

## DARK SPOTS IN MACHINE VISION APPLICATIONS

Understanding how lighting in the machine vision industry works is crucial to capturing the most accurate images possible. **Dark spots are caused by the hole where the camera is placed**. The effect of the dark spot is worse on shiny materials. Traditionally dark spots would be eliminated by adding a coaxial light on top of the dome but this method has its limits, such as taking unnecessary space, additional costs and longer installations. TPL Vision offers some unique solutions to these challenges.

TPL vision's main objective is to **simplify the route to the best illumination solution** for our customers. We design and create **flexible solutions** that are easily adaptable to numerous applications, at an affordable price.



**One solution that TPL Vision offers is to minimise the diameter of the hole at the top of a dome light.** Our **MR-DOME** and **SMALL SDOME II** come with hole aperture adaptors as standard - simply fix these in place at the top of the dome to reduce the dark spot. This is a much more cost-effective solution over using a coaxial illumination. The hole aperture adaptors are easily installed, and they come with various sizes to fit different lenses. The dome lights provide a high degree of homogeneity, allowing a clearer image on uneven and shiny surfaces.

The image on the left shows our multi-award winning **Modular Ringlight** which comes with a **Dome accessory** and the **hole aperture adaptors**.

Below is an example of an image before and after installing the hole aperture adaptors.

The image shows an inkjet code marked on the underside of a can, which is a shiny curved surface.



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Another option is to **add a smaller dome on the back of a flat dome light**. Flat dome lights provide brilliantly homogeneous illumination, but they have the draw back of creating a dark spot at the point where the camera is placed, particularly on shiny surfaces. Adding an SDOMEII to this camera hole is an excellent solution for reducing the dark spot effect because it is more cost effective than a coaxial light and more efficient at reducing the dark spot than simply having a smaller camera hole on your flat dome light.

The **HPFDOME** is our new **high-power flat dome**. This is an efficient light, with a 30% brightness increase and a 40% speed increase compared to the standard MFDOME+ lights. It is easy to integrate thanks to its new connector.

The HPFDOME comes installed with a rugged mounting plate and viewing hole for many of the cameras available on the market. The mounting plate also has threaded holes for direct attachment of an SDOMEII. The images below show how the product is mount together:



**Below are two images of a metal plate being illuminated.** On the left is before the SDOME II has been placed and on the right is with the SDOME II in place. Note that the outer dimensions of the FOV are reduced because the camera is further back when the SDOME II is in place.





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Another illumination technique is to place a backlight into the Field of View of the camera as if the camera is looking into a mirror. If the surface is a perfect mirror the camera will see the backlight perfectly in the reflection. If there any defects or markings on the surface, the light that goes into the defect will go away from the camera as shown in the image below on the left. The image on the right shows some dot peen marked codes on a mirrored surface being illuminated by this technique.



**TPL Vision backlights are exceptionally homogeneous and very bright.** When illuminating this way, the brightness is critical because the FOV is extended when looking through a mirror, this means you will need to have control of your depth of field.

To sum up, dark spots have long been a challenge in the machine vision industry. TPL Vision designed several solutions that are adaptable to many applications depending on the size, shape and material of the product to be analysed. The most important points to understand are **how the light reacts to the analysed surface**, and **how the position of the light and level of the camera aperture allows a clear and stable image**.



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