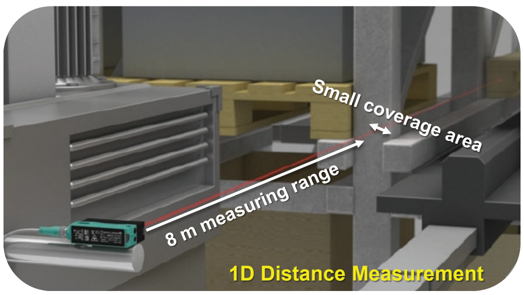
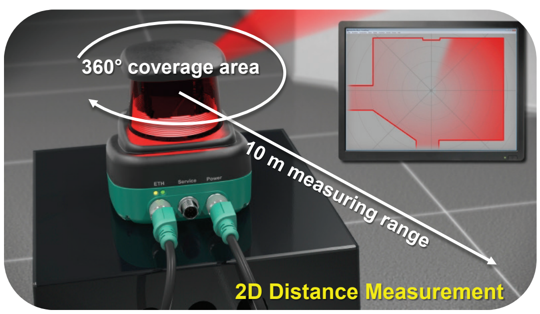
R2000 DETECTION
Q&A

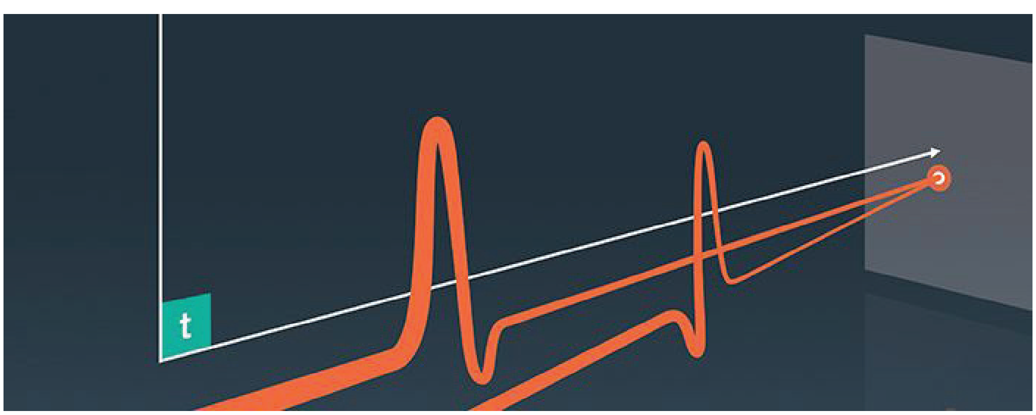
How is a 2D laser scanner different from a standard photoelectric distance measurement sensor?





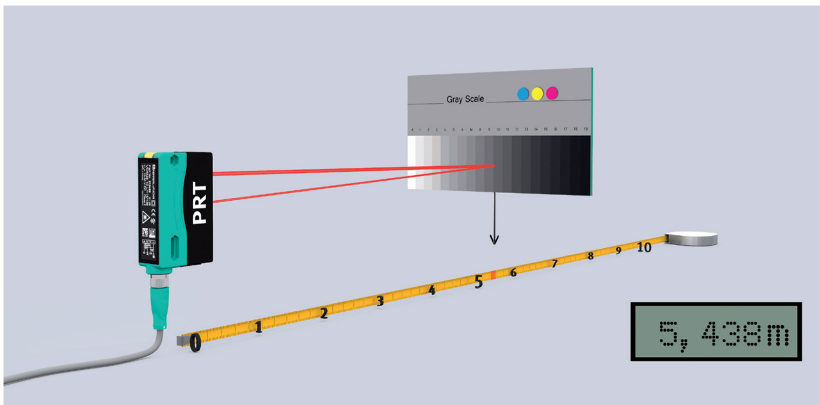
A photoelectric distance measurement sensor in the conventional sense is a device that emits a beam of light in a particular direction and then evaluates the return signal and, in some fashion, calculates the distance. In that regard, a regular photoelectric distance sensor is a 1D "scanner."

Now imagine not a single beam being emitted in one direction, but many beams being sent out in a radial fashion covering an entire plane. A 2D scanner collects additional information; it "knows" where, along the plane, an object is located. Typically, a 2D scanner returns a lot more data: the distance to an object and the angle at which the object has been detected. A 2D scanner with fine resolution, i.e., many finely spaced measurement points along the plane, returns a huge amount of data. PLCs are typically not capable of dealing with this data.



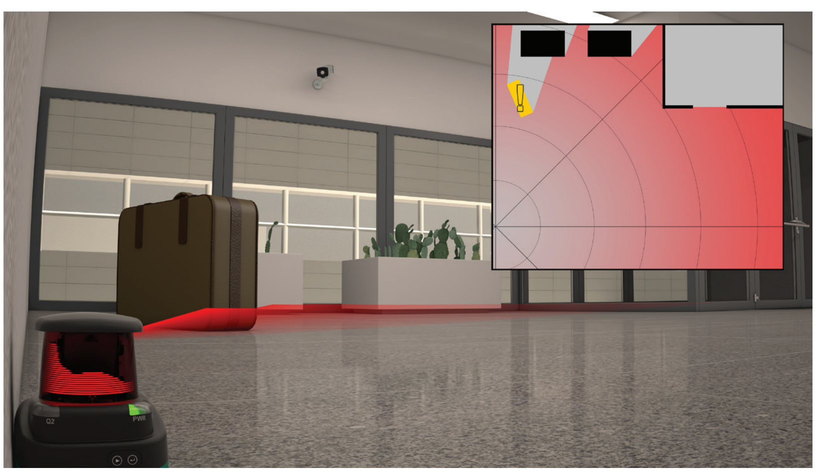
Why would anybody need a 2D laser scanner with digital outputs?

A 2D scanner with digital outputs simplifies the operation of the 2D scanner. Instead of outputting the angles and distances to a target that require the control system to evaluate lots of detailed data, the scanner is configured to associate certain areas of the 2D scan plane with digital outputs. So, the R2000 Detection makes it very simple to identify and flag an object somewhere along the 2D plane. The R2000 Detection can easily be used with conventional PLC logic.



Again, looking at a more traditional photoelectric sensor may help. Imagine a sensor, like the Pepperl+Fuchs VDM28, which is capable of measuring the distance to an object with great precision. The VDM28 can then send that distance information to the control system so that the control system can determine what to do next.

Perhaps the goal is to only process items that are between 5 m and 6 m from the sensor. To make this operation simpler, it is common for a sensor to internally evaluate the distance and turn on its output when the part is in the desired range.



The 2D scanner with digital outputs extends this concept to 2D applications. Instead of dealing with raw angle and distance data, the user can configure zones or fields and then associate these with outputs. Again, the 2D scanner extends the operation of a traditional photoelectric sensor to 2 dimensions.

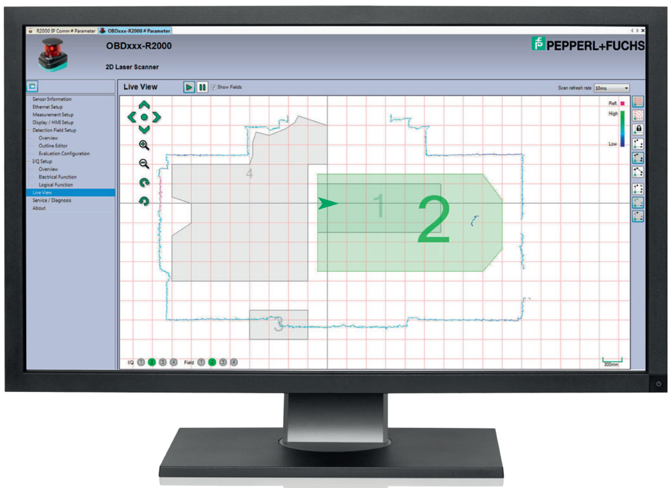
What software is needed to configure the R2000 Detection?

1. **PACTware 4.X**

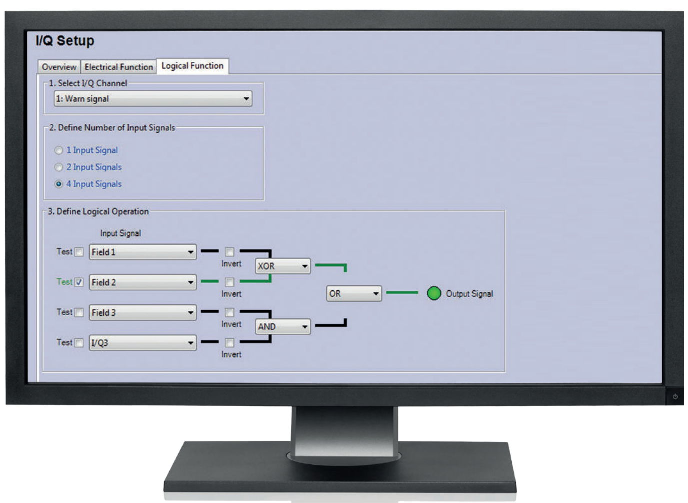
   PACTware is an FDT or “field device tool.” Simply put, it’s an application for installing sensor plug-ins or drivers.

2. **R2000 DTM**

   A DTM or “device type manager” can be thought of as a plug-in or driver created specifically for a family of sensing devices. It provides a user-friendly, graphical user interface when used inside PACTware.



The four detection fields are quickly and easily defined with the DTM’s intuitive field editor.

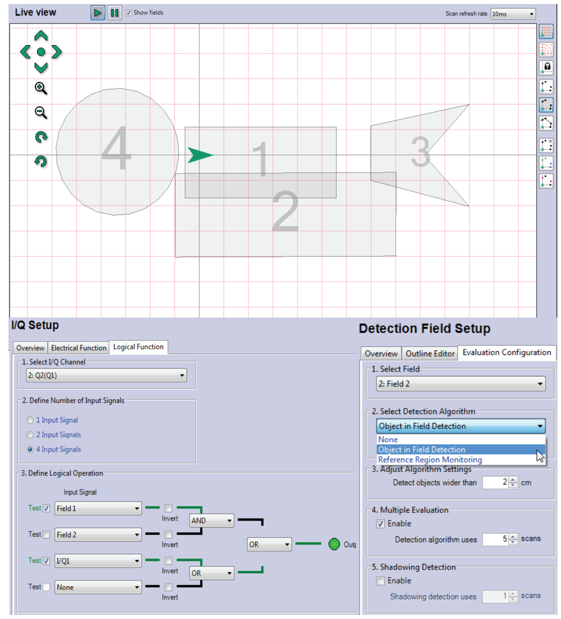


Fields and inputs are linked logically to the outputs and make configuration very simple and user-friendly.

PACTware and R2000 DTM software are a free download at **www.pepperl-fuchs.com/dtm-r2000**

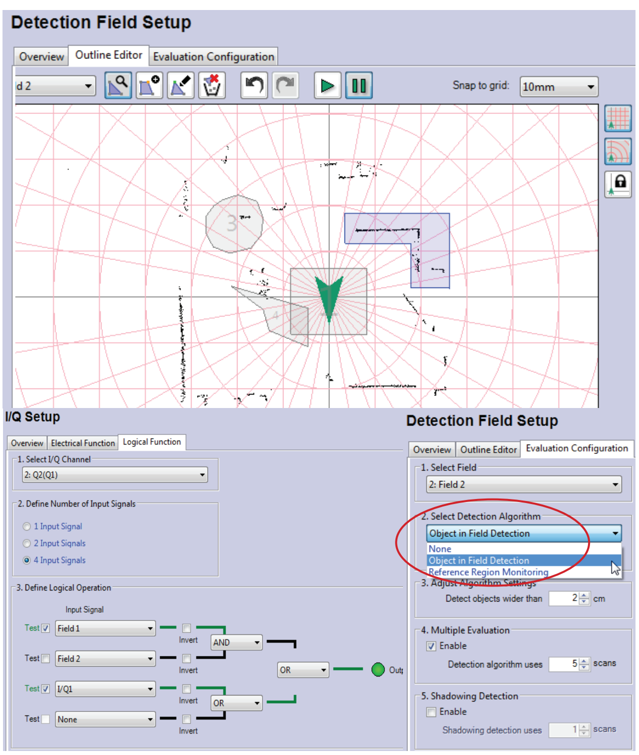
PACTware™ supported by Pepperl+Fuchs

How many customizable fields does the R2000 Detection offer?



You can configure up to four detection fields. Each field can be as simple or as complicated as you like. They can overlap, can be triangular, rectangular, or have virtually any other shape.

What is a detection algorithm? What is Reference Region Monitoring, and when would I use it?



After you have created your custom field, the next step is to select the detection algorithm. This refers to how the object is detected in the field you have just drawn. You have two choices:

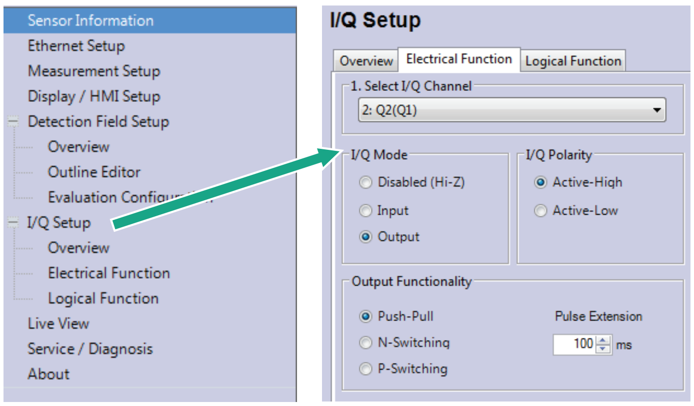
1. **Object in field detection:** Object in field detection means that as soon as an object is detected within the field, the field becomes active.

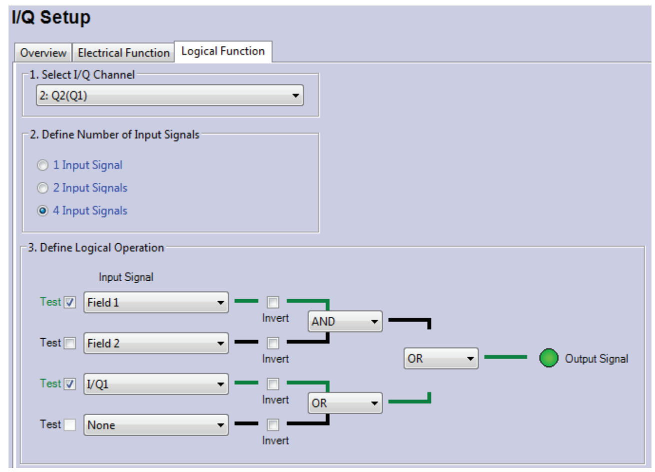
2. **Reference region monitoring:** Reference region monitoring is very similar to background evaluation, a technology we offer in some 1D triangulation-based sensors. In this mode, you draw the field around a reference point such as a floor or wall, then if an object blocks that reference point, the field becomes active. This is very useful because objects can be more reliably detected even under the condition where no light is received back to the sensor. This scenario tends to occur when detecting objects with sharp angles and shiny edges or surfaces. Like a car, for example.

By using a fixed background in the same way a retroreflective sensor uses a reflector, the R2000 Detection scanner can oftentimes detect targets that other scanners cannot. And the background can be just about anything stationary...like a conveyor sidewall, machine part, or factory floor, for example.

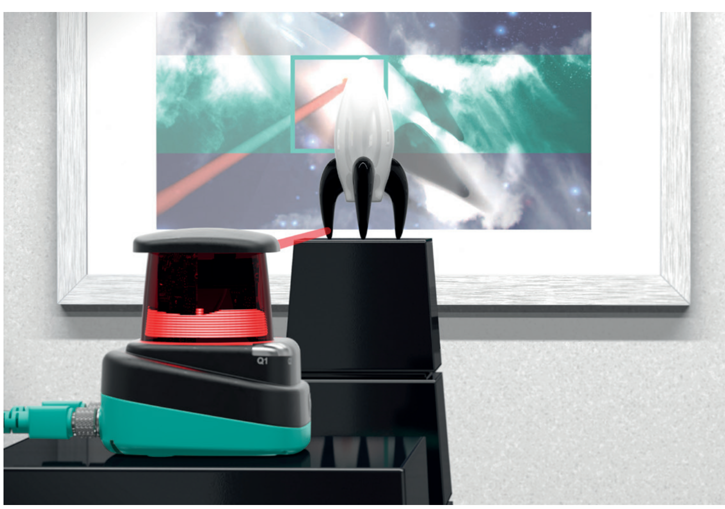
How many outputs does the R2000 offer and how can they be logically combined?

The R2000 offers four independent digital I/O channels. After you have drawn your detection field and customized it to meet your specific needs, you can assign the field to one or more digital I/O channels. Each I/O channel can be configured as an input or output. Outputs can be either an NPN or PNP type; you can add a time delay and change the polarity of the field to N.O. or N.C. Additionally, you can assign logic functions like AND, OR, and XOR with one or more detection fields. This increases the usability of the R2000 Detection and allows multiple customizable fields to be evaluated simultaneously.





Why would I want to configure one of the digital I/O channels as an input?



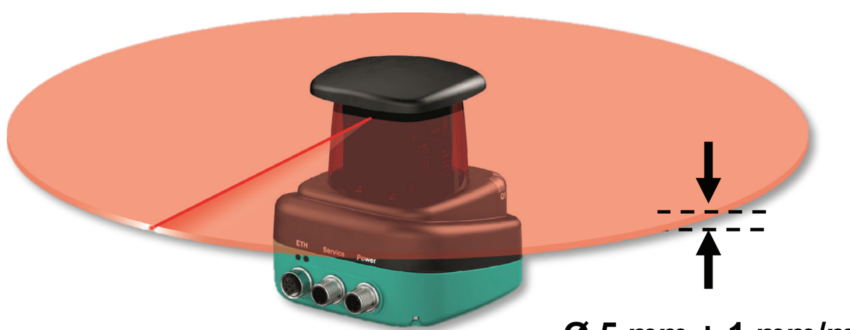
Inputs are not used as commonly as outputs, but here's an example of when you may want to use one: Let's assume that you only want the R2000 to evaluate a field at a specific point in a process or under a certain condition. In all other cases, you want the output to be inactive. Therefore, an external trigger sensor can be used as an input that you can then combine with a specific field in the logical operation section.

Why is this device not safety rated?

Just like the vast majority of sensor applications do not require safety ratings, most applications for 2D laser scanners are dealing with machine detection where safety is just not a requirement. Assistance systems are a new class of applications where a 2D scanner can improve the security of an operation without having to be safety rated.

You talk about precision. What does that mean, and why is it important?

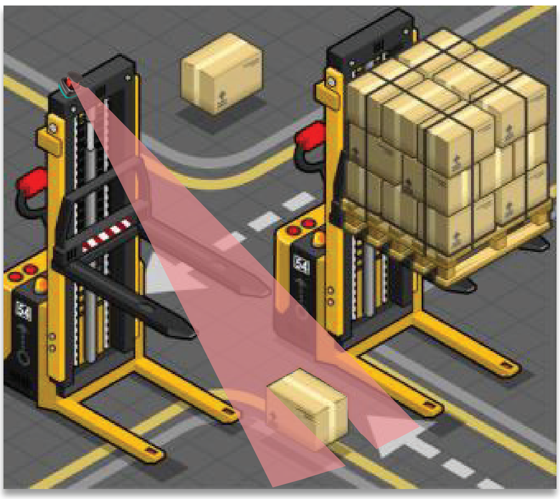
With a 2D laser scanner, precision relates to its ability to accurately measure the distance to an object and correctly determine the angle where the measurement takes place. Other factors like a truly flat, wobble-fee scan plane (discussed later) are also important. The R2000 Detection was designed to shine in all those aspects, giving a user the ability to solve the toughest applications reliably, every time.



What applications can be addressed with this scanner?

The innovative R2000 Detection 2D laser scanner is the perfect combination of modern technology and design elements that raises the bar in scanning technology. This opens up a range of interesting new applications for the R2000. Here are just a few examples:

Level inspection of tubs or cartons on a conveyor



Obstacle detection on an automated forklift

Obstacle detection in a warehouse

Height detection of pallets on a palletizer

Collision avoidance on automated forklift

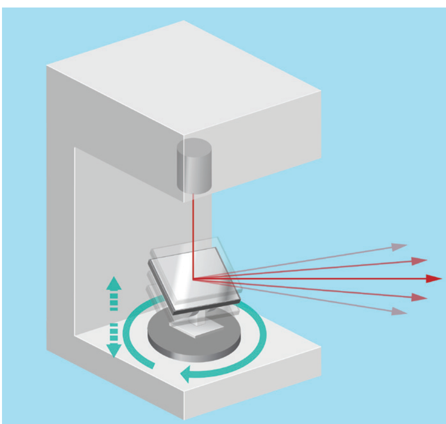
Collision avoidance on overhead monorail

R2000 Detection: Q&A

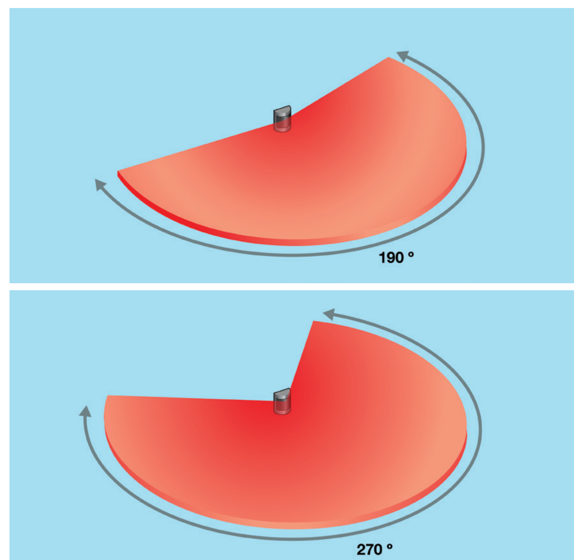
The R2000 Detection uses a unique rotation measurement system. What benefits does this provide?

Unlike typical 2D scanners, the R2000 does not use a spinning mirror to fan the light beam around a circle. Instead, the R2000 spins the entire measuring head. By rotating the measurement head rather than a mirror, we can achieve a full, 360° field of view. Additionally, no spinning mirror and improved rotational efficiency eliminate scanner "wobble." Hence the R2000's "wobble free" scan plane. Also, the shape and intensity of the R2000's laser spot is completely independent of the measurement angle or rotational motion. This is not the case in rotating mirror designs—the emitted light spot tumbles along the scan plane. In order to make a rotating mirror design work reasonably well, the alignment of the laser axis and mirror axis is critical. Any deviation will result in a significantly magnified wobble along the scan plane. In a nutshell, not having to deal with a rotating mirror removes a whole class of design limitations and problems—this is proven with the superior technical data of the R2000.

The competition

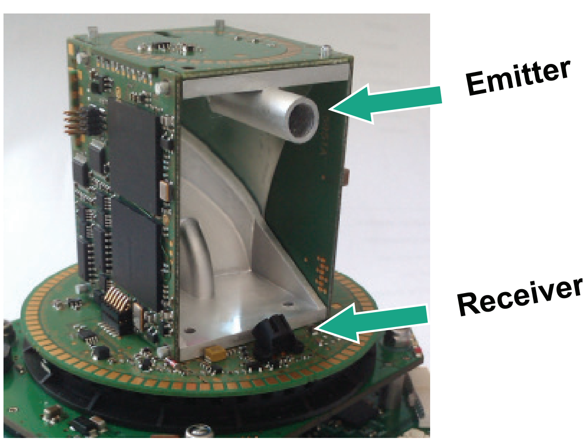


Most 2D scanners spin a mirror, which tends to wobble as it turns, and cannot provide a 360° field of view

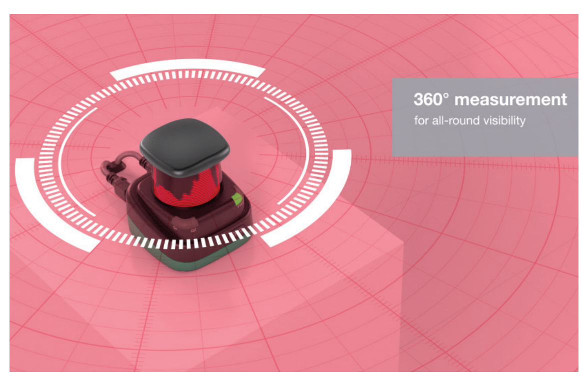


Rotating mirror design produces a limited field of view, e.g., 270°

The R2000 Detection



R2000 Detection eliminates scanner "wobble" by rotating a measuring head, not a mirror

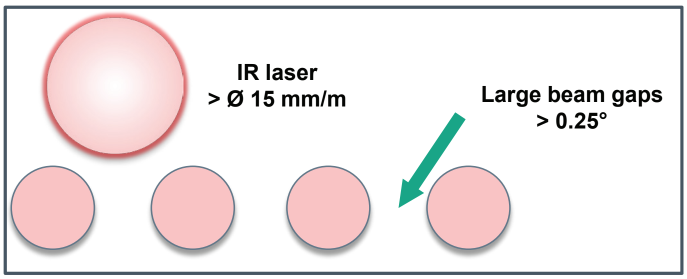


Rotating measurement head creates a "wobble free" 360° field of view

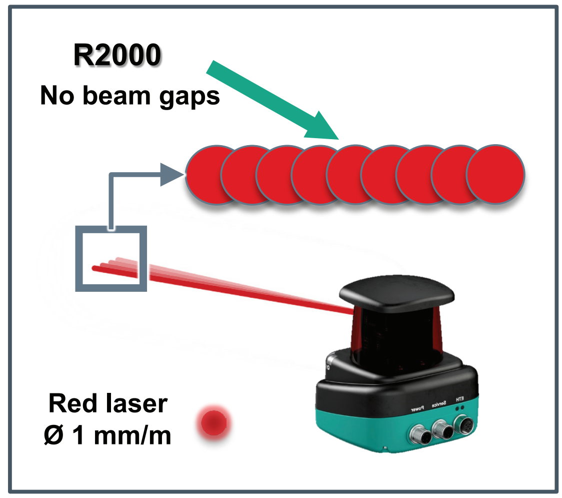
What are the benefits of having a small beam diameter and high angular resolution?

Beam diameter and angular resolution are very important specifications for all 2D laser scanners. They are the key factors that govern the minimum object size that you can detect reliably. The smaller the light spot, the smaller the objects you are trying to detect can be. Also, the higher the angular resolution, the smaller the distance between beam gaps. So, the smaller the objects you are trying to detect can be.

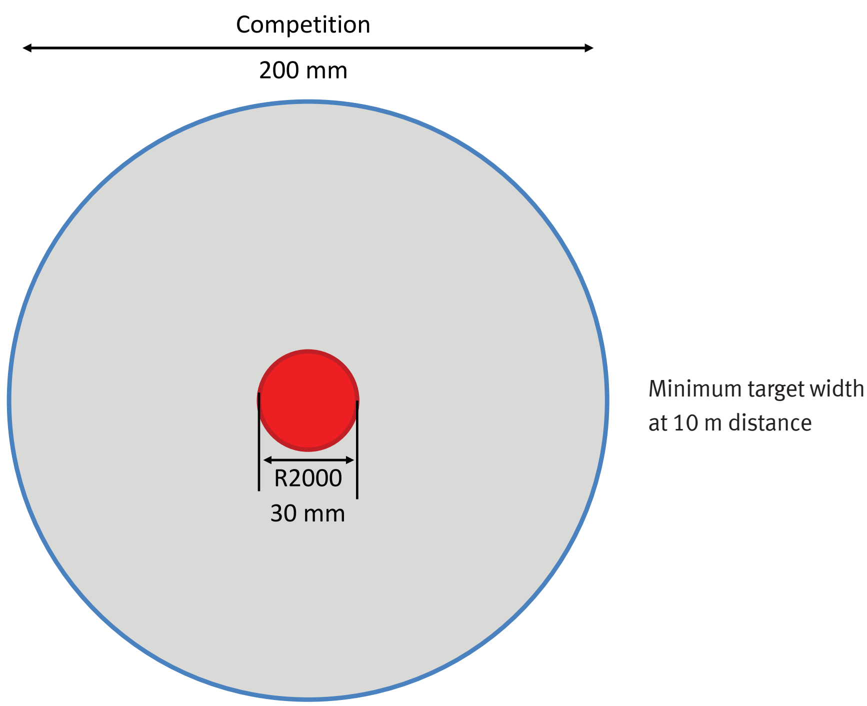
The competition



The R2000 Detection



Small object detection capability



I read about the razor-sharp scan plane. Why is this a critical benefit?

A wobble-free scanner combined with a sharp, pinpoint laser spot makes the plane of light created by the R2000 incredibly stable and razor-sharp. This serves a very practical purpose—sensing objects in tight spaces or just above the surface of a large object. For example, the razor-sharp scan plane allows you to put the sensor right next to a shelf in order to detect small intrusions into the field.