

# IP verses TF

## What is IP?

**IP** stands for International Protection Rating or Ingress Protection Rating. It normally consists of the letters **IP** followed by a two digit number, although correctly portrayed it consists of the letter **IP** and followed by a three digit number. The third number is commonly omitted (Protection against mechanical impacts) because most electronic devices would be difficult and expensive to make to rate well in all three categories.

The first number refers to the ingress of solid objects, the second against ingress of liquids, the third against the ingress of mechanical shock. The higher the number, the better the protection.

<b>SOLIDS, First digit</b>	
<b>0</b>	No protection (sometimes X)
<b>1</b>	Protected against solid objects up to 50mm <sup>3</sup> , e.g. touch by persons hands.
<b>2</b>	Protected against solid objects up to 12mm <sup>3</sup> , e.g. ingress of persons fingers.
<b>3</b>	Protected against solid objects up to 2.5mm <sup>3</sup> , e.g. ingress of tools and wires.
<b>4</b>	Protected against solid objects 1mm <sup>3</sup> , e.g. ingress of tools wires and small wires.
<b>5</b>	Protected against dust, e.g. no harmful accumulation
<b>6</b>	Totally protected against the ingress of dust.

<b>LIQUIDS, Second digit</b>	
<b>0</b>	No protection (sometimes X)
<b>1</b>	Protection against vertically falling drops of water, e.g. vertically dripping water cannot have immediate damaging effect. Test duration 10 min.
<b>2</b>	Protection against light sprays of water up to 15° from vertical either side. Cannot have any immediate damaging effect. Test duration 10 min.
<b>3</b>	Protection against light sprays of water up to 60° from vertical either side. Cannot have any immediate damaging effects. Water volume: 0.7 liters/minute, pressure: 80-100 kN/m <sup>2</sup> . Test duration 5 min.
<b>4</b>	Protection against light sprays of water from all directions, (splashing water), e.g. limited ingress permitted as long as no immediate damaging effects. Water volume: 10 liters/min, pressure 80-100 kNm <sup>2</sup> Test 10 min.
<b>5</b>	Protected against low pressure jets of water from all directions, e.g. limited ingress permitted as long as no immediate damaging effects. Water volume: 12.5 liters/min, pressure 30 kN/m <sup>2</sup> , 3m distance,. Test 3 min.
<b>6</b>	Protected against high pressure jets of water from all directions, e.g. limited ingress permitted as long as no immediate damaging effects. Water volume: 100 liters/min., pressure 100 kN/m <sup>2</sup> . Test duration 3 min.
<b>7</b>	Protected against the effect of intermittent immersion between 15cm to 1m, e.g. water may not enter the enclosure to such an extent that damaging effects become apparent. Test duration 30 minutes.
<b>8</b>	Protected against continuous immersion that no damaging effects are apparent. Submersion conditions must be agreed upon by the manufacturer and user. Must be more severe than code 7.
<b>9</b>	Protected against highly pressurized water and steam jets.

<b>MECHANICAL IMPACT, Third digit</b>	
<b>0</b>	No protection (sometimes X)
<b>1</b>	Protected against impact of 0.225 joule, e.g. 150g weight falling from 15 cm height.
<b>2</b>	Protected against impact of 0.375 joule, e.g. 250 g weight falling from 15 cm height.
<b>3</b>	Protected against impact of 0.5 joule, e.g. 250 g weight falling from 20 cm height
<b>4</b>	Protected against impact of 2.0 joule, e.g. 500 g weight falling from 40 cm height.
<b>5</b>	Protected against impact of 6.0 joule, e.g. 1500 g weight falling from 40 cm height.
<b>6</b>	Protected against impact of 20.0 joule, e.g. 5000 g weight falling from 40 cm height.

## Why TF standard?

The IP standard is too weak and loose to justify a **TUFFCAM** product. Our own testing standards by far exceed any IP rating to render them useless. Also too much trickery is associated in meeting the IP standard. Many cameras claim and do meet IP-67 standards leading the consumer to believe their product is durable, will last and can survive outdoors. After all, a camera that can survive intermittent immersion for a test duration of 30 minutes (IP-67) should have no problem surviving the great outdoors, right? Wrong! The camera housing which is what the IP standard is for, can easily pass when tested. After the test, the connectors used will simply short when immersed in water. Also a camera housing that leaks a little during the 30 minute test but still works, passed! This is why when the camera boasts an IP-67 rating the camera specifications still rate the camera be used in less than 80% humidity. Unless you live in a perpetually dry desert you will need to bring your outdoor camera indoors when the humidity exceeds 80%.

Even the highest (IP-69) rating is in-adequate for **TUFFCAM**.

For a **TUFFCAM** steam jets are not a problem and neither is water pressure up to 500psi indefinitely and there can never be water ingress of any amount.

As for mechanical impact we test differently, than the IP standard.

We use g force. An IP rating for 20.0 joules of energy is nothing. TF-69 rates 1000 g-force which is equal to 1901.2 joules of energy.

Our TF standard is applicable to our video products, where as the IP standard is applicable to only the enclosure or housing and does not consider the long term operation of the electronics inside. A camera sealed inside of a metal enclosure is still subject to fogging of the lens, degradation or failure of electronic components, and degradation or failure due to temperature. For a video camera to be mounted outdoors, quite a few factors must be taken into consideration for the product to have any long term survivability, and the IP standard does not address any of it.

Our TF standards has been initiated to address all of the requirements needed for a video product to survive long term from outdoors to even greater harsh environments.

Back in 1996 SVS conducted its own study on the longevity of outdoor video cameras.

SVS purchased two cameras each from six different camera manufacturers that designated these to be outdoor cameras. These tests were made in New Orleans, Louisiana, where a TUFFCAM

was mounted fully exposed on the end of a building. One each of the other six cameras was mounted under the eave on the end of the same building. Where as the TUFFCAM was mounted to direct exposure to rain and sun, the other cameras were shielded from direct rain and sun, under the buildings eave. The second of each camera was the control camera kept in our lab under a controlled dry environment. Every two weeks the video quality of each camera was compared with the video quality of it's corresponding control camera. Surprisingly after just two weeks there was an observable difference in all cameras except the TUFFCAM. After six months the best of the six cameras displayed half the video quality of their control camera. The others faired worse. Only the TUFFCAM displayed no change of video quality. In fact SVS has had a TUFFCAM video camera mounted outside and powered up since 1994 as well as other models since 1999 and 2001. As of today 2011, none of the TUFFCAM cameras display any degradation in video quality when compared with it's control camera, which is now compared once or twice yearly.

To prevent moisture inside a camera housing requires the camera be vacuum evacuated, injected with dry instrument grade gas and sealed with waterproof seals and connectors. A cable exiting a camera housing allows moisture to travel through the inside of the wire and penetrate the housing. Humidity, especially above 80%, will allow electron flow between the pads of electronic components. Although not a direct short, this resistive short slowly breaks down the handling performance of the integrated circuits, thereby reducing video quality. Temperature fluctuations can also match dew point which will cause the moisture laden atmosphere inside of the camera to condense. Condensation in front of the lens reduces visibility and camera performance while condensation can short the circuit, causing immediate camera failure.

TUFFCAM products are molded solid with our BLACK GOOP, which protects the circuit boards, components, and wiring from moisture, water, chemicals, and temperature. In fact the only void in a TUFFCAM is the lens assembly itself, and this is bathed in pure Nitrogen or Argon gas. All TUFFCAM products are molded under full vacuum to remove any contaminants during the molding process. Our process of construction doesn't require an enclosure, which is what IP standards are for, and totally seals the camera and lens from the exterior atmosphere, thereby protecting it virtually for ever.

As well as permanently sealing the product, our BLACK GOOP also absorbs shock and vibration, allowing our products to survive much greater standards than what IP standards dictate.

For this reason SVS developed our TUFFCAM STANDARDS which is how we test our products to meet our customers demanding requirements.