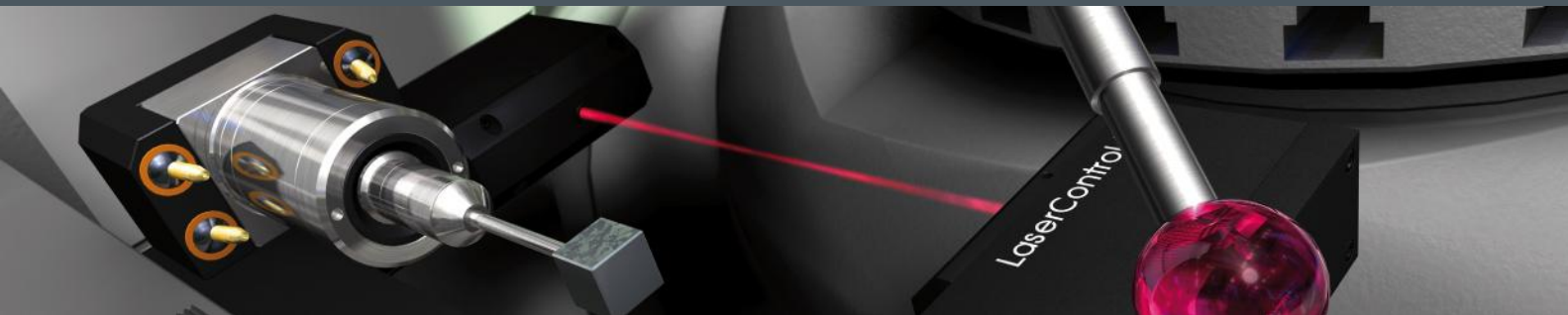


BLUM
NOVOTEST



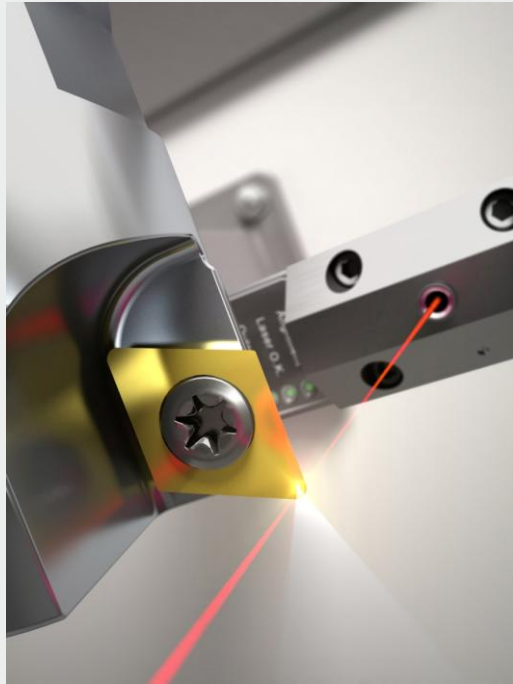
Blum-Novotest GmbH | Business Division Measuring Components



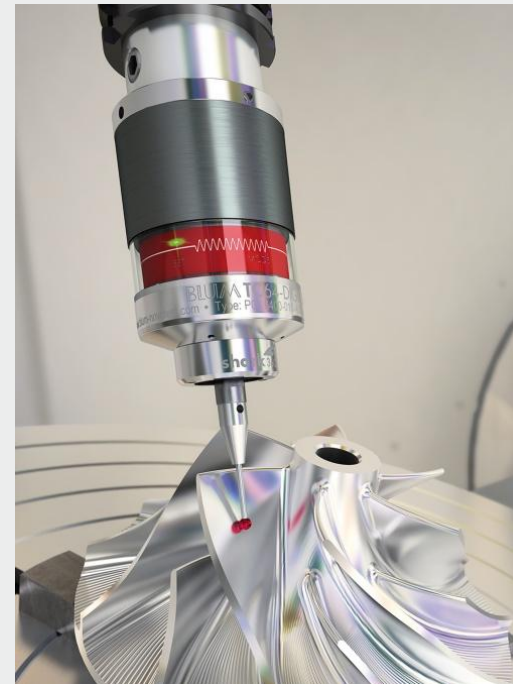
Measuring technology	Advantages	Difficulties	Examples
In-process Measurement (Parallel to machining operation)	<ul style="list-style-type: none">• Short response time	<ul style="list-style-type: none">• Accessibility• Reliability• Feasibility	<ul style="list-style-type: none">• Power Monitoring
Post-process Measurement (Parallel to machining operation)	<ul style="list-style-type: none">• Parallel to machining operation, because after processing• Application specific use of various sensors	<ul style="list-style-type: none">• High cost and space requirement• No original setting• High effort for rework• High complexity in case of automation	<ul style="list-style-type: none">• Measuring stations (automated)• CMM
Process-integrated Measurement (during non-productive time)	<ul style="list-style-type: none">• Flexibility• Easy rework• Short reaction time• Process control	<ul style="list-style-type: none">• Investment in machining time, machine integration	<ul style="list-style-type: none">• Touch Probes• Laser measuring systems• Bore Gauges



Process-integrated Measurement on the machine tool



Tool Measurement



Workpiece Measurement



Business Division Measuring Components

Production Metrology



LaserControl



Tool Setter



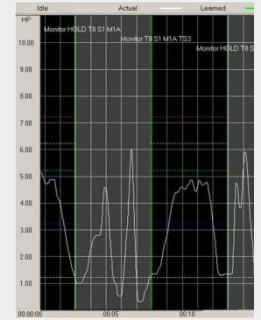
Special Solutions



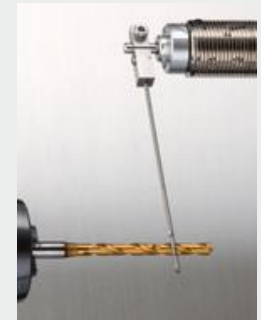
Operator Technology



Vision Systems



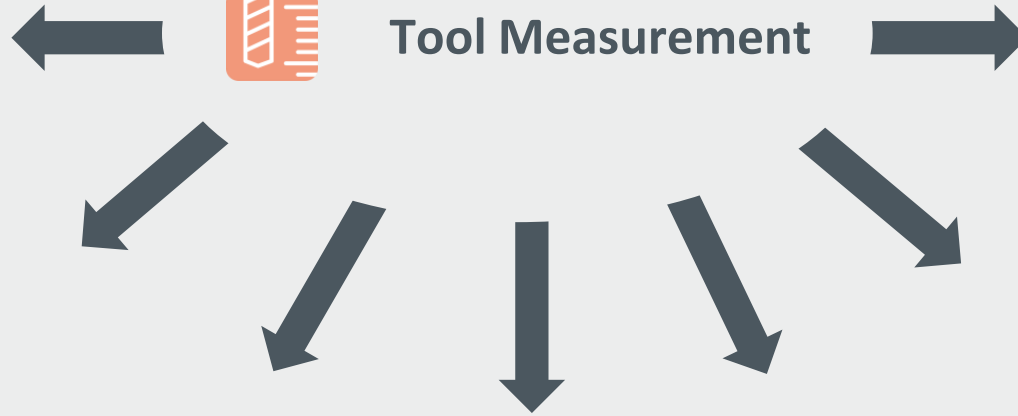
Power Monitoring



Tool magazine solutions (Flip Wire)



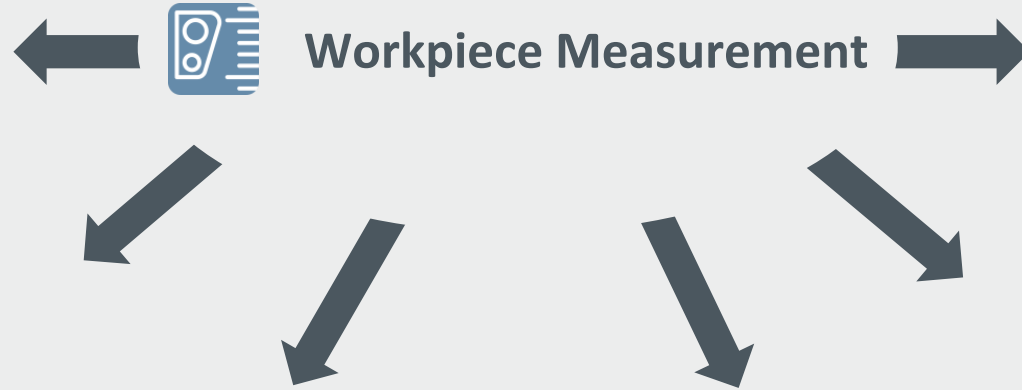
Tool Measurement



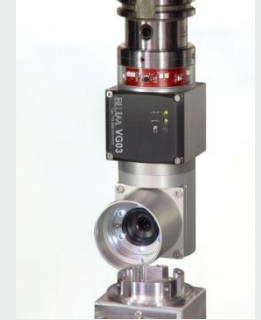


Business Division Measuring Components

Production Metrology



Touch Probes



Vision Systems



Bore Gauges



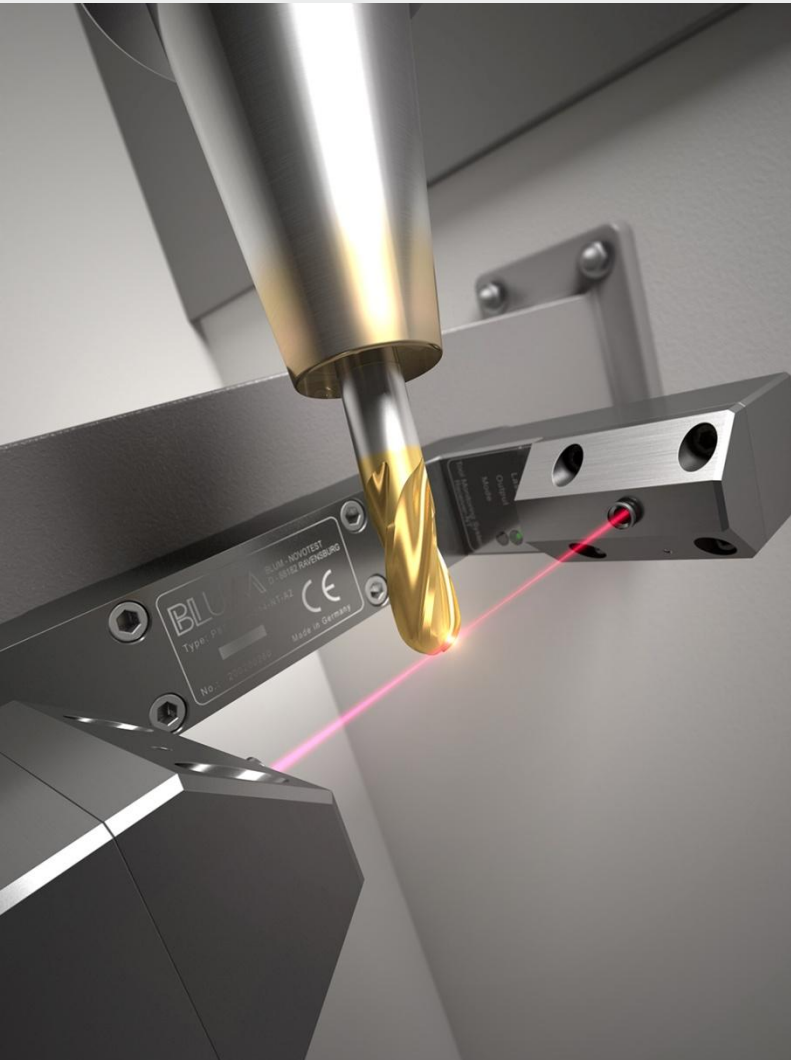
Air Gauges



Temperature Sensors



Manual Measuring Equipment



Tool Measurement



LaserControl



Tool Setting Probes



Workpiece Measurement



Touch Probes



FormControl



Bore Gauges



Special Measuring Systems

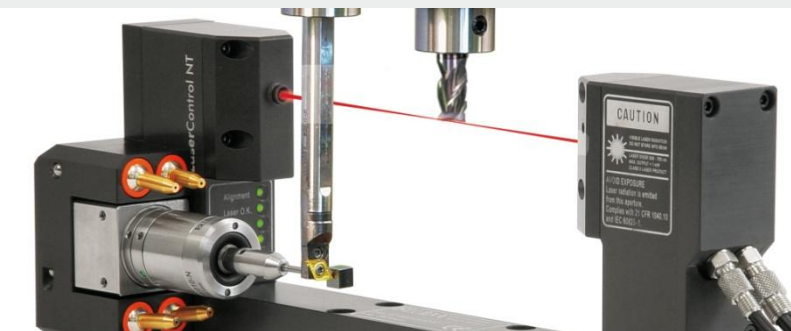
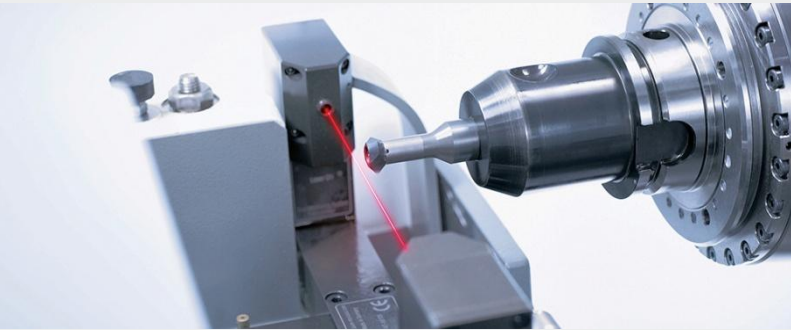


Applications

- > Non-contact tool tool setting in length and radius
- > Shaft breakage detection
- > Single cutting edge monitoring
- > Concentricity control
- > Tool form measurement
- > Wear control
- > Temperature compensation



At nominal spindle speed



System Variants

Support Systems

- > Precise tool measuring in the machining centre
- > Monitoring of smallest tools ($> \varnothing 0,01 \text{ mm}$)

Single Systems

- > Flexible distances between transmitter and receiver
- > Free of collision by installation outside the working area

Combined Systems

- > NT-H 3D: Combined measuring system for tool setting in turn milling centres
- > NT-H: Hybrid laser to reach absolute accuracy limits; thermal compensation of all machine axes



Comparison of Technology: Systems for tool setting and monitoring

Measuring task	Presetting device	Tool Setter	Special Solutions	Vision Systems	LaserControl
Length measurement	✓	✓	✓	(✓)	✓
Radius measurement	✓	(✓)	✗	(✓)	✓
Tool Length Adjustment	✓	✗	✗	✗	✗
Runout Control	(✓)	✗	✗	(✓)	✓
Tool Changing Error	✗	✗	✗	(✓)	✓
Dynamic Spindle Drift	✗	✗	✓	(✓)	✓
Thermal Machine Drift	✗	(✓)	(✓)	(✓)	✓
Tool Breakage Control	✗	✓	✗	(✓)	✓
Single Cutting Edge Control	✗	(✓)	✗	✗	✓
Cutting Edge Form Control	(✓)	✗	✗	(✓)	✓
Tool Identification	✗	✗	✗	(✓)	✓
Wear Compensation	✗	✗	✗	(✓)	✓
Micro Wear	(✓)	✗	✗	(✓)	✓
Investment / Costs	\$	\$	\$\$\$\$\$\$\$\$\$\$	\$	\$\$\$\$



Blum Laser Measuring Systems: Benefits

- > Increase productivity
- > Higher product quality
- > Support unmanned operation
- > Realize closed-loop process
- > Prevent collisions
- > Reduce scrap rate



Tool Measurement



LaserControl



Tool Setting Probes



Workpiece Measurement



Touch Probes



FormControl



Bore Gauges



Special Measuring Systems



Applications

- > Economic solution for fast tool breakage detection
- > Precise tool length measurement
- > Tool radius measurement at spindle speed
- > Use under the most adverse manufacturing conditions
- > Thermal compensation of machine axes



for the harsh climate in machining centres



Z-Series

Z-Pico

- > Compact tool setting probe for micro-machining



Z-Nano

- > Tool length measurement and breakage detection
- > Temperature compensation
- > Linear working principle for measurement of smallest tools



Z-Nano IR | Z-Nano RC

- > Wireless data transmission
- > TWIN-Application with BRC radio technology



3D-Series

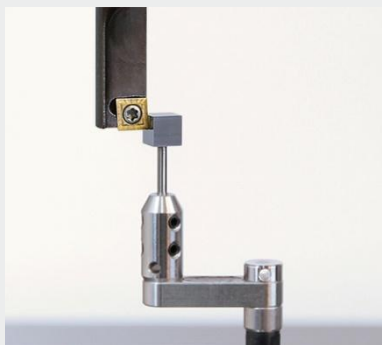
Z-3D | Z-MT

- > Hardwired version



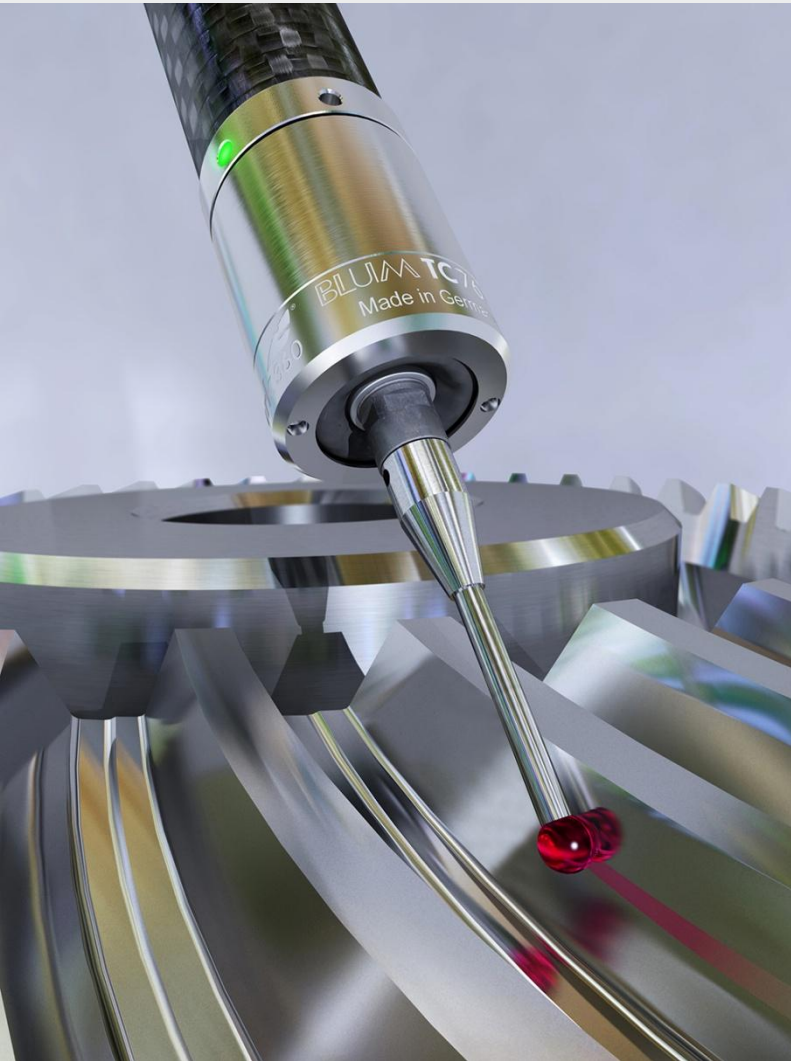
TC54-20 | TC64-20

- > Tool length measurement
- > Tool radius measurement
- > Tool breakage detection
- > Axes compensation



TC53-20 | TC63-20

- > Modular system



Tool Measurement



LaserControl



Tool Setting Probes



Workpiece Measurement



Touch Probes



FormControl



Bore Gauges



Special Measuring Systems



Applications

- > Tool and Workpiece Measurement
- > Set workpiece location
- > Automation of production process
- > Verification of workpiece dimensions
- > Compensation of thermal drift
- > Identify scrap



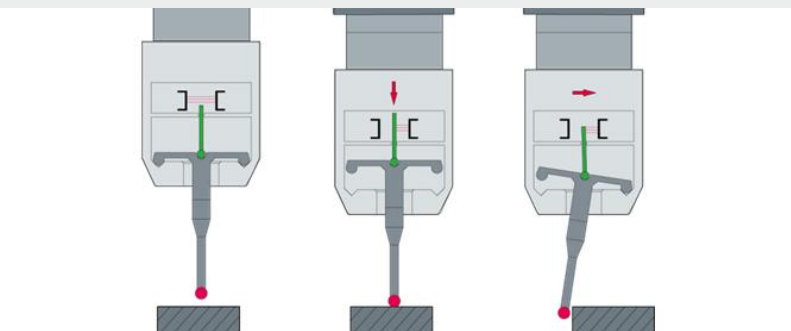
**Increase Profitability through
Automation and Accuracy**



TC50/52 | TC60/62

Universal IR | RC touch probes with multidirectional measuring mechanism and optoelectronic signal generation

- > Applications: Mechanical Engineering, Mold and die production
- > Fast measurements with measuring speed up to 3 m/min
- > Detection of workpiece position
- > Correction of workpiece orientation
- > Contour Measurement
- > Thermal compensation of machine tool

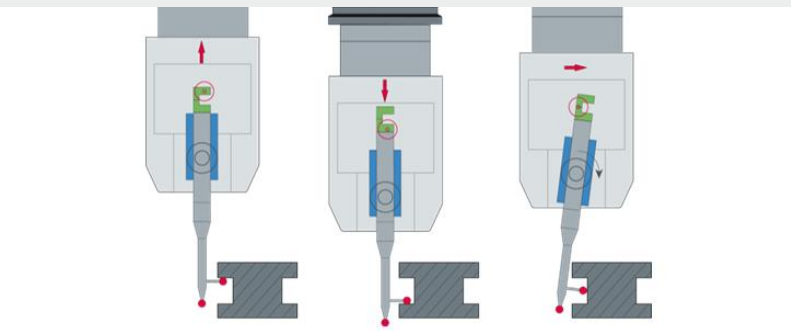




TC51 | TC61

High-dynamic IR | RC touch probe with bidirectional measuring mechanism for highest accuracy

- > Applications: Highly productive mass production, very fast machining centres
- > Fast measurements with measuring speed up to 5 m/min
- > Quick pulling measurements in Z+
- > Measuring tasks requiring superior precision

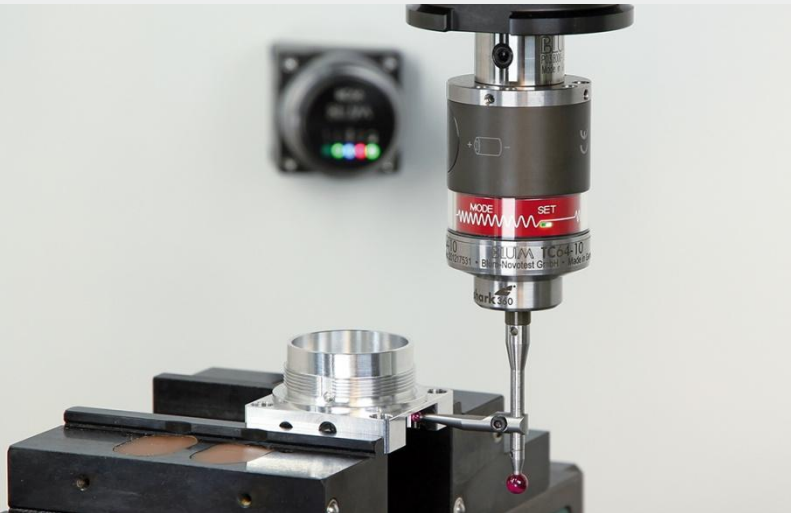




TC53 | TC63

Modular IR | RC touch probe in order to quickly adapt to complex, customer-oriented measuring tasks

- > Applications: grinding, turning and milling machines
- > Torsional measurements
- > Pulling measurements with overhanging stylus
- > Application-specific solutions by modular design and many accessories
- > Special measuring tasks with very long extensions



TC54-10 | TC64-10

Compact IR | RC touch probe with revolutionary shark360 measuring mechanism

- > Applications: Workpiece and tool measurement in turning and milling machines
- > Robust and proven design for the application in turret of small machining centres
- > Pulling and pushing measurement in Z+ and Z-
- > Fast measurements with measuring speed up to 2 m/min

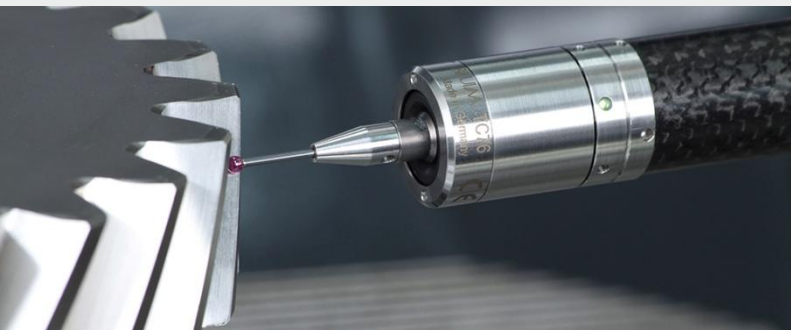


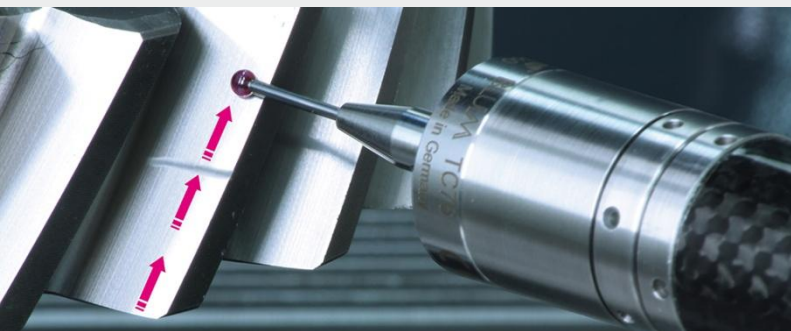


TC76

Extremely compact, hardwired touch probe for smallest machines with limited space

- > Applications: Workpiece and tool measurement in grinding, turning and milling machines
- > Pulling measurements with overhanging stylus
- > Complex, excentric measurements
- > Application-specific solutions by modular design and many accessories





TC64-DIGILOG | TC76-DIGILOG

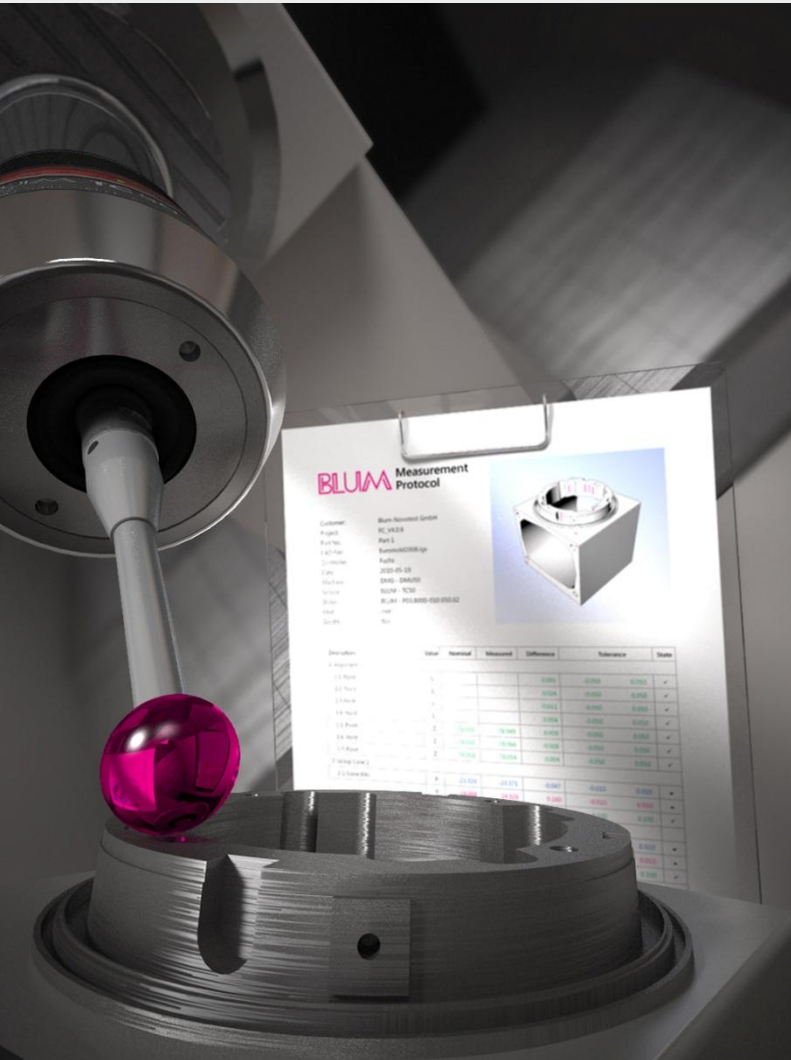
Digilog RC | hardwired touch probe with revolutionary shark360 measuring mechanism

- > Applications: Workpiece measurement in grinding, turning and milling machines
- > DIGILOG = high-precision digital measurement and cyberspeed scans in analogue mode
- > Detection of machining errors by scanning process
- > Checking of complex workpieces, free-form surfaces and contours



Blum Touch Probes: Benefits

- > Time and cost savings due to fast measurements
- > Touch-proof even with coolant
- > Non-lobing touch characteristics
- > No false trigger signal at high acceleration
- > No machine downtime because of wear of probe
- > No regular maintenance



Tool Measurement



LaserControl



Tool Setting Probes



Workpiece Measurement



Touch Probes



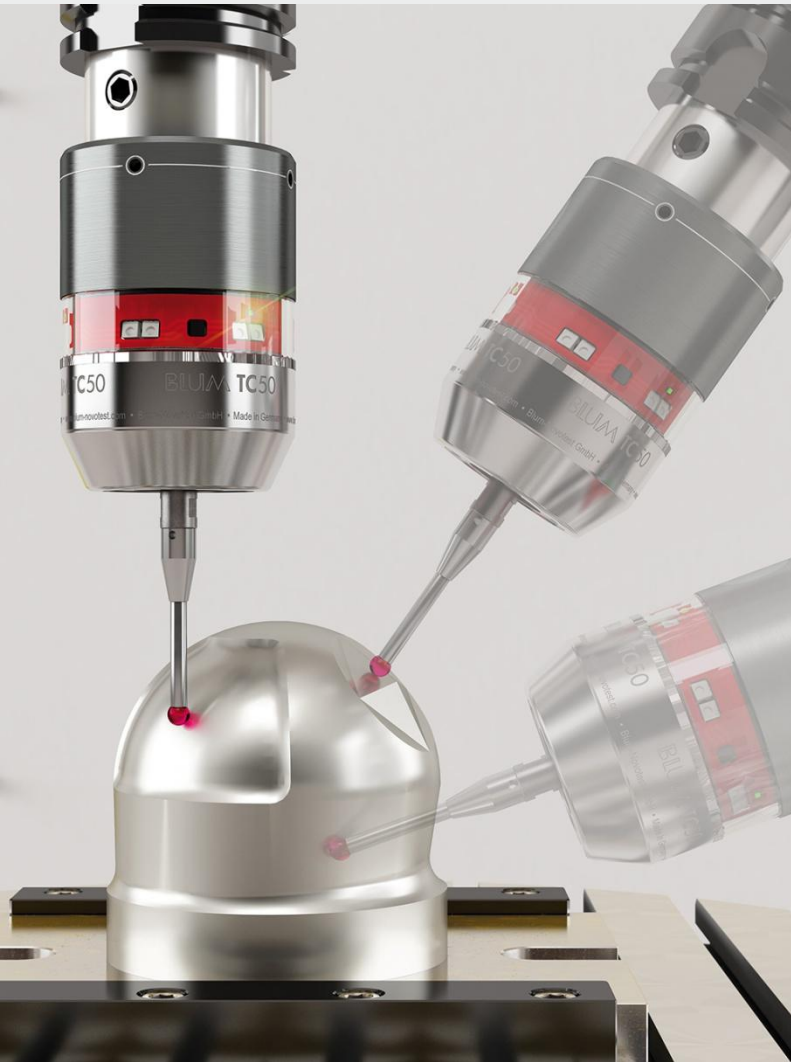
FormControl



Bore Gauges



Special Measuring Systems

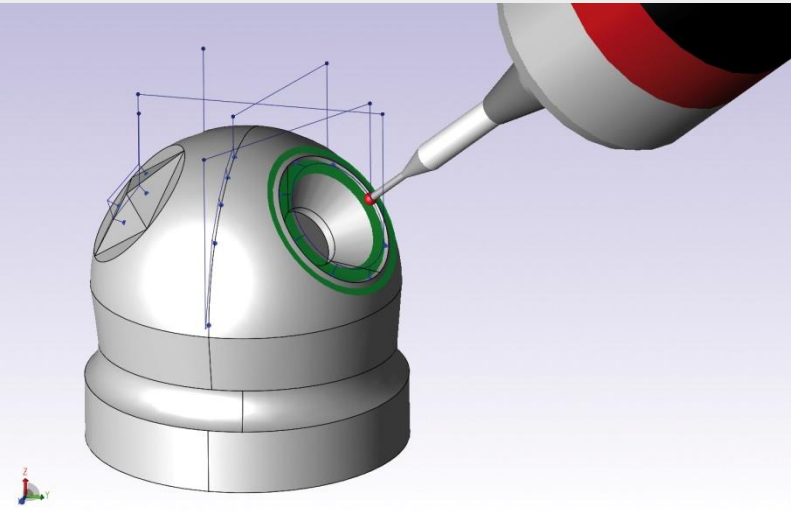


Applications

- > Inspection of workpieces in the machining centre
- > Measurement and evaluation of standard geometries and free-form surfaces
- > Correction of clamping errors through integrated alignment function
- > Detection of machining errors during the process
- > Reduction of idle times by one-time calibration



Measurement by mouse click

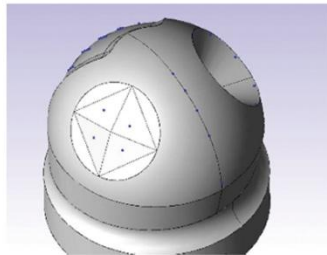


Measuring Software FormControl

Early recognition of errors

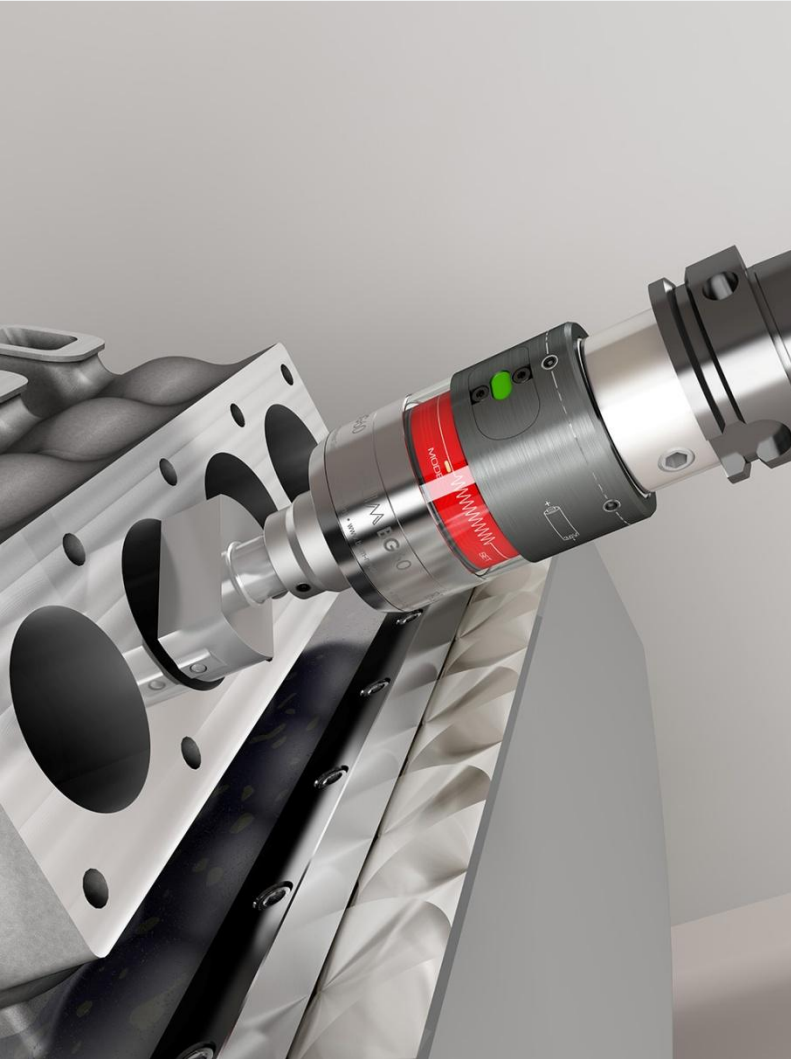
- > Clamping errors
- > Incorrect milling parameters
- > Incorrect tool dimensions
- > Incorrect tool orientation
- > Tool wear
- > Thermal machine drift

BLUM Measurement report



Customer: Formenbau GmbH
 Project: 5A Alukugel
 Part number: 12005824
 CAD data: 5x_Alukugel.igs
 Auditor: Blum
 Date: 2012-01-30
 Machine: DMG - DMU50
 Touch Probe: BLUM - TC52
 Stylus: BLUM - P03.8000-010.050.02
 Unit: mm
 Bestfit: No

Description	Value	Nominal	Actual	Delta	Tolerance	Status
1: Raster						
1.1: Point	L			-0.101	-0.010 0.120	✓
	X	-17.889	-17.968	-0.079	-0.010 0.080	↓
	Y	-10.424	-10.470	-0.046	-0.010 0.080	↓
	Z	10.015	10.059	0.044	-0.010 0.080	✓
1.2: Point	L			0.188	-0.010 0.120	↑
	X	-17.050	-17.189	-0.139	-0.010 0.080	↓
	Y	-10.424	-10.509	-0.085	-0.010 0.080	↓
	Z	11.386	11.479	0.093	-0.010 0.080	↑
1.3: Point	L			0.062	-0.010 0.120	✓
	X	-16.210	-16.253	-0.043	-0.010 0.080	↓



Tool Measurement



LaserControl



Tool Setting Probes



Workpiece Measurement



Touch Probes



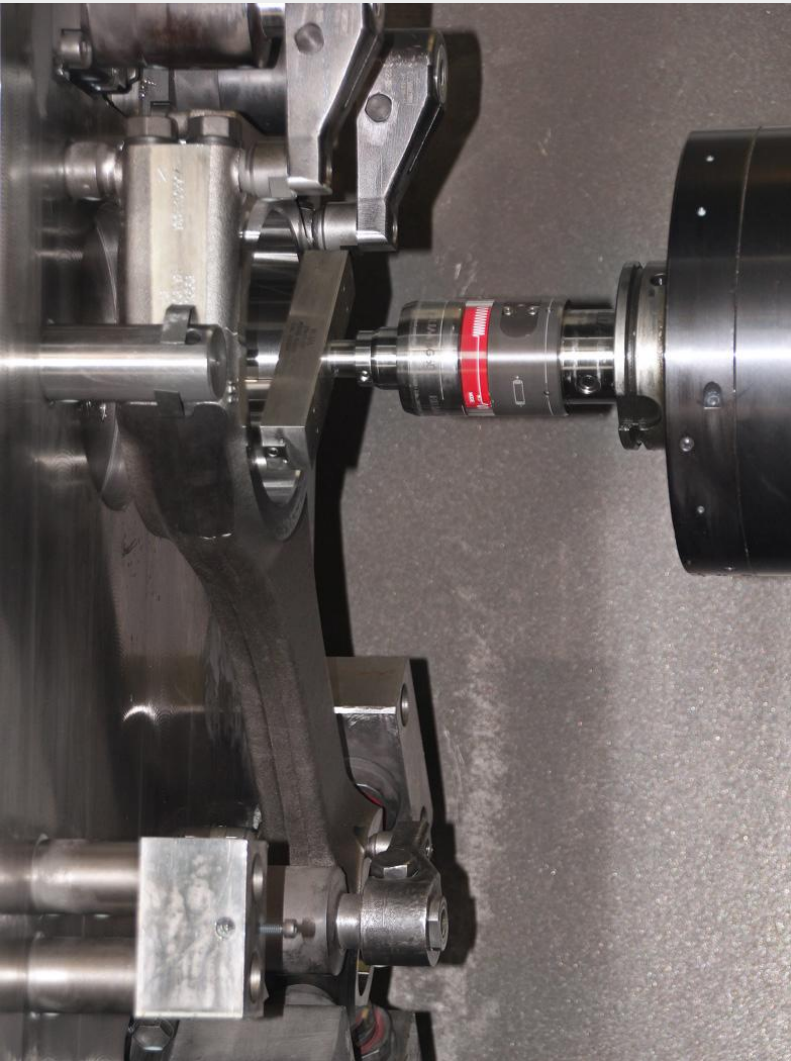
FormControl



Bore Gauges

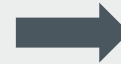


Special Measuring Systems



Applications

- > Quality monitoring of bores in highly productive mass productions
- > Control the production process in a closed process chain
- > Enables unmanned production
- > Measuring system for controlling mechatronic tools
- > Elimination of costly post-process measuring station



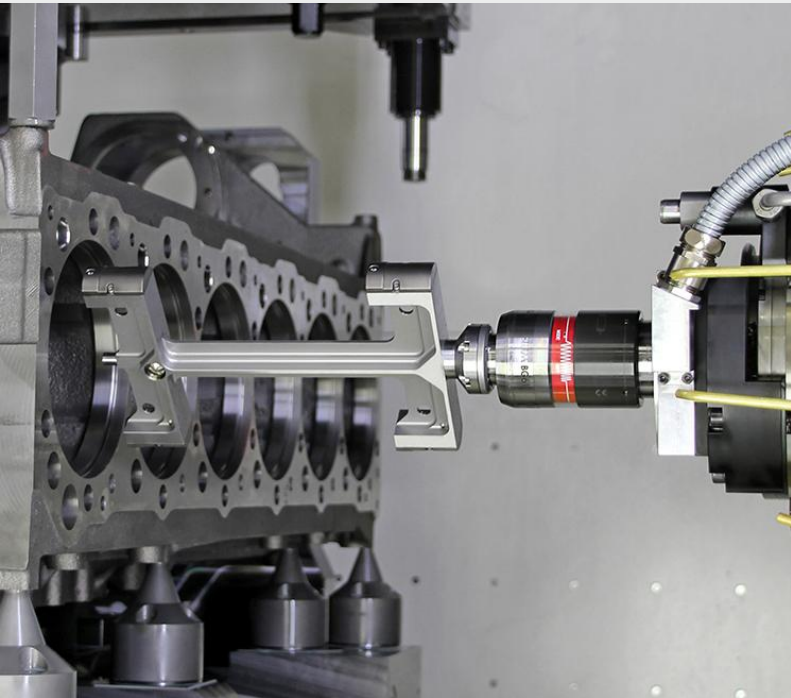
Increased process control through machine-independent precision



BG60

Machine-independent RC bore gauge for quality monitoring of tightly tolerated fits

- > Applications: highly productive machining centres and transfer lines in the production of engines, valves or compressors
- > Automatic measurement of bores
- > Instant process control due to calculation of tool compensation values
- > Measuring device for controlling mechatronic tools

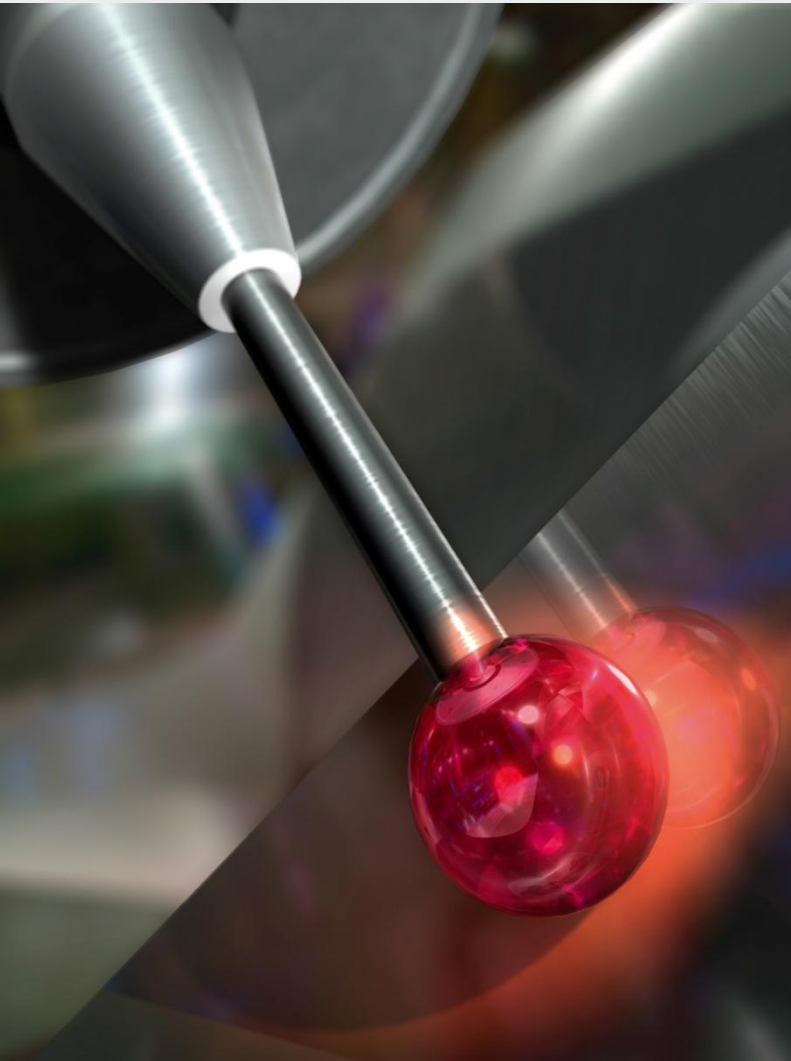


BG61

Customised RC bore gauge for determination of multiple characteristic of bores

- > Extremely fast measurement with up to 8 individual measuring elements
- > Measurement of diameter, position, cylindricity, roundness and concentricity
- > Instant process control due to calculation of tool compensation values
- > Machine-independent measuring system for highly accurate quality monitoring





Tool Measurement



LaserControl



Tool Setting Probes



Workpiece Measurement



Touch Probes



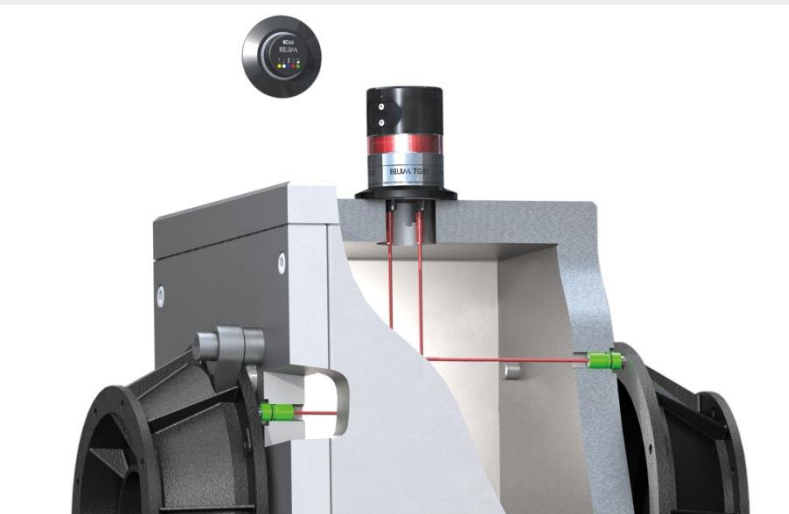
FormControl



Bore Gauges



Special Measuring Systems



TG81

Compact RC temperature measuring system for precise compensation of thermal influences

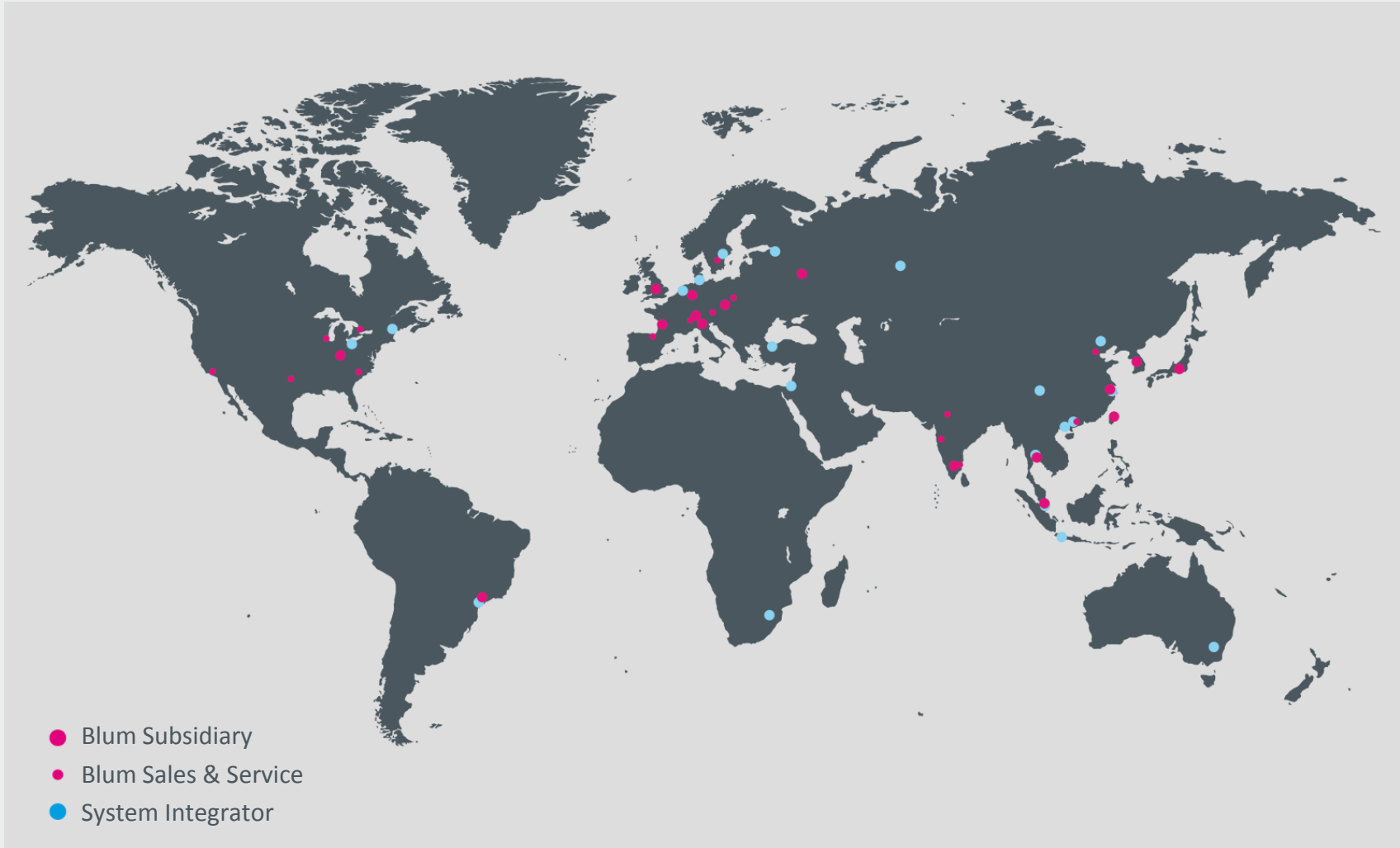
- > Applications: Dry processing or machining of workpieces with strongly fluctuating entry temperatures
- > Optionally applicable with other sensors, e.g. workpiece position or pressure sensor
- > Up to 8 sensors integrated in workpiece clamping device
- > Determination of workpiece temperature during prime time



Service & Support

Worldwide service and qualified consulting

- > Applications training
- > Software development for special applications
- > Retrofitting
- > Customer-specific solutions





- > ALFING
- > ALMAC
- > ALZMETALL
- > APEC
- > AUERBACH
- > AUMAT
- > AXA
- > BENAZZATO
- > BENZINGER
- > BRETON
- > BRIDGEPORT
- > BRÖTJE
- > BROTHER
- > BURKHARDT + WEBER
- > C.B. FERRARI
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- > FANUC
- > FEHLMANN
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- > GROB
- > HELLER
- > HERMLE
- > MAZAK
- > MIKRON
- > MONFORTS
- > MORI SEIKI
- > SPINNER
- > ZIMMERMANN
- > ...

Thank you for your attention!

Τημεκ λον τοι λονι αττεντιον!