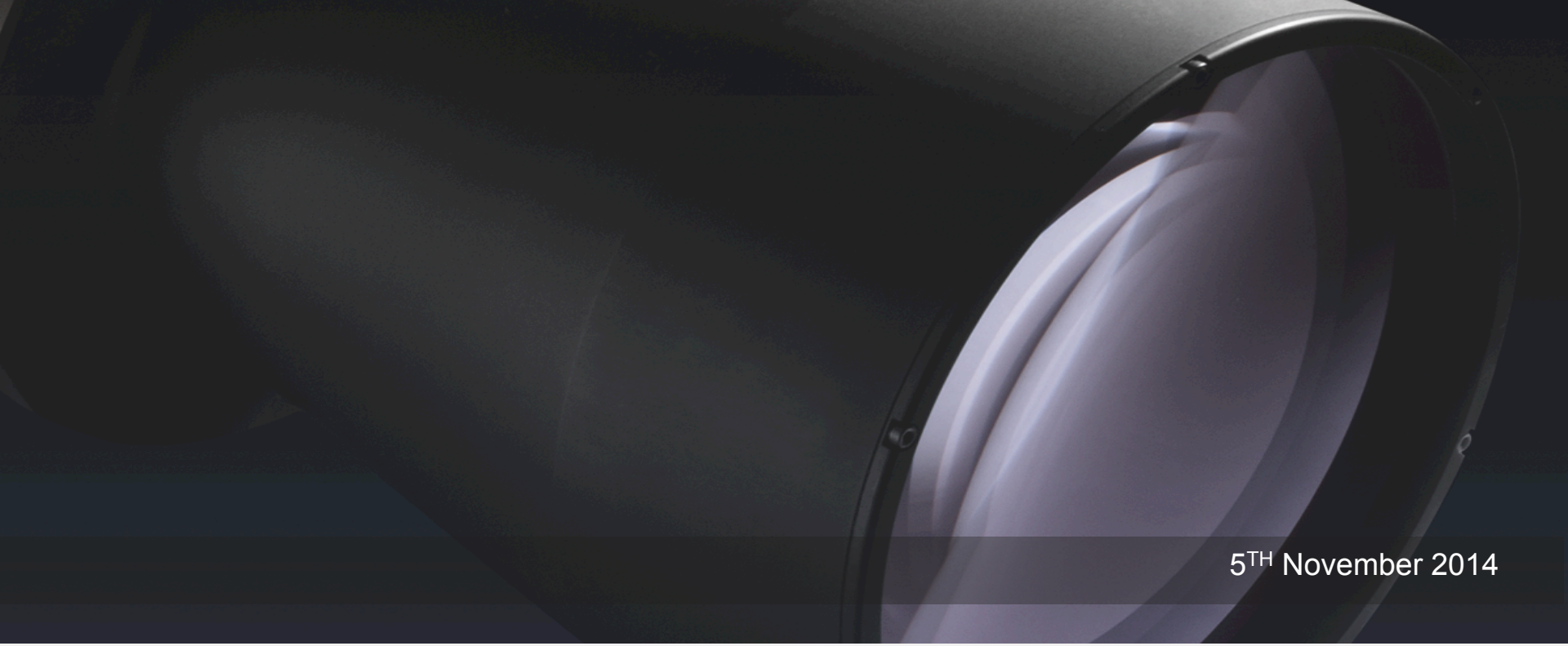

5TH November 2014

Innovative optical solutions for pharmaceutical/biomedical industry

M. Castelletti – *Product Manager, biomedical engineer*

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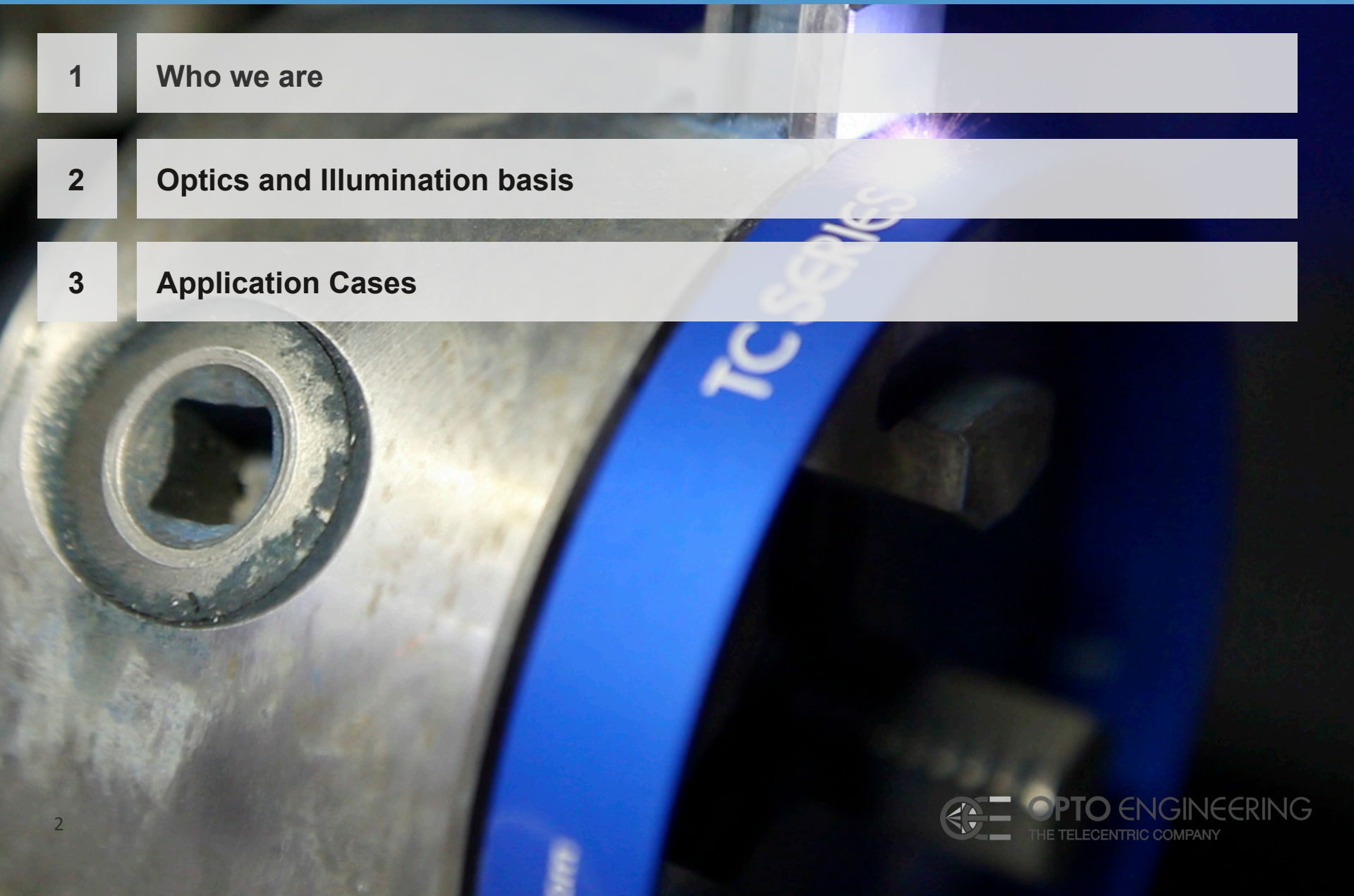

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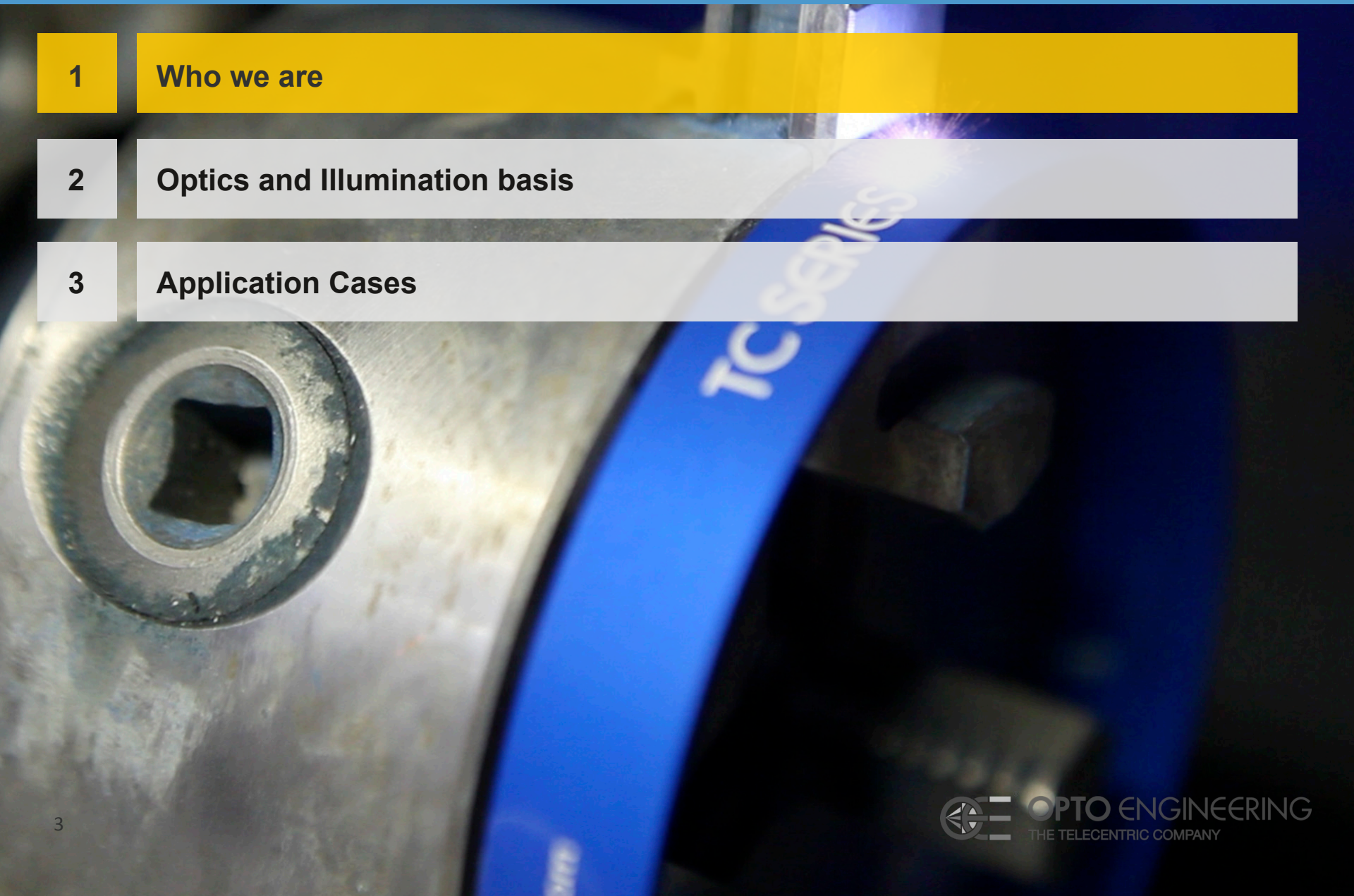

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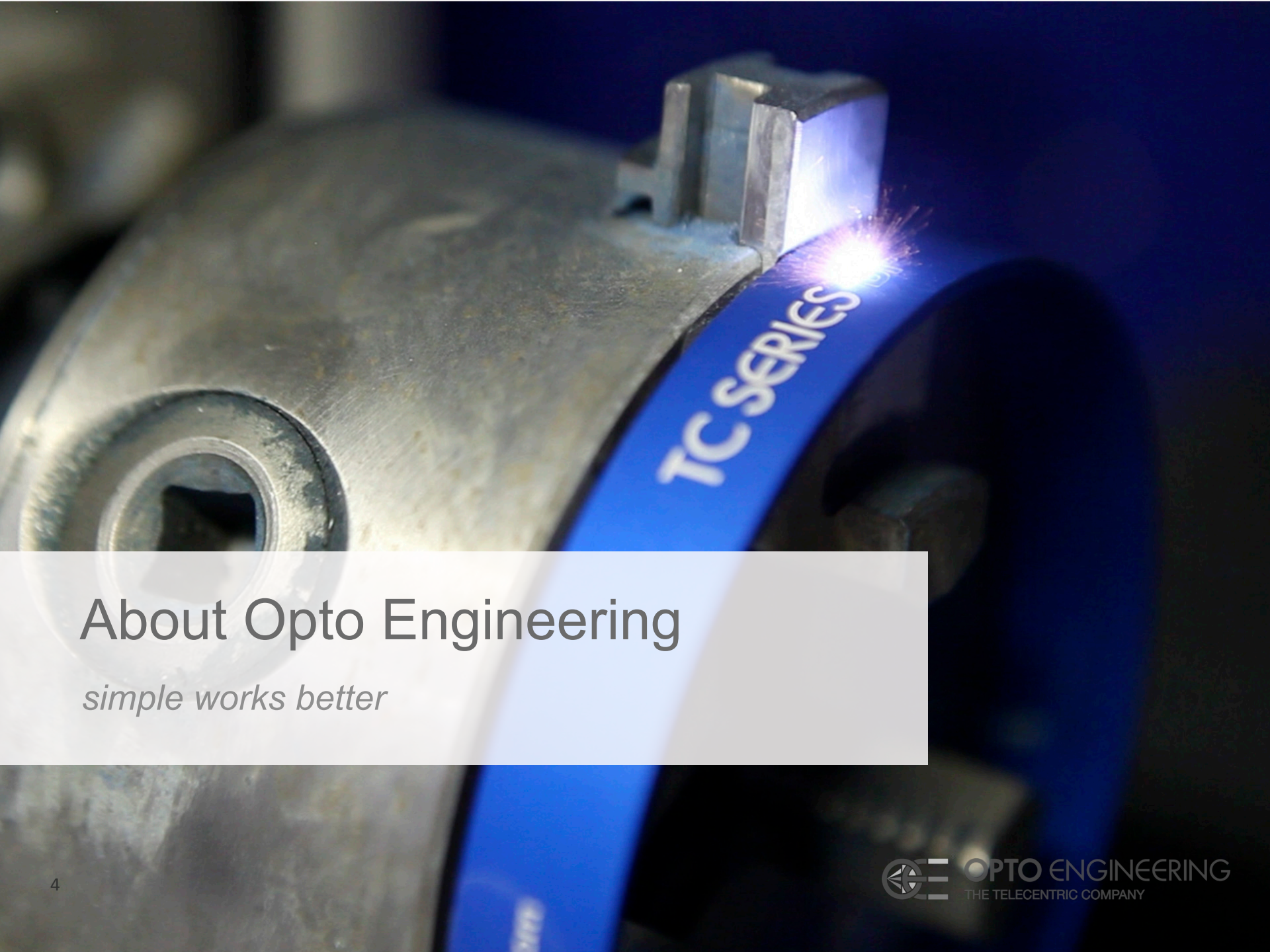

About Opto Engineering

simple works better

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About Opto Engineering

WHO WE ARE

Opto Engineering designs and manufactures optical and illumination systems for the machine vision industry since 2002.

Telecentric

2003

360° optics

2009

Zoom

2011

Illuminators

2014

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Global presence

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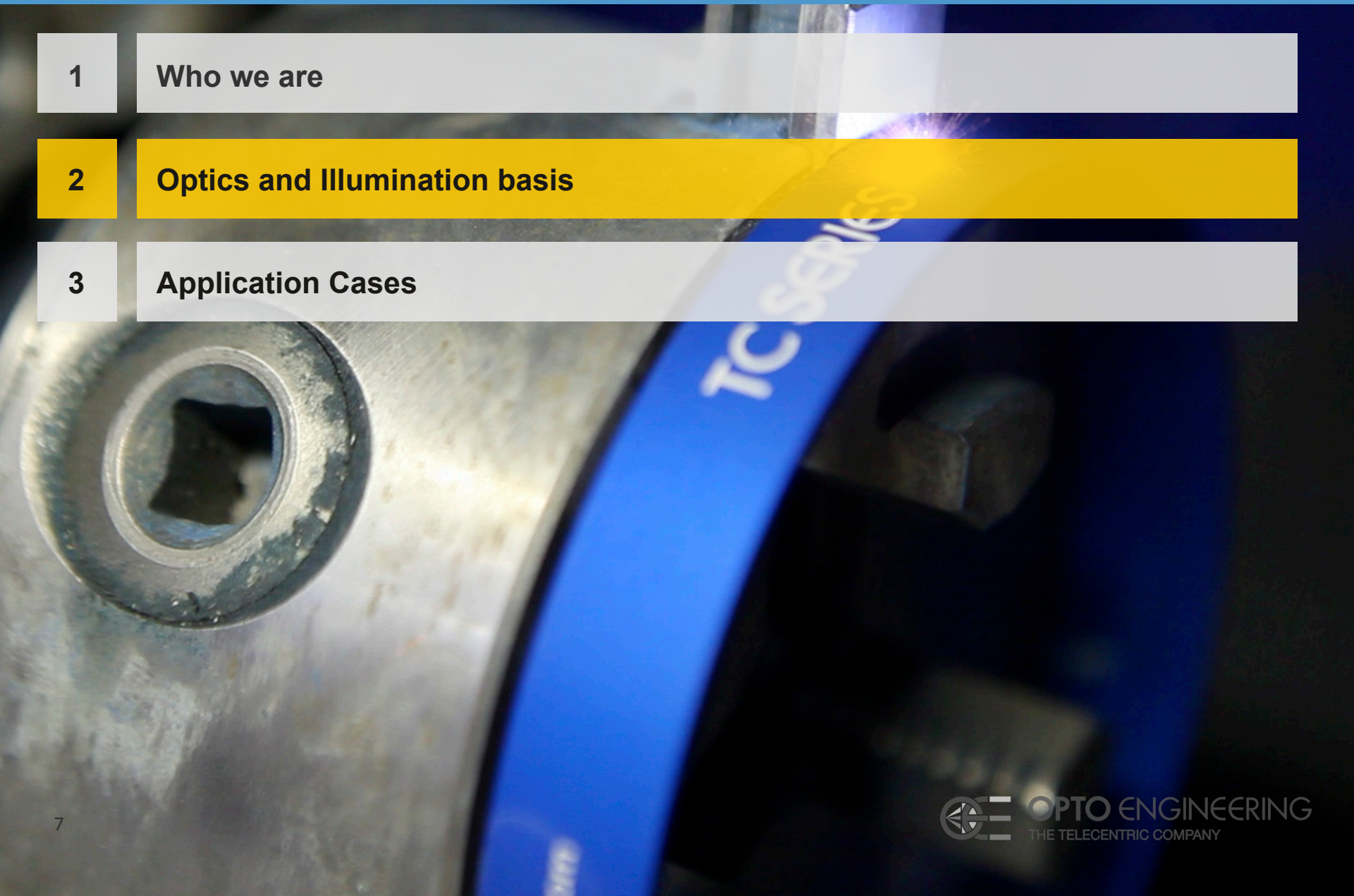


Introduction

CRITICAL PHARMA BIOMED PARTS

Vials

Syringe

CHALLENGE

↑ RAISE QUALITY ↓ CUT COSTS

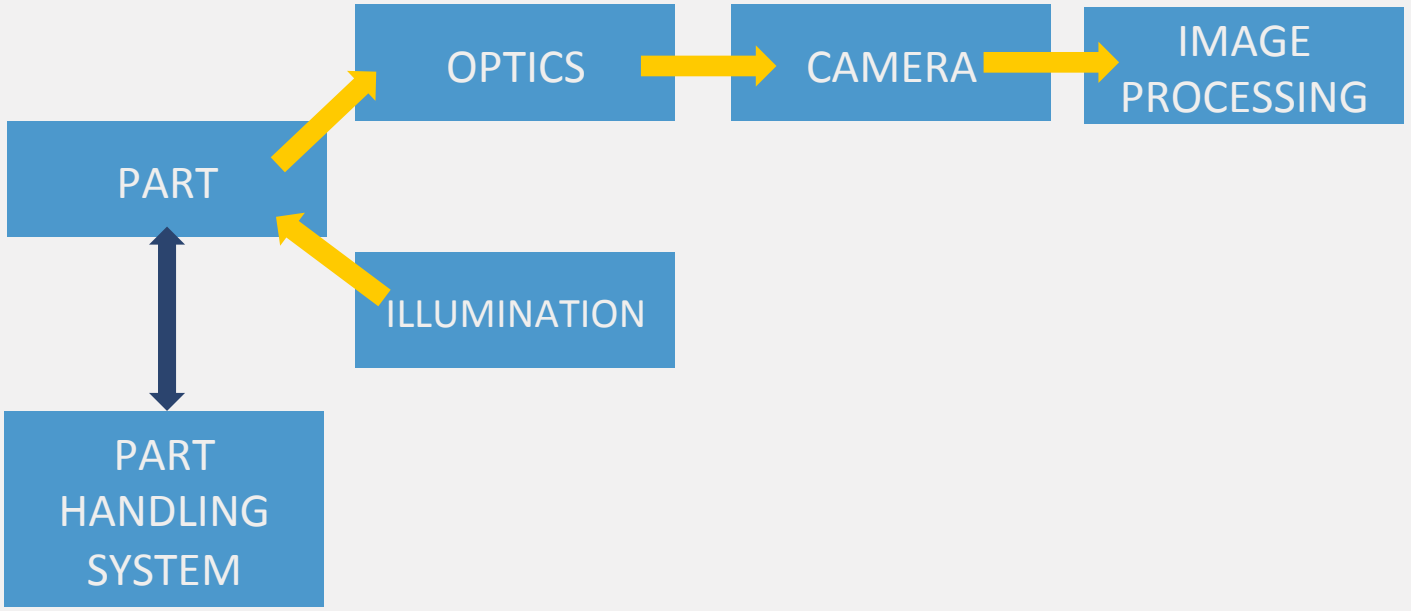
COMPLIANCY WITH REGULATIONS

(100% quality inspection)

MACHINE VISION

Introduction

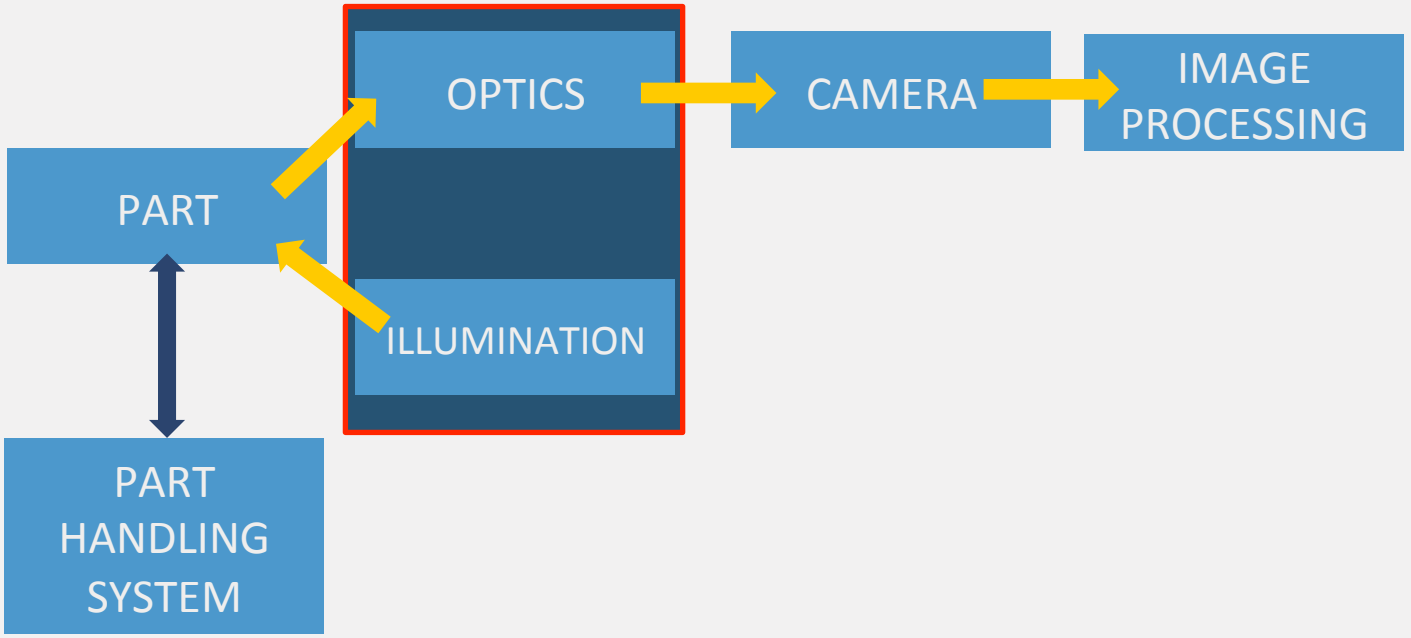
MACHINE VISION SYSTEM – KEY COMPONENTS



Machine vision systems are like a chain: *only as strong as their weakest link*

Introduction

MACHINE VISION SYSTEM – KEY COMPONENTS



Machine vision systems are like a chain: *only as strong as their weakest link*

IT'S ALL ABOUT LIGHT

Optics and illumination can often be the limiting factor in a system's performance

Optics – basic lens types

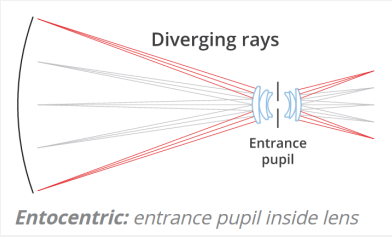
ENTOCENTRIC

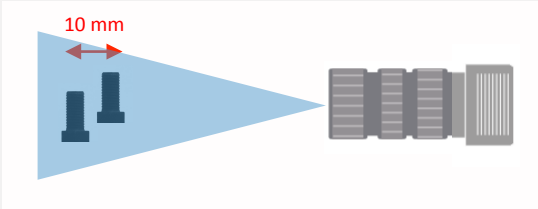
TELECENTRIC

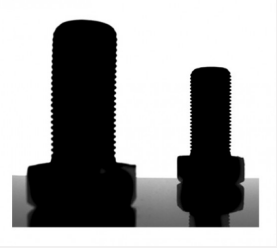
PERICENTRIC

Optics – basic lens types

ENTOCENTRIC

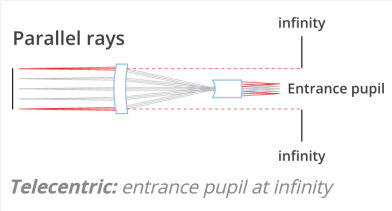


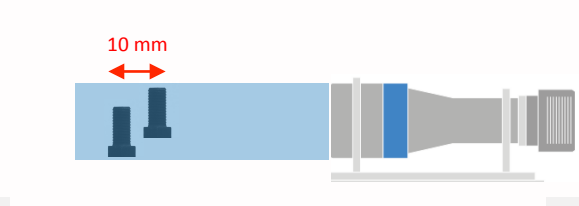




Optics – basic lens types

TELECENTRIC





Telecentric lenses are required for any dimensional measurement imaging application

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Optics – basic lens types

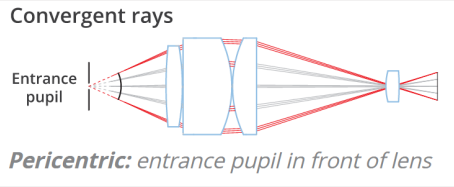
TELECENTRIC

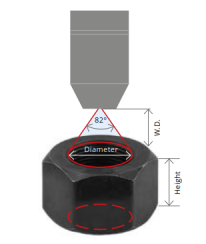
WHEN TELECENTRIC LENSES SHOULD BE USED

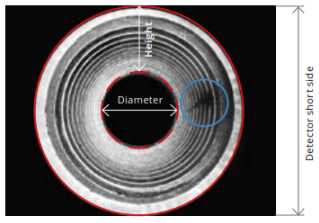
- When a thick object (thickness > 1/10 FOV diagonal) must be measured
- When different measurements on different object planes must be carried out
- When the object-to-lens distance is not exactly known or cannot be predicted
- When holes must be inspected or measured
- When the profile of a piece must be extracted
- When the image brightness must be very even
- When a directional illumination and a directional “point of view” are required

Optics – basic lens types

PERICENTRIC







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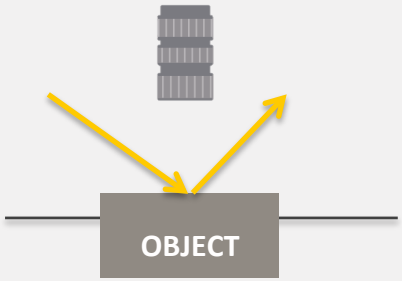
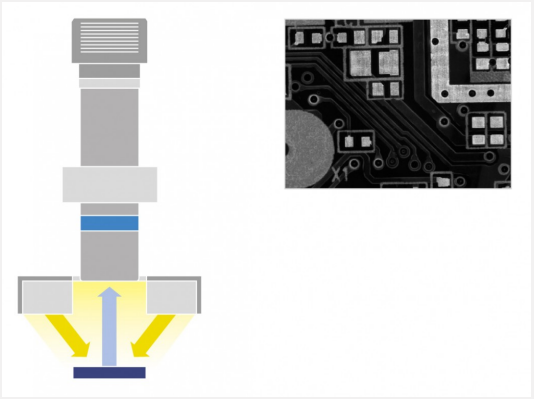
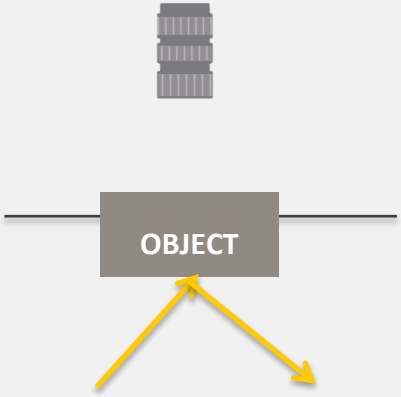
Illumination – basic illumination techniques

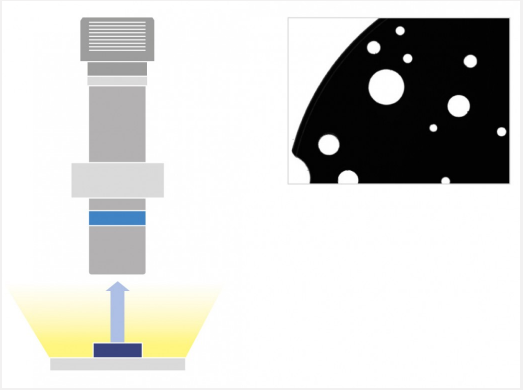
FRONT LIGHT ILLUMINATION





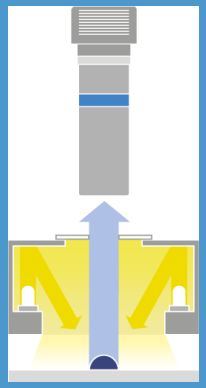
BACK LIGHT ILLUMINATION



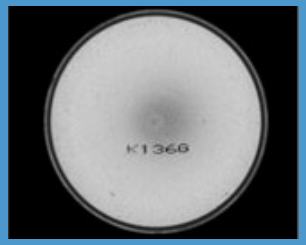


Illumination – basic illumination techniques

FRONT LIGHT ILLUMINATION

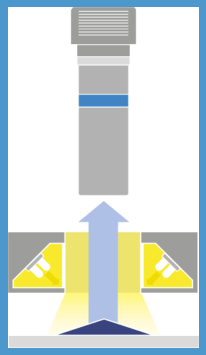


DIFFUSED DOME- Bright field



For complex shapes with curved and shiny surfaces

BACK LIGHT ILLUMINATION



LOW ANGLE RING LIGHTS- Dark field

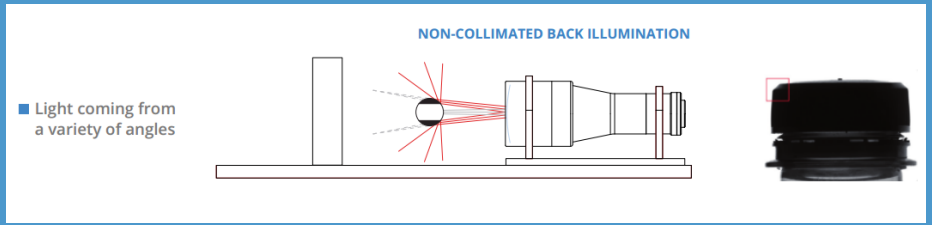
To enhance surface features or textures

Illumination – basic illumination techniques

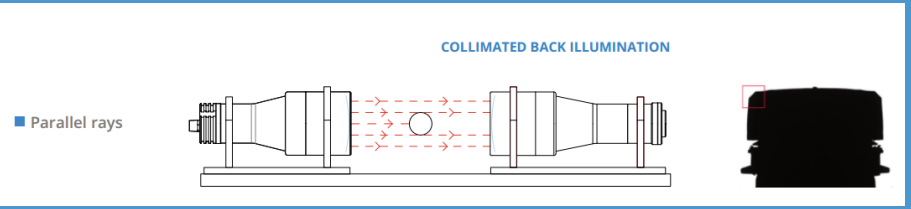
FRONT LIGHT ILLUMINATION

BACK LIGHT ILLUMINATION

DIFFUSED BACKLIGHT



COLLIMATED BACKLIGHT



- Border effects removal - Enhanced Field Depth

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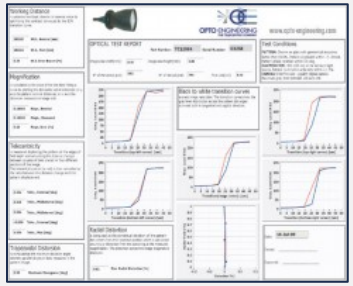
Applications – CASE 1

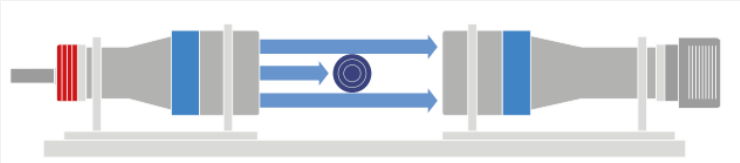
Product: Telecentric lens TC23036 + telecentric illuminator LTCL036-G

- BI telecentricity
- Nearly zero distortion
- Excellent resolution
- Simple and robust design (fixed aperture)
- Detailed test report with measured optical parameters
- Matching telecentric illuminator



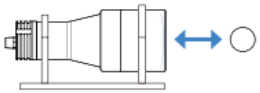
Applications – CASE 1

Product: Telecentric lens TC23036 + telecentric illuminator LTCL036-G



- **High speed** production lines
  The high throughput allows for shorter exposure times

- **Silouetting** and for detecting edges and defects
  Elimination of blurred edges caused by diffuse reflections



- **Increased distance** between object and illumination source

- **Precision measurements**
  where accuracy, repeatability, and throughput are key factors

- **Complete light coupling**
  very high signal-to-noise ratio

- **Border effects removal**
  collimated rays are typically much less reflected

- **Field depth and telecentricity improvement**
  Collimated illumination geometry increases a telecentric lens natural field depth

Applications – CASE 1

Product: Telecentric lens TC23036 + telecentric illuminator LTCL036-G

Application: Glass vials measurement

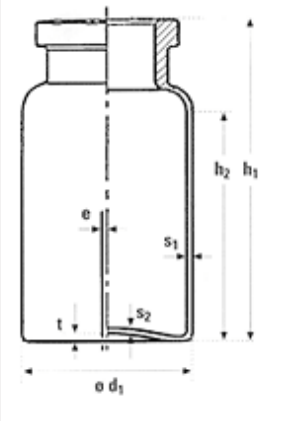
Diffused lighting	Telecentric lighting

Clear object contours can be seen under telecentric lighting,

making accurate measurements of the object possible.

Type of measurements:

- Finish / collar/ cone profile
- Diameter of the neck / cone
- Planarity of the mouth
- Axiality of the neck
- Shoulder angles
- Total length



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Applications – CASE 2

Product: PCCD012 CATADIOPTRIC LENS

360° imaging of small objects

Parts down to 7.5 mm in diameter can be imaged

Extra wide lateral viewing angle

Object sides viewing angle approaches 45°

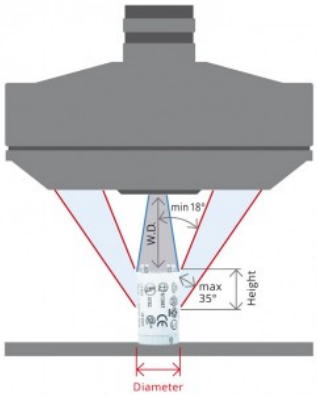
Compactness

The lens can be easily held and integrated in any system

Perfect chromatic correction

For RGB camera applications and color inspection

WORKING PRINCIPLE



IMAGE

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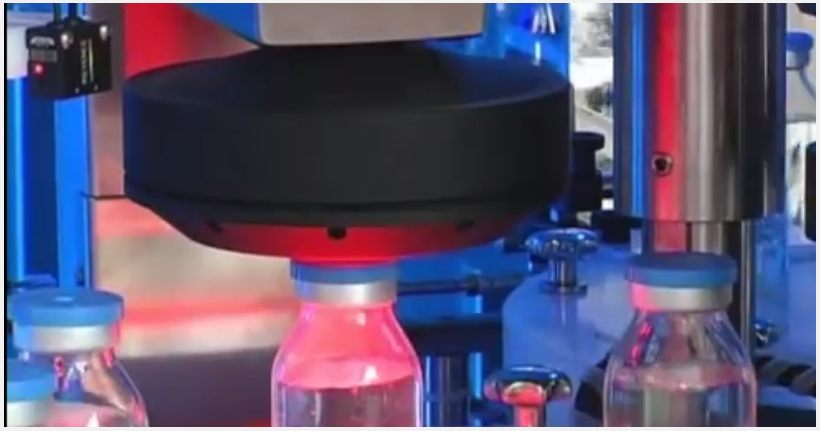
Applications – CASE 2

Product: PCCD012 CATADIOPTRIC LENS

Application: CHECK FOR CORRECT SEALING OF VIALS (FLIP OFF CAP)

SA10 automatic inspection machine for vials



- Production of 6.000 p/H - Totally electronic
- Products are loaded in the machine through baskets.
- Separated in "good" and "reject"

Detection of:

- Stopper absence
- Defective Crimp
- Dents
- Flip Off Deformation
- Wrong Color
- Cap Scratches and Deformation

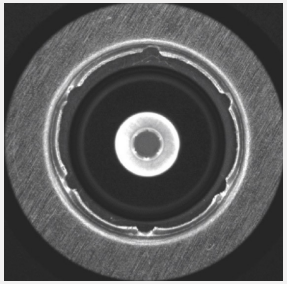


Image courtesy CMP Pharma

Applications – CASE 2

Product: PCCD012 CATADIOPTRIC LENS

Application: Examining the threads of a PET bottle neck preform

OBJECT **IMAGE**

Detection of:

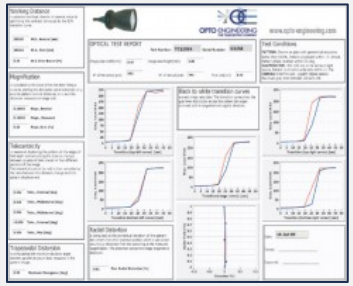
- Incomplete thread
- Defective thread
- Oval Shape
- Mouth defects

Applications – CASE 3

Product: TC16M096 Telecentric lens

FOV: 107 mm

- Wide image circle for 8k-5µm detectors
- High telecentricity
- Excellent resolution and low distortion
- Simple and robust design for industrial environments
- Detailed test report with measured optical parameters



Applications – CASE 3

Product: TC16M096 Telecentric lens

Application: PETRI DISH ANALYSIS

Type of check

- Quantitative and qualitative culture growth
- Colour check for seeding and bacterial growth
- Count and identification of bacterial colonies

TECH SPECS

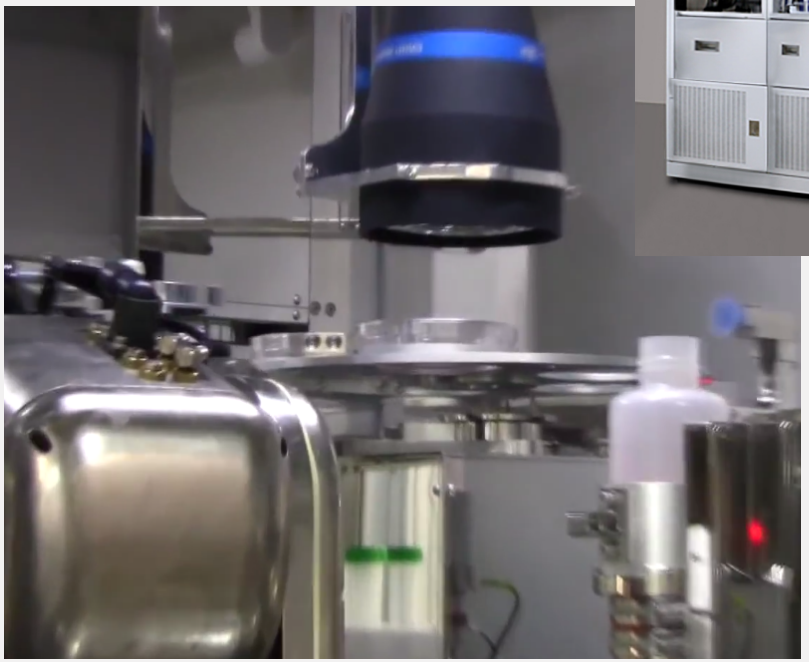
Camera: Dalsa 4K, Sensor: 4096 x 3 pixels with a pixel size of 10um

Illumination: multiple = ringlight, backlight, side illumination to perform different types of control.

Applications – CASE 3

Product: TC23080

Application: Cell culture



FEATURES:

- Fully automated cell culture procedures
- Displays and automatically records images of cultured cells
- Detect and remove human iPS cells which have begun to differentiate

Opto Engineering TC Lens is used by Nobel Prize Dr. Shinya Yamanaka in its IPS (induced pluripotent stem cells) research

Applications – CASE 4

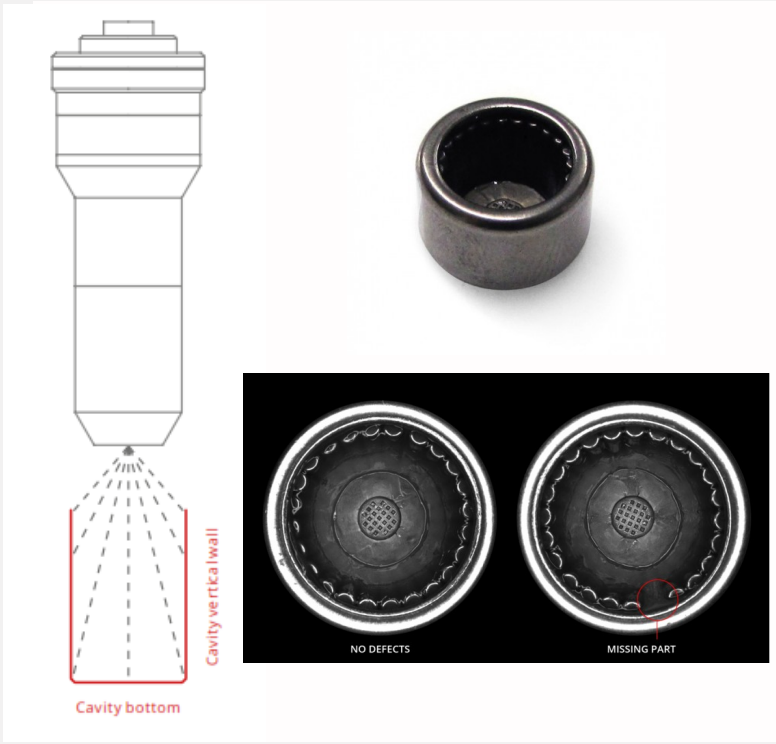
Product: PCHI023 hole Inspection optics

Perfect focusing of holed objects
Both the walls and the bottom of a cavity are imaged in high resolution

Cavity inspection from the outside
No need to put an optical probe into the hole

Very high field depth
Objects featuring different shapes and dimensions can be imaged by the same lens

Wide viewing angle
Sample surfaces are acquired by the lens under a convenient perspective to clearly display their features



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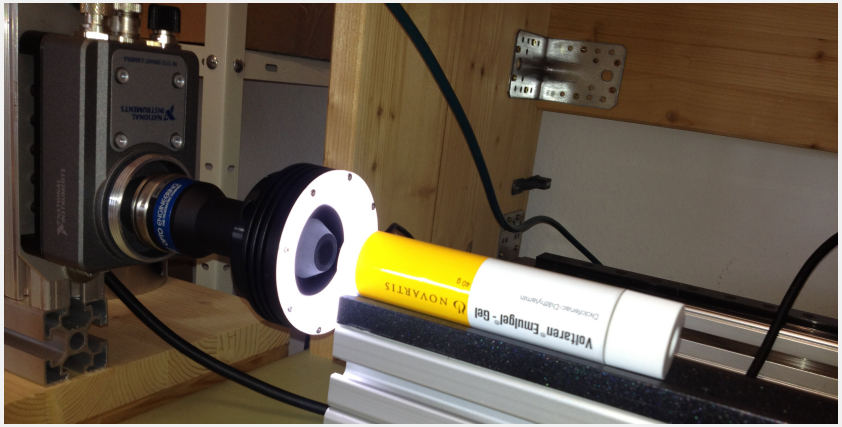
Applications – CASE 4

Zind Engineering
Your Partner for VISIONs

Product: PCHI023 Hole Inspection optics

Application: Check of aluminium tubes for latex seal integrity

SET UP



IMAGES

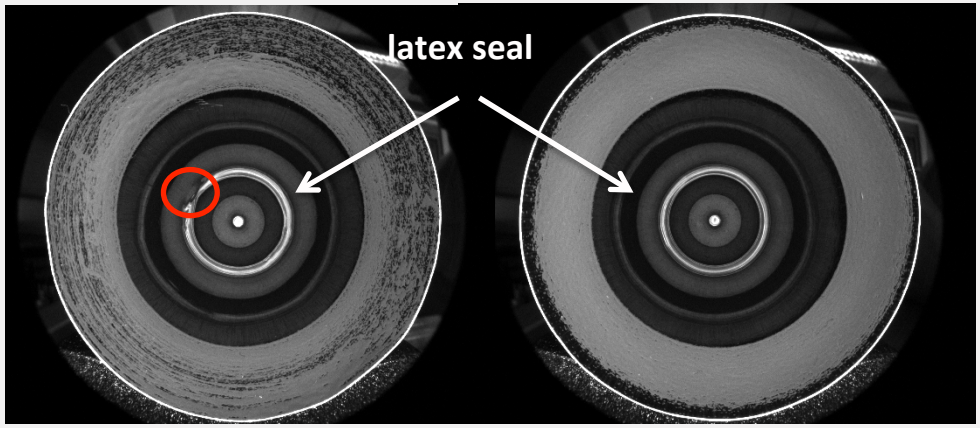


Image courtesy ZIND ENGINEERING

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Applications – CASE 5

PRODUCT: Dome + Low angle illumination system LTDMLAB2-WW

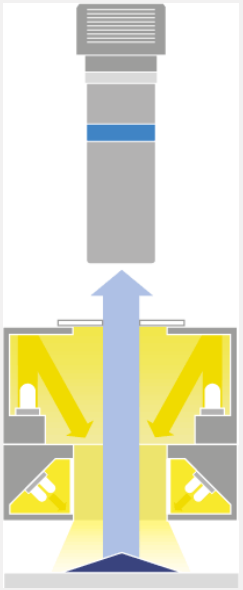
Illumination area Ø = 60 mm

Two independent illumination units in one single solution
Dome unit for homogeneous illuminations and low angle unit for dark field lightning can be independently operated.

Ultra-high power light output and strobe mode only operation
For the inspection of fast moving object and extended LED lifetime.

Rugged industrial design with built-in industrial connector
For easy integration into any machine vision system.

Compatible LTDV strobe controllers available
For easy and appropriate power, control and synchronization of the illuminator.



Applications – CASE 5

PRODUCT: Dome + Low angle illumination system LTDMLAB2-WW

Illumination area Ø = 60 mm

APPLICATION: : Check for defects in rubber stopper for vial caps

OBJECT

IMAGE

dome **low angle** **mix**

Type of check:

- **Cuts**
- **Scratches**
- **Fibers**
- **Contamination**
- **Spots**

Fibers

Applications – CASE 6

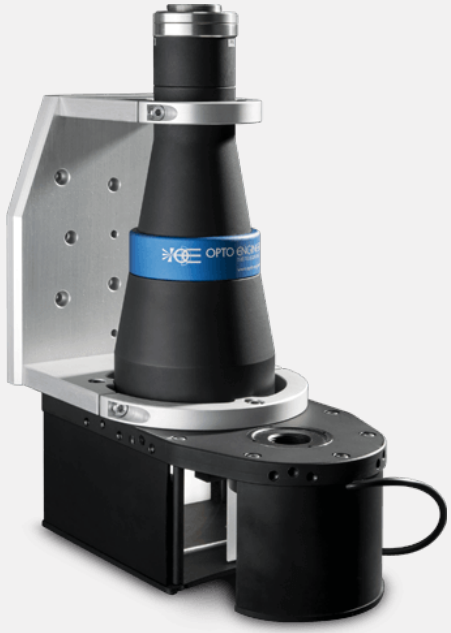
Product: TCCAGE optics

90° lateral imaging:
the 4 orthonormal views allow visualization of object features that are hidden when looked at from the top

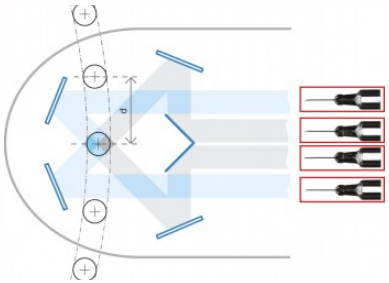
Long and thin object inspection:
the characteristic aspect ratio of the 4 image segments perfectly fits long and thin objects

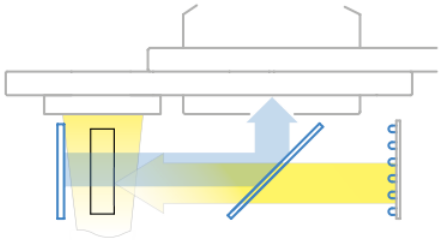
Built-in illumination:
the device also incorporates two different light sources, for back and direct illumination

Suitable for measurement:
the telecentric optics makes this module perfect for any multiple-measurement application.

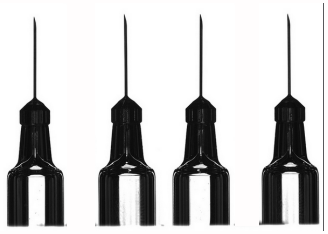


SCHEMATICS





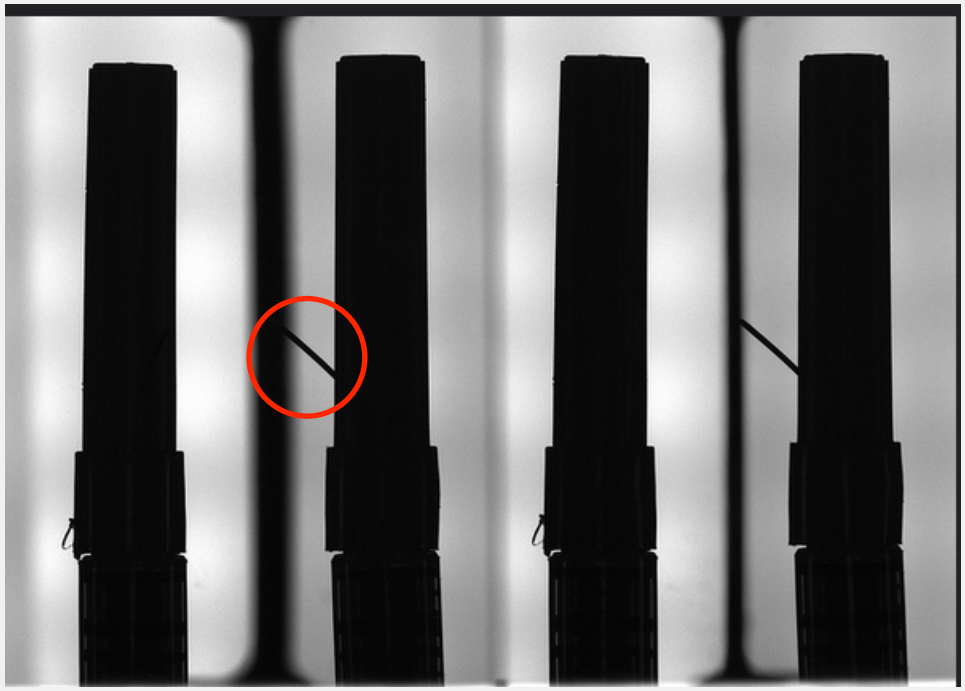
IMAGE

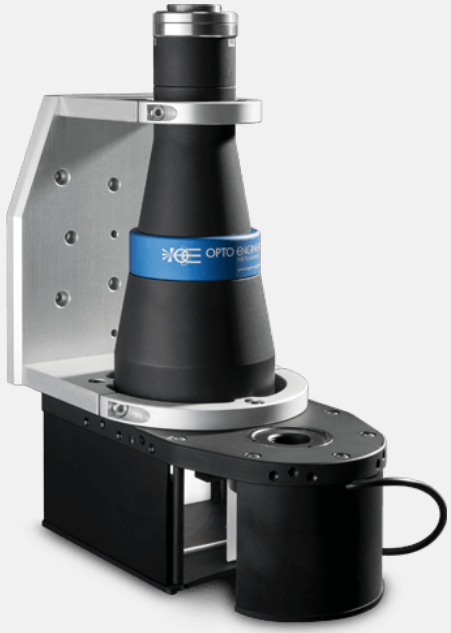


Applications – CASE 6

Product: TCCAGE optics

Application: syringes inspection





Type of check:

- Incorrect cap placement
- Bent needles

4 telecentric views allow inspection of all sides

Applications – CASE 7

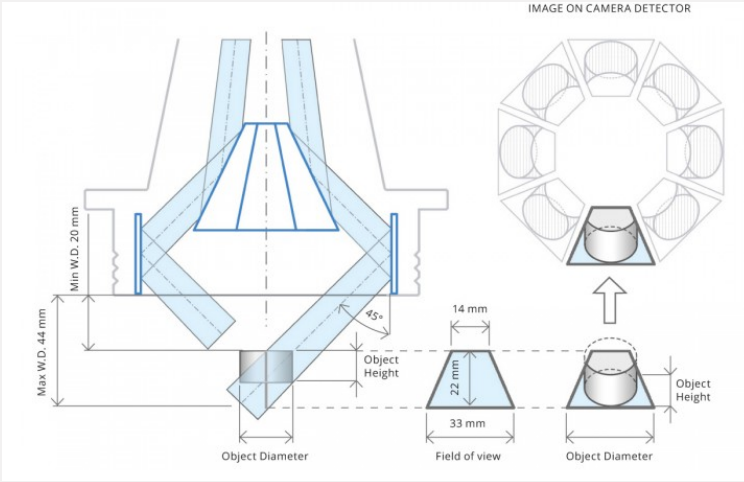
Product: PCPW012

Just one camera
No need for multiple cameras placed around and over the object

Wide viewing angle
45° object sides view makes otherwise hidden features visible

Complete surface inspection
Both inner and outer object surfaces can be imaged in one shot

Very high resolution
Even the tiniest defects can be detected.



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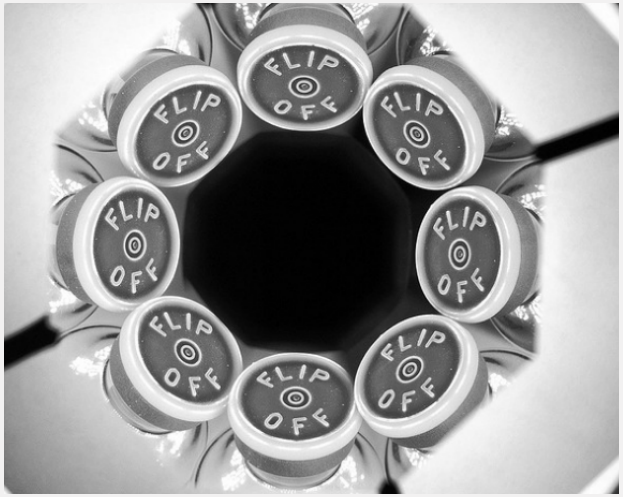
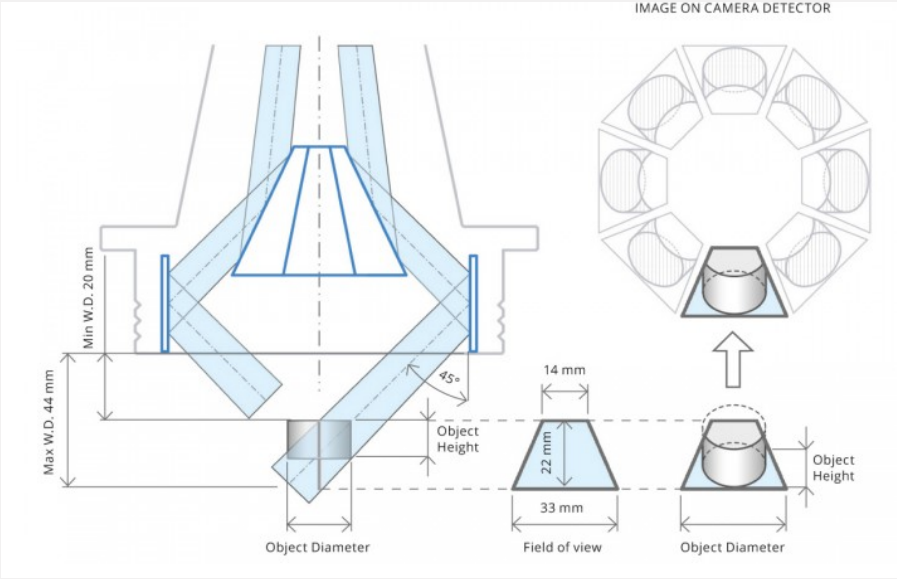
Applications – CASE 7

Product: PCPW012

Application: FLIP OFF cap inspection with one single camera





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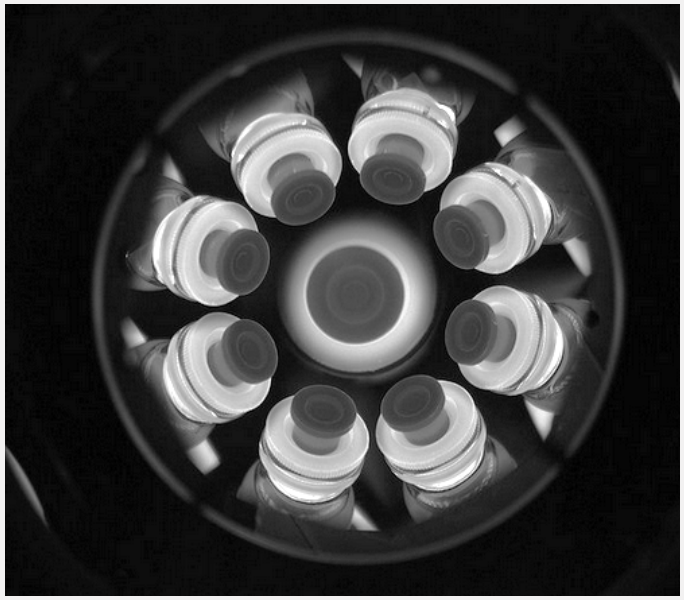
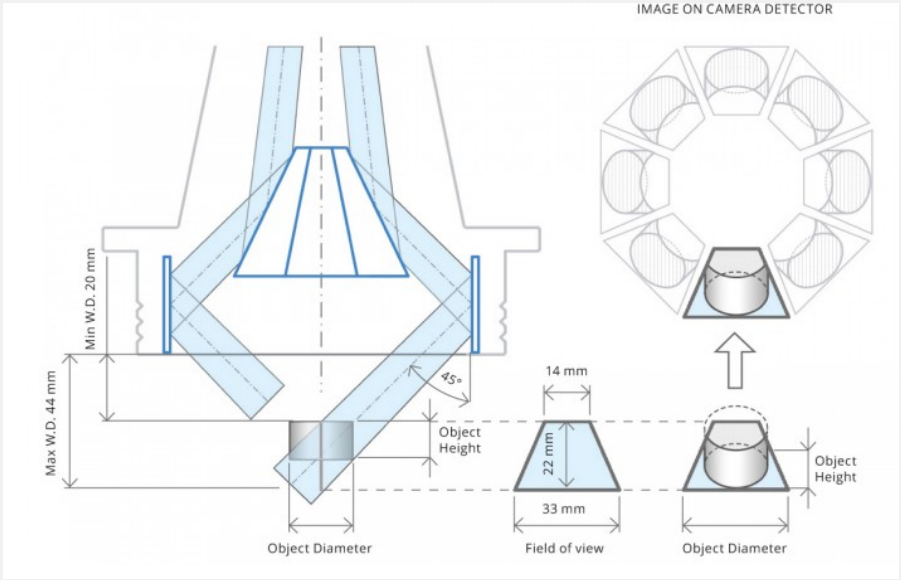
Applications – CASE 7

Product: PCPW012

Application: cap inspection with one single camera





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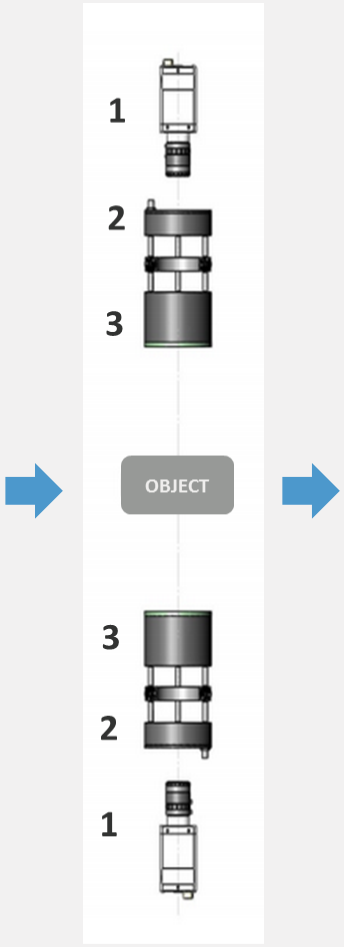
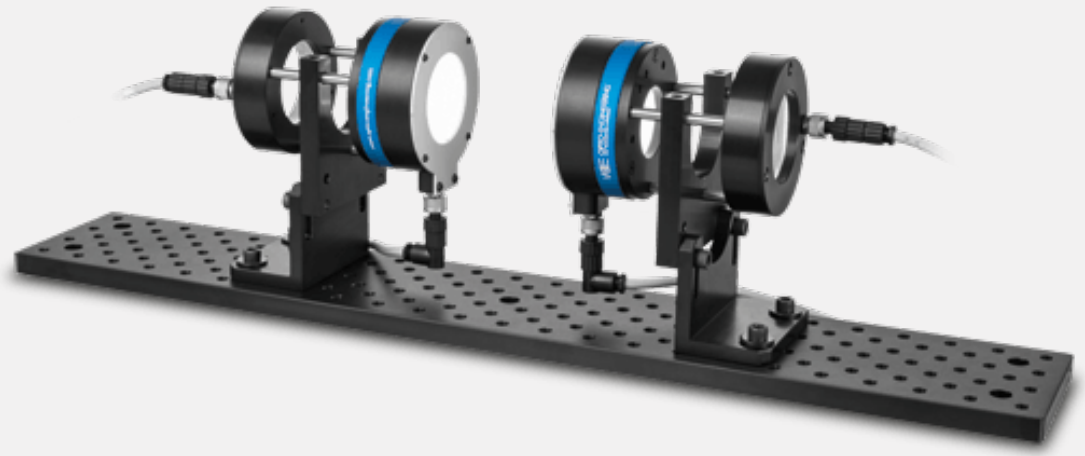
Applications – CASE 8

Product: Viewthrough system

Compact illumination solution designed to illuminate two sides of an object almost simultaneously





1 = Camera
2 = Special active "view-through" backlight unit
3 = Front Dome

Applications – CASE 8

Compact illumination solution designed to illuminate two sides of an object

INSTANT 1

SCHEMATICS

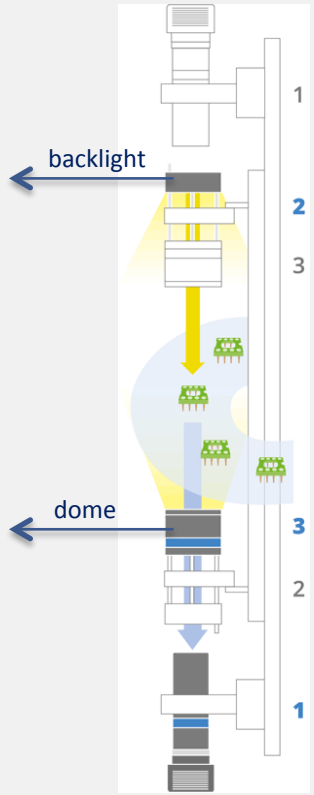
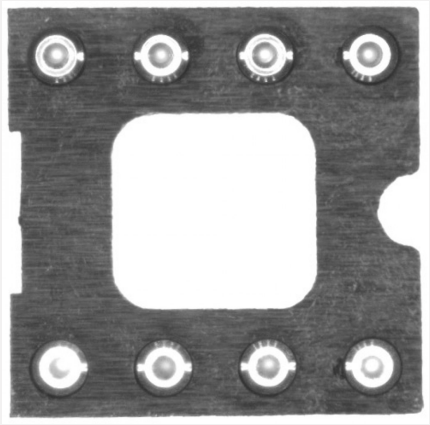


IMAGE (bottom)



DIL Socket BOTTOM SIDE

INSTANT 2

SCHEMATICS

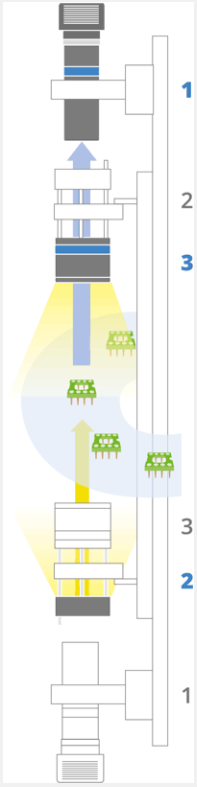
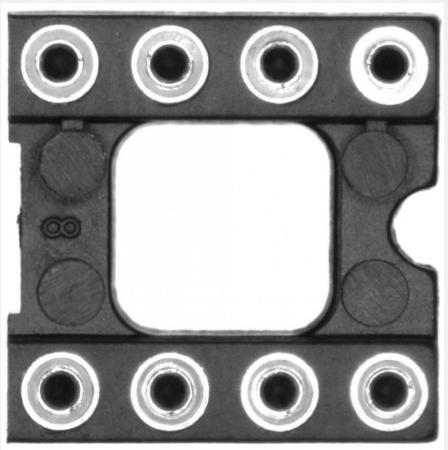


IMAGE (top)

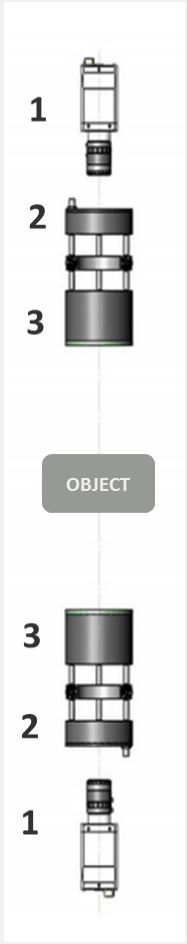


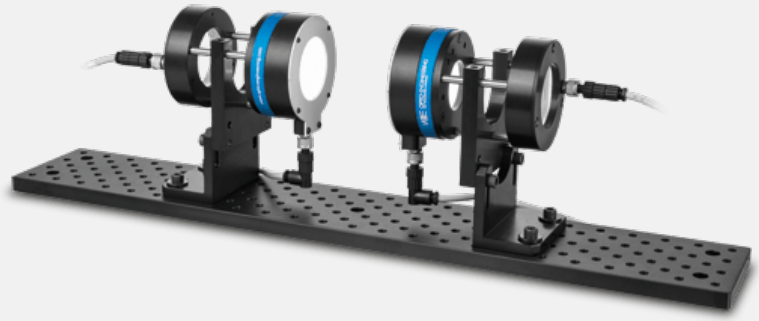
DIL Socket TOP SIDE

1 = Camera / 2 = Special active "view-through" backlight unit / 3 = Front Dome

Applications – CASE 8

Compact illumination solution designed to illuminate two sides of an object





Achieved thanks to the special backlight units which act:

- as transparent windows (when turned off)
- as backlights (when turned on)

Compact space-saving solution for inspection of fast moving object

- Illuminates two sides of an object almost simultaneously

1 = Camera / 2 = Special active "view-through" backlight unit / 3 = Front Dome

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Thank you

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