

The new confocalDT 2451/2471 high precision controllers are the next generation of confocal chromatic measuring technology. Due to their excellent signal/noise ratio, these new models can achieve measuring rates of 10kHz with white light LEDs and 70kHz using an external Xenon light source.

The new active exposure regulation feature in the CCD array enables accurate, fast surface compensation on difficult changing surfaces during dynamic measurement processes.

Thanks to a user-friendly web interface, the entire configuration can be carried out without using any additional software. Data output is via Ethernet, EtherCAT, RS422 or analog output. confocaIDT 2451/2471 systems are used for complex distance and thickness measurements and can be used with any IFS sensor. Optical signals are transferred between sensor and controller via optical fibers.



EtherCAT Conformance tested: IFC2451





All thickness measurement settings are configured through the web interface. A number of transparent materials are stored in the expandable materials database.



Controller		IFC2451	IFC2451 IFC2451MP		IFC2471 IFC2471MP			
Multi peak measurement		2 peaks	up to 6 peaks	2 peaks	up to 6 peaks			
Light source		internal v	white LED	external xenon light source IFX2471				
Measuring rate		adjustable 10 / 5 / 2.5	/ 1 / 0.3 / 0.2 / 0.1kHz	adjustable 70 / 50 / 25 /	/ 10 / 5 / 2.5 / 1 / 0.3kHz			
	Ethernet / EtherCAT		1	nm				
Resolution	RS422	18 bit						
	Analog	16 bit						
Storage		up to 20 calibration tables for different sensors, menu selection						
Controller inputs / outputs		sync-in / trigger-in, sync-out error1-out, error2-out encoder (3x A, B, Index) EtherCAT/Ethernet RS422 analog: current, voltage (16 bit D/A converter) sync-in / trigger-in, sync error1-out, error2-ou encoder (3x A, B, Index) EtherCAT/Ethernet RS422 analog: current, voltage (16 bit D/A converter)			er-in, sync-out error2-out A, B, Index) /Ethernet 422 e (16 bit D/A converter) e, light-bulb exchange			
EtherCAT		EtherCAT						
Operating elements, controller displa	аy	On/Off switch; Button for dark alignment (as well as for reset to factory setting after 10s) 4x LED for intensity, range, status, supply voltage						
Supply voltage, power consumption	controller external light source	24 VDC ±15 %, ~10 W - 24 VDC ±15 %, ~10 W 90 265 VAC, ~100 W			5 %, ~10 W AC, ~100 W			
Housing		Aluminium case for DIN rail mounting						
Protection class		IP40						
Operating temperature controller external light source		5°C up	to 50°C -	5°C up 5°C up	to 50°C to 40°C			
Storage temperature		-20°C up to 70°C						
Permissable ambient light		30,000lx						
Safety; EMC Interference emission Interference resistance		CE EN 61 000-6-3 / DIN EN 61326-1 (class B) EN 61 000-6-2 / DIN EN 61326-1						
Shock		15 g, 6ms						
Vibration		2g / 10 Hz 500Hz						
	sensor	2 - 50m						
Optical fiber cable length	xenon light source	- 1m		m				
	connector	E2000						
	EtherCAT, Ethernet	CAT5E; length <100 m						
Cable length (all cables are shielded)	supply, RS422, sync./ error	<30m						
	analog	<30m						
	encoder	<3m						



| 7

confocalDT IFS 2400/2401 Confocal chromatic displacement sensor



The confocal sensors of the series 2400 and 2401 are applicable for distance and one-sided thickness measurement. The large tilt angle and the relative long stand off distance allow the use in many application fields. Measuring distance on shiny and transparent objects, one-sided thickness measurement; this sensor is ideal for precision measurement against any diffuse and specular materials e.g. film, liquid, glass, metal, polymer and many more.









IFS 2401-3







ø11 Tolerance: Total diameter +0.2 / -0.1 mm ; Single components ±0.1 mm MR = Measuring Range

Thickness measurement of rear windows





IFS 2401-10

28 37.6

45.5

ø27

ø20

SMR 27

MR 10



191.5

149.2

105.

SMR 67

MR 8.5

SMR = Start of Measuring Range





55.3

59.7 172.5



Dimensions in mm

Sensor model (standard)	IFS 2401-0.12	IFS 2401-0.4	IFS 2401-1	IFS 2401-3	IFS 2401-10	IFS 2400-10	IFS 2400-24	IFS 2401-25	
Measuring range	120µm	300µm	1mm	3mm	10mm	8.5mm	24mm	22mm	
Start of measuring range appr.	3.4mm	10.5mm	10mm	16.3mm	27mm	67mm	213mm	20.2mm	
Spot diameter	7µm	10µm	10µm	25µm	50µm	50µm	100µm	100µm	
Lippority (diaplocoment mecourement)	0.12µm	0.3µm	0.5µm	1.5µm	5µm	5µm	12µm	11µm	
Lineanty (displacement measurement)	≤± 0.1	% FSO	≤± 0.05 % FSO						
	0.24µm	0.6µm	1 <i>µ</i> m	3µm	10µm	10µm	24µm	22µm	
Linearity (trickness measurement)	≤± 0.2 % FSO			≤± 0.1 % FSO					
Resolution 1)	4nm	10nm	30nm	50nm	0.12µm	0.5µm	1µm	0.2µm	
Sensor	200g	220g	220g	160g	190g	680g	520g	190g	
sensor+MA 2400	380g	400g	400g	340g	370g	900g kg	760g	370g	
Max. tilt 2)	±43°	±28°	±27°	±22°	$\pm 14^{\circ}$	$\pm 14^{\circ}$	±5°	±8.5°	
Ambient light	30,000 lx								
Protection class	IP 65								
Operation temperature	+10 +50°C								
Storage temperature	-30 +70°C								
Sensor cable (fiber optic cable)	length: standard 3m; option up to 50m bending radius: static 30mm; dynamic 40mm								
Shock	15 g; 6 ms								
Vibration	2g / 10 Hz 500 Hz								
Electromagnetic compatibility (EMC)	EN 50081-1 and EN 61000-6-2								

FSO = Full Scale Output

All data at constant ambient temperature (25±5°C) against optical flat; specifications can change when measuring different materials. ¹⁾ Averaging factor 512 ²⁾ Maximum tilt that allows a stable signal

Accessories: mounting adapter MA2400 for sensors 2400/2401 (consisting of a mounting block and a mounting ring)



confocalDT IFS 2402 Confocal chromatic miniature sensors





The miniaturized series optoNCDT 2402 offers all advantages of the confocal measurement principle, with only 4mm outer diameter. Due to a unique and patented lens design, this compact sensor allows measuring in narrow cavities and bores. Sensors with axial measuring direction and sensors with 90° beam exit are available, which can measure radially in small cavities and bores. For mounting in magnetic environments sensors with titanium housing are available.



Diameter measurement in small bores with IFS2402/90 sensors

IFS 2402-0.4/1.5/4/10



IFS 2402/90-1.5/4/10

Dimensions in mm.



Sensor model (miniature)	IFS 2402-0.4	IFS 2402-1.5	IFS 2402/90-1.5	IFS 2402-4	IFS 2402/90-4	IFS 2402-10	IFS 2402/90-10	
Measuring range	400µm	1.5mm	1.5mm	3.5mm	2.5mm	6.5mm	6.5mm	
Start of measuring range approx.	1.5mm	0.9mm	2.5mm 1)	1.9mm	2.5mm 1)	2.5mm	3.5mm 1)	
Spot diameter	10µm	20µm	20µm	20µm	20µm	100µm	100µm	
Linearity	~0.3µm	1.2µm	1.2µm	~3µm	2µm	13µm	13µm	
Linearity				≤± 0.2% FSO				
Resolution	16 nm	60 nm	60 nm	0.1µm	0.1µm	0.2µm	0.2µm	
Weight	15g							
Max. tilt (direct reflexion)	$\pm 8^{\circ}$	± 5°	± 5°	$\pm 3^{\circ}$	± 3°	± 1.5°	± 1.5°	
Ambient light	30,000 lx							
Protection class	IP 40							
Operation temperature	+10 +50°C							
Storage temperature				-30 +70°C				
Sensor cable (fiber optic cable)	le	ength: integral ca	ble 2m; option up t	o 50m bending	radius: static 30m	m; dynamic 40m	m	
Shock				15 g, 6ms				
Vibration	2g / 10 Hz 500Hz							
Electromagnetic compatibility (EMC)			EN 500	81-1 and EN 610	000-6-2			

FSO = Full Scale Output All data at constant ambient temperature (25±5°C) against optical flat; specifications can change when measuring different materials. ¹⁾ Distance from sensor axis ²⁾ Averaging factor 512

Accessories: mounting adapter MA2402 for sensors 2402











confocalDT IFS 2403 Confocal chromatic hybrid sensors



The combination of a gradient index lens (GRIN lens) with a relay lens represents a favorable compromise between the IFS2401 standard sensors and the IFS2402 miniature sensors. The sensors of the IFS2403 series with an external diameter of 8mm can still be used for precise measurement in relatively tight installation situations. Due to the larger numerical aperture in comparison with the IFS2402, significantly larger stand off distances and steeper tilt angles can be realized than for the miniature sensors.

Sensors with axial measuring direction and sensors with 90° beam exit are available, which can measure radially in small cavities and bores.



Measurement in bores with IFS2403/90 sensors

IFS 2403-0.4/1.5/4/10



IFS 2403/90-1.5/4/10



 $\begin{array}{ll} \mbox{Tolerance } \pm 0.1 \mbox{ mm} \\ \mbox{MR} = \mbox{Measuring Range} \\ \mbox{Dimensions in mm}. \end{array} \\ \label{eq:MR}$

Sensor model (GRIN lens with relay optics)	IFS 2403-0,4	IFS 2403-1,5	IFS 2403/90-1,5	IFS 2403-4	IFS 2403/90-4	IFS 2403-10	IFS 2403/90-10	
	1	1				1	1	
Measuring range	400µm	1.5mm	1.5mm	4mm	4mm	10mm	10mm	
Start of measuring range	2.8mm	8.1mm	4.9mm	14.7mm	12mm	11mm	8.6mm	
Spot diameter	9µm	15µm	15µm	28µm	28µm	56µm	56µm	
Linearity (diaplessment measurement)	0.3µm	1.2µm	1.2µm	3µm	3µm	20µm	20µm	
Linearity (displacement measurement)			\leq \pm 0.08 % FSO			≤± 0.2 % FSO		
Linearity (thickness massurement)	0.6µm	2.4µm	2.4µm	6µm	6µm	40µm	40µm	
Linearity (Inickness measurement)			${\leq}\pm$ 0.16 % FSO			≤± 0.4 % FSO		
Resolution 1)	16 nm	60 nm	60 nm	0.2µm	0.1 <i>µ</i> m	0.2µm	0.2µm	
Weight	25 g							
Max. tilt (direct reflexion)	± 13°	± 16°	± 16°	$\pm 6^{\circ}$	$\pm 6^{\circ}$	$\pm 6^{\circ}$	$\pm 6^{\circ}$	
Ambient light	30,000 lx							
Light source	LED							
Protection class	IP 40							
Operation temperature	+10 +50 °C							
Storage temperature	-30 +70 °C							
Sensor cable (fiber optic cable)	length: integral cable 2m; option up to 50m bending radius: static 30mm; dynamic 40mm							
Shock	15 g, 6 ms							
Vibration	2g / 10 Hz 500 Hz							
Electromagnetic compatibility (EMC)	EN 50081-1 and EN 61000-6-2							

FSO = Full Scale Output All data at constant ambient temperature (25±5°C) against optical flat; specifications can change when measuring different materials. 1) Averaging factor 512

Accessories: mounting adapter MA2402 for sensors 2402











confocalDT Confocal chromatic measurement

System setup



Customer specific modifications

On occasions, application requirements exceed the performance limits of standard sensors and controllers. To facilitate such special tasks it is possible to customize the sensor design and to adjust the controller accordingly. Common requests for modifications include changes in design, mounting options, customized cable lengths and modified measuring ranges.



Possible modifications

- Sensors with connector
- 90° cable exit
- Vacuum suited sensors without outgassing
- Reduced sensor length
- Mounting options
- Extended sensor lance
- Optical filter for ambient light compensation
- Sensor material

Accessories

Software

IFD24n1-Tool

Accessories light source

IFX2471/Xe/75	external Xenon light source for controller
	IFC2471 (70 kHz)
IFX2471/Xe/75-light-b	ulb for IFX2471
IFL2451/LED-light-bul	b for IFC2451
IFL2451/LED(003)-light	nt-bulb for IFC2451(003) with cooling element
CL2471-1/Xe	Light source cable, 1m
CL2471-1/Xe/Y4	Light source cable for 4 controller, 1m

Free demo software tool included in delivery

Accessories 2400/2401

C2401-X	Fiber optical cable (3 m, 10 m,
	customer specific length up to 50m)
C2401/PT-X	Armored cable (3 m, 10 m,
	customer specific length up to 50m)
C2401-3(10)	Sensor cable for drag chain use, 3m
C2401-5(10)	Sensor cable for drag chain use, 5m

Accessories 2402/2403

CE2402-x	Extension for fiber optical cable (3/10/13/30/50m)
Option PT	Sensor with armored cable
	(3/10m, customer specific length up to 50m)
C2402/Vac/KF16	Vacuum feedthrough
C2405/Vac/6/CF63	Vacuum feedthrough
C2405/Vac/9/CF63	Vacuum feedthrough

Accessories

SC2471-3/USB/IND	Connector cable IFC2451/2471, 3m
SC2471-3/IF2008	Connector cable IFC2451/2471-IF2008, 3m
SC2471-3/CSP	Connector cable IFC2471-CSP2008, 3m
SC2471-20/USB/IND	Connector cable IFC2451/2471, 20m
SC2471-10/USB/IND	Connector cable IFC2451/2471, 10m
SC2471-10/IF2008	Connector cable IFC2451/2471-IF2008, 10m
SC2471-10/CSP	Connector cable IFC2471-CSP2008, 10m
PS2020	Power supply 24 V / 2,5 A
EC2471-3/OE	Encoder cable, 3m

Fiber optic

Temperature range : -50°C bis 90°C Bending radius: 30/40 mm



Easy to plug: E2000 standard connector



boreCONTROL Non-contact internal wall inspection



Precise detection of diameters, defects, notches and hollows

boreCONTROL is a optical bore hole sensor and functions with a special version of the standard IFS 2402/90 sensor. The sensor can be used for bore holes with diameters from 4mm upwards. The sensor is rotated by an electric motor and can measure the diameter, roundness, concentricity, tapering and the straightness of bore holes.

Features

- Completely non-contact and wear-free measurement
- High speed sampling rate 5kHz
- Intensity information for surface inspection
- Active temperature compensation
- High repeatability and measurement stability

Typical applications







Steps Ovality

Diameter

Ovality Roundness

Depressions Concentricity Coaxiality

Conicity Straightness



MICRO-EPSILON MESSTECHNIK GmbH & Co. KG

Koenigbacher Str. 15 · 94496 Ortenburg / Germany Tel. +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90 info@micro-epsilon.com · www.micro-epsilon.com