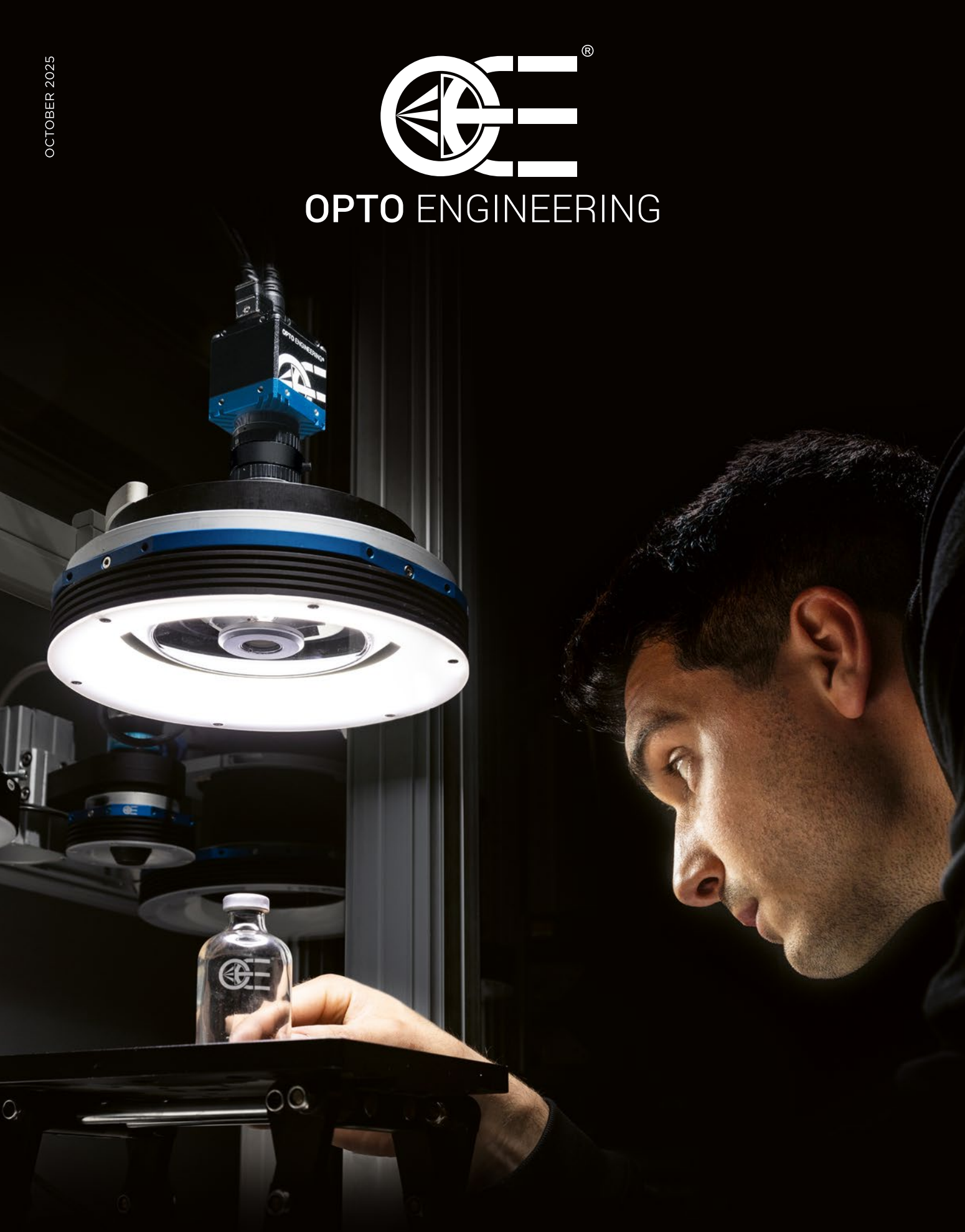
OCTOBER 2025

OPTO ENGINEERING



THE MACHINE VISION COMPANY®

OPTICS • CAMERAS • LIGHTING • SOFTWARE

THE® MACHINE VISION COMPANY

The partner for vision system developers.

We design and manufacture optics, cameras, lighting, and software, providing comprehensive support for our customers' vision applications.

VISION EXPERTS AT YOUR SERVICE

As machine vision experts, we are dedicated to provide comprehensive support across all product categories: optics, cameras, lighting, software, and accessories. With our extensive know-how and unique pre/post-sales assistance, we support our customers in tackling the complex challenges of machine vision.

INNOVATIVE PRODUCTS WITH PATENTED TECHNOLOGIES

PATENTED

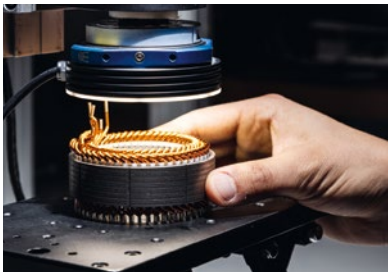
Our commitment to innovation ensures a wide range of products featuring patented and distinctive technologies. From advanced optics to cutting-edge software solutions, our portfolio is crafted to address the unique needs of various industries. By leveraging our proprietary technologies, we deliver exceptional value and reliability, supporting our customers to achieve their goals with confidence.

ONE PARTNER FOR ALL MACHINE VISION COMPONENTS

Explore our extensive range of advanced machine vision components, featuring thousands of high-quality products. Our portfolio includes innovative solutions designed to tackle even the most complex challenges that were once considered unsolvable. Additionally, we offer a variety of versatile, general-purpose components to meet the diverse needs of different applications.

FEASIBILITY STUDIES PERFORMED ON YOUR SAMPLES

Send us your test parts and share your vision challenge with us. Our dedicated and experienced technical team will test your samples in our state-of-the-art laboratories to find the perfect solution tailored to your specific application.



FREE DEMO UNITS

If you need to test our products directly at your site, reach out to us, and we will ensure you receive all the demo units necessary for your evaluation. We understand the importance of hands-on testing and our team is committed to providing you with the necessary resources to make well-informed decisions.

REGISTER NOW TO ACCESS OUR ONLINE CUSTOMER PORTAL!

Join our online customer portal to access exclusive support. Download all technical documentation without the need to fill out forms! Our expert technicians and engineers are on hand to provide personalized technical advice and sales support to maximize the potential of our products.

WE ARE OPTO ENGINEERING®

Experience drives innovation • Shaping the future of machine vision with expertise, vision and focus.

OUR VISION

In a world where imaging technologies will increasingly be part of everyday life, we want to become the preferred partner for anyone working within the machine vision industry, in a corporate or academic role.

OUR MISSION

Our goal is to create over time a distinctive and sustainable service while developing, supplying, and supporting the most advanced products and technologies in the machine vision field.

OUR MILESTONES

2002

OPTO ENGINEERING

ESTABLISHMENT
Opto Engineering® is founded in **Mantua** by **Claudio Sedazzari**, offering engineering services in Machine Vision and Imaging. The first line up of telecentric optics designed and manufactured by Opto Engineering is born.

2008

USA
The first foreign branch office **Texas Industrial Optics Inc** is set up in **Houston**, Texas.

2009

360° VIEW OPTICS
Launch of specialized optics for **360° View** inspection designed and manufactured by Opto Engineering.

2012

CHINA
The strong expansion in the Chinese consumer electronics market sets the stage for the establishment of the second branch office:
Deep View Trading & Services Co. Ltd.
Based in **Shanghai**, it is set up to support **local sales**.

2013

GERMANY
The German branch office **Opto Engineering Deutschland GmbH** is established in **Munich**, with the goal of better serving a highly developed local customer base.

COMMITMENT

Commitment is the ethical approach to work that exhibits itself through the active participation in a sustained growth process, a virtuous circle that is a source of inspiration by itself as well as to everyone else.

COURAGE

Courage is the determination to change always choosing the best path instead of the shortest one, facing one's own limits and overcoming them, without being afraid of falling and getting up again.

INTELLECTUAL HONESTY

Intellectual honesty is the ability to observe oneself through someone else's eyes while remaining anchored in one's own convictions and prioritizing wisely truth over comfort.

2014

LIGHTING
The technology offering is expanded to include **lighting** products and starting the production of **high-power LED devices**.

2015

CORE TECHNOLOGY
International launch of the **world's most compact telecentric lens**.
The **CORE** technology is protected by an **international patent**.

2018

SOFTWARE
International launch of the **Software** category with Opto Engineering® branded product.

2021

CAMERAS
The launch of the developing program that will position Opto Engineering® as the **designer and manufacturer of cutting-edge ITALA® industrial cameras**.

2022

20 YEARS ANNIVERSARY
Opto Engineering® celebrates 20 years of innovation and excellence with a prestigious event bringing together customers, industry leaders, and authorities to mark this significant milestone.

2025

LET'S SHAPE THE FUTURE OF MACHINE VISION, TOGETHER

OEVIS®

OPTO ENGINEERING® VISION SOFTWARE

OEVIS® is a cutting-edge environment for rapidly developing machine vision applications without the need for programming. It is tailored for system integrators, machine vision specialists and automation engineers who seek a versatile and user-friendly vision software solution.

KEY ADVANTAGES

- **Ease of Use**
  Intuitive, flowchart-based development with no programming required
- **All-in-One**
  Develop and execute with the same license. Effortlessly configure any GenIcam camera.
- **Easy integration**
  Supports diverse hardware and communication protocols
- **Comprehensive Support**
  Access extensive resources, example programs, support and training
- **Advanced Capabilities**
  Handle complex inspections with multiple cameras and multi-threading

30-DAY FREE DEMO LICENSE
CONTACT US

FUNCTIONALITIES

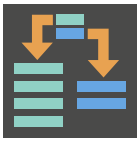
FLOW-BASED PROGRAMMING

Fast-use, intuitive graphical development method with automatic linking of computer vision and logic tools.

MULTITHREADING ADD-ON

Parallel execution of algorithms and analysis cycles. Synchronous or asynchronous acquisition from multiple cameras and simultaneous image processing.

MACRO, LOOPS & CONDITIONS



Create complex programs, including loops, conditions and subprograms without writing any code.

HMI DESIGN

Easily create beautiful and customized user interfaces within the same application software used to create your vision project. Moreover, unlock limitless customization thanks to the seamless integration of custom built .NET HMIs.

DEBUGGING

Run one single tool at a time for troubleshooting or checking whether the program is correct or not.

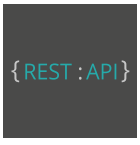
CUSTOM .NET TOOLS

Develop your customized algorithms in .NET and seamlessly import them as OEVIS tools.
OEVIS® takes care of the rest, from image data to hardware I/O.

EASY FACTORY INTEGRATION

Support a variety of communication protocols used in factory automation such as Modbus, Ethernet/IP, OPCUA and many more.

REST API



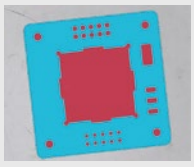
Seamless communication with web services, remote and local servers.

WIDE SELECTION OF TOOLS FOR COMPUTER VISION

IMAGE PROCESSING, SEGMENTATION AND DEFECT DETECTION

OEVIS® features many algorithms for surface and completeness inspection, including blob analysis, erosion, dilation, opening and closing, segmentation tools, standard, relative, dynamic, color thresholding, image unwrapping and many more.

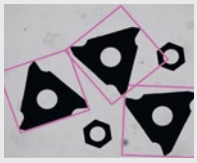
Identification of machining debris within holes through blob extraction.



Completeness inspection of PCBs via thresholding and morphological algorithms.

TEMPLATE MATCHING

OEVIS® matching algorithms robustly and accurately identify objects even under challenging conditions such as rotation, local deformation, varying textures, and changes in scale.

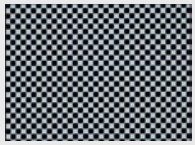


Identify objects based on template matching algorithms.

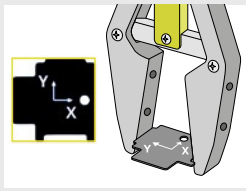
Template matching to identity food can position and rotation.

CALIBRATION, CORRECTION OF DISTORTION, ROBOT GUIDANCE

OEVIS® high-performance algorithms for distortion correction meet the requirements of telecentric optics, eliminating perspective distortion. Furthermore, OEVIS® integrates precise hand-eye calibration algorithms for vision-guided robotic applications, such as pick-and-place.



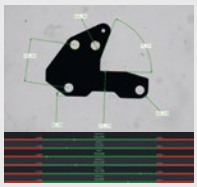
Distortion correction for telecentric optics.



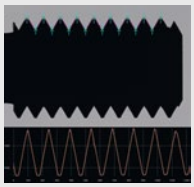
Calibration for robot guidance.

1D-2D EDGE DETECTION AND METROLOGY

OEVIS® efficiently finds edges using many different algorithms and contour analysis techniques. OEVIS® state-of-the art algorithms measure with subpixel accuracy diameters, lengths, concentricity, radiuses, and angles of complex parts.



High precision measurement of complex parts.



Edge detection and extraction of profile data from threads.

BARCODE, 2D DATACODE AND OPTICAL CHARACTER RECOGNITION (OCR)

OEVIS® ensures fast reading of barcodes and Data codes like ECC200, QR, PDF417 and more. Its OCR delivers accurate character recognition, irrespective of orientation or font, leveraging deep learning frameworks like Tesseract and PaddleOCR that boost performance especially under poor lighting or complex layouts.

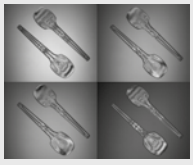
Datamatrix reading on pharmaceutical products.

Read dot prints on complex background.

POLARIZATION ANALYSIS

OEVIS® features many algorithms to analyze images acquired with polarized cameras, including AoLP/DoLP mapping, simulation of polarization states and so on.

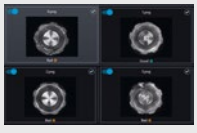
False-color image in HSV space showing the angle of polarization of plastic parts.



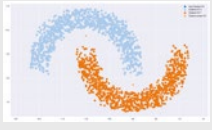
0°, 45°, 90° and 135° angle of polarization of plastic parts.

DATA CLASSIFICATION & MACHINE LEARNING

OEVIS® features machine learning models (MLP, SVM, KNN) and clustering functions (KMeans, DBSCAN) for complex image analysis tasks such as distinguishing between different textures or cluster objects with irregular shapes.



Parts classified based on their proximity to labeled examples.



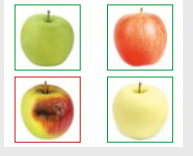
Visualization of a typical data clustering distribution.

DEEP LEARNING

OEVIS® lets you run your own Deep Learning models thanks to its native support to ONNX open-source format. For example you can train a neural network in PyTorch, export it to ONNX and then deploy it in OEVIS® using ONNX Runtime.

ONNX

Native support to ONNX (Open Neural Network Exchange) deep learning models.



Anomaly detection: identify outliers which significantly differ from the majority of the data.

SIMPLIFIED WORKFLOW

OEVIS® is conveniently organized into four sections that guide you in the development of your vision application.

1 - SYSTEM

- Connect & configure third-party automation hardware via multiple supported communication protocols.
- Manage multiple users access with specific permissions.

Wide range of supported standards, communication protocols and hardware.

- Profinet[1]
- Ethercat[1]
- Ethernet/IP[1]
- Modbus TCP[1]
- ADAM Advantech I/O
- Modbus Client TCP / RTU[2]
- Modbus Server TCP / RTU[2]
- OPC UA Client[2]
- Serial RS232/RS485[2]
- TCP/IP[2]
- WebSocket[2]
- HTTP[2]
- MQTT Client[2]
- Advantech PC
- AdLink PC
- IMAGO Technologies PC
- Neousys PC

[1] via CIFX Hilscher cards

[2] native support

CAN'T FIND YOUR HARDWARE? CONTACT US.

2 - ACQUIRE

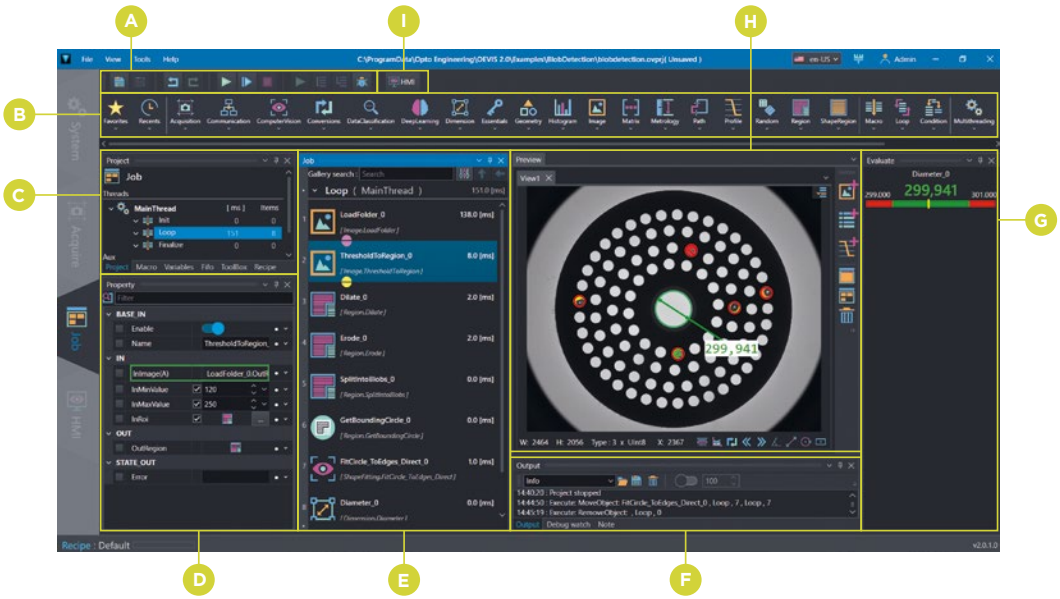
- Acquire from multiple cameras.
- Preview the live streaming images.
- Directly set all the GenICam parameters of each connected device.

Supports any GenICam GenTL camera.

GENICAM

3 - JOB

- Create your vision project using various tools.
- Design from scratch a beautiful front end.
- All the windows can be conveniently moved according to the user preferences.



A EXECUTION PANEL

Save, run in a loop or once, stop and debug your project. Select whether to run only the main thread or multiple threads simultaneously.

B JOB TOOL BAR

Tools are the bricks of an OEVIS® project. Each tool is composed by an action that is performed when the tool is run and a list of properties that customize its behavior.

C PROJECT EXPLORER

View Project parts (init, loop and finalize), manage Macros, create global Variables and Fifo queues, view and search tools and create Recipes, where you can save values to be published on the HMI.

D PROPERTY INSPECTOR

Display and set all the tools properties, including name, input & output values. Parameters followed by the "(A)" symbol automatically link to the first compatible value in the execution flow (if existing).

E JOB PANEL & SEARCH BAR

This panel shows the list of selected tools. The connection between tools is shown by half-circles located at the top (inputs) or at the bottom (outputs) of each tool. Different colors identify connections between different tools.

F DEBUG TOOLBOX

Display the event log, keep track of the property value of the selected tools when the program is running and test the connection to a Modbus server.

G EVALUATE

Visually display dimensional values or any other numerical property to quickly verify if it falls within a predefined range.

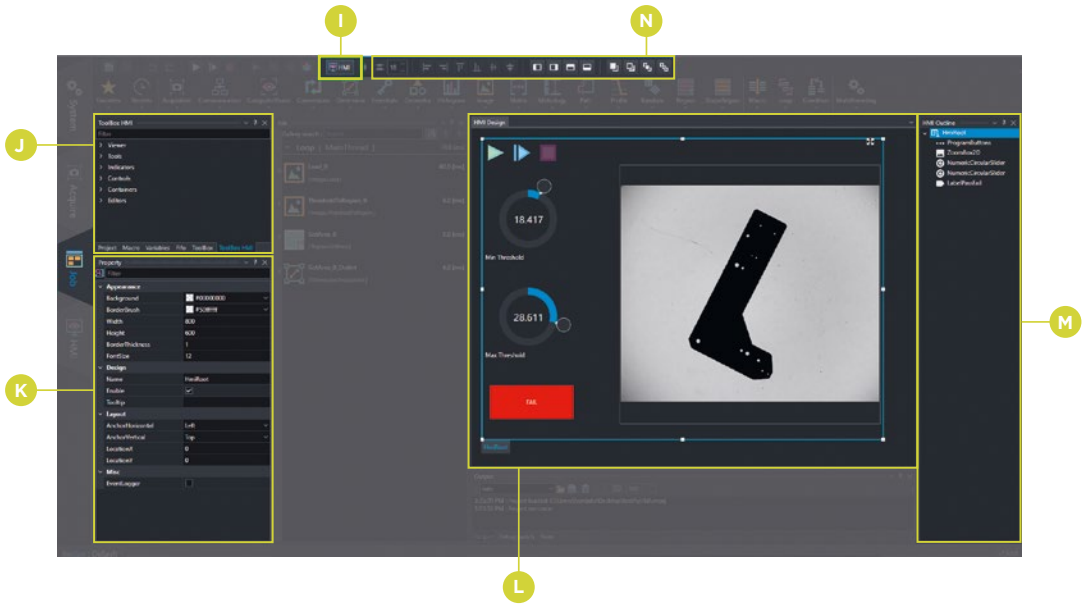
H VISUALIZER

Preview the results of image analysis and display edges or other properties via drag & drop functionality from the property panel. Add multiple views, display data tables and much more.

I HMI DESIGN

Design and customize your application's front end with a built-it advanced graphic editor.

Click on the HMI button to activate several controls to design your application's front end interface.



J HMI TOOL BOX

Add a wide variety of items including charts, visual indicators of any type, toggle switches, control buttons, text and your logo. Simply drag & drop them onto the HMI canvas.

K HMI PROPERTY AND LINKING

Deeply customize the HMI by editing the layout, appearance and behavior of the controls. To link the property of a tool to an HMI control, simply select the control, highlight the tool that you want to link and drag the tool's property onto the control label.

L HMI DESIGN CANVAS

The design canvas is where all control items are displayed. You can resize, move or transfer into different containers any item by dragging it with the mouse.

M HMI OUTLINE

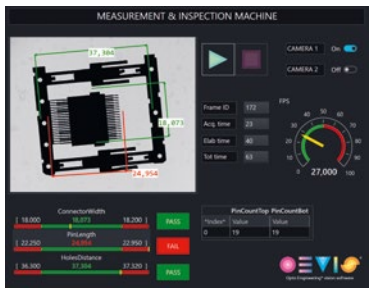
View all the HMI items that you have added displayed in a tree and organized according to their hierarchy.

N HMI TOOL BAR

Quickly edit the layout of controls including alignment, spacing, order of appearance and easily dock the selected control to the left/ right/top/bottom/ side of its parent container.

4 - HMI EXECUTION

Results of the processing are displayed to the end user in beautiful and intuitive front ends.



MACHINE VISION LIBRARIES

Opto Engineering® graphical environments are powerful, flexible, easy to use, and are designed to quickly develop and run new vision applications without the need to write program code.

TCLIB Suite

Software library & stand-alone tools
for the optimization of telecentric setups

- State-of-the-art algorithms for distortion calibration.
- Ensure the best focus and alignment with fast and intuitive stand-alone tools to achieve the best measurement results.

360LIB Suite

Software library & stand-alone tools
for the optimization of 360° optics setups

- State-of-the-art algorithms for unwrapping and correction of decentering.
- Achieve the best results for OCR/OCV/barcode reading with 360° view optics.

ITALA®

AREA SCAN CAMERAS DESIGNED AND MANUFACTURED IN ITALY BY OPTO ENGINEERING®

ITALA® is the family of power over ethernet area scan cameras entirely designed, assembled and tested in Italy by Opto Engineering®. ITALA® cameras are GigE Vision, GenICam and tested according to the EMVA 1288 standard.

OUR WIDE RANGE OF AREA SCAN CAMERAS

GigE Vision
GenICam
1288 EMVA Standard Compliant

SERIES	ITALA G GigE Vision PoE cameras	ITALA G.EL GigE Vision PoE cameras with liquid lens control	ITALA G.SWIR GigE Vision VIS-SWIR PoE cameras	ITALA G.IP Dustproof & water resistant GigE Vision PoE cameras
MODELS	38 models (19 mono, 19 color)	26 models (13 mono, 13 color)	1 model (mono)	28 models (14 mono, 14 color)
SENSOR TYPE	SONY Pregius™, Pregius™ S, Polarsens™ CMOS	SONY Pregius™ and Pregius™ S CMOS	SONY SenSWIR™	SONY Pregius™ and Pregius™ S CMOS
SENSOR FORMAT	1/2.9" - APS-C	1/2.9" - 1.2"	1/2"	1/2.9" - 1.2"
RESOLUTION	0.4 - 31.5 MP	1.6 - 24.6 MP	1.3 MP	0.4 - 24.6 MP

WHY SHOULD YOU CHOOSE ITALA® CAMERAS?

SONY **High-quality SONY Pregius™, Pregius™ S, Polarsens™, SenSWIR™ sensors**

Superior rugged design for industrial applications
- -25° C to 65° C operating temperature
- Stainless steel mount
- Milled aluminum body
- Tested for shock and vibration resistance

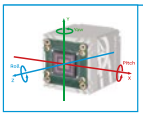
Broad range of I/Os ideal systems with multiple cameras and illuminators
- Industry standard Hirose 12 pin connector
- Up to 2 inputs and 4 sync outputs
- Dedicated input for encoder signal
- Serial interface: send/receive Modbus commands via RS232/RS485

Ideal for high-speed applications
- Never miss a frame thanks to the Burst mode and a large on-board image buffer
- High performance FPGA

Fast shipping service from Italy within 2 days*
*available in selected countries

5 YEARS

5 YEARS WARRANTY



Sensor alignment
We check the sensor alignment of each camera to ensure maximum performance.

Complete electronic testing
All the features of our cameras are checked to ensure perfect operation.

Burn-in test
Each camera undergoes severe testing to avoid possible early failures.

1288 EMVA Standard Compliant

EMVA 1288 test
Each camera is tested according to the EMVA1288 standard.

ADVANCED FUNCTIONALITIES FOR DEMANDING APPLICATIONS

DISCOVER ALL THE MODELS

CONNECTIVITY

Power Over Ethernet
POE allows a single cable to provide both data and power to the camera.

12-24
Voltage supply.

Opto-isolated I/O
Optically isolated input and output logic.

Encoder
Input an encoder signal to the camera.

Dual serial interface
Dual protocol serial interface selectable by user.

Modbus
Send and receive Modbus commands via serial interface.

Direct communication with PLCs/other devices.

100% synchronized acquisition for precision inline inspections.

FAST ACQUISITION

Burst
Take several images in quick succession.

Sequencer
Real time switching between different camera settings among different captured frames.

Dual exposure
Acquire two images in rapid succession.

Fast trigger mode
Reduced jitter time between electrical trigger input and frame acquisition.

Image compression
Compress the output image to overcome the connection bandwidth limits.

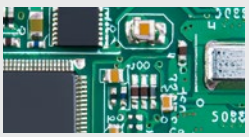
Checking bottles fill level at high speed.

Flexibility to use multiple lighting configurations with one single camera.

OPTIONAL LIQUID LENS CONTROL

Liquid lens controller
Control the liquid lens directly through the camera without the need for an external driver.

Autofocus
Automatically focus parts at different working distances.



Quick autofocus of parts at different working distances.

DATA ACQUISITION

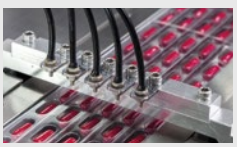
12-bit depth
Up to 12 bit for pixels analog-to-digital conversion.

Chunk data
Attach extra data to the image frame.

Region of interest
Select and acquire a specific region of interest of the frame.

Binning and decimation
Aggregate the values of adjacent pixel (binning) or subsample the image pixels (decimation).

High-speed inspection of colored pad printed plastic caps.

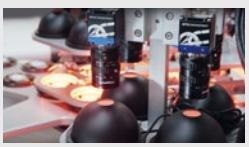


Presence/absence control of tablets in pharmaceutical lines.

MULTI-CAMERA SYSTEMS

Precision Time Protocol
Synchronize system clocks through the network to have precise timings.

Scheduled action command
Send and schedule actions at a precise time, such as camera triggering.



Four ITALA® cameras combined with fixed focal length lenses and dome lights.

COLOR MANAGEMENT

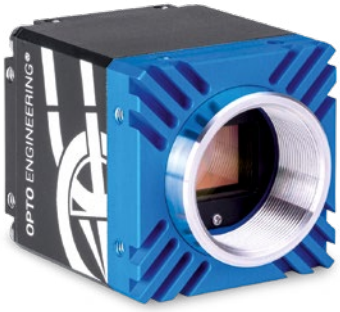
Auto white balance
Automatically or manually equalize the color channels to get balanced images.

Color Correction Matrix
Balance the color to get better color fidelity.

Verification of automotive paint finish.

ITALA G

Industrial GigE Vision PoE cameras



PATENTED

GiGE VISION

GEN<i>CAM

KEY ADVANTAGES

- **12 pin I/O connector**
- **Power Over Ethernet**
- **Latest CMOS Sony sensors**
- **Resolution: 0.4 to 31.5 MP**

ITALA G is a series of GigE Vision industrial cameras designed and manufactured in Italy by Opto Engineering®. Combining a robust and reliable design, these cameras are suitable for any imaging application.

These premium cameras simplify the use of external hardware, optimize image quality based on environment light conditions and offer an intuitive user experience thanks to their automatic functions that ensure top performances and time saving.

HIGH QUALITY SENSORS

SONY Pregius™ sensors
SONY Pregius™ Global shutter CMOS image sensors.

SONY Pregius™ S sensors
SONY Pregius™ S back-illuminated Global shutter CMOS image sensors.

EXTENSIVE FUNCTIONALITIES

12 pin connector ensures robust connection and extensive functionalities: up to 2 inputs and 4 synch outputs with opto-isolation.

IMAGE COMPRESSION

Opto Engineering® Image compression proprietary algorithms increase speed while retaining 100% of image data. In a typical scenario, the frame rate can increase by 1.5-2 times, depending on the specific image content.

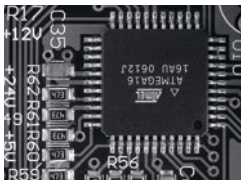


Image without Image compression.

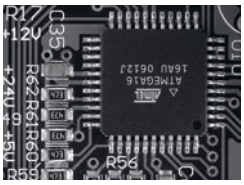


Image with lossless image compression.

ENCODER CONTROL

ITALA® cameras can receive a signal from incremental encoders to precisely identify the position/speed of the inspected part at any time. This is especially useful in applications such as precise robot guidance or accurate inline inspection where 100% synchronized acquisition is required.

BURST MODE

Burst mode is used to temporarily capture a series of images at a rate that is faster than the rate at which they are transferred to the host.
In burst mode acquisition, ITALA® cameras acquire multiple images of the inspected part at a rate equal to the sensor speed limit: these images are stored in a large on-board image buffer, which is efficiently managed by a high performance FPGA.

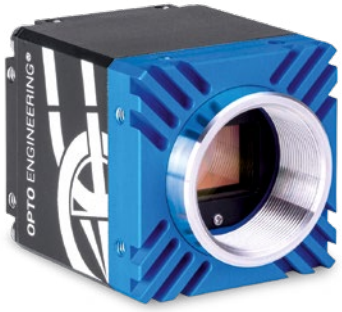
IDEAL FOR MULTI-CAMERA SYSTEMS

IEEE 1588 Precision Time Protocol allows to accurately synchronize clocks of multiple GigE Vision cameras on an ethernet network. This function is particularly useful in multi-camera systems and when inspecting moving parts.

Additionally, when PTP is enabled, the Scheduled Action Command feature allows simultaneous software triggering of multiple cameras at a specific time in the future, with sub-microsecond accuracy.

ITALA G

With polarized sensors



PATENTED

GiGE VISION

GEN<i>CAM

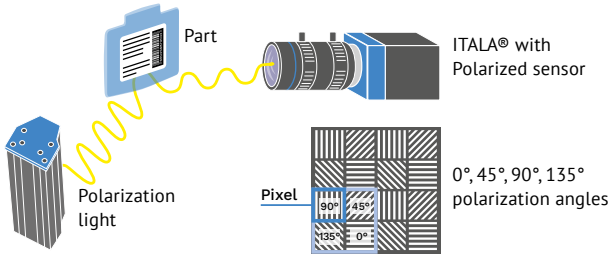
The ITALA G cameras integrate **5 MP** and **12.3 MP Sony Polarsens™** sensors that capture polarization data in addition to brightness and color information.

ITALA polarized camera filter unwanted reflection or glare as well as enhance contrast by detecting polarization angles of light.

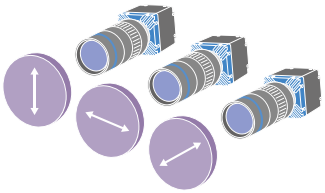
KEY ADVANTAGES

- **Four directional polarizations in one single acquisition**
- **Dedicated ITALA APIs**
  to calculate angle, degree of polarization and Stokes parameters
- **Simple set-up without accessory filters**

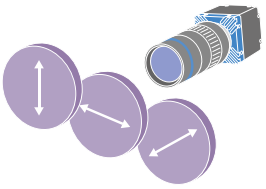
WORKING PRINCIPLE



TRADITIONAL SOLUTIONS

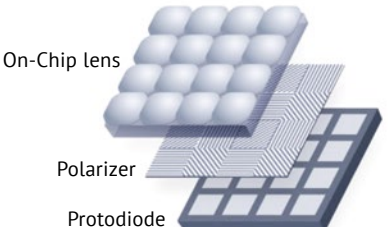


Three cameras with different polarization filters.



Three filters that rotate in front of a single camera.

ITALA® CAMERAS



Four directional polarizations in one single acquisition.

APPLICATIONS

Barcode reading in presence of reflections

ITALA® with a standard sensor.

ITALA® with Sony Polarsens™.

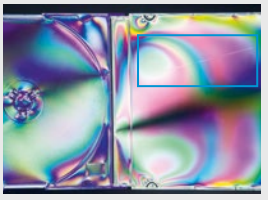
Presence/absence of pills in blister packs

ITALA® with a standard sensor.

ITALA® with Sony Polarsens™.

Scratch inspection on a transparent plastic surface

ITALA® with a standard sensor.



ITALA® with Sony Polarsens™.

ITALA G.EL

Industrial GigE Vision PoE cameras with liquid lens control

PATENTED

GiGE VISION

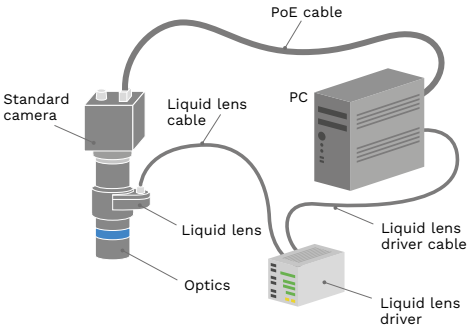
GENICAM

ITALA G.EL is a series of GigE Vision PoE area scan cameras designed to directly control the focus of Optotune® liquid lenses without additional external controllers.
ITALA G.EL cameras easily control the liquid lens via GenICam feature tree and feature the autofocus functionality.
The wiring is greatly simplified: all you need is a PoE cable from the camera to the PC and a specific cable that connects the ITALA G.EL camera to the liquid lens.

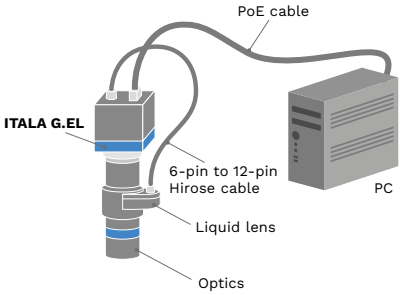
KEY ADVANTAGES

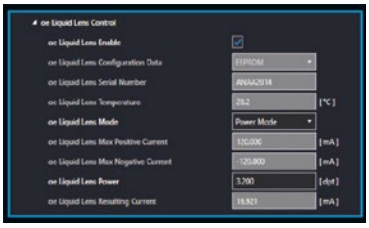
- **Built-in liquid lens control**
  Control the liquid lens directly through the camera without the need for an external driver
- **Autofocus**
  Automatically focus parts at different working distances. Robust to noise (high Gain). Usable in low light environment. Hardware-based feature: deterministic, fast and accurate results.
- **Simplified wiring**
- **Resolution: 1.6 to 24.6 MP**

STANDARD SOLUTION WITH EXTERNAL DRIVER



SOLUTION WITH ITALA G.EL



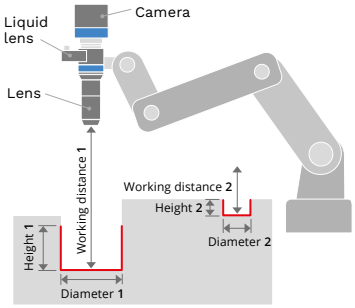


Direct liquid lens control via GenICam feature tree.

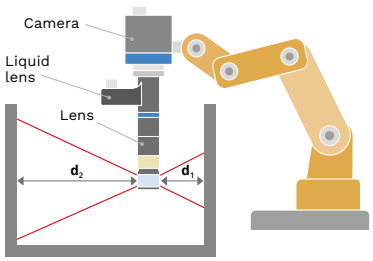
APPLICATIONS




Quick and remote autofocus of parts at different working distances.



ITALA G.EL with PCHI-AF hole inspection lens for cavity inspection from the outside.



ITALA G.EL with PCBP-AF boroscpic probe for cavity inspection.

WIDE RANGE OF COMPATIBLE OPTICS

EL5MP
5 MP fixed focal length lenses for sensors up to 2/3" with liquid lens technology.

EL12MP
12 MP fixed focal length lenses for sensors up to 1.1" with integrated liquid lens technology.

TCEL
Telecentric optics with liquid lens technology.

PCHIL-EL
Hole inspection optics with liquid lens focusing.

PCBP-AF
Boroscopic probe with liquid lens focusing.

ITALA G.SWIR

Industrial GigE Vision VIS-SWIR PoE cameras

GiGE VISION

GENICAM

ITALA G.SWIR is a series of GigE Vision PoE industrial cameras capable of detecting both visible and short wave infrared (SWIR) light from 400 to 1.700 nm using Sony's SenSWIR™ InGaAs technology.
These cameras enable a wide range of applications in high resolution spanning from semiconductors precision positioning (SWIR light penetrates silicon wafers) to food inspection (water absorbs light at a wavelength equal to 1450 nm).

KEY ADVANTAGES

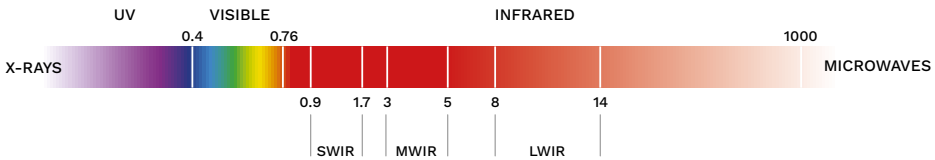
- **Visible + SWIR**
  Image acquisition in the visible and short-wave infrared spectrum up to 1.7 µm
- **High quantum efficiency even in visible wavelength**
  Thinner top indium-phosphorus layer allows more light reaching InGaAs layer
- **Finer pixel pitch and smaller pixels**
  High-resolution in small camera

Dual use product subject to export control.

ITALA G.SWIR cameras are designed and manufactured in Italy by Opto Engineering®, combining a robust and reliable design with advanced functionalities.

HIGH QUALITY SENSORS

SenSWIR™ sensors
SONY SenSWIR™ image sensors detect wavelenghts from 0.4 µm to 1.7 µm.

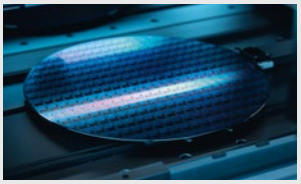


APPLICATIONS

Food sorting & foreign object detection.

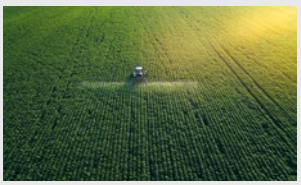
Plastic waste recycling.

Detection of contaminants in pharmaceutical tablets.

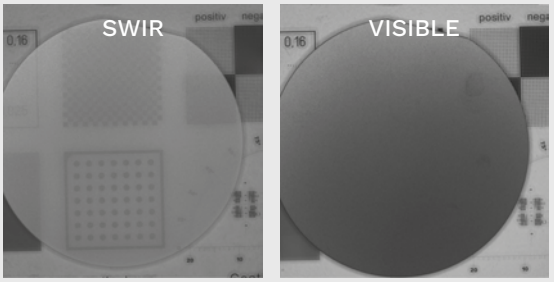


Semicon - silicon wafer positioning & ICs inspection.

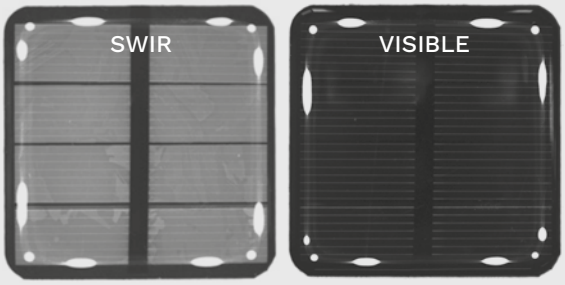
Identification of flames in wildfires through smoke.



Crop Health Assessment.



Silicon wafers appear transparent at 1200 nm. Backside illumination enables to inspect the alignment of marks in bonded wafers pairs. Frontside SWIR illumination can be used to detect micro-cracks and voids.



Multi-crystalline silicon solar cells can be inspected at 1300 nm to identify cracks or other defects.

ITALA G.IP

Dustproof & water resistant GigE Vision PoE cameras

PATENTED

GiGE VISION

GENICAM

KEY ADVANTAGES

- **IP67-rated housing**
  Protection against water and dust.
- **Ruggedized**
  -25° C to 65° operating temperature.
  Stainless steel mount, milled aluminum body.
  Tested for shock and vibration resistance.
- **Compatible IP67 lens tubes**

ITALA G.IP is a series of GigE Vision PoE area scan cameras featuring an IP67-rated housing.
By adding sealed lens tubes from IPT series and IP67 cables, ITALA G.IP cameras ensure protection against solid particles like dust, dirt, sand and water.

These cameras are designed to be used in harsh industrial environments, such as in the food & beverage or in the automotive industries, enabling excellent imaging in challenging conditions without bulky additional enclosures.

Opto Engineering® offers sealed lens tubes of different diameters to be used with varying lens sizes (IPT series) to complete your vision system.

COMPLETE IP TESTING

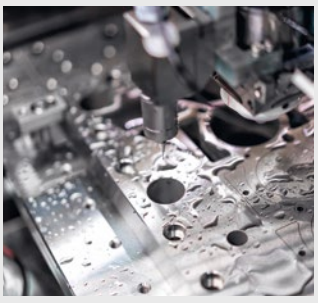
The Ingress Protection (IP) rating grades the resistance of an enclosure against the intrusion of dust or liquids.

All ITALA G.IP cameras are rigorously tested for ingress protection to ensure perfect operation.

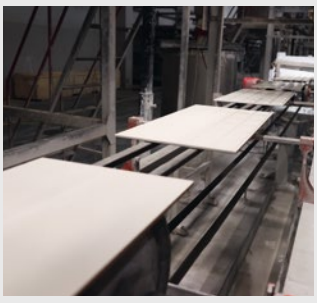
APPLICATIONS

ITALA G.IP is a great camera solution in harsh, dirty and wet industrial environments.

Automotive.



Machined metal parts in wet environments.



Ceramic tile production.

Inspection in the food industry.

ITALA SDK

KEY ADVANTAGES

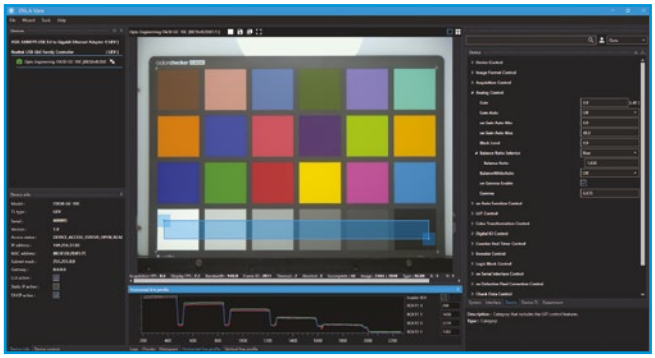
- **Extensive documentation with practical code examples showing common and advanced use cases**
- **Standardized camera control via familiar GenApi implementation Up-to-date SFNC feature names**
- **Event interface and chunk data support**
- **Utilities for camera network configuration and firmware updates**
- **NDIS filter driver improves streaming stability and CPU usage**
- **Camera settings download from device to file and vice versa**

The **ITALA SDK** (Software Development Kit) is a robust and easy-to-use API designed from scratch to support all Opto Engineering GigE Vision cameras.
The compliancy to the GenICam standard grants easy and precise configuration and control of cameras thanks to GenTL.

PROGRAMMING LANGUAGES, OS AND ARCHITECTURES

API C | API C++ | API C# | API python | arm

ITALA VIEW

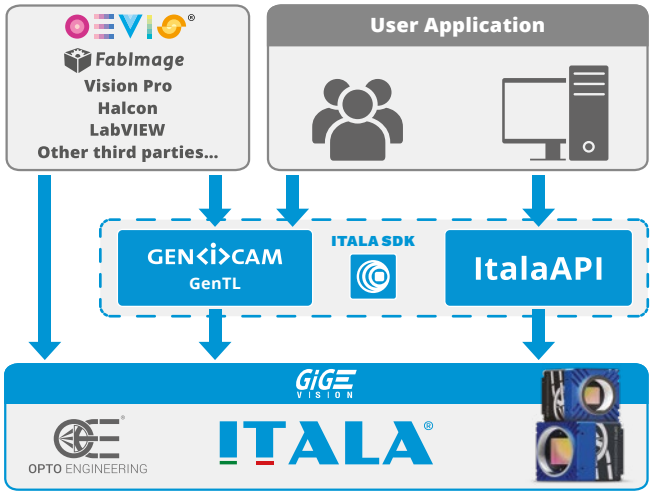


Comprehensive set of utilities and wizards

- **IP configurator**
- **Firmware update**
- **LUT, Defective pixels correction, Color correction**
- **Liquid lens control via GenICam feature tree**
- **Multi-camera display and control**
- **Enhanced display for polarized images**
- **Image analysis tools**

ITALA View is a fully featured GUI tool which allows the evaluation, configuration, control, streaming and monitoring of ITALA® cameras.

THIRD PARTY SOFTWARE COMPATIBILITY

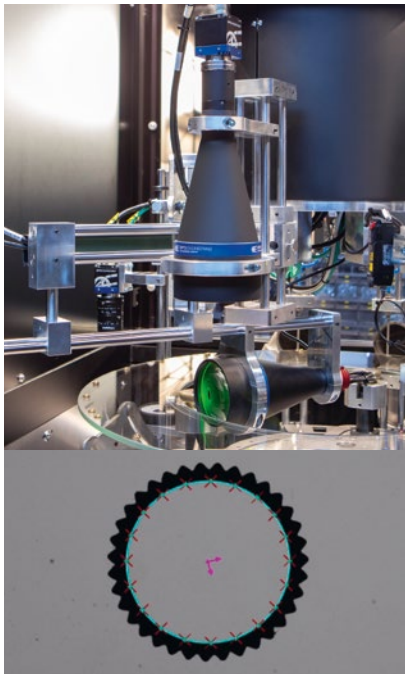


- **Easy integration with third party vision software.**
- **Fully compliant with any GigE Vision 2.x software.**
- **Interoperability with other GigE Vision compliant devices:** the SDK includes a GenTL producer (.cti file) compliant with the GenTL specifications hosted by EMVA.

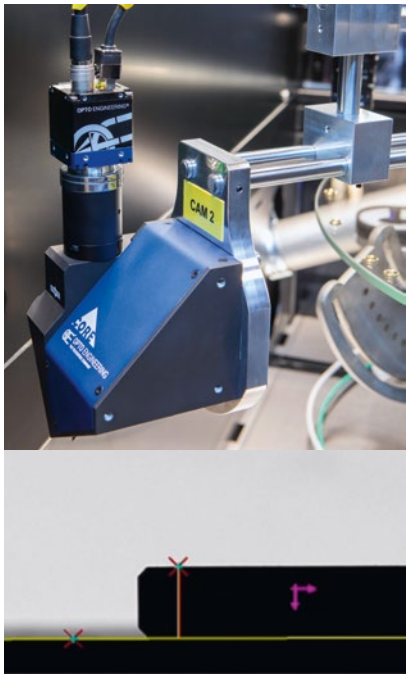
SUCCESS CASES

QUALITY CONTROL OF METAL TURNED COMPONENTS WITH ITALA G

Measurement and quality control of turned parts at 30.000 pieces per hour. Diameter and height dimensions between 3 mm and 50 mm.



A 12MP camera measures the diameter combined with a telecentric lens and a backlight.

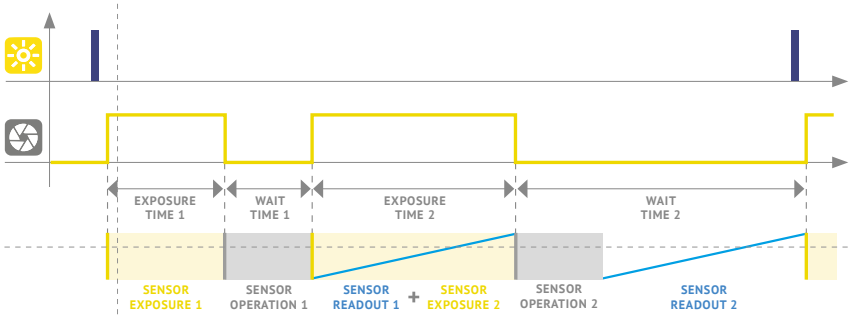


A 12MP camera measures the height combined with a CORE telecentric lens and a telecentric illuminator.

A 5MP camera with a 35 mm fixed focal lens inspects surface defects or processing residuals.

HIGH SPEED CHECK OF INJECTOR NOZZLES WITH TCCAGE OPTICS AND ITALA G

A 5MP camera reads the data matrix and measures the nozzle diameter with a TCCAGE lens.



Dual exposure timings and operations.

ITALA G is used in combination with TCCAGE optics, a bi-telecentric system for multiple side imaging and measurement at 90° which integrates both a ring light for surface inspection and a backlight for measurement. The double exposure function of ITALA G cameras allows two frames to be acquired as closely as possible by overlapping the reading of the first sensor with the exposure of the second.

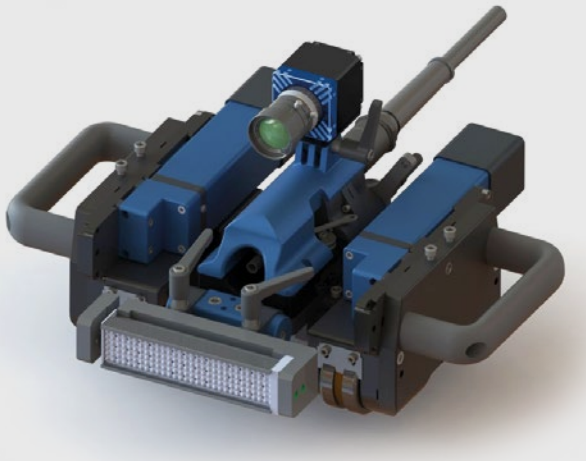
ROBOTS FOR REMOTE PIPELINE INSPECTION WITH **ITALA G**

ITALA G cameras are installed on robots designed for Non-Destructive Testing (NDT) and evaluation of critical infrastructures in the Oil and Gas, Aerospace and Nuclear industries.
The environments in which these types of activities are carried out are often particularly noisy, poorly lighted, dirty and subjected to vibrations.
The main challenge in this kind of application is to **guarantee an appropriate Field of View**, environment robustness and vibrating tolerancing, high data transfer rate and suitable illumination for operation in low light conditions.

To achieve the desired features and functionalities, the vision inspection system features one **ITA24-GC-10C**, a GigE color area scan camera featuring 2.4MP (1936x1216), one **EN5MP1616**, a 16 mm fixed focal 5MP lens and a **LTZPFL080-00-6-W-24V**, a compact white bar light ideal when the robot must operate in enclosed and low light conditions.

The vision system can be used for several purposes:
- to provide live feeds to the operators during beyond line-of-sight operations;
- for visual inspection of surface defects, weld inspection, corrosion mapping for preventative maintenance in various industrial environments;
- as part of the autonomous vision system to allow the robot to operate independently with minimal operator support.

ITA24-GC-10C, a GigE color area scan camera featuring 2.4MP (1936 x 1216) and EN5MP1616, a 16 mm fixed focal 5MP lens.



Opto Engineering ITALA® camera on robot.

Opto Engineering ITALA® camera on board of NDT inspection system.

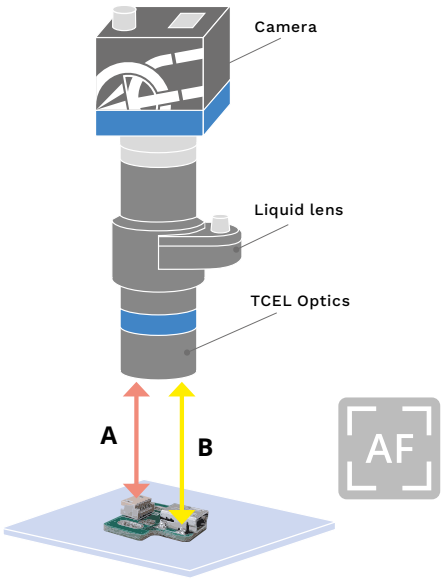
Non destructive testing of critical infrastructures.

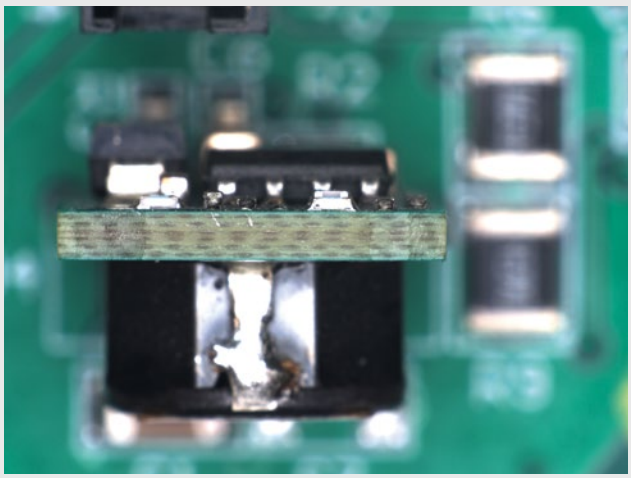
PCBA INSPECTION AND MEASUREMENT WITH **ITALA G.EL** AND **TCEL** LENSES

ITALA G.EL cameras and **TCEL optics** enable precise inspection of assembled electronic boards (PCBAs), facilitating tasks such as component marking code reading, fiducial identification and post-soldering component alignment and orientation of polarized components verification.

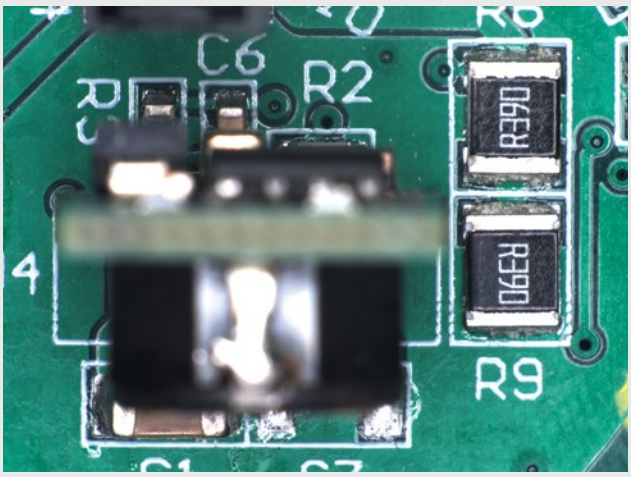
Liquid lens technology combined with **telecentric lenses** allows easy, fast and accurate measurement of components features, including pinouts and creepage distances.

Advanced **autofocus algorithm** dynamically and automatically optimizes focus condition at varying working distances ensuring maximum image sharpness.





***WD-A**: focus on higher components.*

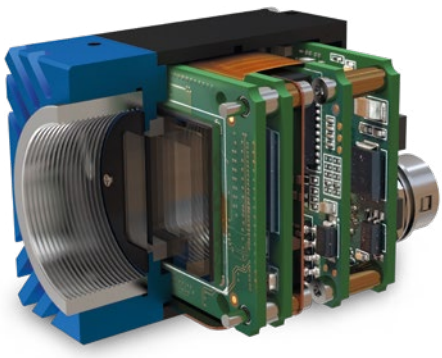


***WD-B**: focus on lower components.*

CUSTOMIZED MACHINE VISION CAMERAS

Opto Engineering® offers **customized industrial cameras** specifically tailored to answer every need. These cameras start from a set of basic common features to provide a wide range of customizations, both hardware and software/firmware.

- **Wide range of high-quality Sony sensors available**
- **Powerful scalable hardware.**
  Possibility to support additional algorithms and/or expansion boards to connect different types of actuators and sensors.
- **Modular software and firmware code**
- **Customizable mechanics**



THE VOICE OF OUR CUSTOMERS

"ITALA G cameras have excellent performances. Integration and firmware update were quick and simples thanks to Itala View software. The milled aluminum body dissipates heat very well and the steel threading is very solid: features that are indispensable in an industrial environment."

Machine builder for automotive, aerospace & watchmaking industries, Italy.

"We have integrated PCHI023-AF optics with ITALA G.EL: the direct control of liquid lenses is a great advantage."

Machine builder inspecting fasteners, Italy.

"The greatest strengths found in ITALA cameras are the extreme ease of use and the completeness of the documentation provided."

Builder of 100% sorting machines for screws, lathes and bolts, Italy.

"We were immediately convinced by the high quality of the ITALA cameras and the excellent technical support service."

Machine builder of scientific equipment for medical applications, USA.

"The industry environment where our machine vision system will be deployed is quite harsh, so we needed a robust camera. ITALA cameras perfectly fit our needs."

System integrator, Germany.

"We decided to switch to ITALA cameras on the confidence we have in Opto Engineering. Their cameras have a 12-pin Hirose instead of 6pin, so they can handle more outputs."

Manufacturer of machines for measurement and inspection of valves and metal fittings, Italy.

"ITALA cameras not only have top quality technical features, Opto Engineering also offers an excellent customer service."

AOI machine builder, Germany.

"I talk with Opto Engineering and problems go away."

Global polymer manufacturer, USA.

CB series

DISCOVER ALL THE CABLES

Cables for machine vision cameras

Opto Engineering® provides various kind of cables to match our offer of machine vision cameras.

All the cables we offer meet industrial standards of robustness and durability.

ETHERNET CABLES

ITALA G, G.EL, G.SWIR, G.IP

RJ45 Ethernet cable, CAT6A, industrial level, high flexible cable with screw lock.
IP67 cables with M12 Ethernet connectors are available for the ITALA G.IP series, ensuring maximum system sealing.

I/O CABLES

ITALA G, G.SWIR, G.IP

I/O cables, side 1 Hirose 12 pin, side 2 flying leads.
Also available in the IP67 version to ensure maximum sealing with ITALA G.IP series.

ITALA G.EL

I/O cable (side 1 Hirose 12 PIN, side 2 Hirose 6 pin) for liquid lens control.

Y-shaped I/O cable (side 1 Hirose 12 pin, side 2 Hirose 6 pin, side 3 flying leads) for liquid lens control. This configuration allows external powering and the usage of triggering and I/O signals.

OPTICS

LEADING TELECENTRIC TECHNOLOGY

Opto Engineering, The Telecentric Company®

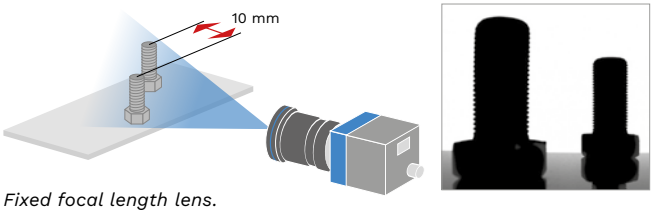
With its extensive family of telecentric lenses covering a wide range of sensor sizes and magnifications, Opto Engineering® is one of the world leaders in telecentric technology.

Telecentric lenses represent the key component of any vision-based measurement system, overcoming most of the limitations of entocentric optics.

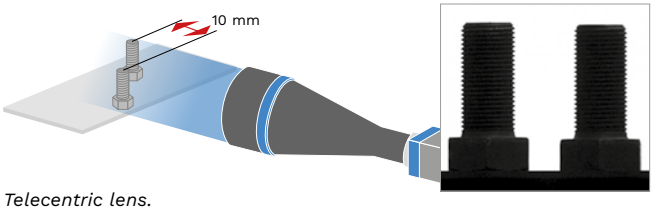
WHY TELECENTRIC LENSES?

Telecentric lenses only accept rays parallel to the lens optical axis and ensure:

- No perspective errors
- Constant magnification
- Low image distortion
- High image resolution and contrast
- No edge position uncertainty and border effects*
- Increased depth of field*



Fixed focal length lens.



Telecentric lens.

*When used in combination with telecentric LED illuminators.

EXTENSIVE RANGE OF TELECENTRIC OPTICS

CLASSIC

Bi-telecentric lenses

Long working distance telecentric lenses

COMPACT

PATENTED

Ultra compact bi-telecentric lenses

FOCUS TUNABLE

PATENTED

Telecentric lenses with integrated liquid lens technology

COAXIAL

Coaxial telecentric lenses

FLAT

Flat telecentric lenses

3D

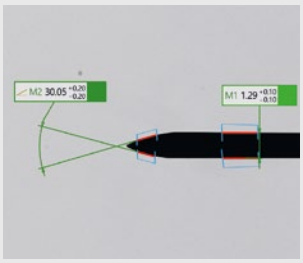
Bi-telecentric lenses with Scheimpflug adjustment

MULTI-MAG

Dual magnification telecentric lenses

MULTIPLE APPLICATION AREAS & OUTSTANDING CASES

Alignment and assembly of 189 sensors of the largest telescope CCD camera at the Vera C. Rubin Observatory in Chile.



High-precision measurement of needle tips in the pharmaceutical industry.

Imaging of stem cells used in the research project of Dr. Yamanaka that won the 2012 Medicine Nobel Prize.

Inspection of engine stators for electric vehicles.

CORE & CORE PLUS TECHNOLOGY

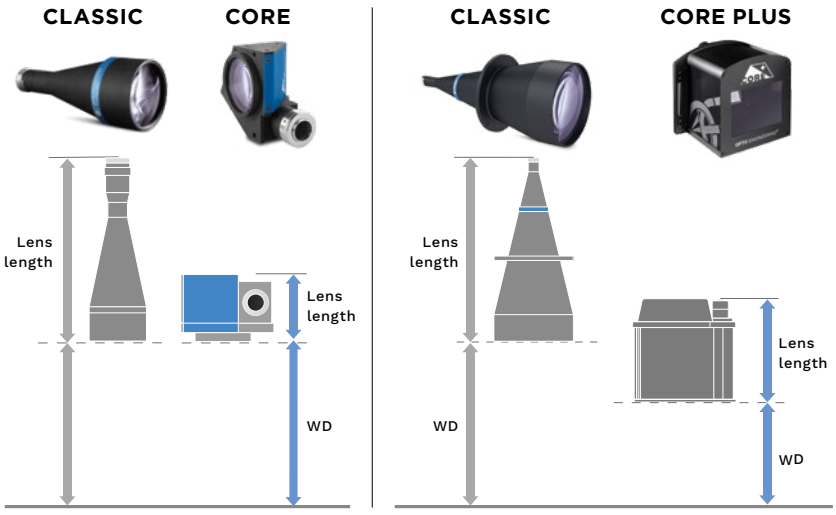
- Unique patented optical design
- CORE models up to 70% smaller than classic telecentric lenses
- Excellent optical performances
- Matching telecentric illuminators
- CORE PLUS models are designed for large FOVS

inVISION TOP INNOVATION 2016

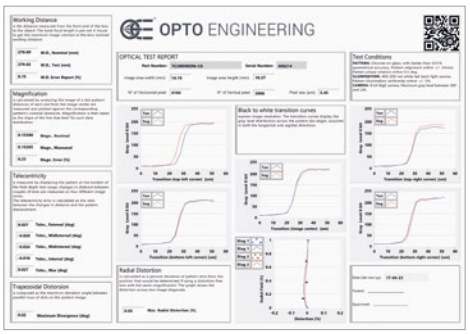
Vision Systems DESIGN 2016 Innovators Awards GOLD

PATENTED

SPACE SAVING DESIGN



COMMITMENT TO QUALITY



All our telecentric lenses are tested and supplied with a **detailed test report with measured optical parameters**.

TELECENTRIC LENSES WITH LIQUID LENS TECHNOLOGY

TCEL series

Telecentric optics with integrated liquid lens

MAG. **0.243x-3.5x**
MOUNT **C**

PATENTED

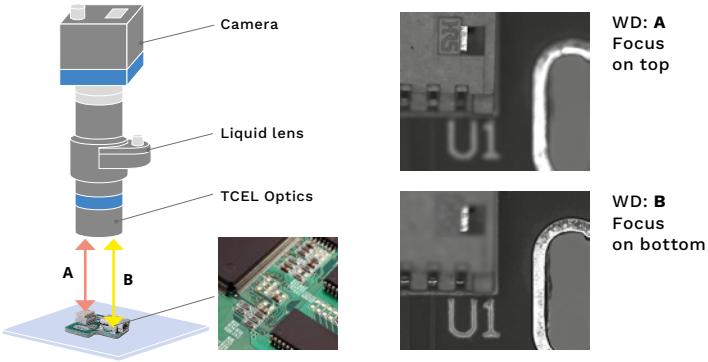
For certain applications, depth of field (DoF) may not be sufficient when using a high-magnification telecentric lens.

To compensate for the shallow DoF, it is possible to:
• Select a lens with a lower magnification, yet with a wider field of view and a smaller viewed object;
• Select a larger pixel size, but with worse resolution;
• Select a lens with a higher f/N, yet with reduced resolution and incoming light.

To overcome these limitations, Opto Engineering® has designed TCEL, a series of telecentric optics with integrated liquid lenses that combine the advantages of telecentric and liquid lens technologies.

KEY ADVANTAGES

- **Extended depth of field** of telecentric optics
- **Low distortion and superior optical performances**
- **Remote, fast and precise changes of focus**
- **Versatility** for inspection and measurement applications in a variety of industries



Inspection of electronic components with various heights in PCBs.

TCZEL series

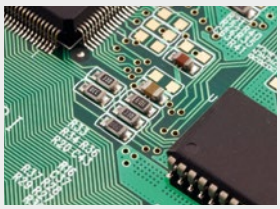
Telecentric zoom lens with dual liquid lens technology

MAG. **0.18x-0.55x**
MOUNT **C**

PATENTED

TCZEL series takes the integration of liquid lenses into telecentric optics to the next level offering a perfect combination of telecentric lens accuracy, advantages of zoom lenses and versatility of liquid lens technology.

Measurement of precision mechanical parts.

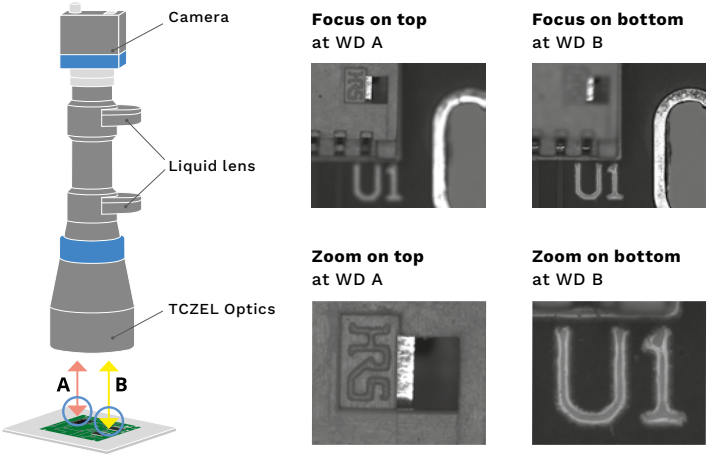


Inspection of electronics and semicon.

Models with integrated liquid lens drivers available upon request.

KEY ADVANTAGES

- **Dual liquid lens technology for maximum versatility**
  Adjust both the magnification and the working distance thanks to the synergy of the two built-in liquid lenses
- **Reduced wear**
  No moving optical mechanical parts
- **Remote and precise change of focus and zoom**
- **Faster than traditional zooms**
  Liquid lens technology allows to operate in a few milliseconds



Inspection at different magnifications of electronic components with various sizes and heights in PCBs.

TELECENTRIC LENSES

DISCOVER ALL THE MODELS

Telecentric lenses represent the core business for Opto Engineering®: these products benefit from more than 20 years of effort in progressive Research & Development, resulting in a wide range of part numbers for a diverse and ever-growing number of applications.

CLASSIC TELECENTRIC LENSES - HIGHLIGHTS

TC series

Bi-telecentric lenses for sensors up to 2/3”

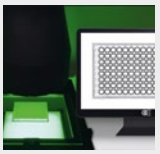
MAG. **0.025-2 x**
MOUNT **C**
W*f*/N **8-14**

KEY ADVANTAGES

- Bi-telecentricity
- Low distortion and excellent optical resolution
- Easy filter insertion
- Fixed aperture for enhanced reliability and robustness
- Models with camera phase adjustment for easy integration
- Detailed test report with measured optical parameter
- Full range of matching telecentric illuminators

Coil spring measurement.

Inspection of copper wires wrapped around the iron cores in electric engines stators.



Imaging of cell cultures in multiwell plates with no perspective error.

Inspection and measurement of pharmaceutical needles.

TC1MHR series

Telecentric lenses for sensors up to 1/1.2”

MAG. **0.045-0.639 x**
MOUNT **C**
W*f*/N **8-11**

TC2MHR series

Telecentric lenses for sensors up to 1”

MAG. **0.053-0.768 x**
MOUNT **C**
W*f*/N **8-16**

TC3MHR series

Telecentric lenses for sensors up to 1.1”

MAG. **0.059-0.850 x**
MOUNT **C**
W*f*/N **8-11**

TC4MHR series

Telecentric lenses for sensors up to 4/3”

MAG. **0.059-4 x**
MOUNT **C - F - J** (M42x1 FD 12)
W*f*/N **8-18**

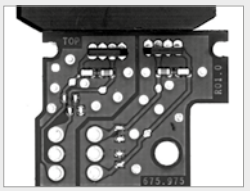
KEY ADVANTAGES

- Low distortion and excellent optical resolution
- Easy filter insertion
- Fixed aperture for enhanced reliability and robustness
- Models with camera phase adjustment for easy integration
- Detailed test report with measured optical parameter
- Full range of matching telecentric illuminators

Measurement of precision flat coil springs with TC1MHR telecentric lenses.

Crack detection on silicon wafers with TC2MHR high resolution telecentric lenses and dark field illumination.

Measurement of automotive cogwheels with a TC3MHR telecentric lens.



PCB measurement and detection of missing/excessive soldering paste with TC4MHR telecentric lenses.

SPECIAL F/# & MOUNTS

We manufacture lenses with non-standard F/# and mounts upon request.

TC CORE series

Compact bi-telecentric lenses
for sensors up to 2/3”

MAG. **0.052 - 0.184 x**
MOUNT **C**
W*f*/N **8**

TC1MHR CORE series

Compact telecentric lenses
for sensors up to 1/1.2”

MAG. **0.087 - 0.222 x**
MOUNT **C**
W*f*/N **8**

TC2MHR CORE series

Compact telecentric lenses
for sensors up to 1”

MAG. **0.104 - 0.267 x**
MOUNT **C**
W*f*/N **8**

TC3MHR CORE series

Compact telecentric lenses
for sensors up to 1.1”

MAG. **0.118 - 0.303 x**
MOUNT **C**
W*f*/N **8**

TC4MHR CORE series

Compact telecentric lenses
for sensors up to 4/3”

MAG. **0.143 - 0.366 x**
MOUNT **C - F - J**
W*f*/N **8**

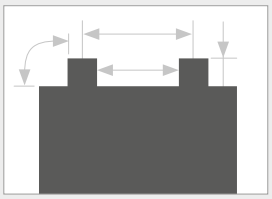
KEY ADVANTAGES

- Extremely compact shape
- Excellent resolution and low distortion
- Flexibility and smart integration
- Detailed test report with measured optical parameters
- Full range of matching compact telecentric illuminators

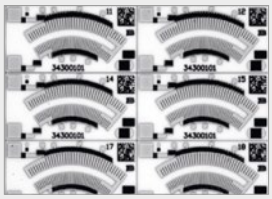
PATENTED

Vision Systems Design 2016 Innovators Awards GOLD

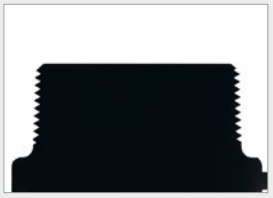
inVISION TOP INNOVATION 2016



Inspection of EV batteries electrodes with TC CORE compact telecentric lenses and LTCLHP CORE telecentric illuminators.



High resolution inspection of electronic boards with TC CORE lenses and bright field illumination.



Threaded metal cylinder inspection with TC1MHR CORE lenses.

Dimension control of plastic bottles and preforms up to 200 mm in diameters with TC2MHR CORE lenses.

High-precision measurement of needles with TC3MHR CORE lenses.

Alignment of connector pins using a TC4MHR CORE lens and a backlight.

TC CORE PLUS series

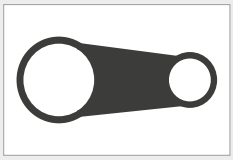
Compact large FOV bi-telecentric lenses for sensors up to 2/3”

MAG. **0.027-0.059 x**
MOUNT **C**
LARGE **FOV**
Wf/N **8**

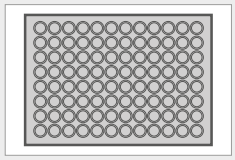
TCHR CORE PLUS series

Compact large FOV telecentric lenses for sensors up to 4/3”

MAG. **0.053-0.117 x**
MOUNT **C-F**
LARGE **FOV**
Wf/N **10-14**



2D measurement of large mechanical parts with TC CORE PLUS telecentric lens.



High-resolution imaging of 96-wells microplates with compact TCHR CORE PLUS telecentric lens.

FIXED WORKING DISTANCE TELECENTRIC LENSES - HIGHLIGHTS

TCLWD series

132 mm working distance telecentric lenses for sensors up to 2/3”

MAG. **0.5-3.5 x**
MOUNT **C**
Wf/N **12-24**

KEY ADVANTAGES

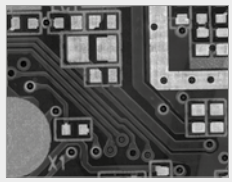
- High telecentricity
- Excellent optical resolution
- Fixed long working distance
- High numerical aperture
- Detailed test report with measured optical parameters
- Full range of compatible illuminators and accessories

TCLWD3M series

Fixed working distance telecentric lenses for sensors up to 1.1”

MAG. **0.200-1 x**
MOUNT **C**
Wf/N **8-12**

Precision measurement of a machine tool with TCLWD lens in combination with a LTLCHP telecentric backlight.



Fiducial identification and alignment of an electronic board with TCLWD3M lens.

Measurement of a clock gear using TCLWD3M lens and backlight illumination.

COAXIAL TELECENTRIC LENSES - HIGHLIGHTS

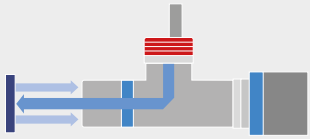
TCCX series

132 mm working distance coaxial telecentric lenses for sensors up to 2/3”

MAG. **0.5-3.5 x**
MOUNT **C**
Wf/N **12-24**

KEY ADVANTAGES

- Excellent optical resolution
- Large numerical aperture
- Compact built-in illumination
- Fixed long working distance
- Easy rotational phase adjustment
- Detailed test report



Details of an electronic board measured with a TCCX lens with green coaxial illumination.

CUSTOM OPTICS

We design and manufacture customized lenses to meet specific requirements.

Coaxial telecentric lens for the semiconductor industry.

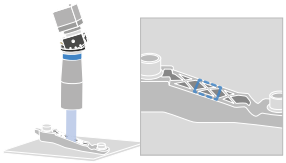
Large FOV flat telecentric lens for linescan applications.

3D TELECENTRIC LENSES

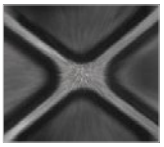
TCSM series

3D bi-telecentric lenses with Scheimpflug adjustment for sensors up to 2/3”

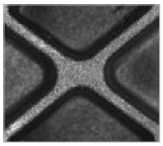
MOUNT **C**
W*f*/N **8**



WITHOUT TILT ADJUSTMENT



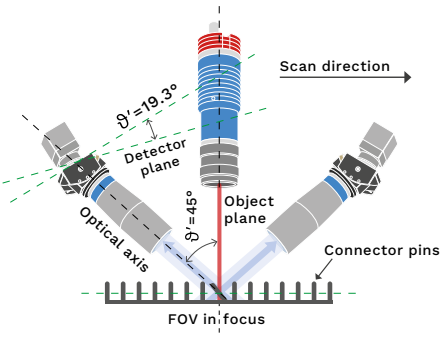
WITH TILT ADJUSTMENT



TCSM telecentric lens imaging sloped parts.

KEY ADVANTAGES

- Tilt adjustment to perform oblique measurements
- Radially undistorted images
- Bi-telecentricity



Two TCSM024 lenses scan connector pins and capture the light emitted from the LED projector and reflected off the pins. The lenses are positioned at 45° (θ) relative to the object plane and are tilted at 19.3° relative to the detector plane (θ') thanks to the built-in tilt adjustment.

FLAT TELECENTRIC LENSES

TC4K series

Flat telecentric lenses for 4k line scan sensors

MAG. **0.159 - 0.478 x**
MOUNT **F**
MOUNT **N** (M42x1 FD 10.56)
MOUNT **J** (M42x1 FD 12)
W*f*/N **16**

KEY ADVANTAGES

- Compact flat design for easy integration
- Easy rotational phase and focus adjustment
- Compatible LTCL4K flat telecentric illuminators and deflecting mirrors
- Detailed test report with measured optical parameters

Camshaft measurement.

TELECENTRIC OPTICAL BENCHES

TCBENCH series

Telecentric optical benches for precision measurements

MAG. **0.093 - 1 x**
MOUNT **C**
W*f*/N **8 - 11**

KEY ADVANTAGES

- Pre-assembled and pre-aligned set-up
- Best optical performance
- Unpaired measurement accuracy
- Detailed test report with measured optical parameters

High accuracy measurements of a plastic syringe body using TC BENCH.

CLASSIC TELECENTRIC LENSES FOR LARGE SENSORS - HIGHLIGHTS

TC10M series

Telecentric lenses for sensors
up to APS-C and 4k line scan cameras

MAG. **0.075x - 0.888 x**
MOUNT **F**
MOUNT **J (M42x1 FD 12)**
W*f*/N **8 - 11**

TC12M series

Telecentric lenses for sensors
up to APS-H and 4k line scan cameras

MAG. **0.1 - 1.825 x**
MOUNT **F**
MOUNT **J (M42x1 FD 12)**
W*f*/N **8-16**

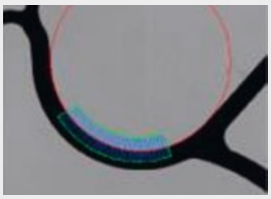
TC16M series

Telecentric lenses for sensors up to
43.3 mm and 8k line scan cameras

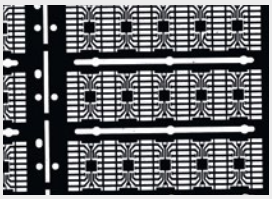
MAG. **0.116 - 3 x**
MOUNT **F**
MOUNT **Q (M58 x 0.75 FD 6.56)**
MOUNT **K (M58 x 0.75 FD 12.96)**
W*f*/N **8-18**

KEY ADVANTAGES

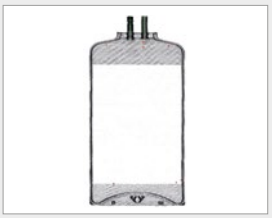
- Wide image circle for large sensor sizes
- Excellent resolution and low distortion
- Simple and robust design
- Wide range of models for FOVs up to 372 mm in diameter
- Detailed test report with measured optical parameters



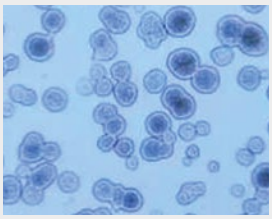
Inspection of complex sealing pieces using TC10M lenses.



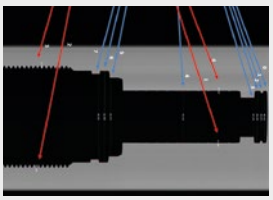
Electronic board inspected with TC10M lenses and collimated backlight.



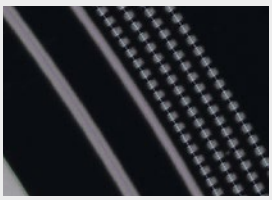
Inspection of IV bags with high resolution TC12M telecentric lenses.



Cell counting and bacteria culture growth detection with TC16M telecentric lenses.



Measurement of the width and length of a motor rod with TC16M lens.



Detection of impurities, scratches and measurement of features distances on film encoder wheels with TC16M lenses.

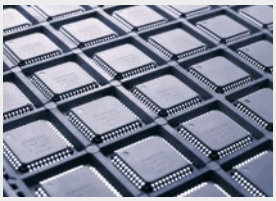
TCSE series

High-resolution telecentric lenses
for 4/3", APS-C, APS-H and
full frame sensors

MAG. **0.366 - 2.750 x**
MOUNT **F**
MOUNT **J (M42x1 FD 12)**
MOUNT **I (M58x0.75 FD 11.48)**
W*f*/N **8-32**

KEY ADVANTAGES

- Excellent resolution and low distortion
- Long working distance
- Models with variable aperture
- Models optimized for use in the NIR wavelength range



Inspection of chips.

Solar cell inspection.

360° VIEW LENSES

DISCOVER ALL THE MODELS

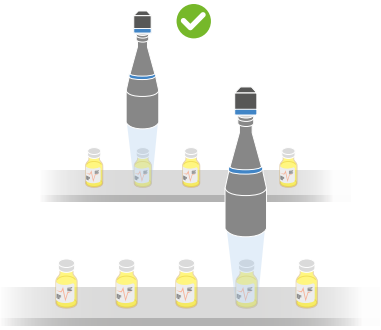
Many machine vision applications require the inspection of features randomly located on both the outer and inner sides of the inspected part, as well as on its top and bottom surfaces.
Opto Engineering 360° view lenses frame curved 3D surfaces into a focused image on the camera sensor allowing you to get a 360° inspection with just one camera.

WHY 360° VIEW LENSES?

Featuring a unique optical design, Opto Engineering's 360° view lenses enable the inspection of all outer or inner surfaces of a product by reducing the number of vision system components and offering superior efficiency compared to other solutions. They ensure:

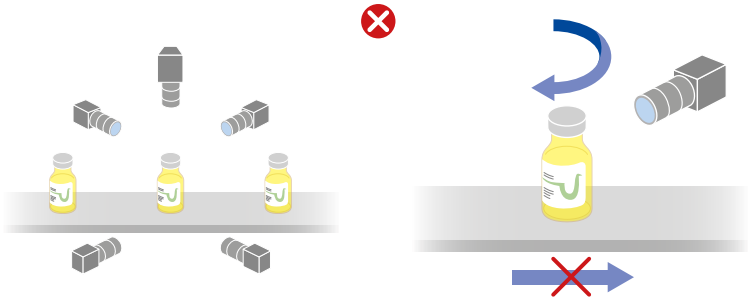
- 2D image of a 3D object with a single camera
- Simultaneous inspection of top and sides
- Compatibility with inline and high-speed inspections
- Compact and robust design
- No need for part or camera rotation
- Easy set up
- Easy software analysis
- High throughput

360° VIEW APPROACH



VS

COMMON APPROACHES



Multicamera system

Line scan system

EXTENSIVE RANGE OF 360° VIEW LENSES

OUTER INSPECTION LENSES

Top and lateral side view

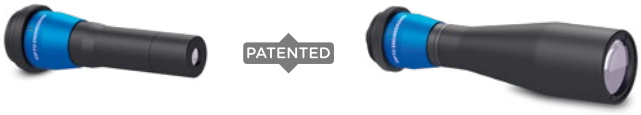
INNER INSPECTION LENSES

Bottom and/or lateral side view

MULTI-VIEW LENSES

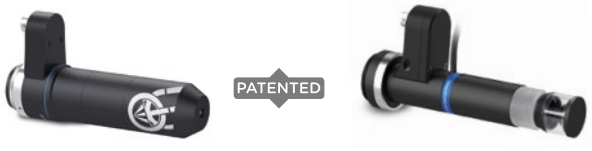
Multiple side imaging

NANO INSPECTION LENSES



All-round view for microcomponents

LIQUID LENS TECHNOLOGY



360° view lenses with integrated liquid lenses

Not sure which 360° view lens to select?

Contact our vision experts for free feasibility tests on your samples and technical assistance.

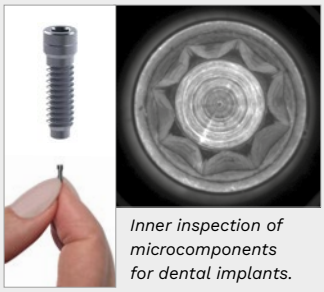
VARIOUS SOLUTIONS TO MEET DIVERSIFIED APPLICATION NEEDS

Product series	360° view model	Inspection Type	Side	Bottom	Top	Diameter Range (mm)	Max Image Circle Diameter (mm)	Available sensor sizes	Focusing	Variable iris
HC series	**HCN13010**	Inner	✓	✓	✗	0.75 - 2	3.8	1/3"	Manual	✗
	HCN13040	Inner	✓	✓	✗	2 - 10	3.8	1/3"	Manual	✗
PCBP series	**PCBPN013**	Inner	✓	✗	✗	5.5 - 25	3.4	1/3"	Manual	✗
	PCBPN013-WG	Inner	✓	✗	✗	8 - 25	3.4	1/3"	Manual	✗
	PCBPxxx	Inner	✓	✗	✗	25 - ∞	7.0	1/3"- 1/2" - 2/3"	Manual	✗
	PCBPxxx-AF	Inner	✓	✗	✗	25 - ∞	7.0	1/3"- 1/2" - 2/3"	Liquid Lens	✗
PCHIL series	**PCHILxxx**	Inner	✓	✓	✗	10 - 120 (*)	10.7	1/3" - 1/1.8" - 2/3" - 1.1"	Manual	✓
	PCHILxxx-EL	Inner	✓	✓	✗	10 - 120 (*)	10.1	1/3" - 1/1.8" - 2/3" - 1.1"	Liquid Lens	✗
HC series	**HCSIxxx**	Inner	✓	✓	✗	10 - 110 (*)	10.8	1/3" - 1/1.8" - 2/3" - 1.1"	Manual	✓
	HCBIxxx	Inner	!	✓	✗	10 - 220 (*)	10.8	1/3" - 1/1.8" - 2/3" - 1.1"	Manual	✓
PC series	**PCN013**	Outer	✓	✗	✓	2 - 12	3.6	1/3"	Manual	✗
	PCxx020XC	Outer	✓	✗	✓	10 - 35	6.8	1/3" - 1/1.8" - 2/3"	Manual	✓
	PCxx030XS	Outer	✓	✗	✓	15 - 52.5	6.6	1/3" - 1/2" - 2/3"	Manual	✓
	PCxx030HP	Outer	✓	✗	✓	20 - 65	4.8	1/3" - 1/2"	Manual	✓
PCCD series	**PCCDxxx**	Outer	✓	✗		10 - 75	9.6	1/3" - 1/2" - 2/3" - 1"	Manual	✓
	PCCDL	Outer	✓	✗	!	10 - 110	10.0	1/2" - 1.1" (**)	Manual	✓
PCPW series	**PCPWxxx**	Multi-view	✓	✗	!	30 - 50	6.6	1/3"- 1/2" - 2/3"	Manual	✓
PCMP series	**PCMPxxx**	Multi-view	✓	✗	✓	2.5 - 10	6.6	1/2" - 2/3"	-	✗
TCCAGE series	**TCCAGExxx**	Multi-view	✓	✗	!	0 - 16	-	1/2" - 2/3" - 1" - 1.1" - 4/3"	-	✗

Height range: please refer to the product datasheet or ask our technical support.
(*) The diameter of the inspectable object may exceed the given specifications. For more information or feasibility tests, please contact your Area Manager.
(**) Variable image circle

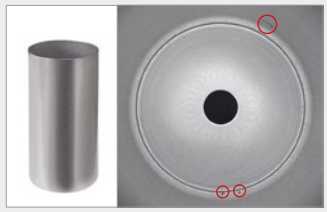
✓ *Yes* ✗ *No* ! *With some exceptions*

MULTIPLE APPLICATION AREAS & OUTSTANDING CASES



Inner inspection of microcomponents for dental implants.

OCR and code reading on pharmaceutical vials for traceability.



EV 4680 cylindrical battery inner inspection for the identification of cracks and foreign parts.

Comprehensive inspection of complex aluminum parts to detect machining and casting features.

PASSION FOR INNOVATION

360° optical innovations are the result of our continuous R&D investments. Most of our designs have been patented internationally and received numerous awards. They represent an innovative, simple and effective way of resolving vision applications previously considered impossible.

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VISION SYSTEMS DESIGN 2024 Innovators Awards BRONZE HONOREE

VISION TOP INNOVATION 2022

COMPLETE SOLUTIONS

To perfectly match our 360° view lenses, we developed a wide selection of compatible LED ring lights integrating specific mechanical interfaces to be mounted on the lenses.
This optimizes illumination during inspections and maximizes the overall system performance.

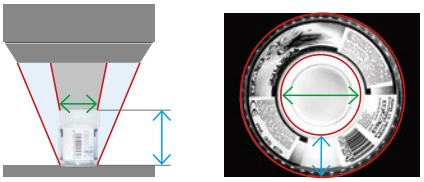
PC series

Pericentric lenses for 360° top and lateral view with just one camera

PATENTED

KEY ADVANTAGES

- Quick and reliable complete top and lateral inspection
- 2 to 65 mm object diameter
- Wide viewing angle
- Fast image analysis



Working principle and sample image.

OCR and Matrix Code reading on vials

Our **PC series** lenses can efficiently inspect objects with diameters up to 65 mm such as vial caps for:

- **EXPIRATION DATE READING**
- **MATRIX CODE READING**
- **BARCODE READING**
- **TRACK AND TRACE PROCESSES**

The expiration date can be easily read without the need to know the bottle orientation.

PC SERIES HIGHLIGHTS

PCxx020XC

Ultra-compact pericentric lenses for the inspection of object with diameters from 10 to 35 mm

NEW

PATENTED

KEY ADVANTAGES

- Industrial compact design for applications with space limitations
- 10 to 35 mm object diameter
- 25° max viewing angle
- Fast image analysis

MATCHING LED ILLUMINATOR

LTRN179W20 ring light is specifically designed to be clamped onto PCxx020XC lenses to maximize illumination of inspected objects.

PCN013

Nano pericentric lens for 1/3" sensors, sample diameters down to 2 mm

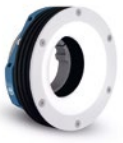
NEW

PATENTED

KEY ADVANTAGES

- Perfect focusing of small objects
- Simultaneous top and side inspection with just one camera
- 2 to 12 mm object diameter
- Fast image analysis
- 21° max viewing angle
- Manual focus adjustment

MATCHING LED ILLUMINATOR

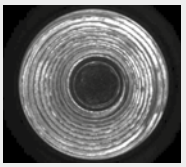


LTRNHP035W45 ring light is specifically designed to be clamped onto PCN013 lenses to maximize illumination of small objects.

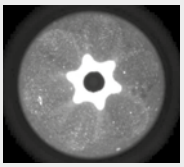
Inspection of fasteners and tools

Our nano pericentric lens easily inspects small to very small objects to detect:

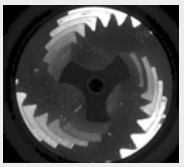
- **MISSING THREAD**
- **MACHINING DEFECTS**
- **RESIDUALS**



Screw.



T10 Torx tip.



M12 tapping tool.

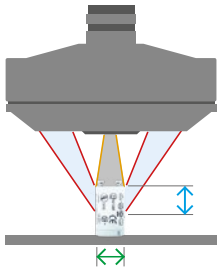
PCCD series

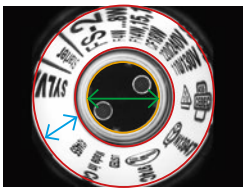
Catadioptric lenses for 360° top and lateral view with just one camera

PATENTED

KEY ADVANTAGES

- 360° imaging of outer surfaces
- 7.5 to 75 mm object diameter
- Extra wide lateral viewing angle (35°)
- Compactness
- High resolution
- Perfect chromatic correction



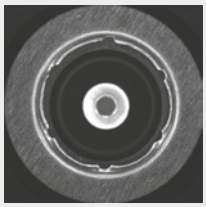


Working principle and sample image.

Check for correct vial sealing (flip-off caps)

Our **PCCD012 lens** and our high-power ring light LTRNHP165W45 can detect with one single camera:

- **STOPPER ABSENCE**
- **DEFECTIVE CRIMP**
- **DENTS**
- **FLIP-OFF DEFORMATION**
- **WRONG COLOR**
- **CAP SCRATCHES**



High speeds can be reached thanks to the low F/# of the PCCD lens.

PCCD SERIES HIGHLIGHTS

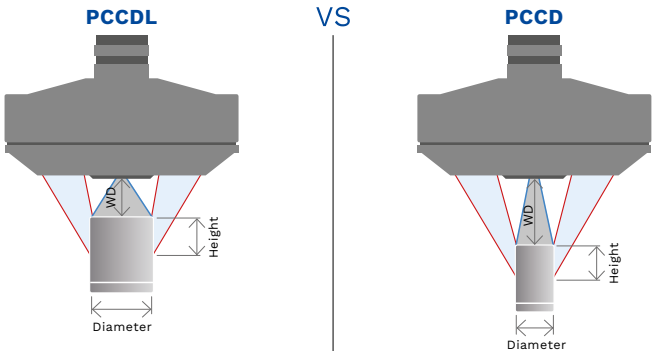
PCCDL

Pericentric catadioptric lens for 1/2" - 1.1" sensors and large FOVs

PATENTED

KEY ADVANTAGES

- 10 to 110 mm object diameter
- One model for various sensor sizes
- Extra wide lateral viewing angle (35°)
- Top and side inspection at high resolution



- **LARGER FOVs**
- **MORE VERSATILE DESIGN**

Inspection of caps for cosmetic containers

Detection of surface defects on the top & side of caps in combination with its matching LTRNOB ring light.

Inspection of food cans

Detect defective sealings or dents and defects on top & side surfaces of food cans.

HC series

Hypercentric lenses for 360° inspection of the inner sides and bottom of cavities

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KEY ADVANTAGES

- Perfect focusing of hollow objects with just one camera
- Cavity inspection from the outside
- Special design with rays passing through bottlenecks and narrow openings
- Object diameter from 10 to 220 mm (HCBI model) and 10 to 110 mm (HCSI model)
- Very high field depth and flexibility
- Wide viewing angle
- Manual focus adjustment and variable iris
- Optimized for objects with 1:3 size ratio

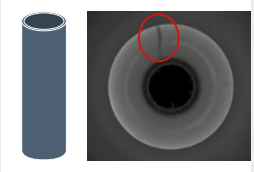
Inspection of bottles

HC lenses can easily inspect bottles and containers in the food & beverage/cosmetic/pharmaceutical industries for:

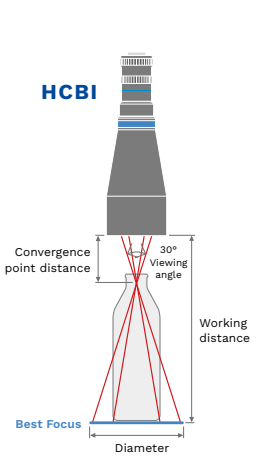
- **CHARACTER RECOGNITION**
- **DENT IDENTIFICATION**
- **CONTAMINANT DETECTION**

Inspection of hollow mechanical components

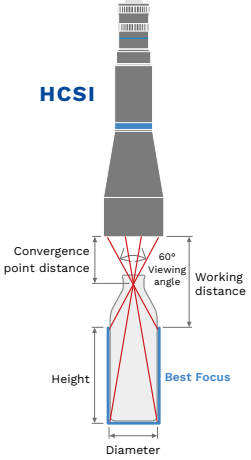
HCBI lenses can be used to efficiently inspect the bottom and side walls of hollow objects, such as tubes, for the detection of defects, like cracks or scratches.



Two versions for different inspections



HCBI *hypercentric lenses optimized to inspect the bottom surface of hollow objects at high resolution.*



HCSI *hypercentric lenses for the inspection of both the bottom and the inner walls of cavities in perfect focus.*

HC SERIES HIGHLIGHTS

HCN13010 and HCN13040

Nano hypercentric lenses for inner inspection of small holes and cavities for 1/3” sensors

VISION SYSTEMS DESIGN 2025 Innovators Awards GOLD HONOREE

KEY ADVANTAGES

- Perfect focusing of small cavities and hollow objects with just one camera
- Object diameters from 0.75 to 10 mm
- Cavity inspection from the outside
- Special hypercentric design to bypass bottlenecks
- Very high field depth and flexibility
- Manual focus adjustment

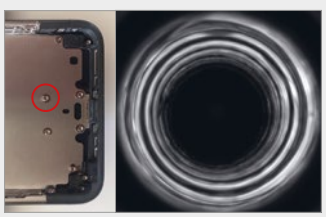
MATCHING LED ILLUMINATOR

LTRNHCNW ring light is specifically designed to be clamped onto HCN13040 and HCN13010 lenses to maximize illumination of small cavities.

HCN lenses can easily inspect holes of small dimensions in various industrties to detect:

- **MISSING THREAD**
- **DEFECTS**
- **SPECIFIC FEATURES**
- **FOREIGN PARTS**
- **SHAPE DEFORMATION**

Inspection of smartphone threaded holes

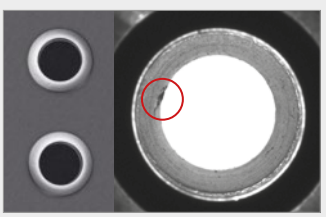


1 mm diameter threaded holes.

Inspection of dental implant parts

0.75 mm diameter dental screw.

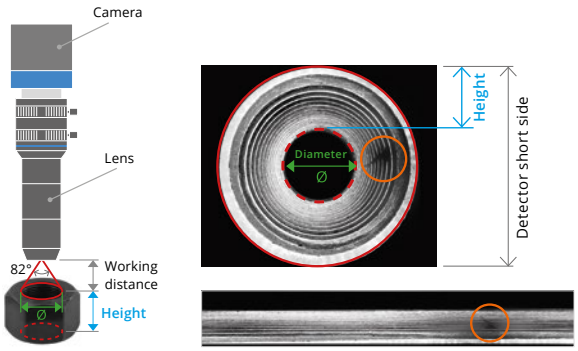
Inspection of aerospace rivet holes



8 mm diameter rivet hole.

PCHIL series

Large aperture hole inspection lenses for 360° inside view



Working principle and sample image.

WHAT'S NEW

Key improvements over the previous **PCHI series**:

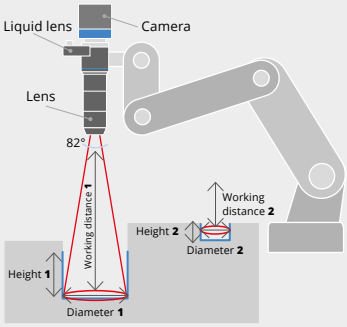
- Variable iris mechanism
- Larger aperture
- Higher resolution
- Easier and more precise manual focusing

KEY ADVANTAGES

- Perfect focusing of holed objects
- Cavity inspection from the outside
- 10 to 120 mm object diameter
- Very high depth of field
- Wide angle of view (82°)
- Models with integrated liquid lens technology for fast and repeatable autofocus

Cavity inspection

Inspection of plastic bottle caps for thread and shape defects.

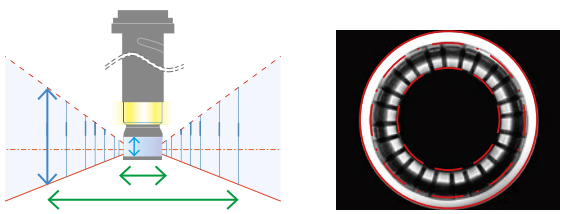


Quickly refocus and inspect various cavity diameters in complex mechanical parts.

PCPB series

Boroscopic probes for panoramic cavity imaging and measurement from inside

PATENTED



Working principle and sample image.

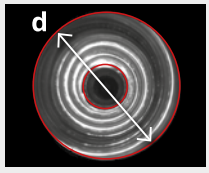
KEY ADVANTAGES

- Inspection of cavities from the inside
- Object diameter from 5.5 mm and above
- High resolution
- Built-in illumination
- Flaw detection and surface defect enhancement
- Models with integrated liquid lens technology for fast and repeatable autofocus

Small mechanical bores inspection

Our **PCBPN013-WG lens** can inspect diameters from 8 mm to 25 mm, looking for:

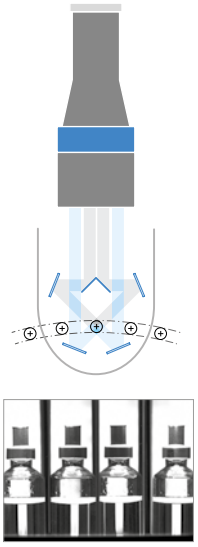
- **BLEMISHES**
- **DENTS**
- **THREADS PRESENCE/ABSENCE**
- **SCRATCHES**



PCBN013-WG lens provides enough resolution to precisely inspect very small bores, such as in this example where the diameter is 8 mm.

TCCAGE series

Bi-telecentric system for multiple side imaging and measurement at 90°



Working principle and sample image.

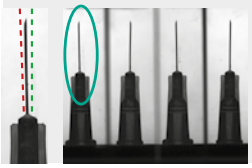
KEY ADVANTAGES

- 90° lateral imaging with 4 orthonormal views
- 8 x 32 to 16 x 68 mm object diameter x height range
- High resolution and telecentricity
- Built-in high-power top and back illumination
- Long and thin object inspection and multiple-measurement applications

Cannula dimensional gauging

Our **TCCAGE** multi-view telecentric lenses can be used to measure:

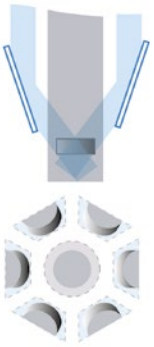
- **CANNULA ANGLE**
- **CANNULA BOW**
- **DEGREE OF ALIGNMENT**



The lack of perspective given by the telecentric view of TCCAGE provides a quick alignment check regardless of the part orientation.

PCMP series

Multi-view optics for measuring and imaging small parts



Working principle and sample image.

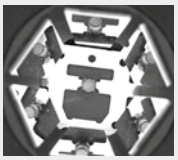
KEY ADVANTAGES

- 1 to 10 mm object diameter
- 37° angle of view
- High depth of field and telecentric view
- Integrated illumination

Inspection and measurement of semiconductors

Our **PCMP** micro polyview lenses can be used to perform:

- **INSPECTION OF COILS, CAPACITORS, CONNECTORS**
- **DIMENSIONAL GAUGING**
- **ASSEMBLY VERIFICATION**



Coil inspection on PCBs.

PCPW series

Poly-view optics for multiple side views in one image

Working principle and sample image.

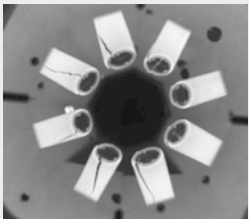
KEY ADVANTAGES

- Image from 8 different points of view in one shot
- 30 to 50 mm object diameter
- 45° viewing angle
- Very high resolution and image brightness
- Complete inner and outer surface inspection

Crack detection on syringe tubes

PCPW polyview lenses, combined with LTRNOB LED ring lights, enable check for:

- **PRESENCE/ABSENCE OF CRACKS**
- **SURFACE DEFECTS**



MACRO & FIXED FOCAL LENGTH LENSES

DISCOVER ALL THE MODELS

Macro and fixed focal length lenses are the perfect optical solution for many machine vision applications. Opto Engineering® macro lenses are the optimal choice for accurate close-up imaging, while our fixed focal length lenses provide the flexibility needed for general-purpose solutions.
Our portfolio includes superior optical quality solutions designed for maximum reliability and innovative products with advanced technology, such as fixed focal length lenses with integrated liquid lenses.

FIXED FOCAL LENGTH LENSES WITH LIQUID LENS TECHNOLOGY

EL12MP series

12 MP fixed focal length lenses for sensors up to 1.1” with liquid lens technology

Focal Length **12-35 mm**
MOUNT **C**
W*f*/N **4**

EL5MP series

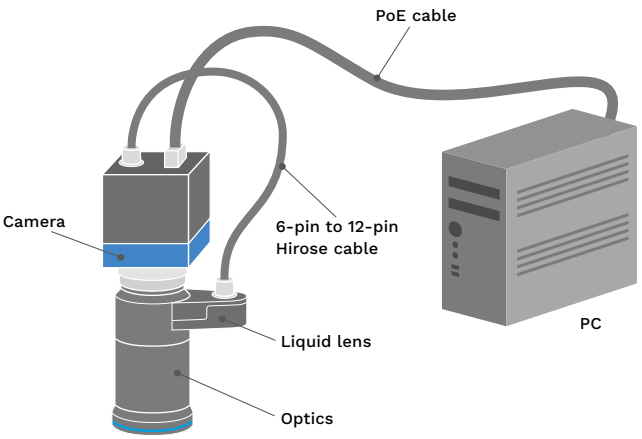
5 MP fixed focal length lenses for sensors up to 2/3” with liquid lens technology

Focal Length **6-25 mm**
MOUNT **C**
W*f*/N **5.6**

KEY ADVANTAGES

- **Remote, precise and extremely fast autofocus in a few milliseconds** thanks to electronically driven liquid lenses
- Ready-to-use solution for easy installation
- **High repeatability** enhanced by a precise thermal calibration
- **Robust design**
  Lifetime guaranteed for over 1 billion cycles
- **Reduced wear**
  No moving optical mechanical parts

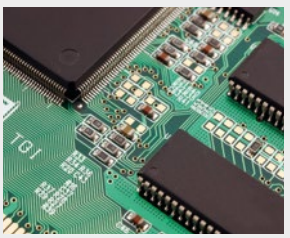
DIRECT LIQUID LENS CONTROL WITH ITALA G.EL CAMERAS



By interfacing the EL12MP or EL5MP lenses with the ITALA G.EL cameras, you can directly control the focus without using additional controllers and simplifying the wiring: all you need is a PoE cable from the camera to the PC and a specific cable that connects the camera to the liquid lens.

Robot guidance for fast pick-and-place.

Inspections involving format changes in the beverage industry.



Inspections of PCBs for positioning check in probe testing machines.

Code scanning and package sorting in logistics.

Label inspection on containers with different dimensions in the cosmetic, healthcare and beverage industries.

Inspection of complex automotive parts with robotic arms.

DID YOU KNOW?

ADVANTAGES OF LIQUID LENS TECHNOLOGY VS. MECHANICAL FOCUSING

- **Fast-focusing speed**
- **Compactness**
- **Robustness and reliability**
- **Cost-effectiveness**

ALL-ROUND INSPECTION OF VIAL CAPS WITH EL5MP LENSES AND ITALA G.EL

ITALA G.EL cameras and EL5MP lenses easily inspect vial caps of different sizes without the need to manually or mechanically refocus.

Thanks to liquid lens technology, it is possible to operate in macro mode without any extension tube, reducing the overall footprint of the vision system and simplifying integration. ITALA G.EL cameras easily control the liquid lens via GenICam feature tree and feature the **autofocus** functionality.

A 5MP camera combined with a 2/3" fixed focal optics with liquid lens performs OCR and data matrix reading.

FIXED FOCAL LENGTH LENSES - HIGHLIGHTS

EN5MP series

Cost-effective 5 Megapixel fixed focal length lenses for sensors up to 2/3"

Focal Length **8-75 mm**
MOUNT **C**

KEY ADVANTAGES

- High quality/price ratio
- Variable aperture
- Manual focus adjustment
- Robust design

EN10MP series

10 Megapixel fixed focal length lenses for sensors up to 4/3"

Focal Length **12-50 mm**
MOUNT **C**

KEY ADVANTAGES

- High quality/price ratio
- Manual focus adjustment and variable aperture
- Low distortion
- Robust design
- Compatible with large high-resolution sensors

DISCOVER ALSO OUR 2 MP AND 8 MP FIXED FOCAL LENGTH LENSES

EN2MP series

EN8MP series

MACRO LENSES - HIGHLIGHTS

MC series

Nearly zero distortion macro lenses for sensors up to 2/3”

MAG. **0.1 - 6 x**
MOUNT **C**
W*f*/N **5.9-38**

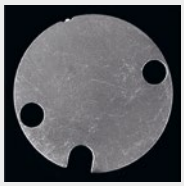
MC3M series

Nearly zero distortion macro lenses for sensors up to 1.1”

MAG. **0.1 - 6 x**
MOUNT **C**
W*f*/N **5.5-36**

KEY ADVANTAGES

- Excellent resolution
- Fixed aperture for enhanced reliability and robustness
- Excellent resolution
- Compact & robust design
- Designed for close-range inspections



Inspection of surface scratches & measurement of metal discs with MC lenses.

Check for missing parts and defects in roller bearings with MC3M macro lenses.

PCB fiducial identification with MC3M macro lens and front ring light illuminator.

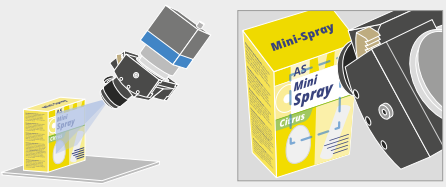
MCSM3M1-025X

Variable macro lens with Scheimpflug adjustment for sensors up to 1.1”

MAG. **0.1 - 6 x**
MOUNT **C**

KEY ADVANTAGES

- Precision Scheimpflug mount
- Optimal resolution and low distortion
- Supports a wide range of magnifications and angles of view
- C-mount
- Compact and robust design



MCSM3M1-025X imaging a sample from an angled point of view.

Without tilt adjustment, the object is not homogeneously focused.

At the Scheimpflug angle, the image becomes sharp.

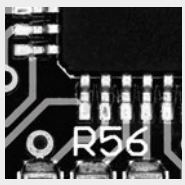
MC3M3-03X

Nearly zero distortion multi-configuration macro lens for sensors up to 1.1”

MAG. **0.1 - 3 x**
MOUNT **C**
W*f*/N **5.6 - 20.5**

KEY ADVANTAGES

- Wide range of magnifications
- Fixed aperture
- Optimal resolution and low distortion at any magnification
- Ideal for inspecting objects of various sizes
- Manual focus adjustment



MC3M3-03X inspecting parts at different magnifications on PCBs.

LIGHTING

TELECENTRIC ILLUMINATORS

Thanks to its extensive experience, Opto Engineering® has applied telecentric technology also to LED illuminators to deliver the best performances in optical metrology applications.

Telecentric LED illuminators are designed to be used in combination with telecentric optics to perform accurate measurements and inspections.

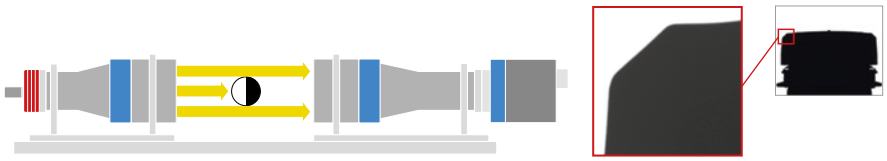
WHY TELECENTRIC LIGHTS?

Telecentric lights positioned behind the object:
- **minimize edge effects** created by light reflections;
- **increase the depth of field** when coupled with a telecentric lens.

Non-collimated back illumination

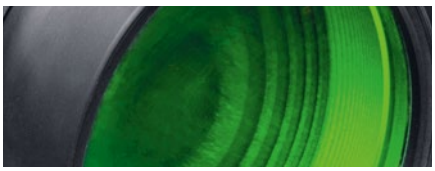
Light coming from a variety of angles.

Collimated back illumination



Parallel rays.

WHY IS GREEN LIGHT SUGGESTED?



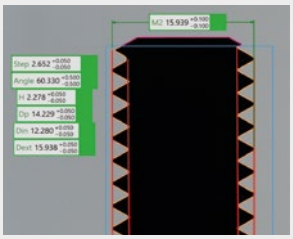
Collimated green light sources ensure the best performances in most measurement applications, because:

• Opto Engineering® telecentric lenses are designed to minimize distortion and maximize telecentricity in the middle of the VIS range, i.e. with green light;

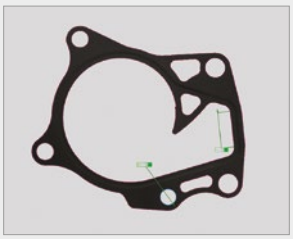
• achromatization is almost perfect within the green wavelengths range, resulting in higher resolution when compared to white light;

• green color is preferred over red since shorter wavelengths increase the lens diffraction limit and the maximum achievable resolution.

WHEN DO YOU NEED A COLLIMATED LIGHT?



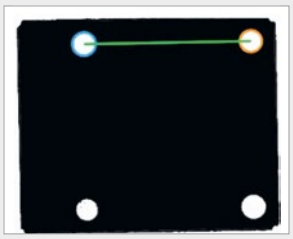
Precision measurements of fasteners.



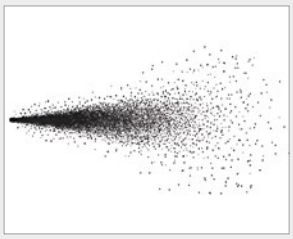
Gaskets and o-ring measurement.

Precision measurements of small gears, nuts.

Compression springs control.



Distances measurement on a PCB board.



Particle measurement and counting.

DISCOVER ALL
THE MODELS

LTCLHP SERIES

CLASSIC

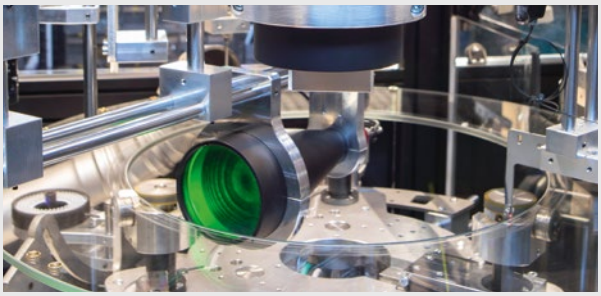
LTCLHP series

High-performance telecentric illuminators

R G B W

KEY ADVANTAGES

- **Excellent illumination stability** featuring no light flickering
- **Border effects removal**
- **Improved depth of field and telecentricity**
- **Homogeneity test report** with measured values
- **14 sizes**
- **Light beam diameters from 16 to 380 mm**



Inline metal parts measurement.

LTCLHP CORE & CORE PLUS SERIES

COMPACT

LTCLHP CORE series

Compact telecentric illuminators

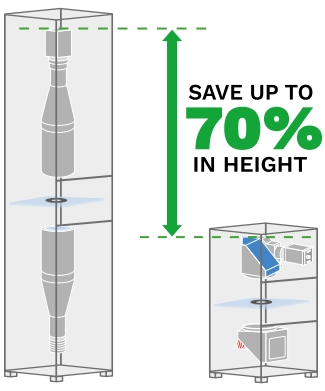
R G B W

COMPACT

LTCLHP CORE PLUS series

Compact telecentric illuminators
for large FOV systems

G



CORE Telecentric illuminator and lens mounted onto a robot arm.

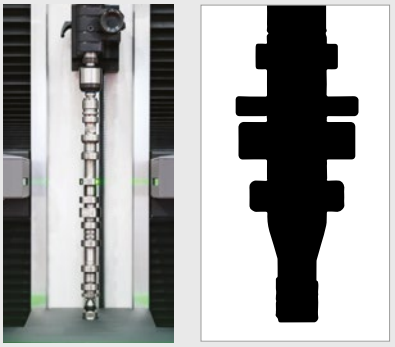
LTCL4K SERIES

FLAT

LTCL4K series

Flat telecentric illuminators for line scan cameras

G W



Camshaft measurement.

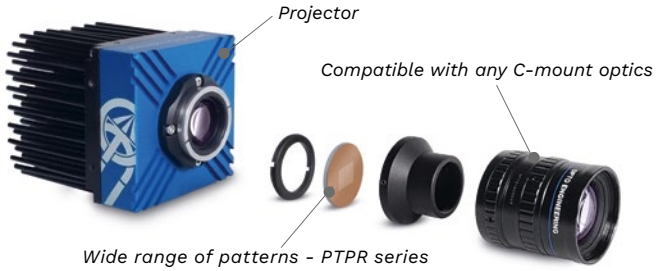
LED PATTERN PROJECTORS

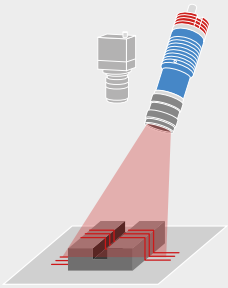
Opto Engineering® extensive range of pattern projectors is designed for inline or offline applications including quality control, 3D reconstruction, dimensional measurement, planarity control, robot guidance and alignment applications.

WHY LED PATTERN PROJECTORS?

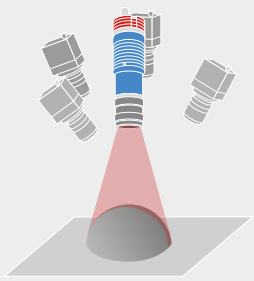
Unlike laser sources, LEDs provide:

- **Thinner lines and sharper edges**
- **More homogeneous illumination and pattern uniformity**
- **No speckle effect generates more accuracy**

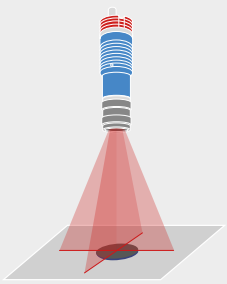




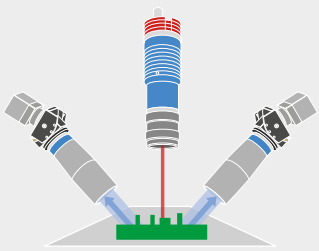
3D profilometry.



Stereovision.



Alignment.



3D inspection of the height of connector pins.

OUR RANGE OF LED PATTERN PROJECTORS

Model	Integrated driver	Passive cooling	Compact shape	5-pin M12 connector	Temperature sensor	Continuous mode	Strobe mode	Projection lens	Power
LTPRHP3W	✓*	✓	✓	✗	✗	✓	✓**	Up to 2/3"	Low
LTPRSMHP3W	✓*	✓	✓	✗	✗	✓	✓**	Up to 2/3“	Low
LT2PRXP	✓	✓	✗	✓	✓	✓	✓	Up to 1.1"	Medium
LT2PRXP-C	✗	✓	✓	✓	✓	✗	✓**	Up to 1.1“	Medium
LT2PRUP	✓	✓	✗	✓	✓	✓	✓	Up to 1.1“	High

** Controls only continuous operation mode.* *** Only with external driver.*

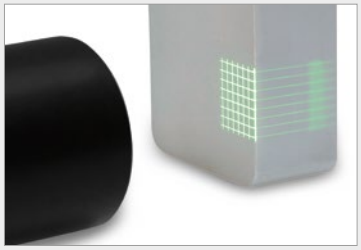
LTPRHP3W SERIES

LTPRHP3W series

3W LED pattern projectors

R G B W IR

Visualization & mapping.



Telecentric pattern projection.

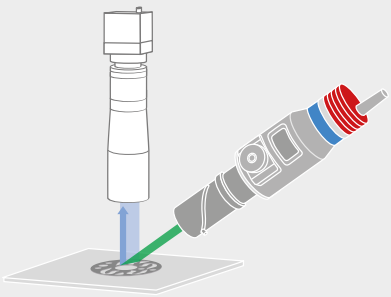
LTPRSMHP3W SERIES

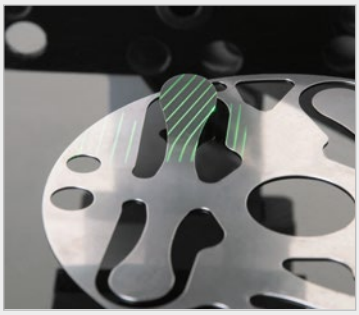
LTPRSMHP3W series
3W tilting LED pattern projectors

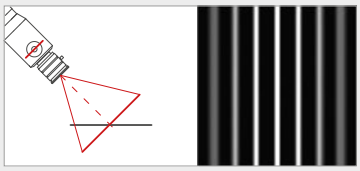
R G B W

WHEN DO YOU NEED A LED PATTERN PROJECTOR WITH A TILT ADJUSTMENT?

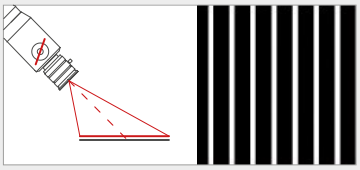
LTPRSMHP3W models allow to maintain focus on tilted planes ensuring accurate inspections by meeting the Scheimpflug priciple.







With tilt adjustment focus is maintained accross the entire plane.



With tilt adjustment focus is maintained accross the entire plane.

LT2PRXP AND LT2PRUP SERIES

- **Built-in driver** for continuous and strobe mode operations
- **5 PIN M12 connector** with PNP/NPN/analog dimming input
- Compatible with **C mount** projection lenses **up to 1.1”**
- **Automatic shut-down** in case of overheating

LT2PRXP series
40W continuous and strobe LED pattern projectors

- Optional compact version for applications with space constraints (external driver needed)

BUILT-IN DRIVER

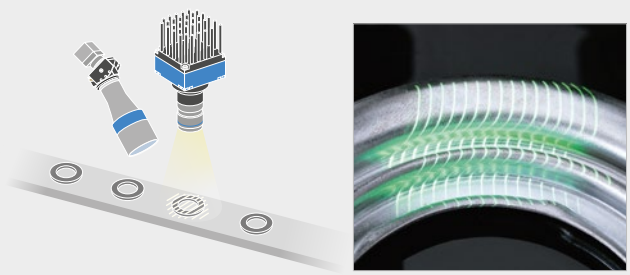
R G B W IR UV

LT2PRUP series
100W continuous and strobe LED pattern projectors

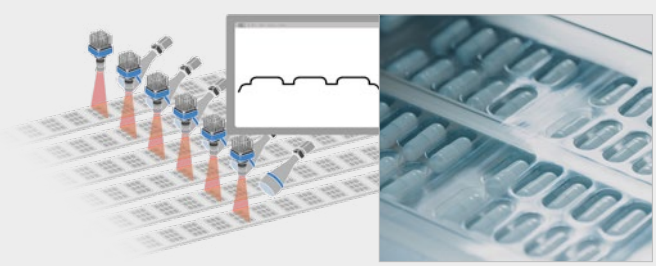
- Ideal for high-speed applications requiring **extreme brightness**

BUILT-IN DRIVER

R G CG B W IR UV



Planarity check of high precision metal components.



Pharmaceutical blister volume control.

LED ILLUMINATORS

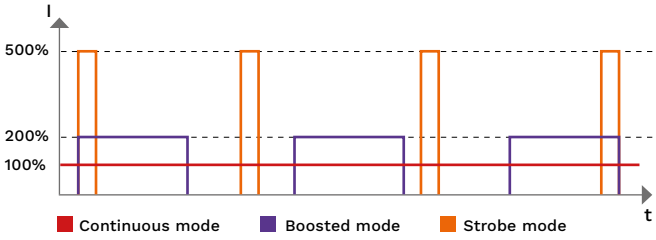
Opto Engineering® offers a wide range of innovative and robust illumination solutions designed to deal with fast-moving objects of various sizes and surface finishes.

LED ILLUMINATORS WITH BUILT-IN DRIVER TECHNOLOGY

To meet the needs of flexibility of use, Opto Engineering® has developed and introduced the integrated driver technology for selected LED illuminators. The built-in driver technology enables operators to easily switch between operating modes, ensuring great application flexibility with no need for an external controller.

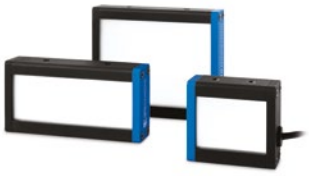
- No need for external controller
- 3 operating modes for maximum flexibility
- Possible LED control via ITALA® cameras

OPERATING MODE	CONTINUOUS	BOOSTED	STROBE
Max. operating time (t)	Unlimited	60s	10ms
Max. duty cycle	100%	50%	10%
Light intensity (I)	100%	200%	500%



Power delivered in the three modalities. The time scale of the strobe mode is different from the other ones.

BACKLIGHTS



R G B W IR

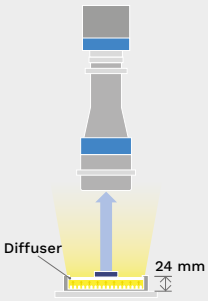
ILLUMINATION AREA

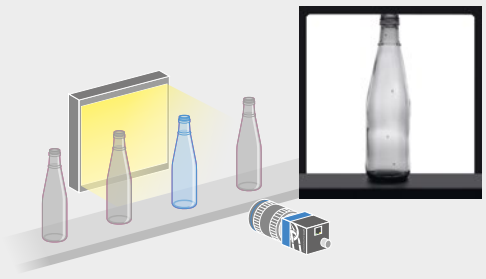
From 48 x 36 mm to 500 x 500 mm

LIGHTING TYPES

DIFFUSED

COLLIMATED





Defect inspection on glass bottles with LT3BC backlight.

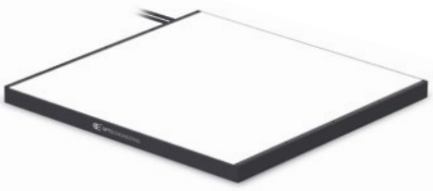
HIGHLIGHTS

LT3BC series

High-power LED backlights with integrated driver

R G B W IR

BUILT-IN DRIVER



- 3 different operating modes for maximum flexibility
- Optional **collimating**, **polarizing** and **protective filters**
- **Automatic shut-down** in case of overheating

RING LIGHTS

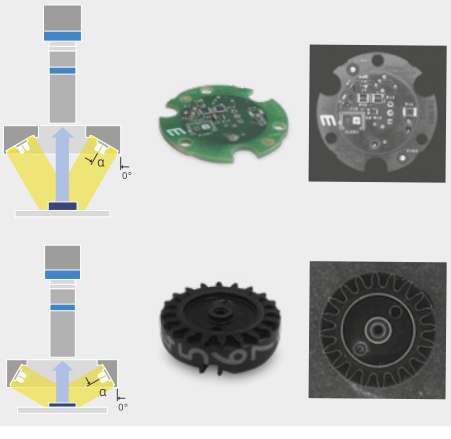
EMISSION ANGLES α

0, 15, 20, 25, 30, 45, 60, 75, 90°

WIDE RANGE OF SIZES

Inner diameter from 4 to 325 mm

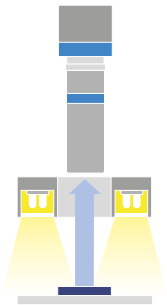
R G B W IR UV RGB RGBW



PCB inspection with LTRNDC 15° ring light (in brightfield configuration) imaged by a macro lens.

Gear dents counting and inspection with LTLADC low angle ring light (in darkfield configuration) imaged by a macro lens.

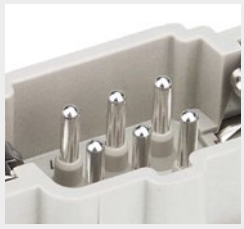
HIGHLIGHTS



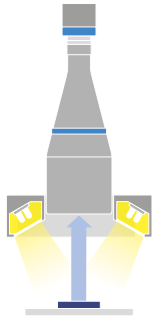
LTRNST series

- Designed to be mounted on telecentric lenses

R G B W IR



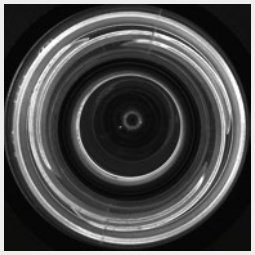
PIN alignment.



LTRNOB & LTRNOBHP series

- Designed to be mounted on 360° view optics
- Specific light angle for 360° view optics

R G B W IR UV RG BW



Check for defects in bottle preforms.

SPOT LIGHTS

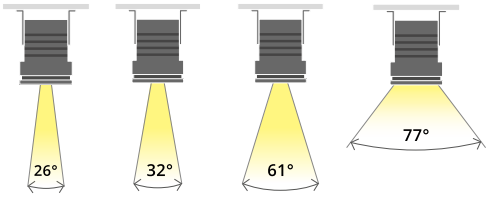
LTSP series

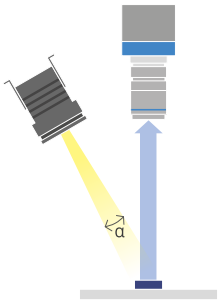
60W LED Spot Lights

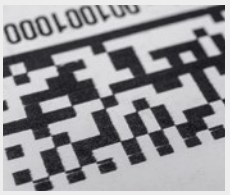
R G B W IR

BUILT-IN DRIVER

- Built-in smart driver for continuous, boosted and strobe operating modes
- 26°, 32°, 61°, 77° beam angles





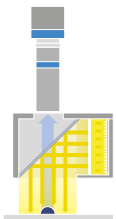


Code reading on cardboard boxes.

OTHER ILLUMINATORS

LTCXC series

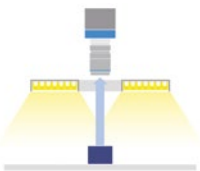
Continuous LED coaxial lights



Locate components on PCB boards.

LTPH series

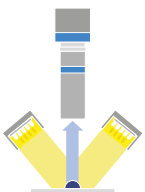
Diffused continuous LED flat dome lights



Expiration date reading on cans.

LTBRDC series

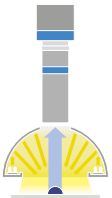
Continuous LED bar lights



Data matrix reading on vials.

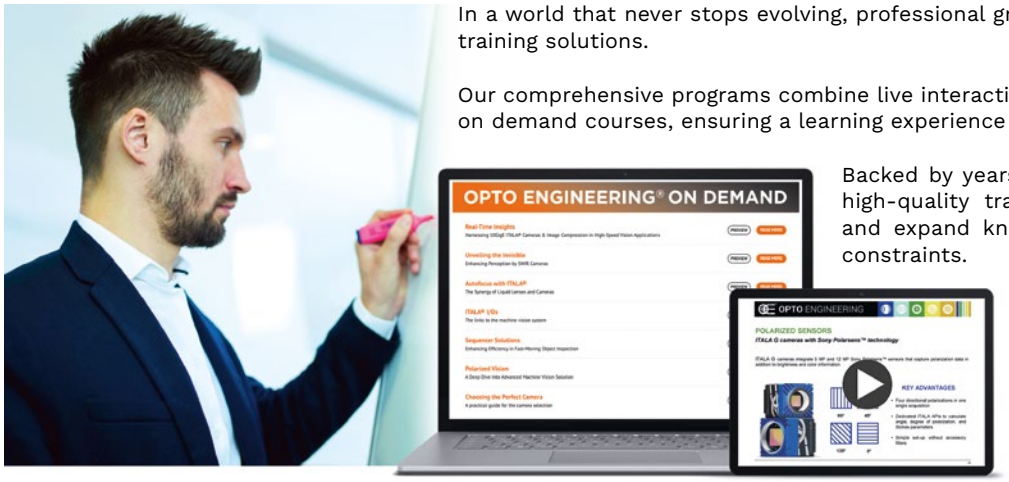
LTDMC series

Continuous LED domes



OCR on food cans.

EXPERIENCE THE EXPERTISE!



In a world that never stops evolving, professional growth requires flexible and effective training solutions.

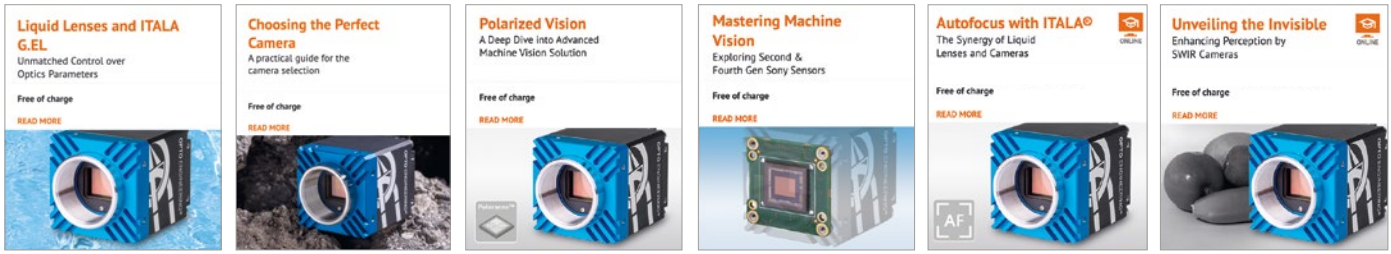
Our comprehensive programs combine live interactive sessions with the convenience of on demand courses, ensuring a learning experience tailored to your needs.

Backed by years of industry expertise, we provide high-quality training designed to enhance skills and expand knowledge, without time or location constraints.

CHECK OUR WEBSITE

CLASSES ON DEMAND

Dive into the **EXE Training** website section to explore a wide range of courses, all designed to offer the unparalleled flexibility of digital learning.



Our training offerings are even more extensive than listed here: **reach out to us to explore the full spectrum of training opportunities available**.

UPCOMING COURSES

In the coming months, we will be launching numerous new courses focused on:

- **the fundamentals of machine vision systems**
- **advanced optical technologies**
- **latest camera innovations**
- **new software solutions**.

Stay tuned for these exciting additions to our training catalog and don't miss out on the opportunity to stay ahead in the rapidly evolving world of machine vision.

CLASSES ON REQUEST

BASICS

Explore the **BASICS** section on our website and unlock a full selection of free resources on machine vision.
With dozens of dedicated pages, you will find a comprehensive theoretical guide packed with in-depth insights and expert knowledge: everything you need to deepen your understanding and refine your skills.
www.opto-e.com/basics

TECH NOTES

The **TECH NOTES** section provides detailed technical instructions and practical tips on using our products, including our suggestions for optimizing their performance and getting the best out of your vision system.

www.opto-e.com/tech-notes

MY VISION TAKEAWAYS

A DISTINCTIVE BRAND OF AWARD-WINNING PRODUCTS

Opto Engineering® is a brand recognized by customers in the machine vision market as a go-to technology provider of optical solutions well known for its quality, innovation and service.

WE ARE CERTIFIED

ASSOCIATIONS WE SUPPORT

OPTO ENGINEERING®

OPTICS • CAMERAS • LIGHTING • SOFTWARE

IMPORTANT: This catalog was printed in November 2025. Please reference our website for current availability and product updates.

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