

PRODUCT OVERVIEW

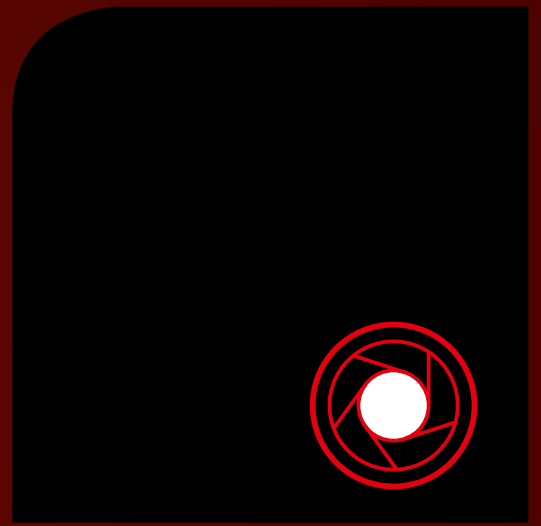
VISION SYSTEMS – LIGHTING – OPTICS

the easy way of machine vision





When the image provides clarity



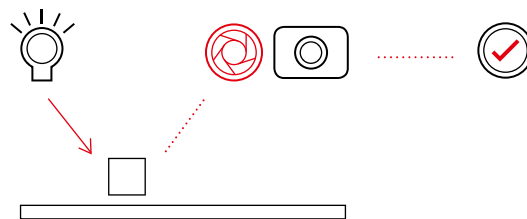
TELECENTRIC LENSES

ENTOCENTRIC LENSES

VICOTAR® OPTICS

A VIEW ANGLE THAT CAPTURES EVERYTHING

Lighting and imaging optics are located at the beginning of the image processing signal path and are thus especially important. Whatever goes wrong at this stage can only be remedied further down the signal path with great effort – if at all. The lens is the bottleneck in the signal chain. For this reason it so strongly influences the performance of an inspection system.



INDUSTRY-PROVEN

vicotar® optics offer a wide range of application options and rugged and precise functionality, even under the toughest production conditions. Thus, vicotar® optics from Vision & Control can be used in the entire range of applications for digital image processing – from simple to complex inspection tasks and from microscopic to macroscopic image acquisition.

WIDE PORTFOLIO

The company's own series of telecentric lenses is particularly comprehensive. They are designed to provide stable, distance-independent measurements. Telecentric lenses, particularly in combination with telecentric lighting, can reliably inspect optically difficult parts, such as glossy or glass objects. Several series of entocentric lenses in various qualities cover nearly all of the remaining application scenarios.

For ideal matching to the respective inspection task, vicotar® offers an extensive range of accessories. Altogether, the Vision & Control brand vicotar® comprises more than 250 components.

ADVANTAGES/PROPERTIES

- ... Use with contact-free test and measurement technology
- ... High quality imaging standards provide reliable results – wherever precise measurements and dependable quality control are crucial
- ... Extremely short image acquisition times and inspection cycles thanks to a highly luminous optical design
- ... Usable over a broad spectral range, from blue to infrared
- ... Deployable for a diverse array of tasks in assembly, handling, packaging and filling processes
- ... Inspection of the smallest details thanks to excellent imaging properties
- ... Industry compatible
- ... No software correction of images necessary due to the high grade quality of the images; this translates into high-speed operation of the imaging system
- ... Large selection of telecentric and entocentric lenses with diverse imaging properties available
- ... An extensive range of accessories allows for complete adaptation to the imaging task

vicotar® optics are an integral part of Vision & Control's component kit: They have been optimally matched to efficiently use all imaging components of Vision & Control's lighting and vision systems. This means:

- ... Exactly calculable project costs, since implementation is based on standard components
- ... Quick project realisation due to short delivery lead times
- ... Uncomplicated and efficient implementation of changed quality control requirements
- ... Quick setup times when changing types
- ... High availability and reduced service and maintenance costs



PRECISION FOR IMAGE PROCESSING

Depending on the test or measurement task, telecentric or entocentric lenses may be most suitable. Ambient conditions as well as many other factors play an important role in selecting the right lens. Our Service team would be pleased to assist you with this.

TELECENTRIC LENSES

Telecentric lenses reliably and precisely accomplish test and measurement tasks. Especially wherever geometrically-exact reproductions of three-dimensional objects are crucial.

ENTOCENTRIC LENSES

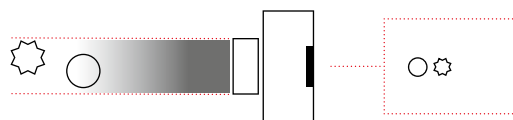
Because of their perspective-related imaging properties, entocentric lenses are used for the inspection of attributes, i.e. when objects must be inspected with respect to certain attribute qualities.

ADVANTAGES

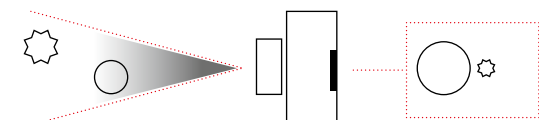
- ... No change in the image scale due to object shifting
- ... Minimal distortion
- ... Perspective-free
- ... High-grade quality of images
- ... Edge masking is avoided

- ... Low weight
- ... Small dimensions
- ... Infinitely adjustable and fixable distance settings make it possible to adapt the lens to the working distance and inspection area

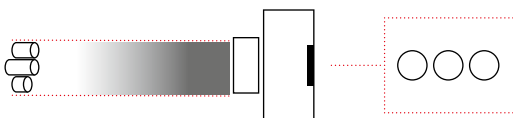
PRINCIPLE



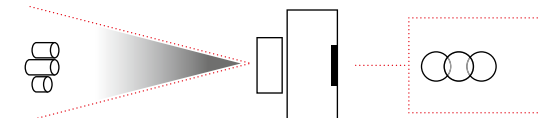
Objects are imaged perspective-free. In contrast to perspective-based imaging, the spatial orientation of the objects is lacking. That is why objects with the same dimensions at varying distances from the camera appear to be equally large in the image.



The further an object is away from the camera system, the smaller it appears in the image. This corresponds to the perception of the human eye (the natural perspective).



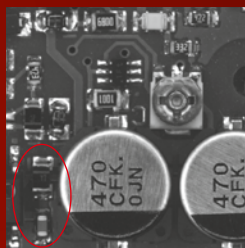
Perspective-free imaging makes it possible to represent all components without edge masking. The elements in the image do not cover up one another.



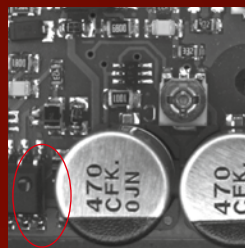
The perspective image has the effect that components of varying height can mask one another in the image. Not all objects or structures are visible.

COMPARISON WITH A TEST IMAGE

IMAGE ACQUISITION OF A CIRCUIT BOARD



Telecentric lens

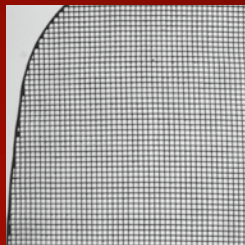


Entocentric lens

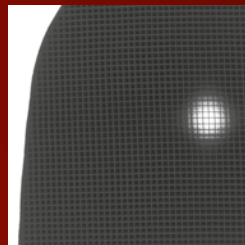
Fig. left: Viewed from the telecentric perspective, components on the base of the circuit board become visible.

Fig. right: From the entocentric perspective, the marked areas show those areas which are masked by raised components (condensers, height: 10 mm).

INSPECTION OF CATALYTIC CONVERTERS



Telecentric lens



Entocentric lens

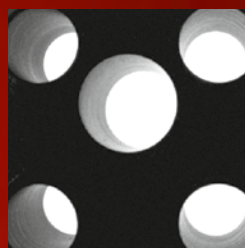
Fig. left: The honeycomb structure of the 100 mm deep ceramic body can be completely and thoroughly inspected.

Fig. right: In the perspective image, only a few honeycomb cross-sections can be seen.

MEASUREMENT OF DRILL HOLES IN A 10 mm THICK PERFORATED SHEET



Telecentric lens



Entocentric lens

Fig. left: Hole diameters appear to be equally large and do not show a distorted perspective.

Fig. right: In the perspective image of the perforated sheet, the walls of the holes are visible. A measurement is therefore not possible.

TELECENTRIC LENSES

ENLARGING TELECENTRIC LENSES



... T10
... T24
... T42
... T43
... T45
... T51
... T80
... Microscope lenses

PROPERTIES

- ... Image scale from 0.7 to 10-fold magnification
- ... Object field between $0.4 \times 0.3 \text{ mm}^2$ and $10.8 \times 10.8 \text{ mm}^2$
- ... Telecentric beam path on the object
- ... For use with matrix and line scan cameras up to a sensor diagonal/length of 21.4 mm
- ... High resolution and low-distortion

TIP

In case of very great enlargements, with transmitted light applications, diffraction effects can occur at the object edges. To minimise/prevent these occurrences, it is recommended to use blue telecentric lighting.

APPLICATION FIELDS

- ... Measuring/inspecting of very small, flat parts
- ... High detail resolution of small object fields (recognition of surface structures in the μm range)
- ... Measurement of vacuum pipette holes
- ... Inspection and measurement of high precision milled parts, miniature and microscopic injection-moulded parts

REDUCING TELECENTRIC LENSES



... T100
... T107
... T125
... T150
... T151/152
... T201
... T240
... T360

PROPERTIES

- ... Image scale from 0.07 to 0.7-fold magnification
- ... Object field of $6.6 \times 4.9 \text{ mm}^2$ to $100 \times 75 \text{ mm}^2$
- ... For use with matrix and line scan cameras up to a sensor diagonal/length of 21.4 mm (1.2")
- ... Lens with long and short working distance for the same object field
- ... Adjustable aperture enables adaptation of resolution and depth of field
- ... Particularly precise in combination with telecentric lighting

APPLICATION FIELDS

- ... Measurement and inspection of objects which:
 - Are located in different positions vis-à-vis the camera
 - Could not be exactly positioned
- ... Control of deeper, more complex parts with holes, openings, raised areas, etc.
- ... Precise measurement of the outer contour of light-transmissive objects



TELECENTRIC WIDEFIELD LENSES

PROPERTIES

- ... Image scale from 0.03 to 0.08-fold magnification
- ... Object field between 77 x 58 mm² and 360 x 230 mm²
- ... Maximum image sensor diagonal 16 mm (1")
- ... Low weight with extremely large object field
- ... Most effective in combination with monochromatic lighting

APPLICATION FIELDS

- ... Large objects or a high quantity of objects to be controlled at one time
- ... Inspection of deeper objects with holes, openings, etc.
- ... Inspection of the honeycomb structure of catalytic converters



... TL250 ... TL371 ... TL380

ACCESSORIES

MICROSCOPE TUBES

- For use in cameras with C-mount connectors, in combination with microscope lenses



LENS MOUNT

- For secure attachment of the telecentric lenses in the test stand or on the machine



PSOgo SERIES

- Front-end unit for telecentric lenses and telecentric lighting for integration under confined environmental conditions
- Optical beam path is deflected by 90°.



FILTER

- For the focused filtering of certain light information
- To protect the lenses



SAFETY GLASSES AND POLARISING FILTER

- Protect the front lens against contamination and mechanical influence
- Suitable for all series

TIP

In the detailed product overview table you will quickly find the right telecentric lens for your requirements.



<http://www.vision-control.com/en/products-services/optics/product-overview/>

TELECENTRIC LIGHTS

- Is especially suitable for use in combination with telecentric lenses
- Application: High precision measurements, suppression of stray light on the outer contour of the test objects



ENTOCENTRIC LENSES

| SERIES | ... VCN ... VCG | ... VCH ... VCR | ... VCZ ... VCK | ... RWO ... RWQ |
|--------|--------------------|--------------------|--------------------|--------------------|
|--------|--------------------|--------------------|--------------------|--------------------|

APPLICATIONS

- ... Packaging industry
 - . Printed image control, presence control of packaged goods
- ... Glass industry
 - . Surface inspection of plate glass, inspecting the mouths of returnable bottles
- ... Automotive
 - . The presence of individual components in a complex assembly
 - . Read codes and characters

VCN

- Lens series for typical machine vision tasks
- ... For cameras with image sensors up to 2/3"
 - ... Minimum pixel size 6 μm
 - ... Focal lengths of 3.5 to 100 mm
 - ... Distance and aperture settings can be fixed

VCH

- Lenses with high quality imaging optics
- ... For high resolution cameras up to 1"
 - ... Minimum pixel size 4 μm
 - ... Focal lengths of 4.8 to 50 mm
 - ... Distance and aperture settings are adjustable

VCG

- Lens series for typical machine vision tasks
- ... For cameras with image sensors up to 1.2"
 - ... Focal lengths of 4.8 to 50 mm
 - ... Distance and aperture settings are adjustable

VCR

- High resolution lenses, smallest resolvable pixel pitch of 3.5 μm
- ... For cameras with image sensors up to 1.2"
 - ... Minimum pixel size 3.5 μm
 - ... Distance and aperture settings are adjustable

TIP

Focal length calculator
<http://www.vision-control.com/en/products-services/optics/focal-length-calculator/>

Use this to determine the focal length for entocentric lenses and the corresponding intermediate ring, if needed.

- ! The selection tables and focal length calculator provide initial assistance. **If you have specific application scenarios, please contact our Support team: +49/0 3681-797420.** To reliably select components in special borderline cases, a feasibility study is absolutely imperative. For this, our experienced Service staff are available to help you in our application lab.



VCZ

Zoom lens

- ... For cameras with image sensors up to 1.2"
- ... Adjustable focal length from 4.5 to 10 mm
- ... Distance and aperture settings are adjustable

VCK

Lenses with the smallest dimensions, low own weight (enables the use on moving machine parts)

- ... For cameras with image sensors up to 1/3"
- ... Focal lengths of 2.1 to 25 mm
- ... Fixed-focus lens with a fixed aperture, focusable by means of adapter

RWO

Lenses with a beam path deflected by 90°, for use under difficult installation conditions

- ... For cameras with image sensors up to 2/3"
- ... Fixed working distance
- ... Test areas from 2.1 x 2.1 mm² to 131 x 99 mm²
- ... Adjustable aperture
- ... Low distortion (<0.1%)

RWQ

Lenses with a beam path deflected by 90°, for use under difficult installation conditions

- ... For cameras with image sensors up to 1.2"
- ... Fixed working distance
- ... Test areas from 3.7 x 2.8 mm² to 226 x 226 mm²
- ... Adjustable aperture
- ... Low distortion (<0.1%)

ACCESSORIES

INTERMEDIATE RINGS

- The working distance and image scale of an entocentric lens can be adjusted by means of intermediate rings.
- By utilising intermediate rings it is also possible to use lenses at a lesser distance than the minimum object distance. The focal length calculator supports you in determining the exact size.

FILTER

- For the focused filtering of certain light information
- To protect the lenses



VISION & CONTROL GMBH

Mittelbergstraße 16 D-98527 Suhl Germany

Phone +49 (0)3681/7974-0 Fax +49 (0)3681/7974-44

www.vision-control.com