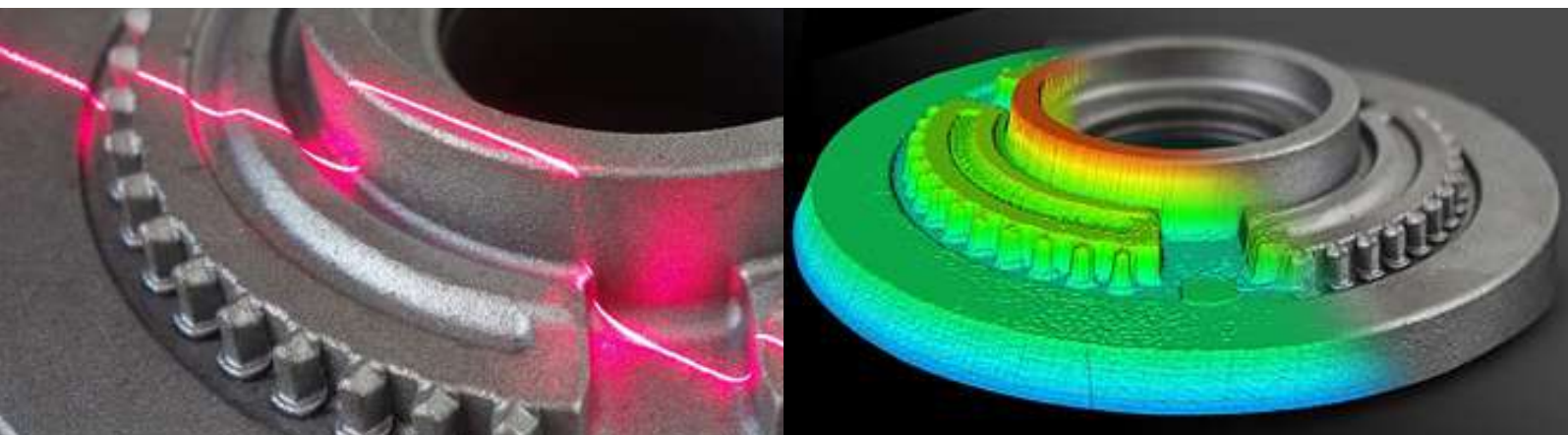




C5 Series

High Speed 3D Sensors
with High Speed and Ultra High Resolution

- Profile Speed up to 200 kHz (200,000 Profiles/s)
- Resolution up to 12 Megapixel
- Ruggedized Enclosure (IP67)
- Integrated High Precision 3D Profile Algorithms
- Enhanced 3D Imaging with HDR-3D Technology
- Integrated Illumination Control
- GigE Vision and GenICam Compliant
- Sophisticated 3D Scan Features like Autostart, Automatic AOI-Tracking, Multiple AOIs, etc.



C5 Series

High Speed Sensors for Three-Dimensional Measuring Tasks with High Precision

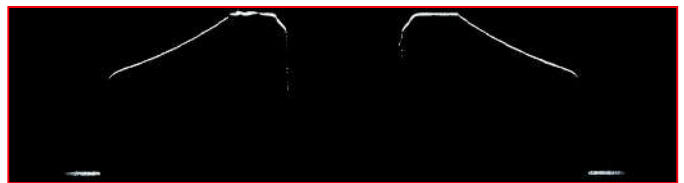
C5 sensors scan objects by means of the sheet of light method. This occurs through a projected laser line that migrates along the surface. With the help of a C5 camera, an image of the laser line is acquired from the triangulation angle alpha (α). As a result of this arrangement, the 3D profile of the object is captured.

Through an internal processing of the line images performed by different evaluation algorithms, the C5 camera generates the 3D scan data. Using state-of-the-art FPGA technology, the C5 sensors can operate at profile speeds of up to 200 kHz, independently of the chosen algorithm.

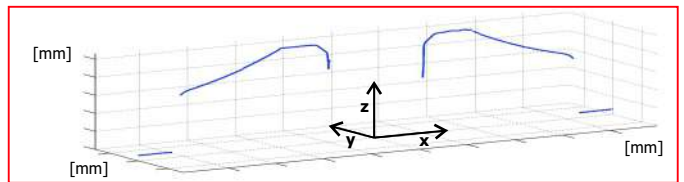
The transmission of the 3D data is carried out via a Gigabit Ethernet interface that complies with the GigE Vision standard and GenICam protocol. Once the C5 camera is connected, the vision software will automatically load an XML file with all camera functions. This is why the integration of AT's 3D sensors requires no more effort than setting up a conventional 2D camera.



The C5 Sensor records the Shape of the Laser Line.



Captured Laser Line in the Sensor Image



Display of 3D Data in a Vision Software

Special Features



AOI-Functions

Automatic AOI-Tracking, Automatic AOI-Search, Autostart



Multiple Feature Output

Sensor output delivers data of position, intensity, line width, etc.



Multiple Sensor-AOIs

Define up to 8 AOIs for dividing the sensor in separate subwindows for detection of multiple lines



High Dynamic Range (HDR-3D)

HDR-3D enables the scanning of objects with inhomogeneous reflection properties



Advanced Triangulation Algorithms

Wide variety of evaluation algorithms (COG, FIR-PEAK, TRSH, MAX) and filters (smoothing and derivative)



Chunk Data

Additional information output, e.g. timestamps, trigger/encoder coordinate, frame index, etc.



Enhanced Encoder Interface

Enables asymmetric signal transmission, supports differential (RS422) and of single-ended/single-channel encoders



GEV Events & Packet Resend

Secure data transmission according to the GigE Vision® standard

Options at a Glance



Starter-Kit

Complete 3D measuring setup with C5 sensor, laser, I/O panel and mounting



3D Calibration Software

Calibration tool for laser triangulation setup with optimum capturing quality



C-Mount / F-Mount

Suitable adapters for several lenses



3D Matching Software

Variance comparison between scanned objects and prime examples



Lens Cover

Robust tube with protection class IP 67 for use in production areas with harsh environments



Scheimpflug Adapter

Angled adapter for sharper profile capturing by means of the Scheimpflug principle

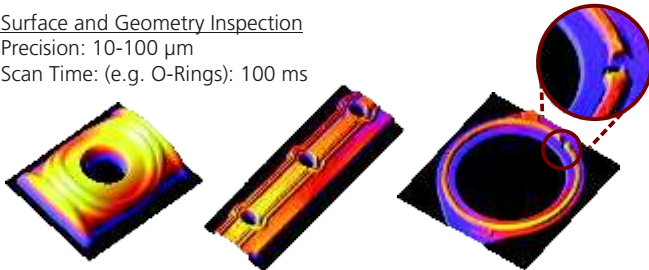
3D Imaging Applications

Examples of Typical Applications with CX Sensors

Inspection of Elastomer Parts (e.g. Radial Shaft Seals, Gaskets, Tyres)

Surface and Geometry Inspection

Precision: 10-100 μm
Scan Time: (e.g. O-Rings): 100 ms



Inspection of Metal Parts (e.g. Brake Discs, Conrods, Pistons)

Surface and Geometry Inspection

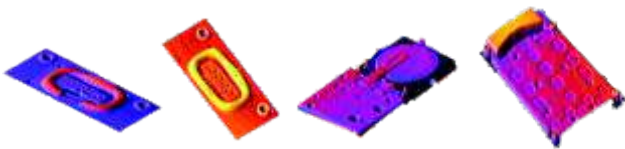
Precision: 10-100 μm
Scan Time: (e.g. Brake Discs): 1 s



In-Line Inspection in Assembly Lines (e.g. Glue Beads, Rivets, Screws, PCBs, Batteries, Contacts)

Assembly Verification, Flatness & Geometry Inspection

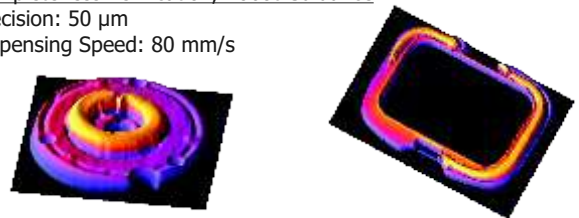
Precision: 20 μm
Scan Time: <1 s



Inspection of Adhesive and Sealing Beads (e.g. Automotive Parts)

Online inspection During Dispensing, Volumetric Measurement, Completeness Verification, Robot Guidance

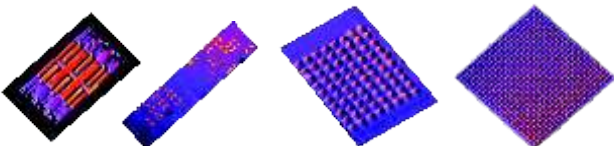
Precision: 50 μm
Dispensing Speed: 80 mm/s



Inspection of Electronic Components (e.g. PCBs, BGAs, Connectors)

Inspection of Solder Paste, Assembly Verification, Coplanarity Inspection, Pin Inspection

Precision: 5 μm
Scan Speed (e.g. BGA): 300 mm/s



Weld Seam Inspection (e.g. Steel Blank Welding)

Surface and Geometry Inspection

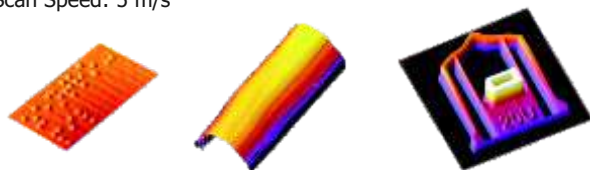
Precision: 10 μm
Weld Speed: 250 mm/s



Automatic Text Recognition (e.g. Tyre Specification, Braille Characters)

OCR (Optical Character Recognition)

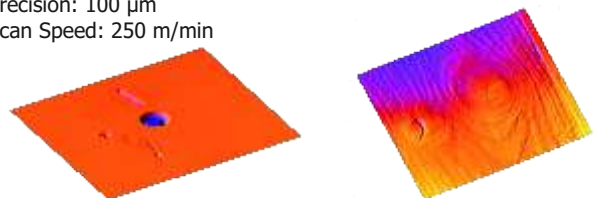
Precision: 10-100 μm
Scan Speed: 5 m/s



Inspection of Wood Surfaces (e.g. Plywood)

Surface Inspection, Detection of Branch Holes, Detection of Glue Stains, Texture inspection

Precision: 100 μm
Scan Speed: 250 m/min

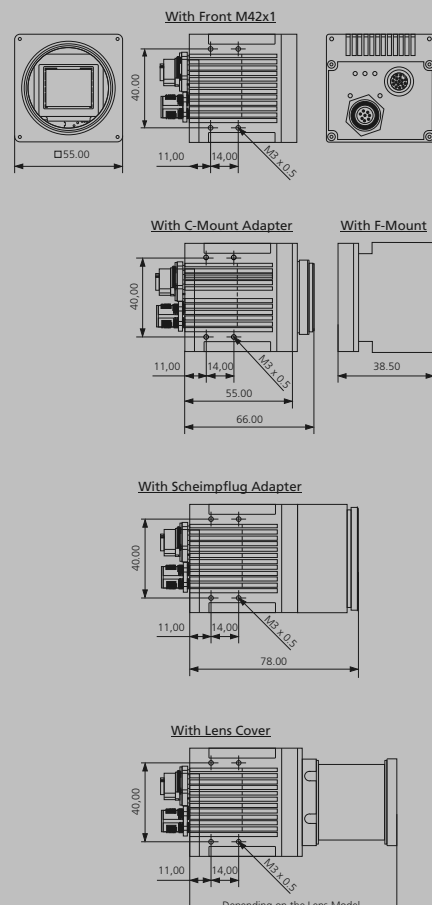


C5 Series

Technical Specifications

	C5-1280-GigE			C5-2040-GigE		C5-2040-4M-GigE		C5-4090-GigE	
Sensor Resolution	1280 (H) x 1024 (V)			2048 (H) x 1088 (V)		2048 (H) x 2048 (V)		4096 (H) x 3072 (V)	
Pixel Size	6.6 µm x 6.6 µm			5.5 µm x 5.5 µm		5.5 µm x 5.5 µm		5.5 µm x 5.5 µm	
Dynamic Range (*with HDR-3D)	90 dB			90 dB		90 dB		90 dB (with HDR-3D)	
Digitization	10 Bit			10 Bit		10 Bit		10 Bit	
Sensitivity	9.6 V/lux.s @ 525 nm			5.56 V/lux.s @ 550 nm		5.56 V/lux.s @ 550 nm		4.64 V/lux.s @ 550 nm	
Sensor Algorithm	MAX, TRSH, COG, FIR-PEAK			MAX, TRSH, COG, FIR-PEAK		MAX, TRSH, COG, FIR-PEAK		MAX, TRSH, COG, FIR-PEAK	
Profile Length in 3D-Mode	1280 Pixel per Profile			2048 Pixel per Profile		2048 Pixel per Profile		4096 Pixel per Profile	
Typical Profile Speed depending on Number of Sensor Rows Height Resolution can be increased by using TRSH (1/2 pixel) or COG/FIR-PEAK (1/64 pixel) without Loss of Speed	Sensor Rows	Profile Speed		Sensor Rows	Profile Speed (with 2048 Pixel)	Sensor Rows	Profile Speed (with 2048 Pixel)	Sensor Rows	Profile Speed (with 4096 Pixel)
		with 1280 Pixel	with 688 Pixel						
	1024	1.07 kHz	1.86 kHz	1088	340 Hz	2048	180 Hz	3072	75 Hz
	256	4.26 kHz	7.40 kHz	256	1.4 kHz	1088	340 Hz	512	450 Hz
	128	8.48 kHz	14.7 kHz	128	2.6 kHz	256	1.4 kHz	128	1.7 kHz
	32	32.8 kHz	59.1 kHz	64	5.2 kHz	64	5.2 kHz	32	5.8 kHz
		16	63.0 kHz	16	16.0 kHz	16	16.0 kHz	16	9.7 kHz
		8	116 kHz	8	25.0 kHz	8	25.0 kHz	8	14.5 kHz
Max. Frame Rate for Image Mode (Full Frame)	- 288 fps (Internal Recording)			- 170 fps (Internal Recording)		- 90 fps (Internal Recording)		- 32 fps (Internal Recording)	
	- 94 fps (via GigE Vision)			- 50 fps (via GigE Vision)		- 25 fps (via GigE Vision)		- 9 fps (via GigE Vision)	

General C5 Camera Specifications

Interface Specifications		Mechanical Size	
Digital Input	2 Electrical Isolated Inputs (5 -24 V DC)		
Digital Output	2 Electrical Isolated Outputs (5 -24 V DC)		
Encoder / Resolver Input	Resolver Interface with Signals A, /A, B, /B, Z, /Z High Speed, Triple RS-422 / RS-485 Receiver Max. Input Voltage TTL (optional HTL ± 24 V DC)		
Analog Output	Range: 0 - 5 V DC		
Data Interface	GigE Vision with GenICam Protocol		
Power Requirements			
Power Supply	10 - 24V DC		
Power Consumption	<6 W		
Mechanical Specifications			
Lens Mount	C-Mount / M42 with F-Mount Adapter		
Size	55 mm x 55 mm x 55 mm		
MASS (without Lens & Adaptor)	200 g		
Housing Mount	M3 + Adaptor Plate with Metric and Inch Threads		
Enviromental Specifications			
Operating Temperature	0°C to +50°C (Non-Condensing)		
Storage Temperature	-30°C to +70°C		
General			
PC Requirements	Gigabit Ethernet NIC		
Operating Systems	Windows 10 / 8 / 7 / XP, Vista, Linux		
Software Environments	Configuration Tool CX-Explorer, GenICam API, Compatible with any GigE Vision compliant Image Processing Library, e.g. CVB, NI-IMAQ, HALCON, MIL, VisionPro, EyeVision, GOM		