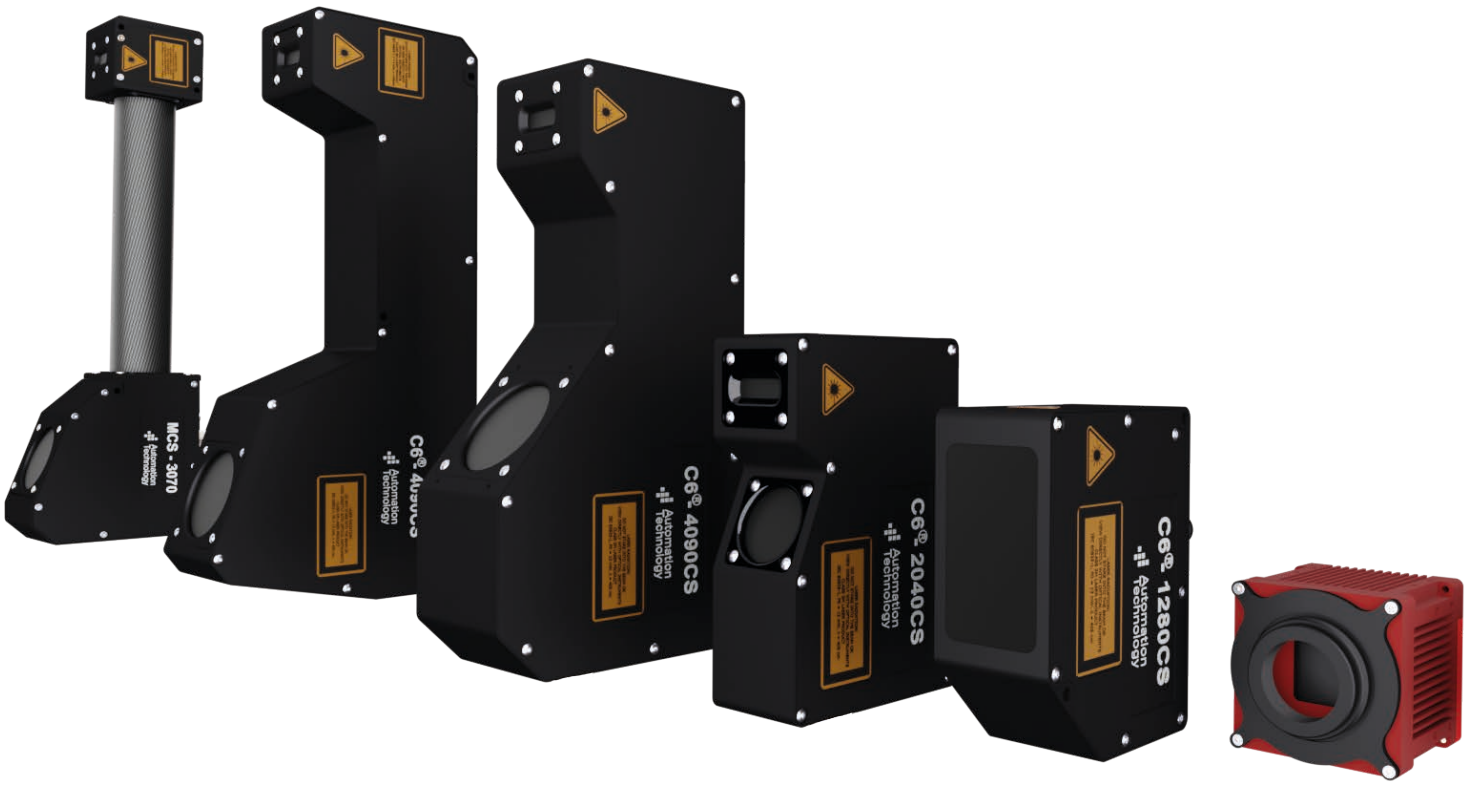
Automation Technology

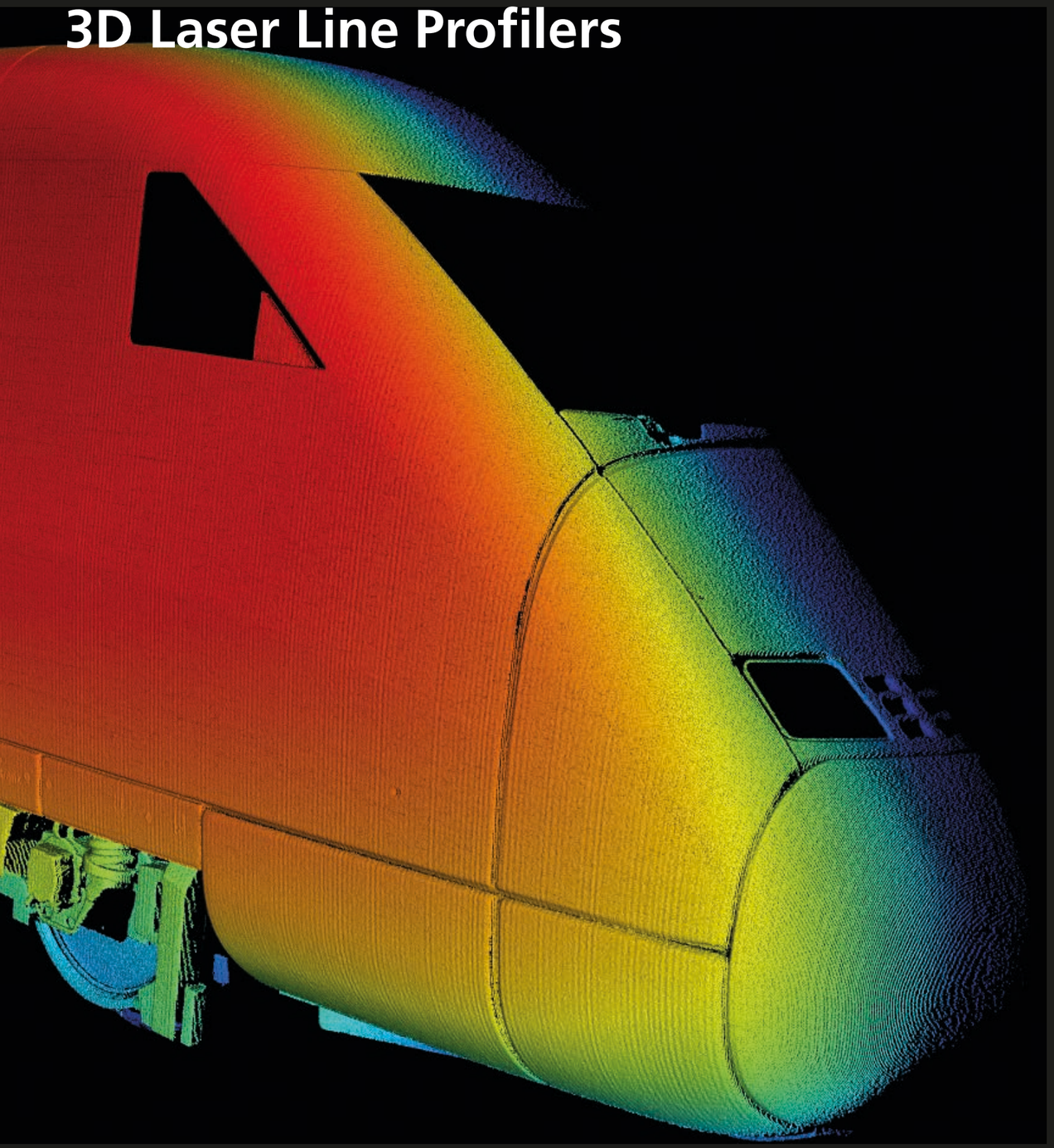



C6 Series

# 3D Sensors

# TAILORED

## 3D Laser Line Profilers



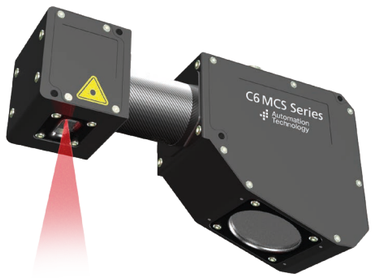
# SOLUTION

## 3D Vision Portfolio

The new C6 Series of 3D sensors from AT is based on a new sensor platform that supports the latest industry standard GigE Vision / GenICam 3D with 1 Gbit/s. The new laser profilers offer an impressive combination of extremely high-speed and high-precision resolution, enabling the C6 Series to enter worlds that 3D imaging has not seen before. They feature profile resolution up to 4096 points per profile and profile speed up to 200 kHz as well as high dynamic range 3D image acquisition. Available as compact sensor, MCS and 3D camera.

### Compact Sensors

- ✔ Factory calibrated 3D sensors
- ✔ Wide range of models with X-FOV 7 - 1290 mm
- ✔ Four different sensor resolutions available (1280, 2040, 3070, 4090)
- ✔ High industrial protection class IP67
- ✔ Available with various laser configurations
- ✔ Resolution Z up to 0.2 µm




### Modular Compact Sensors (MCS)

- ✔ Factory assembled and calibrated 3D laser triangulation sensors consisting of sensor module, laser module and link module
- ✔ Customized 3D sensor designs without NRE or MOQ
- ✔ Four different sensor resolutions available (1280, 2040, 3070, 4090)
- ✔ Configurable according to application requirements like X-FOV, working distance, triangulation angle, number of points per profile, laser wavelength and laser safety class
- ✔ Dual-Head configuration possible for occlusion-free 3D scans
- ✔ High industrial protection class IP67

### 3D Cameras

- ✔ Designed for flexible laser triangulation setups with user-defined lasers and lenses
- ✔ Four different sensor resolutions available (1280, 2040, 3070, 4090)
- ✔ High industrial protection class IP67
- ✔ Available with various lens mounts and Scheimpflug adapters
- ✔ Lens protection tubes

# C6 KEY FACTS

## By Professionals for Professionals

### Highest Resolution

- ✔ Profile resolution up to 4096 points/profile
- ✔ Sophisticated 3D line detection algorithms for every application (FIR-PEAK, MAX, COG, TRSH)
- ✔ Resolution X: up to 5 µm
- ✔ Resolution Z: up to 0.2 µm

### Unique Features

- ✔ GeniCam 3.0: support of latest 3D standards
- ✔ MultiPart: parallel output of different features (e.g. range, reflectance, scatter) at maximum profile speed with optimized pixel formats
- ✔ MultiPeak: output of up to four different peaks for even more robust 3D data and for scanning transparent or shiny objects
- ✔ Region search and tracking: automatically finds and tracks the laser line in the detector image

### Unmatched Profile Speed

- ✔ Profile speed up to 200 kHz
- ✔ 3D data rate up to 128 million 3D points per second
- ✔ Increase profile speed by defining detector regions
- ✔ Support up to four regions

### Various Models

- ✔ Wide range of compact sensors with X-FOV 7 - 1290 mm and numerous laser configurations
- ✔ Wide range of detectors with different resolutions (1280 - 4096 pixel/profile)

### Modular Concept

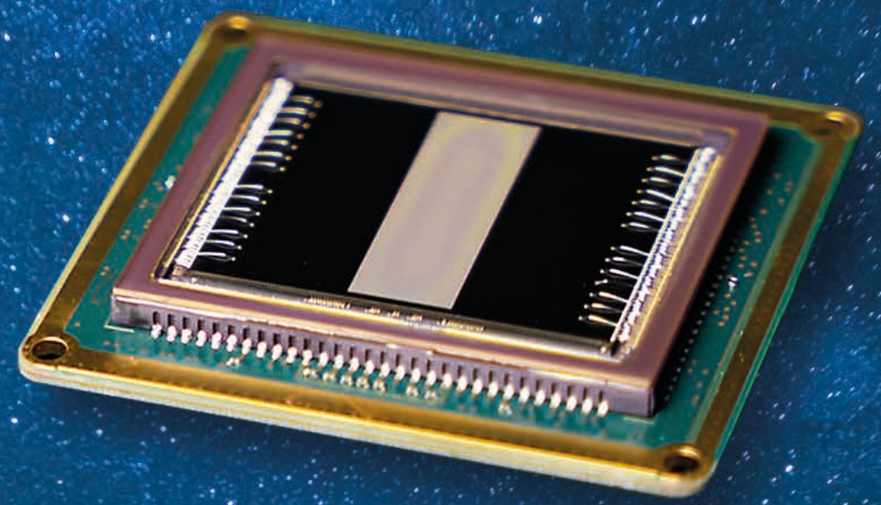
- ✔ Modular Compact Sensors (MCS): individual design optimized for your requirements
- ✔ No additional development costs
- ✔ Without minimum order quantity
- ✔ Short delivery time

# C6 3070

## World's Fastest 3D Sensor

### WARP Speed

- ✔ Widely Advanced Rapid Profiling (WARP)
- ✔ Unmatched profile speed
- ✔ Three different speed levels



### AT's Sensor Technology

- ✔ Exclusive 3K imager design developed by AT
- ✔ High sensitivity and high dynamic range pixel design
- ✔ Integrated on-chip processing

### On-Chip Processing

- ✔ Internal processing speed of 29 gigapixels/s
- ✔ 3D profile pixel output rate of 128 megapixels/s

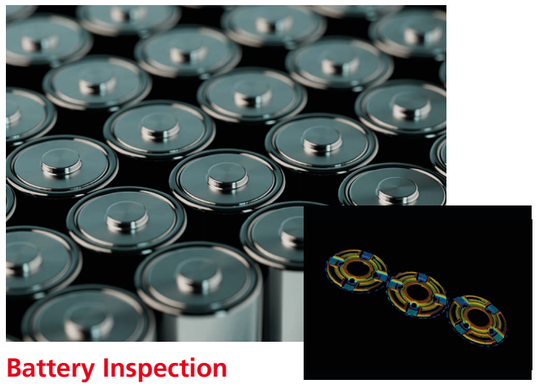
### World's Fastest Profiling

- ✔ Worldwide fastest 3D sensor in the combination of speed and resolution
- ✔ Intelligent line detection algorithms with advanced filtering and validation for highly accurate scans

**Available soon in various models...**

# APPLICATION VARIETY

## Suitable for All Industries

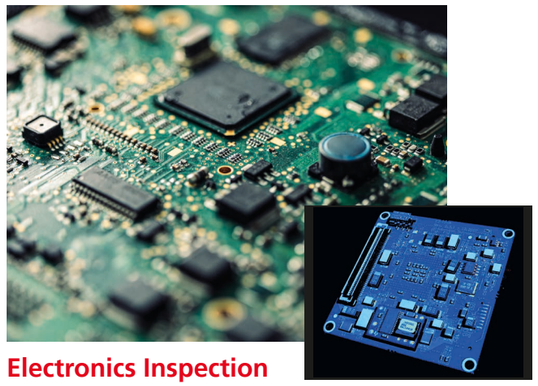


### Battery Inspection

- ✔ Inspection of the inner foil structure of the battery during assembly
- ✔ Inspection of the electrical contact surface of the battery

### Logistics and Packaging

- ✔ Sealing inspection
- ✔ Package quality inspection



### Electronics Inspection

- ✔ PCB Automated Optical Inspection (AOI)
- ✔ Solder Paste Inspection (SPI)

### Food and Beverages

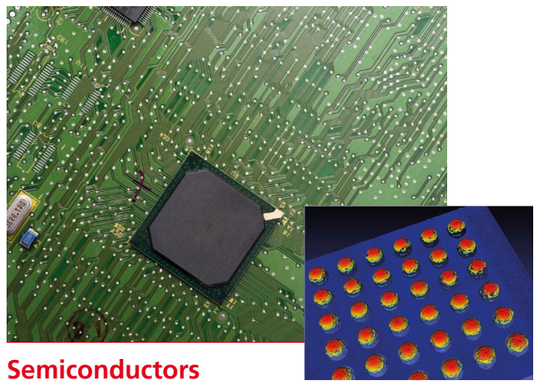
- ✔ Inline food packaging inspection
- ✔ Food branding, decoration, counting and volume measurement

### Automotive

- ✔ Tire inspection
- ✔ Electric vehicle motor assembly inspection

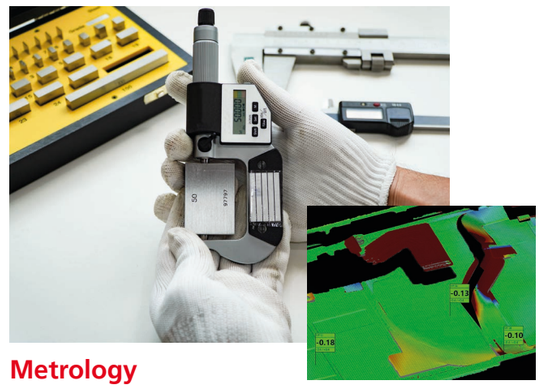
### Wood and Lumber

- ✔ Sawmill production optimization
- ✔ Wood furniture quality inspection



### Semiconductors

- ✔ Inspection of electronic components (BGA, QFP)
- ✔ Silicon wafer inspection



### Metrology

- ✔ Inspection of dimensional properties and geometrical features
- ✔ Comparison to the CAD model

# INTEGRATE

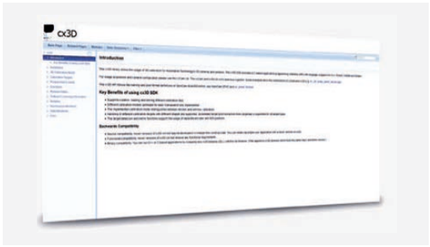
## cxSupport Package

# EASILY

The cxSupportPackage consists of a variety of tools that can be used to acquire 3D images, configure the 3D camera and provide 3D data in the form of range maps or point clouds, among other things.

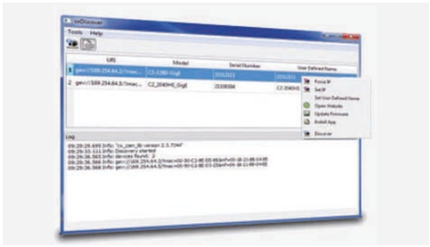
### cxCamLib

- ✔ SDK for image acquisition and camera configuration



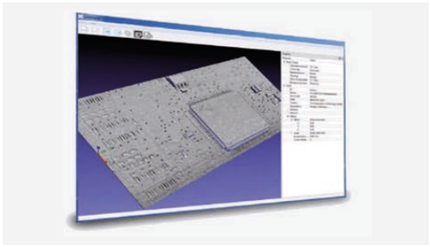
### cx3DLib

- ✔ SDK for intrinsic and extrinsic calibration
- ✔ 3D point cloud and ZMap generation



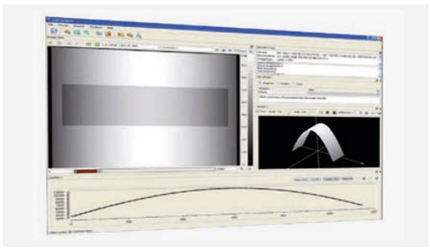
### cxDiscover

- ✔ GigE Vision device discovery tool
- ✔ Network settings configuration



### cxShow3D

- ✔ Sample tool with GUI for 3D point cloud visualization and ZMap generation



### cxExplorer

- ✔ Software for 3D image acquisition, device configuration and data analysis

# COMPACT
## Sensors

## Product Overview

### 3D Compact Sensor C6 CS X-FOV 7-53 mm

- ✔ Profile resolution up to 2048 points / profile
- ✔ Profile speed up to 200 kHz
- ✔ Wide range of models with X-FOV 7 - 53 mm
- ✔ Nominal working distance: 31 - 90 mm
- ✔ Resolution X: 5 - 26 µm
- ✔ Resolution Z: 0.2 - 1.2 µm
- ✔ Z-Range 5 - 46 mm
- ✔ Linearity Z: +/-0.01 % of Z-Range
- ✔ Repeatability Z: 0.1 - 0.5 µm

### 3D Compact Sensor C6 CS X-FOV 29-160 mm

- ✔ Profile resolution up to 2048 points / profile
- ✔ Profile speed up to 200 kHz
- ✔ Wide range of models with X-FOV 29 - 160 mm
- ✔ Nominal working distance: 106 - 197 mm
- ✔ Resolution X: 19 - 78 µm
- ✔ Resolution Z: 0.8 - 5.9 µm
- ✔ Z-Range 40 - 80 mm
- ✔ Linearity Z: +/-0.01 % of Z-Range
- ✔ Repeatability Z: 0.4 - 6.6 µm

### 3D Compact Sensor C6 CS X-FOV 82-145 mm

- ✔ Profile resolution up to 4096 points / profile
- ✔ Profile speed up to 25 kHz
- ✔ Wide range of models with X-FOV 82 and 145 mm
- ✔ Nominal working distance: 172 mm
- ✔ Resolution X: 20 - 35 µm
- ✔ Resolution Z: 0.5 - 0.9 µm
- ✔ Z-Range 15 mm
- ✔ Linearity Z: +/-0.01 % of Z-Range
- ✔ Repeatability Z: 0.4 - 0.7 µm

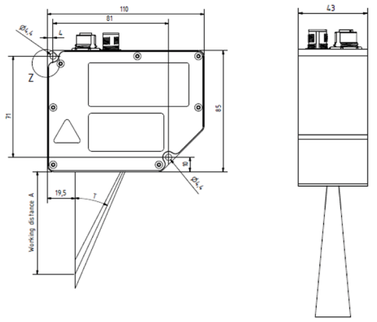
### 3D Compact Sensor C6 CS X-FOV 182-1290 mm

- ✔ Profile resolution up to 4096 points / profile
- ✔ Profile speed up to 200 kHz
- ✔ Wide range of models with X-FOV 182 - 1290 mm
- ✔ Nominal working distance: 400 - 944 mm
- ✔ Resolution X: 44 - 586 µm
- ✔ Resolution Z: 1.4 - 35.3 µm
- ✔ Z-Range 250 - 1090 mm
- ✔ Linearity Z: +/-0.01 % of Z-Range
- ✔ Repeatability Z: 2.1 - 10.0 µm

# Specifications

## X-FOV 7-53 mm

| Model Name | Nominal X-FOV (mm) | Z-Range (mm) | Nominal Working Distance (mm) | Resolution X (µm) | Resolution Z (µm) | Points per Profile | Profile Speed (kHz) | Laser Wavelength (nm) | Laser Safety Class |
|---|---|---|---|---|---|---|---|---|---|
| C6-1280CS35-7 | 7 | 5,2 | 31 | 5 | 0,2 | 1280 | 200 | 405, 450 | 2M, 3R, 3B |
| C6-1280CS35-12 | 12 | 8 | 31 | 10 | 0,2 | 1280 | 200 | 405, 450 | 2M, 3R, 3B |
| C6-1280CS25-20 | 20 | 20 | 72 | 16 | 0,5 | 1280 | 200 | 405, 450 | 2M, 3R, 3B |
| C6-1280CS21-40 | 40 | 46 | 90 | 31 | 1,2 | 1280 | 200 | 405 | 2M, 3R, 3B |
| C6-2040CS21-53 | 53 | 46 | 90 | 26 | 1 | 2048 | 25 | 405 | 2M, 3R, 3B |



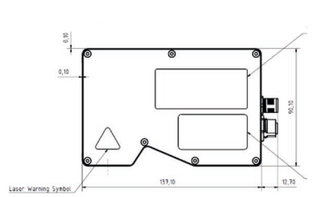


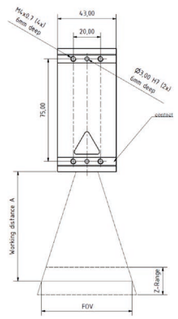


**X-FOV 7-53 mm**

## X-FOV 29-160 mm

| Model Name | Nominal X-FOV (mm) | Z-Range (mm) | Nominal Working Distance (mm) | Resolution X (µm) | Resolution Z (µm) | Points per Profile | Profile Speed (kHz) | Laser Wavelength (nm) | Laser Safety Class |
|---|---|---|---|---|---|---|---|---|---|
| C6-1280CS23-29 | 29 | 40 | 106 | 23 | 0,8 | 1280 | 200 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS23-38 | 38 | 40 | 106 | 19 | 0,7 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-1280CS23-47 | 47 | 40 | 106 | 37 | 1,4 | 1280 | 200 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS23-63 | 63 | 40 | 106 | 31 | 1,2 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-1280CS23-75 | 75 | 40 | 106 | 59 | 2,3 | 1280 | 200 | 405, 660 | 2M, 3R, 3B |
| C6-1280CS14-76 | 76 | 80 | 197 | 59 | 3,5 | 1280 | 200 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS14-100 | 100 | 120 | 197 | 49 | 2,9 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS23-100 | 100 | 40 | 106 | 49 | 1,9 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-1280CS14-120 | 120 | 120 | 197 | 94 | 5,9 | 1280 | 200 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS14-160 | 160 | 80 | 197 | 78 | 4,9 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |

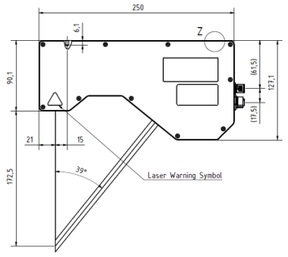


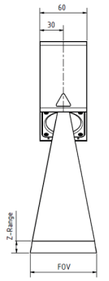




**X-FOV 29-160 mm**

## X-FOV 82-145 mm

| Model Name | Nominal X-FOV (mm) | Z-Range (mm) | Nominal Working Distance (mm) | Resolution X (µm) | Resolution Z (µm) | Points per Profile | Profile Speed (kHz) | Laser Wavelength (nm) | Laser Safety Class |
|---|---|---|---|---|---|---|---|---|---|
| C6-4090CS39-82 | 82 | 15 | 172 | 20 | 0,5 | 4096 | 20 | 405, 660 | 2M, 3R, 3B |
| C6-4090CS39-145 | 145 | 15 | 172 | 35 | 0,9 | 4096 | 20 | 405, 660 | 2M, 3R, 3B |

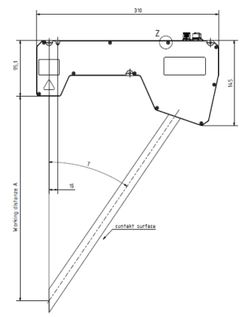


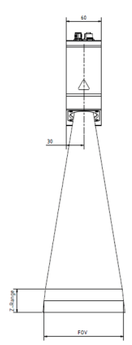




**X-FOV 82-145 mm**

## X-FOV 182-1290 mm

| Model Name | Nominal X-FOV (mm) | Z-Range (mm) | Nominal Working Distance (mm) | Resolution X (µm) | Resolution Z (µm) | Points per Profile | Profile Speed (kHz) | Laser Wavelength (nm) | Laser Safety Class |
|---|---|---|---|---|---|---|---|---|---|
| C6-4090CS30-182 | 182 | 150 | 400 | 44 | 1,4 | 4096 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-1280CS30-248 | 248 | 200 | 400 | 194 | 6,1 | 1280 | 200 | 405, 660 | 2M, 3R, 3B |
| C6-4090CS30-288 | 288 | 250 | 400 | 70 | 2,2 | 4096 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS30-330 | 330 | 200 | 400 | 161 | 5,0 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS18-1060 | 1060 | 800 | 744 | 518 | 26,2 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |
| C6-2040CS15-1290 | 1290 | 1090 | 920 | 630 | 38,0 | 2048 | 25 | 405, 660 | 2M, 3R, 3B |



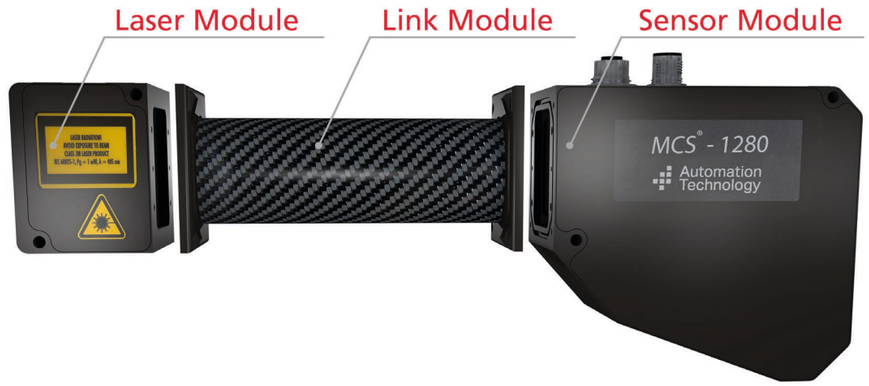




**X-FOV 182-1290 mm**

**Specs for sensor models based on 3070 detector coming soon...**

# MODULAR
## Compact Sensors

## Product Overview




**Factory assembled and calibrated 3D laser triangulation sensors consisting of:**

- ✔ Sensor module
- ✔ Laser module
- ✔ Link module

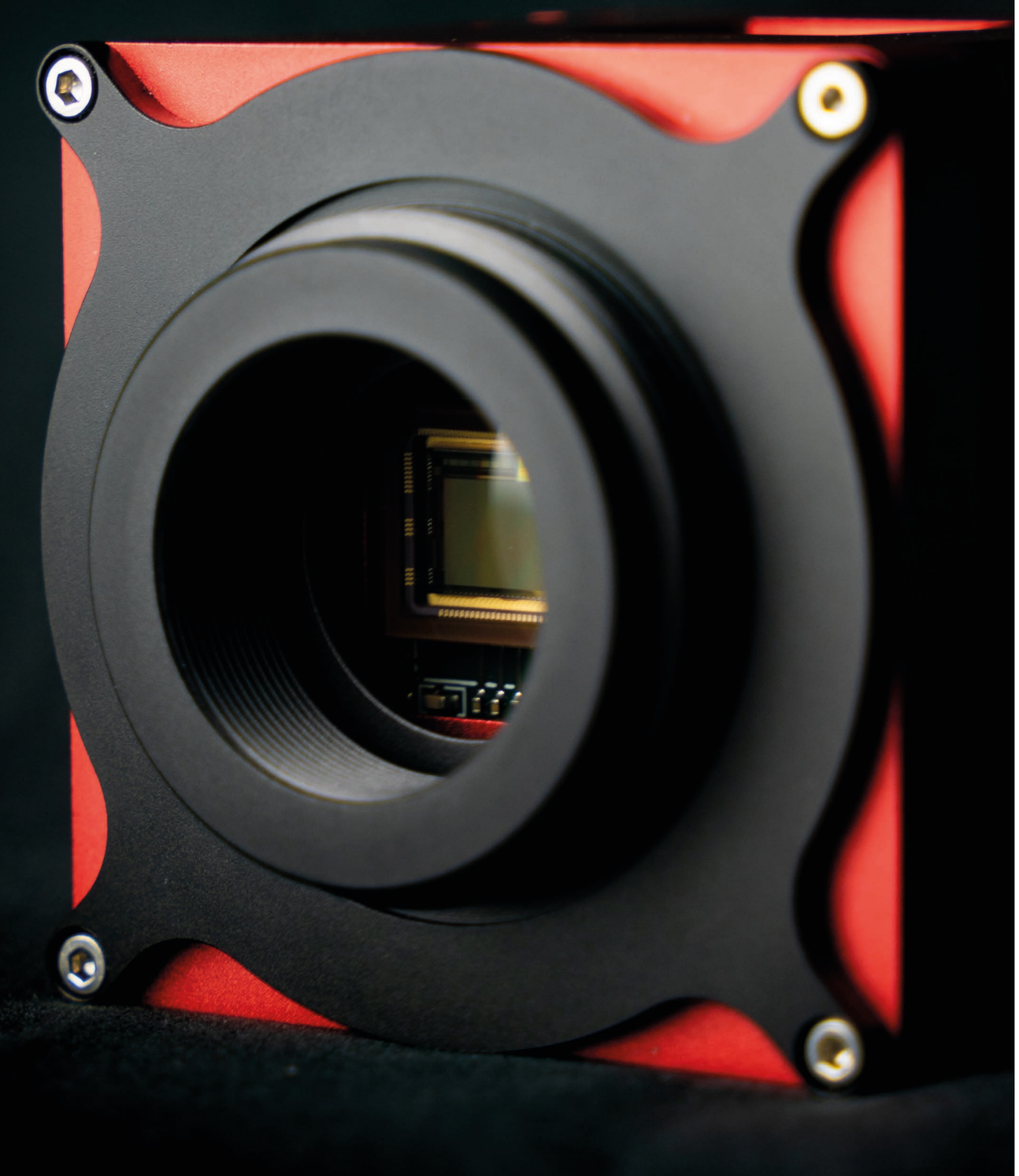
**Configurable according to application requirements:**

- ✔ X-FOV
- ✔ Working distance
- ✔ Triangulation angle
- ✔ Number of points per profile
- ✔ Laser wavelength
- ✔ Laser safety class

**3D Modular Compact Sensors MCS**

- ✔ Number of points per profile: 1280, 2048, 3072 and 4096
- ✔ X-FOV:  70 – 1600 mm
- ✔ Triangulation angle: 15°, 20°, 25°, 30°, 40° and 45°
- ✔ Resolution X: up to 17 µm
- ✔ Resolution Z: up to 1 µm
- ✔ Profile speed: up to 200 kHz

# CAMERA
## For Laser Triangulation



## Product Overview

Designed for flexible laser triangulation setups with user-defined lasers and lenses.

**Available Models:**

- ✔ C6-1280-GigE: 1280 x 1024 pixels
- ✔ C6-2040-GigE: 2048 x 1088 pixels
- ✔ C6-3070-GigE: 3072 x 1020 pixels
- ✔ C6-4090-GigE: 4096 x 3072 pixels

**Standard Lens Mount Version with M42x1**

**Version with Optional C-Mount Adapter**

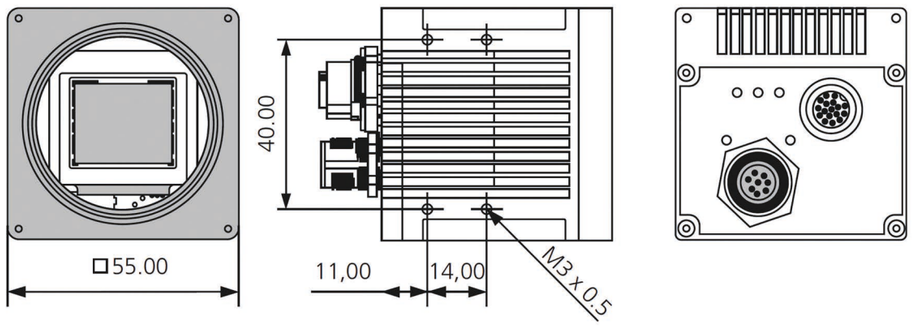
# Specifications

| Model Name | C6-1280-GigE | | | C6-2040-GigE | | C6-4090-GigE | |
|---|---|---|---|---|---|---|---|
| Sensor Resolution | 1280 x 1024 | | | 2048 x 1088 | | 4096 x 3072 | |
| Pixel Size | 6.6 µm x 6.6 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 | |
| Digitization | 10 Bit | | | 10 Bit | | 10 Bit | |
| Sensitivity | 9.6 V/lux.s @ 525 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 | |
| Profile Length in 3D Mode | 1280 Pixels per Profile | | | 2048 Pixels per Profile | | 4096 Pixels per Profile | |
| Typical Profile Speed Depending on Number of Sensor Rows<br><br>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 (with 1280 Pixels) | Profile Speed (with 688 Pixels) | Sensor Rows | Profile Speed (with 2048 Pixels) | Sensor Rows | Profile Speed (with 4096 Pixels) |
| | 1024<br>256<br>128<br>32<br>16<br>8 | 1.07 kHz<br>4.26 kHz<br>8.48 kHz<br>32.80 kHz<br>63.00 kHz<br>116.00 kHz | 1.94 kHz<br>7.67 kHz<br>15.05 kHz<br>54.22 kHz<br>95.74 kHz<br>155.17 kHz | 1024<br>256<br>128<br>32<br>16<br>8 | 0.34 kHz<br>1.40 kHz<br>2.60 kHz<br>9.70 kHz<br>16.0 kHz<br>25.00 kHz | 3072<br>512<br>128<br>32<br>16<br>8 | 145 Hz<br>851 Hz<br>3.10 kHz<br>9.70 kHz<br>14.90 kHz<br>20.30 kHz |

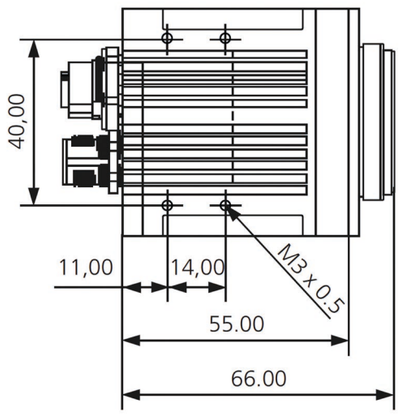
| General C6 Camera Specifications | |
|---|---|
| **Interface Specifications** | |
| Digital Input | 2 Electrical Isolated Inputs (5-24 V DC) |
| Digital Outputs | 2 Electrical Isolated Outputs (5-24 V DC) |
| Encoder / Resolver Input | High-Speed Resolver Interface with Signals A,/A, B, /B, Z, /Z |
| Analog Output | Range: 0-5 V DC |
| Data Interface | GigE Vision with GenICam Protocol |
| **Power Requirements** | |
| Power Supply | 10 - 24V DC |
| Power Consumption | max. 12 W |
| **Mechanical Specifications** | |
| Lens Mount | M42x1 / optional with C-Mount or 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 /11, Linux |

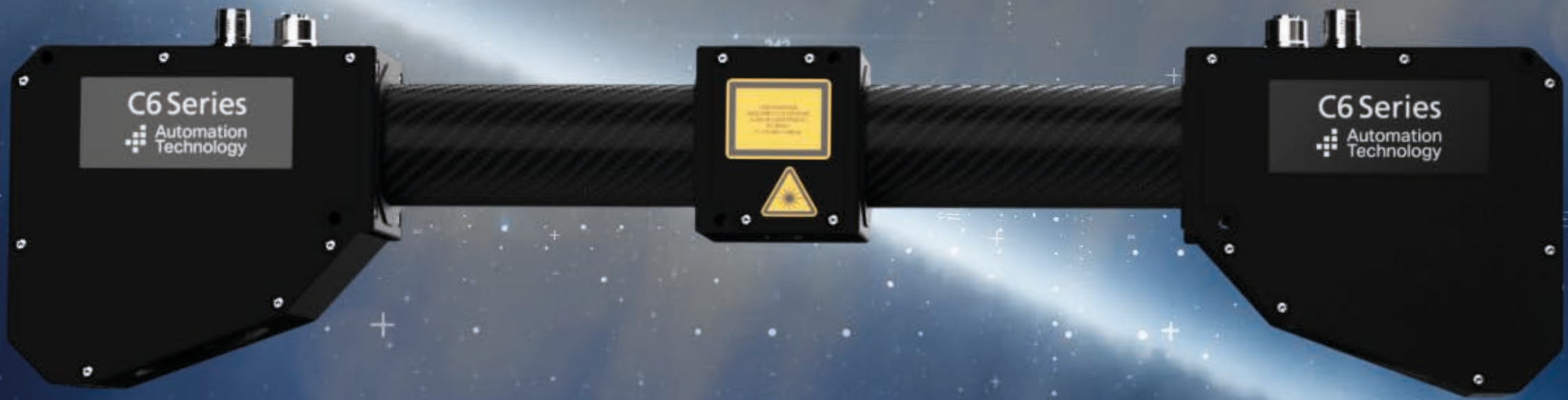
**Specs for camera models based on 3070 detector coming soon...**

## With Default Lens Mount M42x1




## With C-Mount Adapter

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