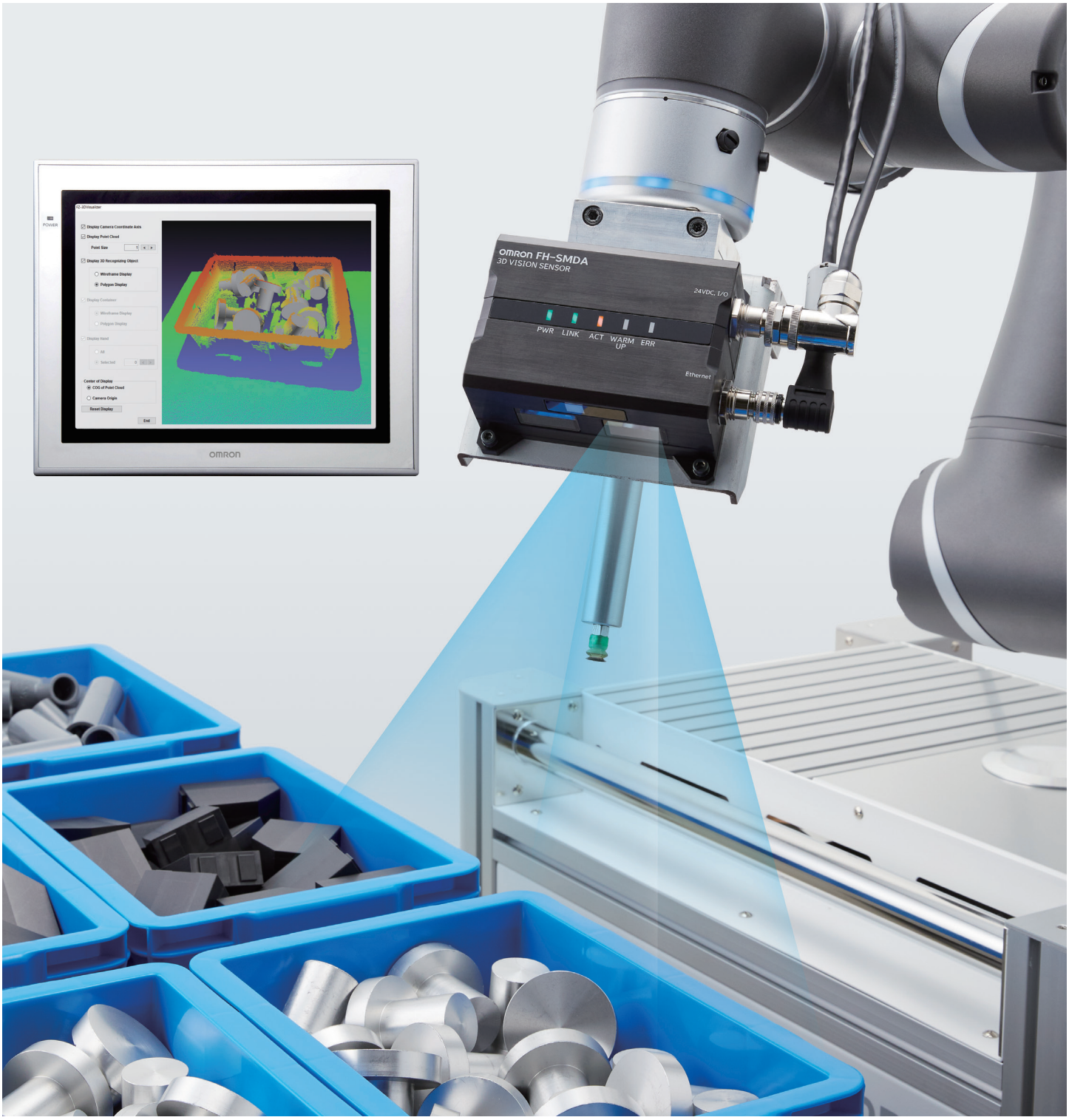
OMRON

3D Robot Vision System FH-SMD Series

A complete solution for automating human-intensive part picking



Freeing people from monotonous and heavy physical work

The challenges of meeting today's bulk part feeding needs

Production workers are hard to come by these days, and labor costs have risen sharply, putting pressure on manufacturers to automate complex manual processes.
Automated systems must continue to identify complex shapes among bulk parts, pick them up, and align them according to feeding types and locations.
While many automated part picking solutions fail to achieve human-level speed and flexibility, Omron is making great progress in this area.

Three features of 3D vision sensing close to human capabilities

Small and light

Fits in preexisting compact spaces

Approx.0.4 s to detect *1

Faster cycle time thanks to human-like speed and flexibility

Wizards

Easy setup without manuals

*1. Total time for 3D measurement and 3D recognition under our specified conditions. It varies depending on the target.

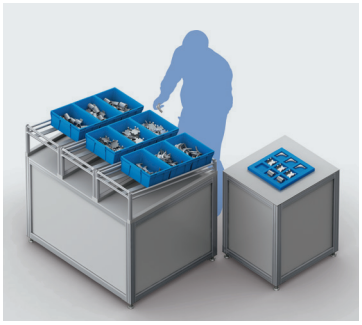
Fits in preexisting compact spaces

The 3D vision sensor can be installed without a major change in the layout of the production system.

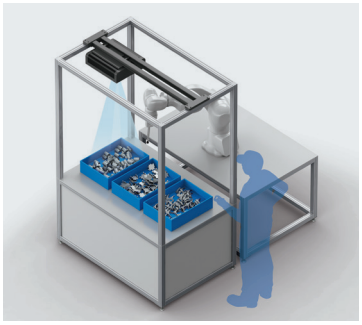
Small and light design saves installation space

FROM The production site layout must be significantly changed for automation

Others 3D vision sensor and its mounting equipment are too big to install in a typical workspace, requiring a major layout change.



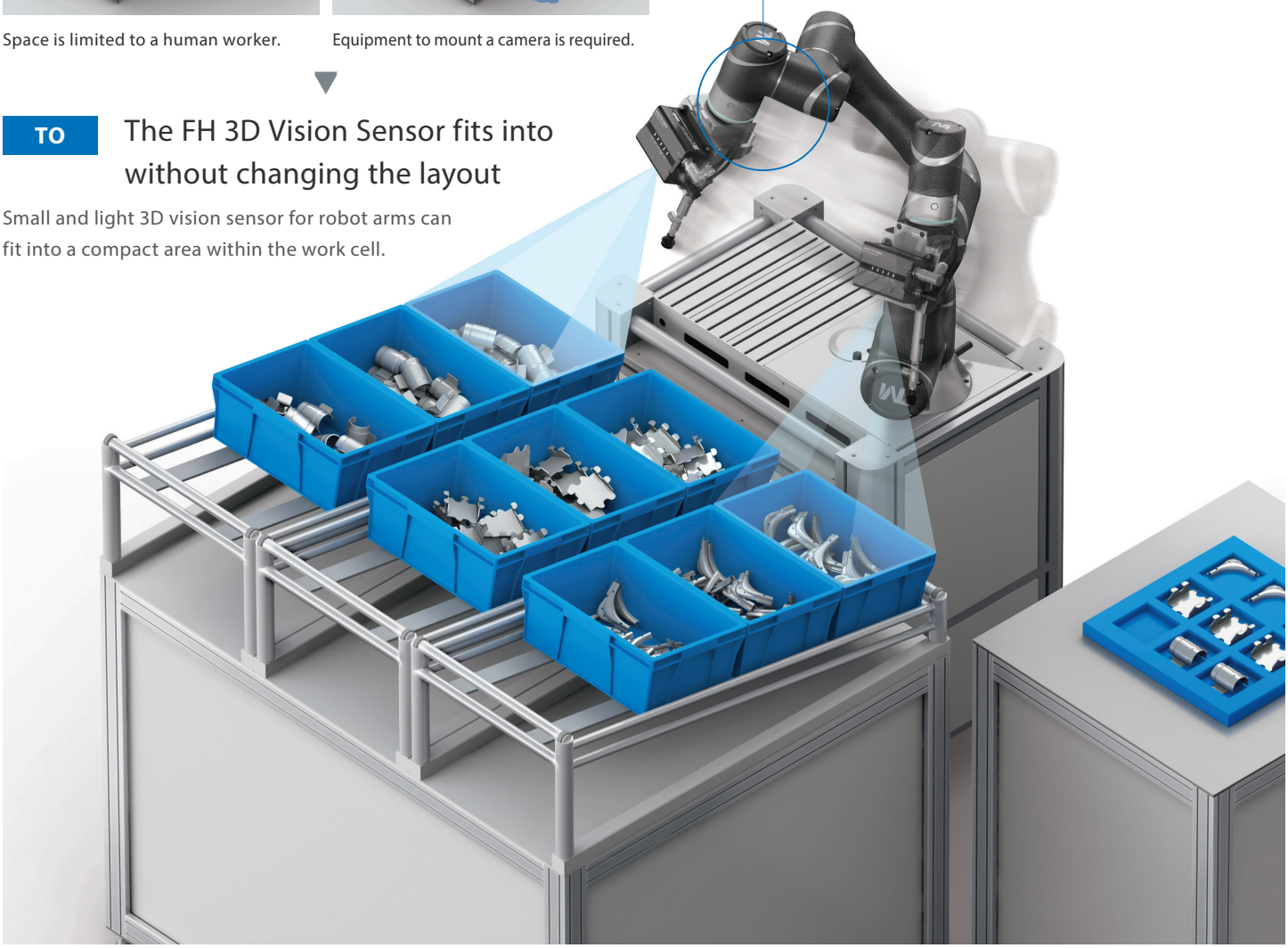
Space is limited to a human worker.



Equipment to mount a camera is required.

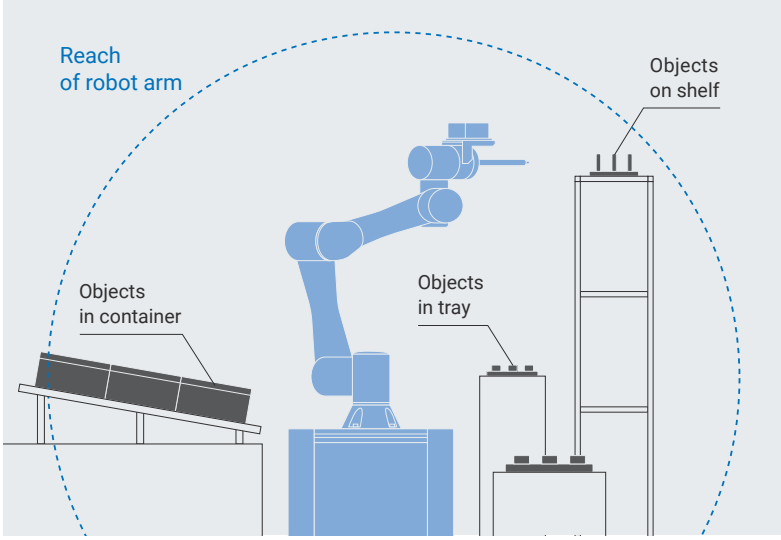
TO The FH 3D Vision Sensor fits into without changing the layout

Small and light 3D vision sensor for robot arms can fit into a compact area within the work cell.



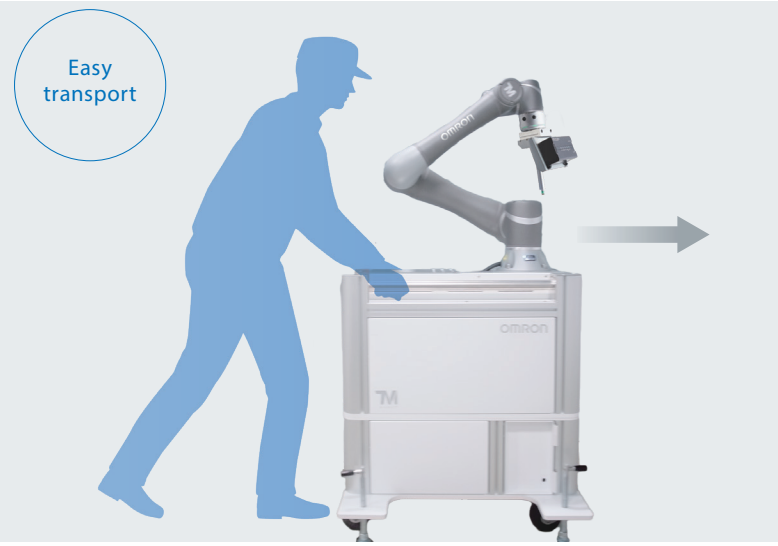
Flexible part picking from multiple locations

Combined with a robot, the sensor enables flexible picking according to the positions of part trays and shelves.



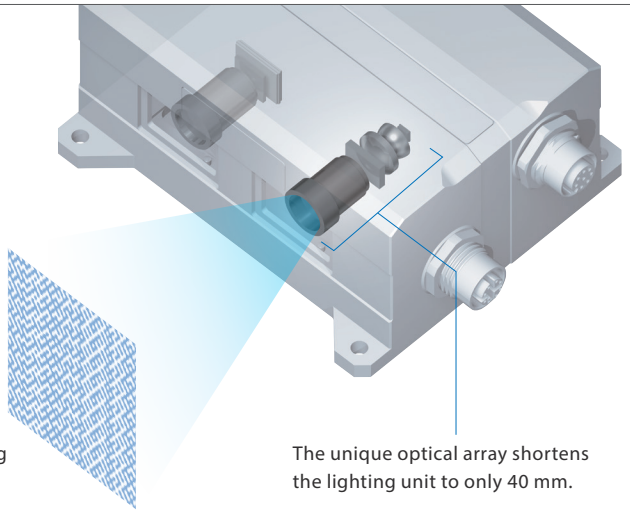
Easily transportable to where needed

The picking system, consisting of the 3D vision sensor for robot arms, collaborative robot, and mobile workstation, can be flexibly transported and relocated for different workspaces.



Optical technology makes the sensor small and light enough to mount on collaborative robots

Others 3D cameras using the phase-shifting method requires a projection mechanism that changes the projection pattern, resulting in a large size.
Omron addressed this challenge and developed the 3D measurement technology that reduces in size by making the optical path compact with the mask creating fine patterns.



Target is recognized by illuminating it by one 3D projection pattern.

The unique optical array shortens the lighting unit to only 40 mm.

Faster cycle time thanks to human-like speed and flexibility

The advanced 3D vision sensing technology enables fast and accurate part recognition.

High-speed detection in approximately 0.4 seconds [*1] makes picking smooth

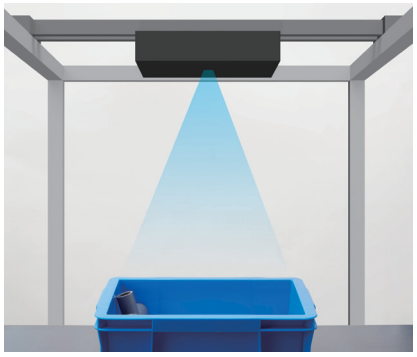
3D measurement to create 3D shape images and 3D recognition to recognize the position and posture of targets were sped up, which made high-speed part detection possible.

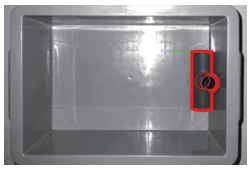
Breaking the challenge of emptying all bins with less blind spots

There are blind spots where a fixed camera cannot detect parts inside the bin. To detect these parts, an operator must reposition items in the bin so that the parts are within the field of view. Cameras installed at the robot arms can reduce blind spots by changing the viewpoint, reliably detecting parts without using large-scale equipment.

FROM Fixed camera

There are blind spots where parts cannot be detected.

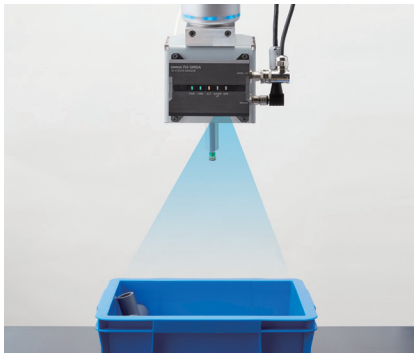


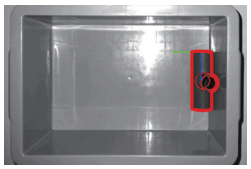


From above : Cannot detect because the cylindrical part is too small to be detected

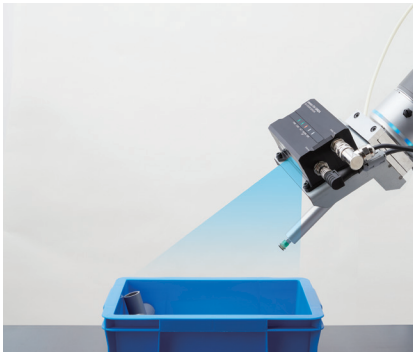
TO Camera for robot arms

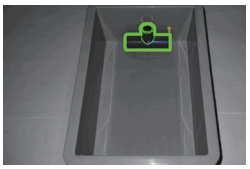
The camera changes the viewpoint, reducing blind spots.





From above : Cannot detect because the cylindrical part is too small to be detected





Moved to upper right : Can detect

New technologies enable high-speed detection in approximately 0.4 seconds

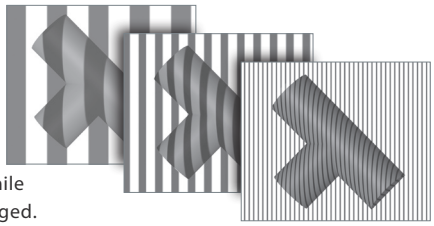
3D measurement technology for a single-shot measurement PATENT PENDING *3

FROM

Phase-shifting method

Multiple shots

Many images need to be captured for measurement while the projection pattern is changed.

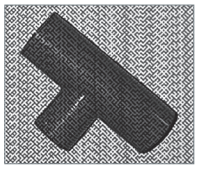


TO

Omron's structured light

One shot

A unique projected pattern image can be captured for measurement.

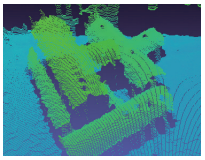


3D recognition technology for improved high-speed 2D search PATENTED *3

FROM

Previous 3D recognition searches using large-volume model

Comprehensive matching using 3D model

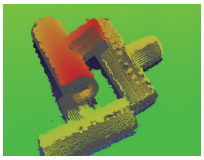


Search and comparison

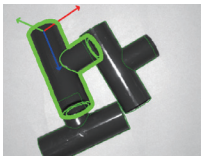
TO

Omron's new method searches using small-volume model

3D matching after efficiently narrowing down the area using 2D feature model



Search



Comparison

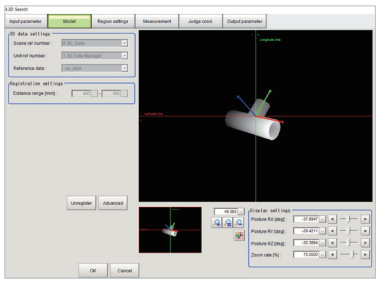
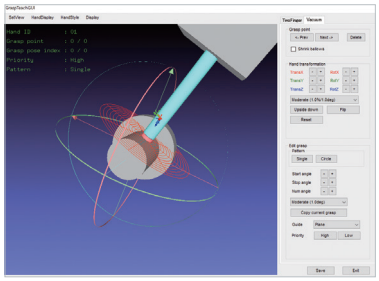
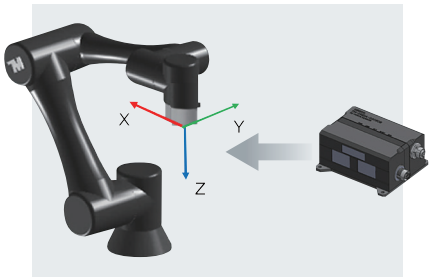
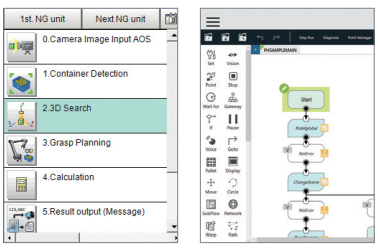
*1. Total time for 3D measurement and 3D recognition under our specified conditions. It varies depending on the target.

*2. Time measured under our specified conditions is provided for reference.

*3. "PATENT PENDING" means that we applied for a patent in Japan, and "PATENTED" means that we obtained a patent in Japan. (As of February 2021)

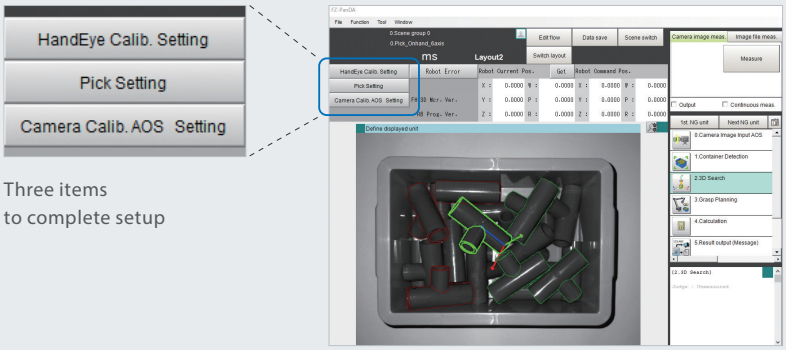
Easy setup without manuals

The wizards guide you step-by-step through setting up a picking application, from camera setup to calibration.

Setup procedure	You want to	Support function in wizard	
Capture, recognition	Create a part model for 3D recognition seen from all directions	Just load CAD data **Model Registration**	
Grasping object	Register a pose of grasping and test without operating the robot	No need to operate the robot **Grasp Pose Registration**	
Coordination with robot	Set up to calibrate the camera and robot	No need to operate the robot **Automatic Calibration**	
	Set up to connect the robot	Sample programs for various robots **Robot Setting Tool**	

Wizards

Just follow the instructions in the wizards to set approximately 80 parameters required for a picking application, without referring to manuals.

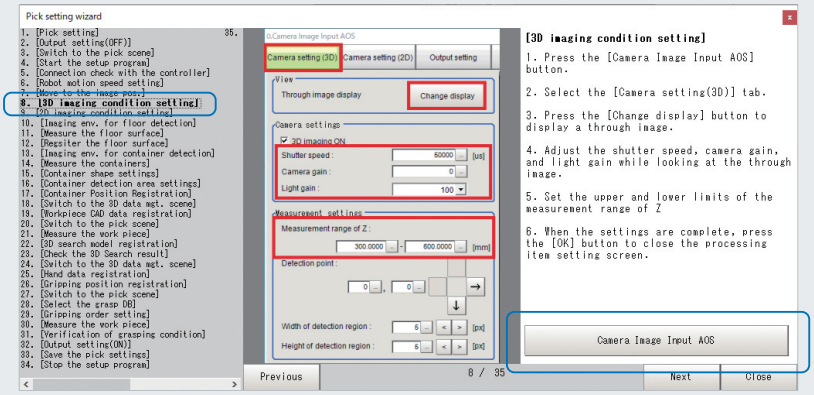


Three items
to complete setup

Choose

Choose one from three items
to suit your needs.

In case of Pick Setting

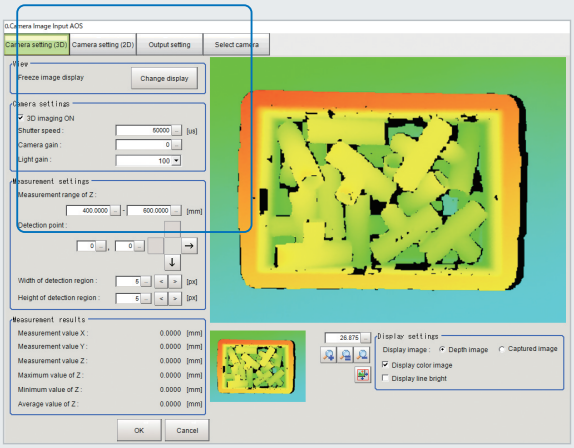


Setup procedure and wizard

View

Understand the setup procedure
and items to enter together with
the image of the setup screen.

Click the button at the lower right
to display a separate operation window.



Operation window (displayed in a separate window)

Operate

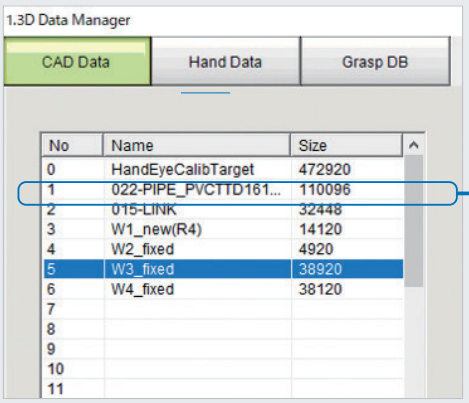
Enter the settings while referring
to the setup procedure.

Capture, recognition

Model Registration

Just load CAD data of a part to automatically generate a 3D search model.
The CAD data of parts, grasp point data, and hand data can be managed to use for all scenes.
When a new product is added, search models of its parts can be generated from the managed CAD data by copying the scene data.

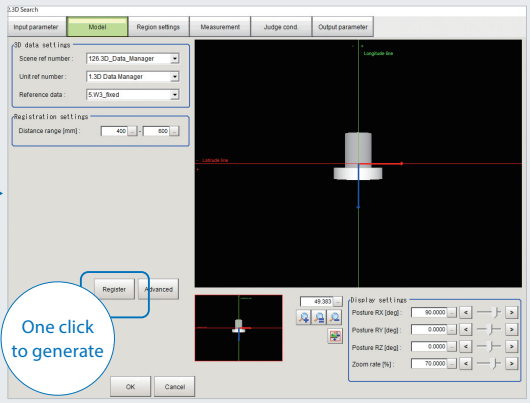
Data manager screen



Integrated management of CAD data, hand data, and grasp data

Just select

Model registration screen

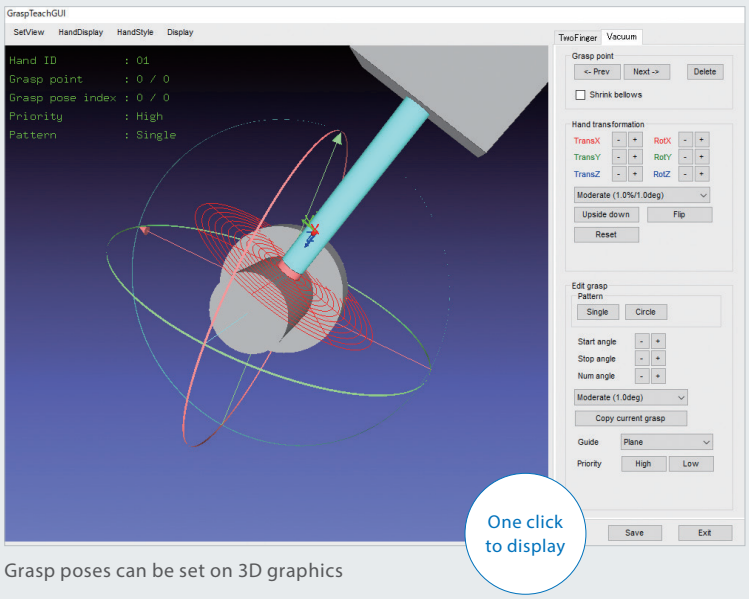


A single click to generate a 3D search model from CAD data

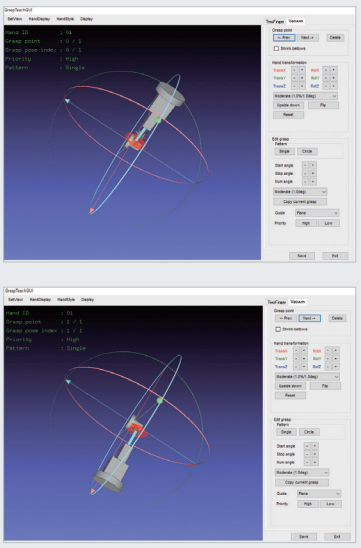
Grasping object

Grasp Pose Registration

Grasp poses can be set on part's CAD data, which eliminates the need to operate a physical robot.



Grasp poses can be set on 3D graphics



Multiple grasp points can be set

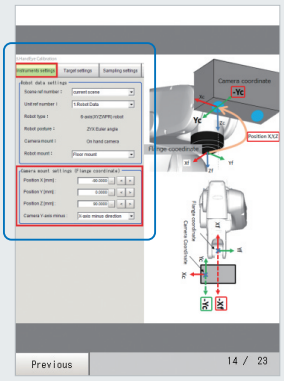
Coordination with robot

Automatic Calibration

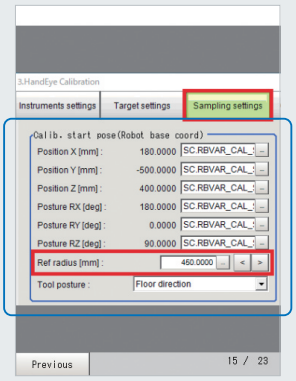
Calibration between the 3D vision sensor and robot can be performed automatically without the need for complicated setup.

Enter values in only two fields

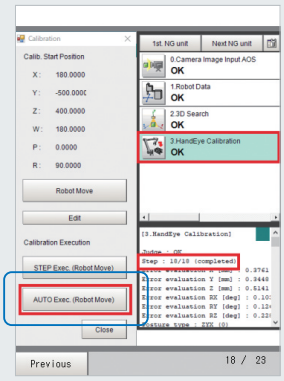
Click a button to automatically calibrate



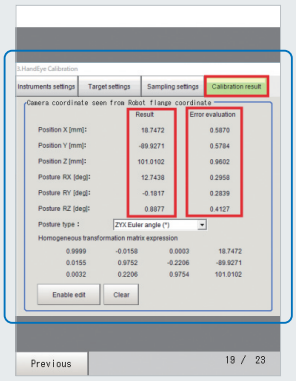
Specify the offset position of the 3D vision sensor



Specify the distance between the camera and calibration target



Execute automatic calibration



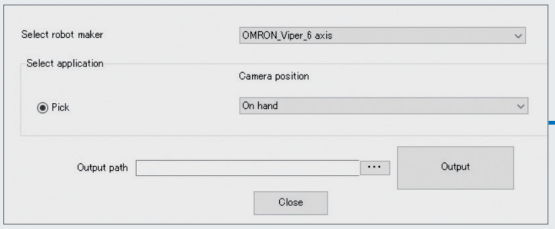
Result values are displayed

Coordination with robot

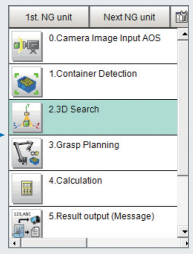
Robot Setting Tool

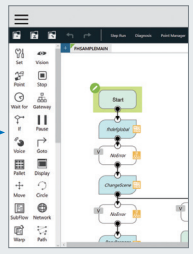
Omron provides sample scene data and robot connection programs tailored to individual robots.
You can download the Robot Setting Tool for free after purchasing the product and signing up online.
For details, see the member registration sheet attached to the 3D Robot Vision Software.

A sample scene data for the 3D vision sensor and sample program for the robot can be automatically created just by selecting the connected robot.



Robot Setting Tool





Sample scene data for 3D vision sensor

- For picking application
- For hand-eye calibration

Easy to connect

Sample program for robot

- Sample program
- Setup program

System configuration

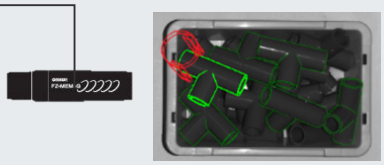
Omron offers the 3D robot vision system and robots for picking applications.

3D Robot Vision System

This system recognizes positions and postures of parts and outputs the position information of parts to the robot.

3D Vision Sensor for Robot arms
FH-SMD Series

Vision System
FH Series
FH-5050



3D Robot Vision Software

You can use it just by adding it to the sensor controller.

- 3D recognition
- Communications with robots
- Calibration

Robot

Robots from Omron (TM & Viper Series) and other major vendors can be used.

Collaborative Robots
TM Series

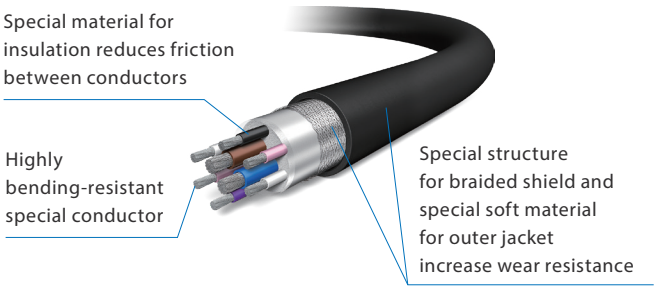
	TM5X-700	TM5X-900	TM14X	TM12X
Reach	700 mm	900 mm	1100 mm	1300 mm
Max. payload	6 kg	4 kg	14 kg	12 kg

For more information about robots, visit Omron's website:
https://automation.omron.com/en/us/products/families/collaborative-robots

Super-flexible cable ensures long-term stable operation

The new cable offers approximately 10 times *1 the bending resistance of conventional flexible cables. High bending resistance significantly reduces the frequency of replacing the cables on robot arms.

*1. It's compared with the FHV7 Smart Camera flexible cables.



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