

## CATADIOPTRIC PC LENSES

**PCCD Series** are pericentric lenses exclusively developed and produced by Opto Engineering® to enable the 360° side view imaging of small objects.

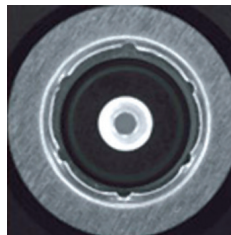
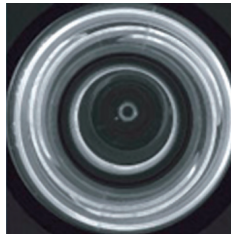
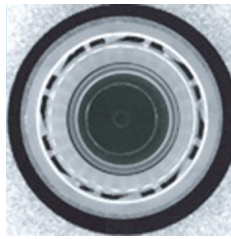
Their innovative optical design, based on a catadioptric system, makes it possible to image small objects, with diameters as small as 7 mm.

The sides of the object are imaged through the catadioptric system, while the top surface is directly imaged onto the center of the detector. The compactness and high resolution performances of these lenses make them the perfect choice for the inspection of components like pharmaceutical containers, plastic caps, pre-forms, bottle necks, screws and other threaded objects.

# 7 to 25 mm diameter pericentric imaging



**Sample Images taken with PCCD Series Lenses:** the sides of small objects are displayed inside a circular crown on the external part of the image. The top of the object is displayed at the center of the image.

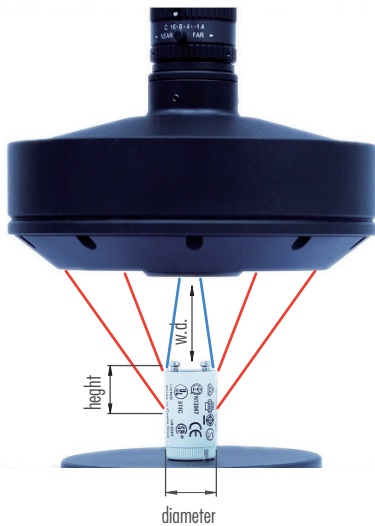


### KEY ADVANTAGES

- 1 360° imaging of small objects:** parts down to 7.5 mm in diameter can be imaged
- 2 Very wide lateral viewing angle:** object sides viewing angle approaches 45°
- 3 Compactness:** the lens can be easily held and integrated in any system
- 4 Perfect chromatic correction:** for RGB camera applications and colour inspection

part number		PCCD013	PCCD012
detector size		1/3"	1/2"
min. FOV (diam x height)	(mm x mm)	7,5 x 5	7,5 x 5
typ. FOV (diam x height)	(mm x mm)	15 x 10	15 x 10
max. FOV (diam x height)	(mm x mm)	25 x 17	25 x 17
wavelength range	(nm)	450 .. 650	450 .. 650
working distance	(mm)	28 .. 56	28 .. 53
CTF @ 50 lp/mm	(%)	> 35	> 30
f-number		6-32	8-32
diameter	(mm)	143	143
length	(mm)	110,5	110,5
weight	(g)	980	990
mount		C	C

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$$c (\%) = \text{diameter} / \text{detector short side}$$

### FIELD OF VIEW SELECTION CHART

PCCD013 field of view				
diameter (mm)	height (mm)	w.d. (mm)	F/#	c (%)
7,5	5,0	53	24	11%
10	6,7	49	16	15%
15	10,0	42	12	22%
20	13,3	35	8	30%
25	16,7	28	6	37%

PCCD012 field of view				
diameter (mm)	height (mm)	w.d. (mm)	F/#	c (%)
7,5	5,0	53	32	13%
10	6,7	49	24	17%
15	10,0	42	16	25%
20	13,3	34	12	33%
25	16,7	28	8	42%



PCCD Pericentric lenses can work either with 1/2" and 1/3" detectors, like standard Pericentric Lenses. The sides of the object being inspected are observed over a wide view angle, approaching 45° at its maximum; this feature makes it possible to inspect complex object geometries under a convenient perspective.

The image of the external walls of the object, captured through the catadioptric system, is inscribed into the short side of the camera detector within a circular crown.

On the other hand, the top of the object is directly imaged onto the central part of the detector area: both the lateral and top view of the object are in perfect focus at the same time.

The "c" parameter describes the dimension of the top view image: it is calculated as the ratio between the central top view diameter and the short side of the detector. The typical ratio between the object height and its diameter is 2/3, which means that, for a given object diameter (i.e. 15 mm), the recommended inspection height will be around 67% of the diameter (10 mm). However, this parameter can be modified to accommodate for different aspect ratios (up to 100%) by adjusting the lens' working distance, focus and F-number.

The table below shows possible combinations of object *diameters* and *heights* along with the appropriate *working distance* and recommended *F-number*; the "c" parameter for each configuration is also listed.

The optics is protected by a glass window, to prevent from the intrusion of dust and impurities into the optical system. The top of the object is imaged through a small removable window, located at the center of the lens. This optical window can be removed and replaced with other type of optics in order to compensate for the object depth, where necessary.

The window's mounting thread can also be used to host and fix a LED illuminator.