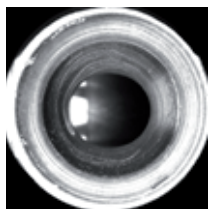


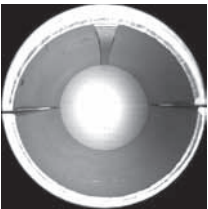


HOLE INSPECTION OPTICS have been developed by Opto Engineering to enable the perfect viewing of holed objects, cavities and containers. Unlike common optics or so called “pinhole lenses” which can only image flat fields of view, hole inspection optics are specifically designed to image both the bottom of a hole and its vertical walls. Thanks to the large view angle (>82° degree) and innovative optical design, these lenses are compatible with a wide range of object diameters and thicknesses. Hole inspection optics are therefore the solution of choice to inspect a variety of different object shapes such as cylinders, cones, holes, bottles or threaded objects.

SAMPLE IMAGES TAKEN WITH HOLE INSPECTION OPTICS



Perfect focusing is maintained throughout the entire depth of a hole.



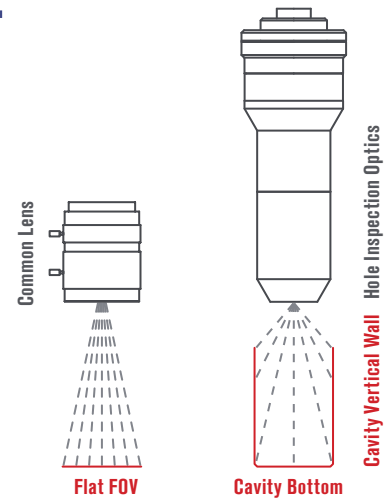
Conical cavity inspection is possible from both sides.



Writings inside a cavity, as well as scratches and tiny defects are easily imaged.



Square, polygonal or irregular cross section objects can be inspected.



KEY ADVANTAGES

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

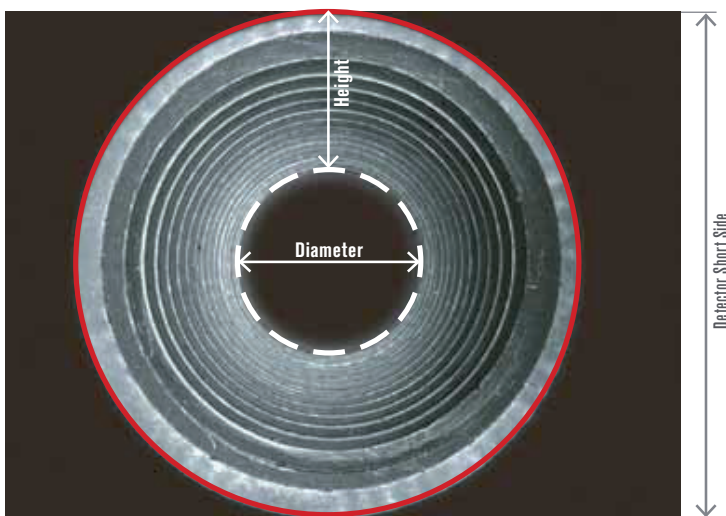
Sample surfaces are unwrapped by the lens under a convenient perspective to clearly display their features.



Hole Inspection optics can image cavities whose diameters and thicknesses span over a wide range of values.

For a given hole diameter, the table below lists the maximum cavity height allowed for both high resolution imaging (small pixel sizes) and normal resolution imaging (>5 micron pixels) applications; the "r" ratio indicates how much of the detector area gets covered by the image of the hole inner walls.

The listed working distance values ensure that the object image is exactly inscribed into the short side of the detector, thus maximizing "r" ratio and image resolution.



$r (\%) = \text{Diameter} / \text{Detector Short Side}$

PART NUMBER		PCH1013	PCH1012
Detector Size		1/3"	1/2"
Min. FOV (Diam x Height)	(mm x mm)	10 x 10	10 x 10
Max. FOV (Diam x Height)	(mm x mm)	120 x 190	120 x 190
Wavelength Range	(nm)	450 .. 650	450 .. 650
Working Distance	(mm)	5 .. 35	5 .. 35
CTF @ 50 lp/mm	(%)	> 40	> 40
F-Number		4,7	5,8
Diameter	(mm)	28,0	28,0
Length	(mm)	102,0	104,0
Weight	(g)	250	250
Mount		C	C

PCH1013 and PCH1012: FIELD OF VIEW SELECTION CHART

Hole Diameter (mm)	High Res. Imaging			Normal Res. Imaging		
	Cavity Height (mm)	r Ratio (%)	Working Distance (mm)	Cavity Height (mm)	r Ratio (%)	Working Distance (mm)
10	6	53	5	10	44	5
15	8,5	55	6,5	14,5	42	6,5
20	13	47	9	22	35	9
25	18	48	11	31	34	11
30	22	48	14	37	36	14
40	31	47	18	53	36	18
50	40	46	23	68	36	23
60	50	43	29	85	35	29
70	60	44	35	102	34	35
80	75	41	41	120	32	41
100	97	40	52	155	31	52
120	120	38	62	190	30	62

APPLICATION EXAMPLE: CAPS INTERNAL WALLS & BOTTOM INSPECTION

