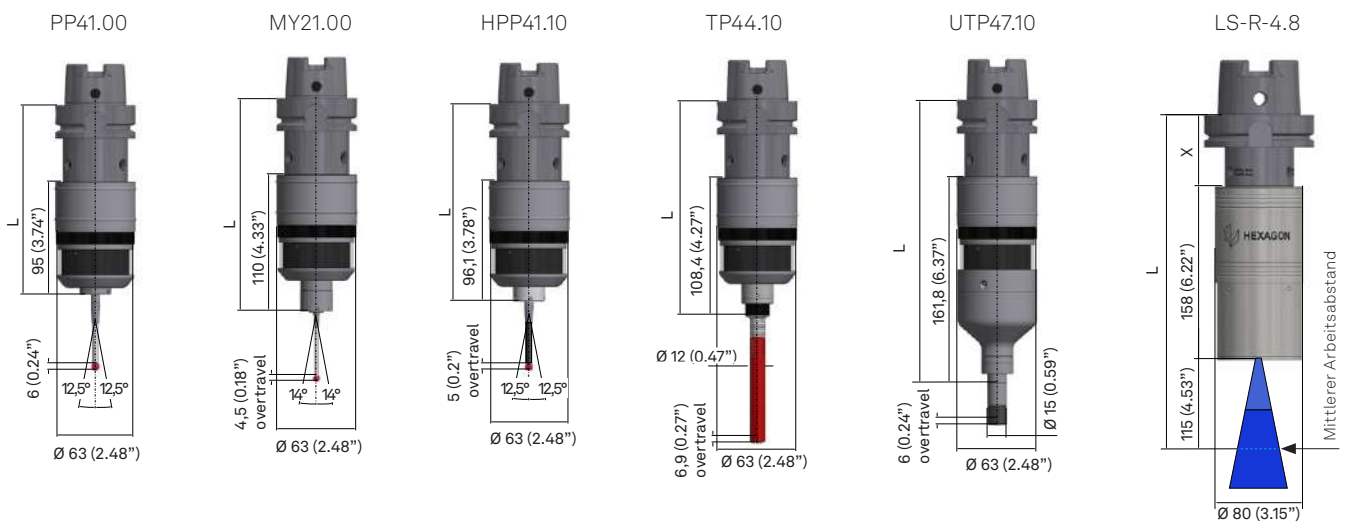
Description	LS-R-4.8
Laserklasse	2 (EN /IEC 60825-1: 2014)
Laser type	PL450B (laser diode)
Measurement accuracy*	30 µm
Emitted wavelength (blue)	450 nm
Laser type	CW Laser (Continuous Wave)
Data transmission	Radio transmission
Working distance and depth (Z) (outer housing edge to average working distance)	115 ± 40 mm
Line width	27,1 mm (minimum working distance) 39,2 mm (average working distance) 51,3 mm (maximum working distance)
Data rate	30.000 to 36.000 Pt/sec
Sensor's insensitivity to extraneous light	5.000 lx (diffused, indirect artificial light)
Operating temperature	5 to 40 °C (41 to 104°F)
Temperature range for specified accuracy	15 to 40 °C (59 to 104°F)
Storage temperature	-25 to +70 °C (-13 to +158°F)
Weight	1900 g (without batteries)
Power supply	4x 3.7V battery, 26650, Li-ion, 5000mAh
Battery lifetime	10 h
Protection against dust and water	IP68 (IEC 60529)

*Depending on the application and installation situation

Dimensions

m&h RWP20.50-G

PP41.00	MY21.00	HPP41.10	TP44.10	UTP47.10	LS-R-4.8

Technical data

Description	Measuring unit PP41.00	Measuring unit MY21.00	Measuring unit HPP41.10
Transmission frequency	2400-2483,5 MHz (2,4 GHz)	2400-2483,5 MHz (2,4 GHz)	2400-2483,5 MHz (2,4 GHz)
Transmission/reception range	Up to 18 m	Up to 18 m	Up to 18 m
Power supply	2x battery (3,6 V / ½ AA)	2x battery (3,6 V / ½ AA)	2x battery (3,6 V / ½ AA)
Material	Stainless steel, POM	Stainless steel, POM	Stainless steel, POM
Temperature range	Operation: 10°C -50°C Storage: -20°C -70°C	Operation: 10°C -50°C Storage: -20°C -70°C	Operation: 10°C -50°C Storage: -20°C -70°C
Sealing	IP68: EN60529	IP68: EN60529	IP68: EN60529
Sensing directions	±X; ±Y; -Z	±X; ±Y; -Z	±X; ±Y; -Z
Maximum stylus overtravel	XY = ±12,5°, Z = -6mm	XY = ±14°; Z = -4.5mm	XY = ±12,5°, Z = -5mm
Trigger force* with 50mm stylus	XY = 0.3 -1.4N (factory setting = 1N) Z = 2.5 -12.5N (factory setting = 8.5N)	XY = 1N Z = 6N	XY = 0,75 ±0,25 N, Z = 7N ±10% (probing feedrate 254mm/min)
Recommended probing feedrate	max. 2000 mm/min	max. 2000 mm/min	100-500 mm/min
Unidirectional repeatability (deflection from one direction) with 50mm stylus and 254mm/min probing feedrate	max. 1 μm (2 Sigma)	max. 1 μm (2 Sigma)	max. 0,25 μm (2 Sigma)
Weight TP-R-400-PP without tool holder	Approx.315g	Approx. 340g	Approx. 315g
Maximum battery life with lithium battery	Operation: 300 h Standby: 12 months	Operation: 300 h Standby: 12 months	Operation: 110 h Standby: 12 months
Tripping force* with 50mm stylus	–	–	XY = 0,1N (typical value) Z = 2,5N (typical value)

m&h TP-R-400

* Tripping force: Force when the probing signal is tripped at the touch point not influenced by the machinedynamics (stops without delay when the touch point is reached)
   Trigger force: Force after passing the touch point influenced by the machine dynamics (positioning speed,delay)

| Description	
Transmission frequency	2400-2483,5 MHz (2,4GHz)
Transmission/reception range	Up tp 18 m
Power supply	2x battery (3,6 V / ½ AA)
Material	Stainless steel, POM
Temperature range	Operation: 10°C -50°C, Storage: -20°C -70°C
Sealing	IP68: EN60529
Sensing directions	±X; ±Y; -Z
Max. stylus overtravel	XY = ±12,5°; Z = -6 mm
Trigger force	XY = 0,3-1,4 N (factory setting = 1 N) Z = 2,5-12,5 N (factory setting = 8,5 N)
Unidirectional repeatability (deflection from one direction)	max. 1 μm (2 Sigma) at 254 mm/min probing feedrate
Maximum battery life with lithium battery	Operation: 300 h, Standby: 12 months

TS-R-400

	Description	m&h RC-R-100 Multisensor	m&h RC-R-100 Core
Radio-wave Receiver	Transmission frequency	2400-2483,5 MHz (2,4 GHz) 5.15-5.25 GHz (WLAN 5 GHz) (20MHz chanels 36, 40, 44, 48)	2400-2483,5 MHz (2,4 GHz)
	Transmission/ reception range	Up to 15 m	Up to 15 m
	Power supply	12 - 30 VDC, max. 400 mA (depending on the output load and the operating state)	12 - 30 VDC, max. 400 mA (depending on the output load and the operating state)
	Weight	RC-R-100-R= 1210g (with cable) RC-R-100-R-PT = 1570g (with cable and protection tube)	RC-R-100-R-PT-C = 1570g (with cable and protection tube)
	Temperature range	Operation 10° - 50°C Storage: 5° - 70°	Operation 10° - 50°C Storage: 5° - 70°
	Material	Stainless steel	Stainless steel
	Sealing	IP68: EN60529 IEC529/DIN40050	IP68: EN60529 IEC529/DIN40050
	Installation (TD)	4 x Cap head screws M4	4 x Cap head screws M4
	Connecting cable	RC-R-100-R = 0,5 m with plug RC-R-100-R-PT = 2 m with plug	RC-R-100-R-PT-C = 2 m with plug

RC-R-100 Multisensor
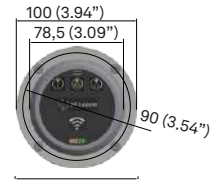
RC-R-100 Core
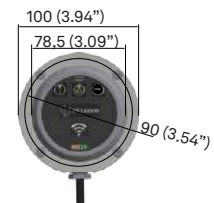
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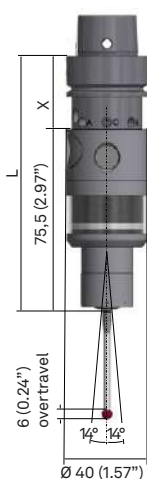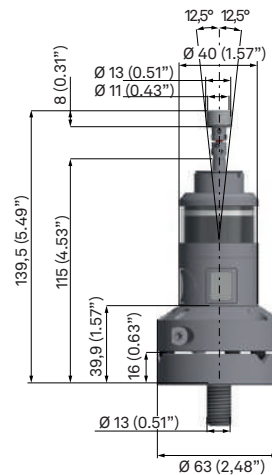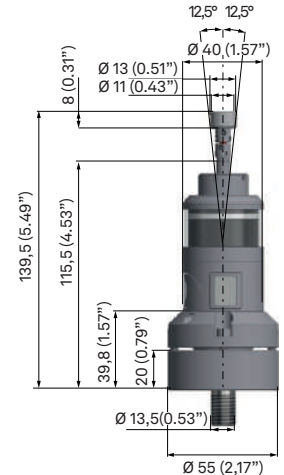
m&h TP-R-400

PP41.00

MY21.00

HPP41.10

TS-R-400-M

TS-R-400-S

HEXAGON

Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter. For more information, visit hexagonmi.com.

Learn more about Hexagon (Nasdaq Stockholm: HEXA B) at hexagon.com and follow us @HexagonAB.