HEXAGON

Data Sheet

Leitz Infinity

Version 2025-3

Introduction

Description

Ultra-high accuracy measuring machine in “Closed Frame, moving table” design.
Optional non contact sensors and roughness measurement.

Applications

Coordinate measurements	Inspection of any kind of parts for production and R&D. Calibration of tools. Reference measuring machines for manufacturing, quality control centers and metrology labs.
Gear inspection	For gear diameters of up to 950 mm. Capable of measuring any type of gear, gear segments, gear racks and gear cutters. No rotary table required for the measurements.
Form testing	Quality control of form tolerances: roundness, cylindricity, flatness, straightness and profil form. Optional: Non contact inspection of surfaces: lenses, mirrors, optical flats etc.
Roughness measurement	Profiler R roughness sensor, automatically interchangeable

Design

Frame	Unique “Closed Frame”- design with fixed portal and moving table. Unitary cast iron / granite construction. No aluminium used in main structure.
Guideways	Pre-loaded air bearings in all axes. Load carrying bearings of the moving table with electronic gap monitoring.
Drives	High performance servo motors with rotary encoders and electronic thrust force control. Power transmission by precision ball drives, near the center of gravity.
Length measuring system	High resolution glass ceramic scales with electro-optical transducers.
Resolution	1 nm (0.001 µm)
Temperature compensation	Automatic temperature compensation for scales and workpiece.
Number of workpiece sensors	4
Damping system	Pneumatic damping

General

Specifications of optical sensors according to ISO 10360-8 and -9 (2013) are stated in separate data sheet „Optical sensors for ultra-high accuracy CMMs“.
All specifications are only valid with original Leitz accessories. Additional specifications for acceptance tests with ball plate are available on request.

Technical Data – probe heads

Probe heads Leitz Infinity	HP-S-X5-HD	LSP-S2-O/-WL	LSP-S4
			
Leitz Infinity	•	o [1] [2]	o [1] [2] [3]
Measuring methods	3D-Self-Centering Scanning, Variable High Speed Scanning, Tag Scan, Scan Catch		
Max. data rate	1000 points/s	1000 points/s	1000 points/s
Probing force	0.1 to 1.2 N	0.1 to 1.2 N	0.02 to 0.16 N
Max. stylus length	800 mm	800 mm	800 mm
Max. stylus weight, incl. clamping	650 g	1000 g	1000 g
Smallest tip diameter	0.3 mm	0.3 mm	0.3 mm
Optical sensors (optional)	-	Precitec S0.3, HP-O, HP-O Hybrid	Precitec S0.3
Roughness sensor (optional)	Profiler R	Profiler R	

• Standard o Optional

For optional probe heads LSP-S2/S4 the following specifications are valid:

[1] $P_{Form.Sph.Scan:PP:Tact} = P_{Form.Sph.Scan:PP:Tact} + 0.4\ \mu m$; $P_{Size.Sph.Scan:PP:Tact} = P_{Size.Sph.Scan:PP:Tact} + 0.4\ \mu m$; $\tau_{Sph.Scan:PP:Tact} = \tau_{Sph.Scan:PP:Tact} + 5s$

$P_{Form.Sph.1x25:SS:Tact} = P_{Form.Sph.1x25:SS:Tact} + 0.1\ \mu m$; $P_{Size.Sph.1x25:SS:Tact} = P_{Size.Sph.1x25:SS:Tact} + 0{,}1\mu m$

[2] $P_{Form.Sph.5x25:MS:Tact} = P_{Form.Sph.5x25:MS:Tact} + 1\ \mu m$; $L_{Dia.5x25:MS:Tact} = L_{Dia.5x25:MS:Tact} + 0.5\ \mu m$; RONt = RONt + 0.2 µm

[3] Probing frequency: 12/min.

Optical sensors and roughness measurement

Optical sensors	HP-O short range	HP-O mid range	Precitec S0.3
Measuring method	interferometric		chromatic confocal
Measuring angle to surface	rough: ± 30°, reflecting: ± 4°	rough: ± 30°, reflecting: ± 1°	± 30°
Working distance	6.5 mm	10.5 mm	4.5 mm
Measuring range / field of view	0.4 mm	2 mm	0.3 mm
Resolution in optical axis direction	< 3 nm	< 3 nm	< 10 nm
Spot diameter	11 µm	40 µm	5 µm
Suitable surfaces	metallic technical surfaces, no spray required		all kinds of surfaces
Laser protection class [1]	2	2	-

[1] Under reasonably foreseeable operating conditions, class 2 laser devices would not be expected to cause any permanent eye damage, provided that any exposure can be terminated through the eyelid closing reflex (assumed to be 0.25 s).

Roughness sensor	Profiler R
Type	tactile, with integrated reference area
Measuring length / range	12.5 mm (15 mm) / 500 µm
Probe tip	2 µm / 90°
Parameter	R_a, R_z, R_q, R_t and more according to ISO 4287 and ISO 13565
Measuring deviation	R_a = 8% for measuring range 0.2 µm - 2 µm
	R_z = 10% for measuring range 1 µm - 10 µm

Options

- Optical sensor Precitec S0.3
- Optical sensors HP-O
- Roughness sensor Profiler R
- Automatic styli changer
- Automatic temperature sensor
- Climate controlled room
- Part loading systems

Optical point sensor HP-O

Optical point sensor Precitec S0.3

Roughness sensor Profiler R

Specifications Leitz Infinity

ISO 10360-2 (2009)

Max. permissible errors MPE [µm]		Leitz Infinity 12.10.7
Volumetric length measuring error [1] [2]	E_0	0.3 + L/1000
Volumetric length measuring error [1] [2]	E_{150}	0.5 + L/1000
Repeatability range [1] [2]	R_0	0.25

ISO 10360-5 (2020)

Max. permissible error MPE [µm]		
Scanning mode form error [3] [6]	$P_{Form.Sph.Scan:PP:Tact}$	0.8
Scanning mode size error [3] [6]	$P_{Size.Sph.Scan:PP:Tact}$	0.7
Scanning time [6]	$\tau_{Sph.Scan:PP:Tact}$	60 s
Single-stylus form error [4] [5]	$P_{Form.Sph.1x25:SS:Tact}$	0.4
Single-stylus size error [4] [5]	$P_{Size.Sph.1x25:SS:Tact}$	0.3
Multi-stylus form error [4] [7]	$P_{Form.Sph.5x25:MS:Tact}$	1.7
Multi-stylus size error [4] [7]	$P_{Size.Sph.5x25:MS:Tact}$	0.4
Multi-stylus location error [4] [7]	$L_{Dia.5x25:MS:Tact}$	1.1

ISO 12181 (2011)

Max. permissible error MPE [µm]		
Form measurement error [8]	RONt	0.4

Environmental conditions and throughput

Permitted environmental conditions	
Temperature limits	19-21° C
Temperature gradient per hour / day / meter	0.3 / 0.4 / 0.1 K
Relative air humidity	30% - 60%, non condensing

Throughput	
Probing frequency	20/min
Max. positioning speed	300 mm/s
Max. acceleration	1500 mm/s²

[1] E_0, E_{150} and R_0 are valid for a length gauge with an uncertainty of calibration of ≤ 0.02 + 0.12 x L/1000 and a CTE between 8 x 10^{-6}/K and 13 x 10^{-6}/K.
The availability of suitable length standards for measuring lengths of more than 1000 mm must be clarified by mutual agreement between the user and the manufacturer.
[2] E_0, E_{150} and R_0 are valid for Leitz Infinity styli ø 5 x 80 mm and ø 8 x 130 mm, without extension; anywhere in the measuring volume.
[3] ISO 10360-5 specifications are valid for a test sphere with calibrated form ≤ 0,1 µm and the respective uncertainty ≤ 0,1 µm and uncertainty of calibrated sphere diameter ≤ 0,11 µm
[4] ISO 10360-5 specifications are valid for a test sphere with calibrated form ≤ 0,05 µm and the respective uncertainty ≤ 0,05 µm and uncertainty of calibrated sphere diameter ≤ 0,1 µm
[5] $P_{Form.Sph.1x25:SS:Tact}$ and $P_{Size.Sph.1x25:SS:Tact}$ are valid for Leitz Infinity styli 3 x 50mm and 5 x 60mm, without extension; anywhere in the measuring volume.
[6] $P_{Form.Sph.Scan:PP:Tact}$ and $P_{Size.Sph.Scan:PP:Tact}$ are valid for a Leitz Infinity stylus ø 3 x 50 and 5 x 60 mm.
[7] $P_{Form.Sph.5x25:MS:Tact}$, $P_{Size.Sph.5x25:MS:Tact}$, $L_{Dia.5x25:MS:Tact}$ are valid for Leitz Infinity styli ø 3 x 50mm and 5 x 60mm. To be tested near the reference sphere.
[8] RONt (MZCI) is valid for a Leitz Infinity stylus ø 5 x 60 mm, filter 50 UPR. Form measurement error (roundness) at a ø 50 mm ring gauge, in scanning mode, acc. to ISO 12 181 (VDI/VDE 2617, part 2.2).

CMM capability charts

Tolerance [mm]	distance or diameter [mm] 50	100	200	400	600	1000	2000
± 0.003	0.3 + L/1000						
± 0.005	0.5 + L/900	0.4 + L/1000	0.3 + L/1000				
± 0.007	0.7 + L/700	0.5 + L/500	0.5 + L/1000	0.3 + L/1000			
± 0.010	0.9 + L/400	0.8 + L/500	0.6 + L/500	0.5 + L/800	0.4 + L/1000		
± 0.015	1.3 + L/300	1.2 + L/350	0.9 + L/350	0.7 + L/500	0.6 + L/700	0.4 + L/900	
± 0.020	1.8 + L/250	1.6 + L/250	1.3 + L/300	0.9 + L/350	0.8 + L/500	0.6 + L/700	0.3 + L/1200

Example: A diameter of 400 mm has a tolerance of ± 0.010 mm. For the inspection a CMM with a length measuring error E_0 = 0.5 + L/800 µm is required.

CMM capability charts - form tolerances Tolerance	0.005 mm	0.007 mm	0.010 mm	0.015 mm	0.020 mm	0.030 mm	0.050 mm
$P_{Form.Sph.1x25:SS:Tact}$ [µm]	0.5	0.7	1.0	1.5	2.0		
$P_{Form.Sph.Scan:PP:Tact}$ [µm]			1.0	1.5	1.5	3.0	5.0

Example:
For inspection of a roundness tolerance of 0.010 mm a CMM with a single-stylus form error $P_{Form.Sph.1x25:SS:Tact}$ = 1.0 µm resp. $P_{Form.Sph.Scan:PP:Tact}$ = 1.0 µm is required.
Note: $P_{Form.Sph.1x25:SS:Tact}$ and $P_{Form.Sph.Scan:PP:Tact}$ are only specified for small areas (up to 30 mm). CMM capability charts are applicable only, if the feature can be measured with a stylus for which the accuracy of the CMM is specified.

Gear inspection

Gear measuring capability

Measuring principle	3-axes measurement, no rotary table required. Profile and flank VHSS scanning with involute path control. Vertical or horizontal alignment of the gear possible.
Evaluation standards	DIN, ISO, AGMA, ANSI, JIS, CNOMO, CAT
Available interfaces	Gleason GAGE 4/WIN, Klingelnberg KIMOS, DMG Mori, Depo, GDE 3
Module range	0.3 – 100 mm
Machine accuracy	Group 1 according to VDI/VDE 2612/2613, pages 1 and 2

Available QUINDOS software modules for gear inspection

Gears		Gear Racks	Worms	Cutting Tools
gear herringbone gear gear gauges unknown gear straight bevel gear spiral bevel gear	tapered pinions clutch gear, curvic couplings hirth gear sprocket CAT gear	rack, constant rack, variable	cylindrical worm worm wheel globoid worm	hob cutter incl. indexable insert shape cutter form cutter shaving gear broach gear offset

Supply / safety specifications

Supply specifications

Controller	Operating voltage	Protection class	Power requirement	Power consumption	Rated current	Recommended main fuse
B5, 230V	230 V, ±10%; 50 Hz; P, N, PE	IP 54	1.4 KVA	0.6 KVA	6 A	15 A
B5, 115V	115 V, ±10%; 60 Hz; P, N, PE	IP 54	1.4 KVA	0.6 KVA	12 A	15 A

Air pressure	≥ 0.55 MPa (5.5 bar)
Air consumption	Approx. 125 NL/min (with pneumatic damping: 225 NL/min)
Air consumption (Eco Mode+)	5 NL/min with pneumatic damping
Air quality	Class 4 according to ISO 8573, part 1

Safety

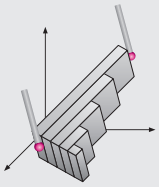
Safety devices	Safety laser scanner at machine granite to monitor the measurement volume.
Safety standards	CE-conform with machine directive (2006/42/EG), EMC-directive (2014/30/EU). NRTL (NFPA79 /61010) on request.

ISO 10360

ISO 10360-2

Volumetric length measuring error

E_o

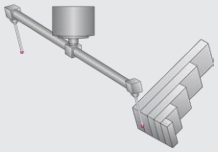


5 gauges have to be measured 3 times with one probing each end, in 7 different directions. All measuring results must be within »E_o«

ISO 10360-2

Volumetric length measuring error

E_{150}



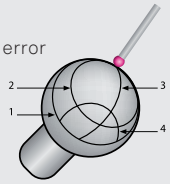
5 length gauges have to be measured 3 times in the YZ- or XZ plane with opposite styli, mounted 150 mm off the Z spindle axis.

ISO 10360-5

Scanning mode form/size error

$P_{Form.Sph.Scan:PP:Tact}$

$P_{Size.Sph.Scan:PP:Tact}$



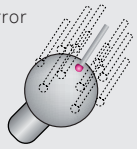
A precision sphere has to be scanned with 4 defined lines.
$P_{Form.Sph.Scan:PP:Tact}$ is the range of all radii.
$P_{Form.Sph.Scan:PP:Tact}$=$R_{max}$ - R_{min} = sphere form, scanning.
$P_{Size.Sph.1x25:SS:Tact}$ is the deviation of measured and calibrated sphere diameter.
$P_{Size.Sph.1x25:SS:Tact}$ = D_{meas} - $D_{cal.}$

ISO 10360-5

Single-stylus form/size error

$P_{Form.Sph.1x25:SS:Tact}$

$P_{Size.Sph.1x25:SS:Tact}$



A precision sphere has to be measured with 25 probings.
$P_{Form.Sph.1x25:SS:Tact}$ is the range of all radii.
$P_{Form.Sph.1x25:SS:Tact}$ = R_{max} - R_{min} = sphere form.
$P_{Size.Sph.1x25:SS:Tact}$ is the deviation of measured and calibrated sphere diameter.
$P_{Size.Sph.1x25:SS:Tact}$ = Dmeas - Dcal .

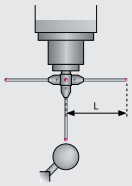
ISO 10360-5

Multi-stylus error

$P_{Form.Sph.5x25:MS:Tact}$

$P_{Size.Sph.5x25:MS:Tact}$

$L_{Dia.5x25:MS:Tact}$

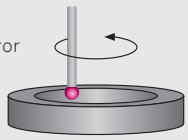


A sphere is measured with 5 styli with 5 x 25 probings. Form, size and location error over 125 points

ISO 12181

Form measurement error

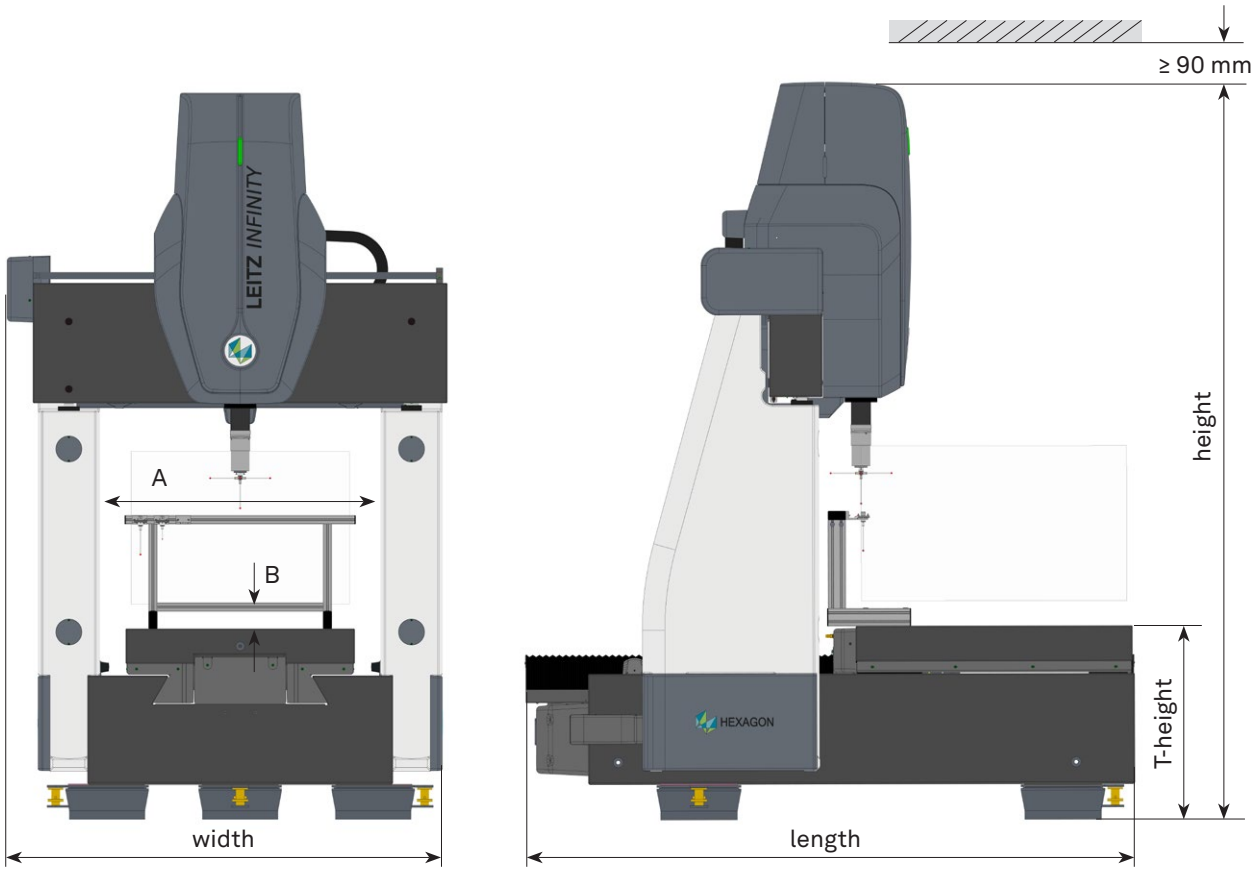
RONt (MZCI)



A ring gauge, ø 50 mm, is scanned with high point density. The range of radial distances is then evaluted on a calculated Tschebyscheff-cirlce.

Measuring ranges and dimensions

Model	Standard X [mm]	Y [mm]	Z [mm]
12.10.7	1200	1000	700



Model	Length [mm]	Width [mm]	Height [mm]	T-Height [mm]	A [mm]	B Standard [mm]	Weight [kg]	Max. Load [kg]
Infinity 12.10.7	2.755	2.019	3.334	875	1.220	110	8.150	750

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

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

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

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