



Sorting with

Up to 6,000 packages per day can be handled with the solution, consisting of a collaborative robot arm, a 3D sensor from ifm and software from Unchained Robotics.

Depending on the customer's requirements, other robots can be used to achieve higher frequency rates or move heavier loads.

3D sensor as the heart of a pick & place solution

Christmas time is calendar time. When the turn of the year approaches, the production of personalised calendars reaches its peak. Individually designed calendars are appreciated as a year-round reminder of happy moments. By means of their pick & place solution in a printing shop, the start-up Unchained Robotics help to deliver the personalised calendars to the customers as quickly as possible. The central elements: a collaborative robot and the 3D sensor from ifm.

The young company Unchained Robotics aims at simplifying the configuration of cobots and their process integration.

An industrial area on the outskirts of Paderborn in East Westphalia: this is where large quantities of calendars are produced. Whether 100 copies for business customers or individual copies for private individuals who create their own personal calendar on online portals: a great variety of calendars in different formats from DIN A5 to DIN A3 are packed for shipment and fed to the pick & place station from Unchained Robotics. Here, a laser scanner automatically detects the bar code to allow tracking via track & trace, before the calendar is picked from the conveyor belt by a collaborative robot and placed on a transport pallet or in a post box – neatly sorted by size.



unfailing Precision

■ Convinced by the 3D sensor – and ifm's technical support

The heart of the robot installation is the 3D sensor from ifm, the O3D. The operating principle of the O3D is based on the time-of-flight principle.

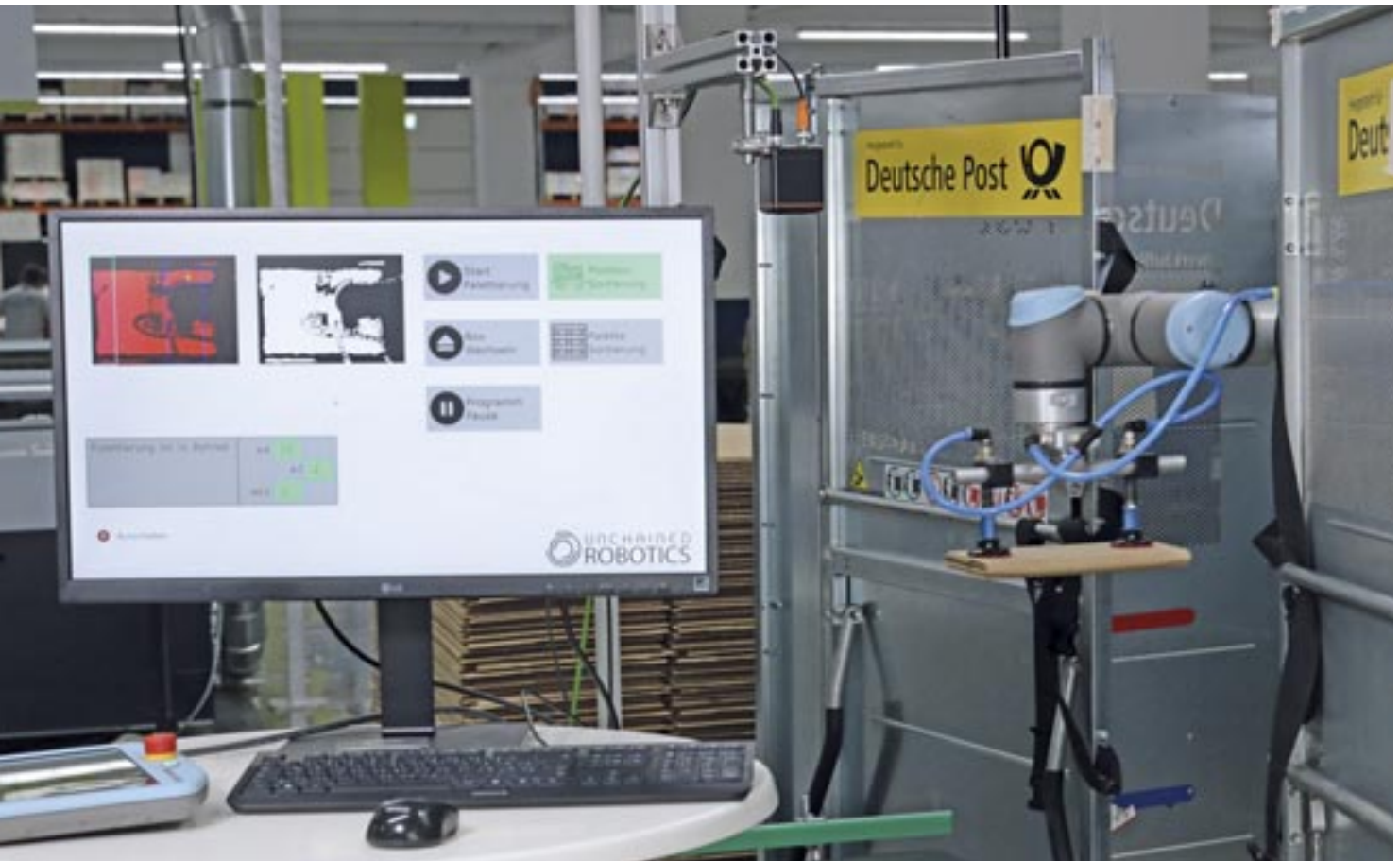
By means of 23,000 pixels arranged in a matrix, the 3D sensor detects the time needed by the light emitted to reach the sensor again as a reflection per capture. Based on this data, the O3D precisely calculates the spatial dimensions of objects and scenes.

“This aspect played an important role in our decision for the O3D,” says Mladen Milicevic, one of the founders of Unchained Robotics. “No other equipment or process stops are necessary, because the sensor exactly detects the height, basic form, angle and displacement of each package. This means that the packages can be placed on the conveyor belt without observing a particular arrangement or orientation. This reduces the strain on the employees and accelerates the manual process,” explains Milicevi.



Based on the data transferred by the sensor, the software calculates the robot arm's movements to ensure precise positioning of the package at the placement location.

” We particularly opted for the O3D and for ifm because of the easy integration into our in-house developed software



Exact data and precise calculation are required to avoid collisions when space is at a premium.

■ Easy integration into existing software

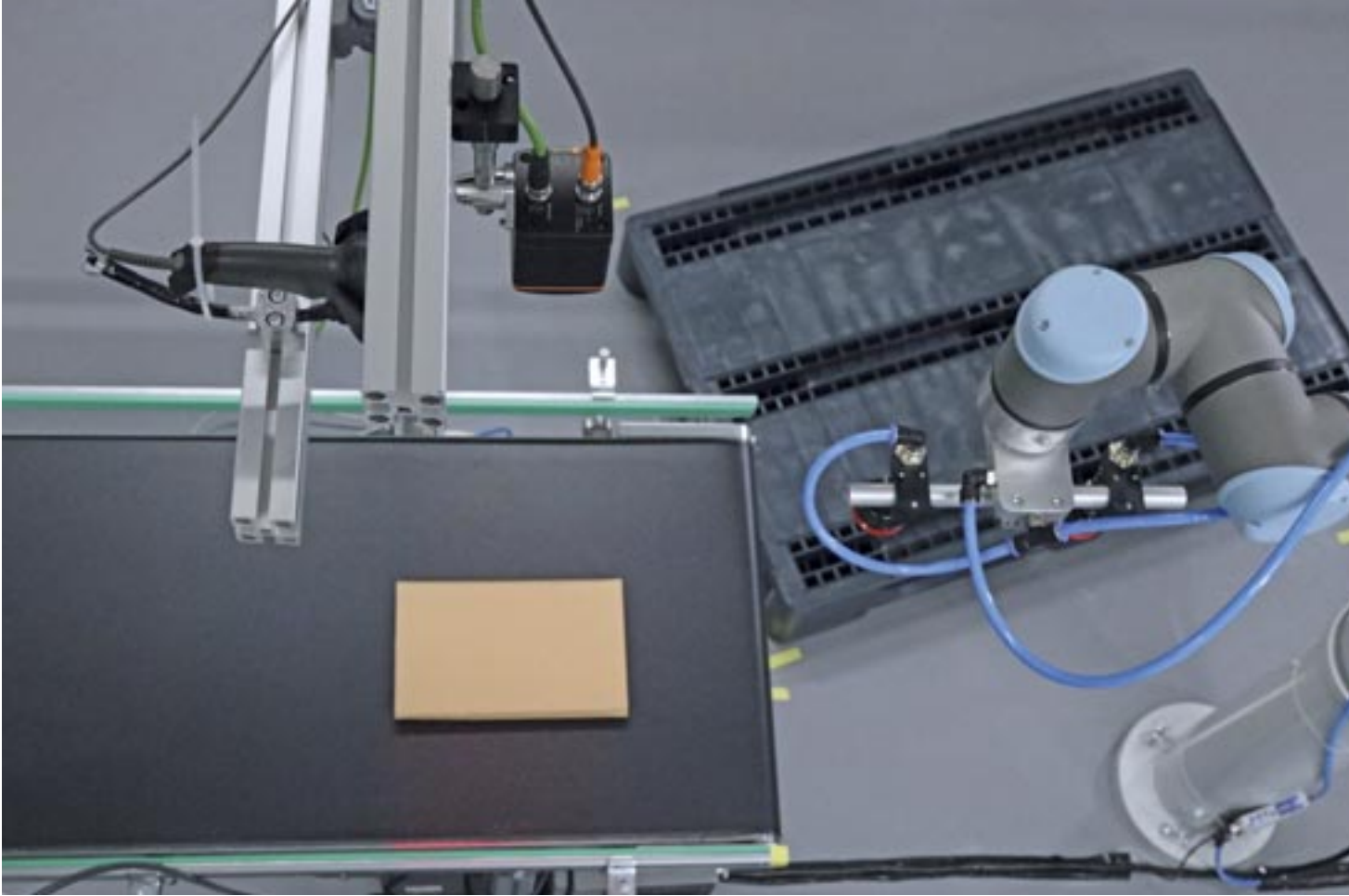
“We particularly opted for the O3D and for ifm because of the easy integration into our in-house developed software,” Milicevic continues. “And if we had questions, ifm’s support helped us quickly and competently.”

Based on the data, the software from Unchained Robotics can exactly calculate where the robot has to place its suction cups on the package to be handled. This ensures that the calendar is always picked up at equilibrium and at optimum orientation.

■ Precision prevents collisions

The high precision obtained by the 3D sensor is indispensable for the pick & place task carried out by the robot.

“Particularly if the calendars are placed in post boxes, space is at a premium. The robot has to move with great precision and within small tolerance values to prevent its arm or the calendar from colliding with the metal walls.” explains Milicevic.



The sensor exactly detects the position and height of the package – by means of 23,000 pixels.

Depending on the format, the robot places up to 12 calendars in a 3 x 4 pattern at the placement location. Thanks to the precise positioning, a stack height of up to 70 centimetres is possible even on open pallets.

“The reliable and precise detection of the height also plays an important role when it comes to selecting the placement location within the pattern,” says Milicevic. “The robot places the packages according to a special height algorithm taking into account the individual package heights. The packages are sorted so that the highest point is always furthest from the robot. Besides, the packed calendars form a virtually homogeneous, flat surface when the maximum stack height is reached.”

■ The camera and the software are the core of the solution

With a frequency rate of eight seconds, the pick & place solution of the start-up also masters the high requirements placed on it in the time before Christmas, when up to 6,000 calendars per day leave the printing shop. The packages can have a weight of up to eight kilograms.

“This is within the limits of the technical data of a collaborative robot arm,” explains Milicevic. “If heavier weights were to be moved or faster frequency rates were required, we would use a more powerful industrial robot. This would be no great problem, as the robot only

plays a minor role in our solution. The core of our universal solution is the combination of camera and software, which makes the solution not only suitable for calendars: It is also suitable for any pick & and place process in which products are placed on or picked up from pallets.”

Another advantage of this powerful combination of sensor and software: As no other system components are required besides the robot arm, the costs for implementation are kept to a minimum.

■ Conclusion

The O3D is a central element of the pick & place solution from Unchained Robotics. Thanks to the exact detection in three dimensions of the packages, the 3D sensor provides reliable information to the software which helps to precisely control the robot arm. Even during the printing shop's busiest times, the calendars are reliably put in the correct placement location – and reach the customers in time.