

Dakota Micro, Inc. Camera IP Testing

Documentation of Tests performed on the Dakota Micro AgCam/EnduraCam cameras to ensure conformation to IP ratings. The below tests indicate self testing by Dakota Micro, Inc. to verify that the AgCam/EnduraCam is rated at IP69.

Updated Tests conducted throughout 2013. Randomized integrity testing performed on a regular basis to ensure continued ratings conformity.

The first digit indicates the level of protection that the enclosure provides against access to hazardous parts (e.g., electrical conductors, moving parts) and the ingress of solid foreign objects. Represents the first digit in the IP rating.

Level	Object size protected against	Effective against	Test Performed	Test Result
0	—	No protection against contact and ingress of objects	Utilized 5mm rigid sphere. No visible external entry points. No ingress.	PASS
1	>50 mm	Any large surface of the body, such as the back of a hand, but no protection against deliberate contact with a body part	Utilized 5mm rigid sphere. No visible external entry points. No ingress.	PASS
2	>12.5 mm	Fingers or similar objects	Utilized 2mm wire. No visible external entry points. No ingress.	PASS
3	>2.5 mm	Tools, thick wires, etc.	Utilized 2mm wire. No visible external entry points. No ingress.	PASS
4	>1 mm	Most wires, screws, etc.	Utilized .75mm wire. No visible entry points. No ingress. Also Camera placed in vibratory tumbler with 50+ pieces >1mm objects. No ingress.	PASS
5	dust protected	Ingress of dust is not entirely prevented, but it must not enter in sufficient quantity to interfere with the satisfactory operation of the equipment; complete protection against contact	Camera placed in pressurized dust chamber for 10 minutes with fine dust/sand mix No ingress.	PASS
6	dust tight	No ingress of dust; complete protection against contact	Camera placed in pressurized dust chamber for 10 minutes with fine dust/sand mix. No ingress.	PASS

Protection of the equipment inside the enclosure against harmful ingress of water. Indicates the second digit in the IP rating.

Level	Protected against	Details	Test Performed	Test Result
0	not protected	—	N/A	PASS
1	dripping water	Dripping water (vertically falling drops) shall have no harmful effect.	Drip box; Camera on turntable. 30 minute duration. No ingress.	PASS
2	dripping water when tilted up to 15°	Vertically dripping water shall have no harmful effect when the enclosure is tilted at an angle up to 15° from its normal position.	Enclosure in 4 fixed positions of 15° tilt. 30 minute duration. No ingress.	PASS
3	spraying water	Water falling as a spray at any angle up to 60° from the vertical shall have no harmful effect.	Oscillating hose: Spray +/- 60° from vertical, distance max 200mm, unidirectional. 10 minute duration. No ingress.	PASS
4	splashing water	Water splashing against the enclosure from any direction shall have no harmful effect.	Oscillating hose: Spray +/- 60° from vertical, distance max 200mm, omni-directional. 10 minute duration. No ingress.	PASS
5	water jets	Water projected by a nozzle against enclosure from any direction shall have no harmful effects.	Pressurized Water jet hose nozzle; Nozzle 6 mm diameter, distance 2.5 to 3m. 10 minute duration. No ingress.	PASS
6	powerful water jets	Water projected in powerful jets against the enclosure from any direction shall have no harmful effects.	Pressurized Water jet hose nozzle; Nozzle 6mm diameter, distance 2m to 3m. 10 minute duration. No ingress.	PASS
7	immersion up to 1 m	Ingress of water in harmful quantity shall not be possible when the enclosure is immersed in water under defined conditions of pressure and time (up to 1 m of submersion).	Immersion tank; Water-level on camera: 1m above bottom. Duration: 30 minute. No ingress.	PASS
8	immersion beyond 1 m	The equipment is suitable for continuous immersion in water under conditions which shall be specified by the manufacturer. NOTE: Normally, this will mean that the equipment is hermetically sealed. However, with certain types of equipment, it can mean that water can enter but only in such a manner that produces no harmful effects.	Immersion tank: 24m. Duration: 5 days. No Ingress.	PASS
9	Powerful high temperature water jets	Protected against close-range high pressure, high temperature spray downs	High pressure, high temperature water jet. Duration: 30 minutes No Ingress.	PASS

“Real World” Testing

Details	Test Result
Camera submerged in salt (ocean) water for 7 days at a depth of 750 feet. No ingress or loss of performance.	PASS
Camera submerged in salt water (indoor shrimp tanks) for 4+ years at a depth of .5-1 meters. No ingress or loss of performance.	PASS
Cameras exposed to rapid, repetitive temperature fluctuations. Indoors 4 hours at approx. 74°, then outdoors at approx. -35°. Test repeated (camera brought back and forth between inside and outside) 10 times. No ingress or loss of performance.	PASS