HEXAGON
MANUFACTURING INTELLIGENCE

DATA SHEET

OPTICAL SENSORS

FOR ULTRA HIGH ACCURACY CMMS

VERSION 2018-3

HP-O

HP-O Optical Sensors			
		Short range	Mid range
Measuring method		Interferometric	
Measuring angle to surface	rough: reflecting:	± 30° ± 4°	± 30° ± 1°
Working distance		6.5 mm	10.5 mm
Measuring range		0.4 mm	2 mm
Resolution in optical axis direction		< 3 nm	< 3 nm
Spot diameter		11 µm	40 µm
Suitable surfaces		Metallic technical surfaces, no spray required	
Laser protection class [1]		2	

HP-O Adjustable
- Fixed sensor with unlimited styli alignment due to 3-axis joint

HP-O Hybrid
- Combination of optical and tactile styli in one configuration
- No sensor change required

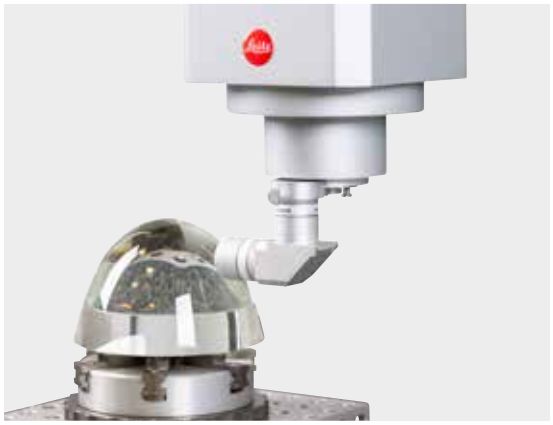
HP-O Flex
- HP-O mounted at 2.5° indexing head
- Utilising optical and tactile styli with the standard tool changer

HP-O Flex 90
- Indexing head 2.5° mounted horizontally
- For non contact blisk inspection

[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).

PRECITEC LR / S3

Precitec Optical Sensors		
	Precitec LR	**Precitec S3**
Measuring method	Chromatic confocal	
Measuring angle to surface	± 35°	± 30°
Working distance	6.5 mm	22.5 mm
Measuring range	0.1 mm	3 mm
Resolution in optical axis direction	< 3 nm	< 100 nm
Spot diameter	1.4 µm	12 µm
Suitable surfaces	all kinds of surfaces, no spray required	
Applications	Lenses, mirrors, die and molds	Turbine blades, glas thickness
Laser protection class [1]	1	-



Precitec LR
- For ultra high precision requirements
- Vertical and horizontal (360° adjustable) versions available

Precitec S3
- Large measuring range (3mm)
- Especially suitable for turbine blades

[1] Class 1 laser devices are safe under reasonably foreseeable operating conditions. In general they would not be expected to emit any radiation which is strong enough to damage eyes or the skin.

HP-L-10.6T

HP-L -10.6T Laser Scanning Sensor	
Measuring method	laser line triangulation
Lines per second	53 Hz
Data rate (max.)	30,000 points/s
Working distance	170 mm ± 30 mm
Field of view	60 mm
Zoom	24; 60; 123 mm
Applications	all kinds of surfaces, no spray required
Laser protection class [1]	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).

HP-L -10.6T
- Fast digitising of surfaces
- Creation of point clouds

SENSOR COMPATIBILITY

	Infinity	Ultra	PMM-C	PMM-Xi	Reference HP	Reference Xi	PMM-F	PMM-G	SIRIO BX
Precitec LR	○	○	○	○ [1]			○	○	
Precitec S3									○
HP-0 Adjustable	○	○	○	○ [1]	○ [2]	○ [1] [2]	○	○	
HP-0 Hybrid	○	○	○		○ [2]		○	○	
HP-0 Flex			○ [1]	○ [1]	○ [1] [2]	○ [2]	○ [1]	○ [1]	
HP-0 Flex 90						○ [2]			
HP-L-10.6.T						○ [2]			

[1] With SENMATION only
[2] In standard temperature range (not with XT Option)

For compatible tactile probe heads and specifications please refer to the valid ultra high accuracy CMM data sheets.
An active damping system is required for the use of optical sensors.

LEITZ REFERENCE LINE

SPECIFICATIONS HP-O

Max. permissible Error MPE [µm] acc. to:			Reference HP	Reference Xi
ISO 10360-8 (2013) [1] [2] [3]			10.7.6 - 45.12.9/10	
Adjustable	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	3.6	3.8
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	6.6	6.8
Hybrid	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	3.6	-
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	6.6	-
Flex	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	3.6	3.8
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	8.0	8.2
Flex 90	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	-	3.8
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	-	8.2
ISO 10360-9 (2013) "Multi Probing System" [1] [2] [3] [4]				
Adjustable	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	5.2	5.4
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	4.8	5.0
	Location error	$L_{Dia\ 2x25:MPS}$	6.2	6.4
Hybrid	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	5.2	-
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	4.8	-
	Location error	$L_{Dia\ 2x25:MPS}$	6.2	-
Flex	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	6.5	6.7
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	6.1	6.3
	Location error	$L_{Dia\ 2x25:MPS}$	6.5	6.7
Flex 90	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	-	6.7
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	-	6.3
	Location error	$L_{Dia\ 2x25:MPS}$	-	6.7

SPECIFICATIONS HP-L-10.6 T

Max. permissible Error MPE [µm] acc. to:			Reference Xi / HH-A-T2.5
ISO 10360-8 (2013) [2] [3]			
HP-L-10.6T	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	30 µm
	Dispersion value 95%	$P_{Form.\ Sphere\ D95\%:Tr}$	40 µm
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	40 µm

[1] Specifications are valid for HP-O short range sensor.
[2] Specifications are valid within the standard temperature range (not with XT Option).
[3] Hexagon Manufacturing Intelligence acceptance test procedure based on ISO standard.
[4] For probe head change (SENMATION) 1µm has to be added.

For some sensor configurations SENMATION is required referring to sensor compatibility table on page 4.

LEITZ PMM-C LINE

SPECIFICATIONS PRECITEC LR

Max. permissible Error MPE [µm] acc. to:			Infinity	Ultra	PMM-C	PMM-Xi
ISO 10360-8 (2013) [1]					8.10.6 - 24.16.10	
Precitec LR	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	1.9	1.9	2.1	2.4
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	4.9	4.9	4.9	5.2
ISO 10360-9 (2013) "Multi Probing System" [1][2]						
Precitec LR	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	3.9	3.9	4.2	4.5
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	3.5	3.5	3.8	4.1
	Location error	$L_{Dia\ 2x25:MPS}$	4.9	4.9	5.2	5.5

SPECIFICATIONS HP-O

Max. permissible Error MPE [µm] acc. to:			Infinity	Ultra	PMM-C	PMM-Xi
ISO 10360-8 (2013) [1][3]					8.10.6 - 24.12.10	
Adjustable	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	2.5	2.8	3.1	3.4
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	5.5	5.8	6.1	6.3
Hybrid	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	2.5	2.8	3.1	-
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	5.5	5.8	6.1	-
Flex	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	-	-	3.1	3.5
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	-	-	6.5	7.1
ISO 10360-9 (2013) "Multi Probing System" [1][2][3]						
Adjustable	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	3.9	3.9	4.2	4.5
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	3.5	3.5	3.8	4.1
	Location error	$L_{Dia\ 2x25:MPS}$	4.9	4.9	5.2	5.5
Hybrid	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	5.2	5.2	5.2	-
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	4.0	4.0	4.4	-
	Location error	$L_{Dia\ 2x25:MPS}$	6.0	6.0	6.0	-
Flex	Form error	$P_{Form.\ Sphere\ 2x25:MPS}$	-	-	6.0	6.2
	Size error	$P_{Size.\ Sphere\ 2x25:MPS}$	-	-	5.4	5.9
	Location error	$L_{Dia\ 2x25:MPS}$	-	-	6.3	6.5

LEITZ PMM-F

SPECIFICATIONS PRECITEC LR

Max. permissible Error MPE [µm] acc. to:			
ISO 10360-8 (2013) [1]			
Precitec LR	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	3.0
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	6.0

SPECIFICATIONS HP-O

Max. permissible Error MPE [µm] acc. to:			
ISO 10360-8 (2013) [1][3]			
HP-O Adjustable	Form error	$P_{Form.\ Sphere\ 1x25:Tr}$	4.0
	Size error	$P_{Size.\ Sphere\ 1x25:Tr}$	7.0

[1] Hexagon Manufacturing Intelligence acceptance test procedure based on ISO standard.
[2] For probe head change (SENMATION) 1µm has to be added.
[3] Specifications are valid for HP-O short range sensor.

For some sensor configurations SENMATION is required referring to sensor compatibility table on page 4.

LEITZ PMM-G

SPECIFICATIONS PRECITEC LR

Max. permissible Error MPE [µm] acc. to:			50.40.20 (1)
ISO 10360-8 (2013) (2)			
Precitec LR	Form error	$P_{Form.\,Sphere\,1x25:Tr}$	4.0
	Size error	$P_{Size.\,Sphere\,1x25:Tr}$	7.0
ISO 10360-9 (2013) "Multi Probing System" (3)			
Precitec LR	Form error	$P_{Form.\,Sphere\,2x25:MPS}$	6.5
	Size error	$P_{Size.\,Sphere\,2x25:MPS}$	5.3
	Location error	$L_{Dia\,2x25:MPS}$	7.2

SPECIFICATIONS HP-O

Max. permissible Error MPE [µm] acc. to:			50.40.20 (1)
ISO 10360-8 (2013) (2) (4)			
HP-O Adjustable	Form error	$P_{Form.\,Sphere\,1x25:Tr}$	5.0
	Size error	$P_{Size.\,Sphere\,1x25:Tr}$	8.0
ISO 10360-9 (2013) "Multi Probing System" (2) (3) (4)			
HP-O Adjustable	Form error	$P_{Form.\,Sphere\,2x25:MPS}$	5.7
	Size error	$P_{Size.\,Sphere\,2x25:MPS}$	5.3
	Location error	$L_{Dia\,2x25:MPS}$	6.7

LEITZ SIRIO BX

SPECIFICATIONS PRECITEC S3

Max. permissible Error MPE [µm] acc. to:			SIRIO BX	SIRIO BX
ISO 10360-8 (2013) (2)			6.8.9	6.8.15
Precitec S3	Form error	$P_{Form.\,Sphere\,1x25:Tr}$	2.7	3.1
	Size error	$P_{Size.\,Sphere\,1x25:Tr}$	5.8	6.2
ISO 10360-9 (2013) "Multi Probing System" (2)				
Precitec S3	Form error	$P_{Form.\,Sphere\,2x25:MPS}$	8.2	8.5
	Size error	$P_{Size.\,Sphere\,2x25:MPS}$	4.5	4.8
	Location error	$L_{Dia\,2x25:MPS}$	8.0	8.4

(1) Specifications for other sizes on request.
(2) Hexagon Manufacturing Intelligence acceptance test procedure based on ISO standard.
(3) For probe head change (SENMATION) 1µm has to be added.
(4) Specifications are valid for HP-O short range sensor.

ISO 10360

ISO 10360-8
Optical Sensors
Form error
Size error

A sphere is measured with 25 optical probings. $P_{Form.Sphere.1x25:tr}$ is the range of all radii = R_{max}-R_{min} (sphere form) $P_{Size.Sphere.1x25:tr}$ is the diameter deviation D_{meas} - D_{cal}

ISO 10360-9
Multiple Probing Systems: MPS
Form error
Size error
Location error

A sphere is measured with contact and non contact sensor, with 25 probings each. Form and size error over all 50 points. Location error $L_{Dia.2x25:MPS}$ = space distance between both centre points

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