Bulking to the next stage

Features

Robot calibration automation reduces startup effort (Proprietary AI technology: Maisart)

The image recognition method can be selected from modelless recognition and model matching recognition

Realizing compact, dust-proof and drip-proof by cooperation with ENSENSO cameras

Concept

Just four steps! Easy and quick to setup!

**STEP 1** Imaging position instruction
Perform initial setting and pattern setting

**STEP 2** Generate calibration program
Select the "Generate program" button to generate program

**STEP 3** Start calibration
Open the operation panel and select the "Start" button. (Calibration starts automatically)

**STEP 4** Calibration complete

Default (Item)
- Camera ID
- Robot ID
- Robot type
- Robot calibration
- Camera installation type
- Camera parameters

Pattern settings (Item)
- Number of patterns size (mm)

ENSENSO Camera

MITSUBISHI ELECTRIC
Changes for the Better
Features

Responding to diverse installation environments

Compact, dust-proof and drip-proof for a wide range of scenes

Challenges

In considering the introduction of 3D Vision to existing and new lines, the adoption was postponed due to the limitation of the device layout and the lack of environmental resistance.

Robotic applications can't actively use 3D Vision

Solution

- Choose from a wide range of cameras (next slide) with a high degree of freedom.
- The compact and lightweight camera body is not only fixed to the trestle but can also handle hand eyes, contributing to the realization of space-saving and advanced applications.
- Can also be used in environments with a dust- and drip-proof camera.

Extensive lineup, compact, environmentally resistant camera integration

3D Vision lineup to lower installation hurdles, aiming for adoption in various use scenes.
**Features**

**Improving tact time by improving measurement time**

**Challenges**

The work process of picking work (measurement → recognition → grasping/conveying)

It is not simple, so there are many issues to improve the takt time.

**To shorten the tact time in bulk picking work**

**Solution**

The combination with the stereo ENSENSO camera (which can calculate height information in one shot) reduces the ga measurement time compared to conventional our company cameras that use the triangulation method (which requires multiple projection in a striped pattern).

**Contributing to tact time improvement by improving measurement time (Approximately 30% improvement compared to the conventional our company in the assumed work of our company)**

**Improved takt time for bulk picking by shortening measurement time!**

---

**Differences in motion with fixed cameras**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Ver.2.0</th>
<th>Ver.3.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement recognition time</td>
<td>1.95 sec</td>
<td>1.5 sec</td>
</tr>
<tr>
<td>Takeout and transport distance: approx. 500 mm (Y direction)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Removal/discharge Dly 0.4 sec, deceleration at approach and during transport</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measurement recognition per cycle</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The Ver. 3.0 measurement and recognition time has been shortened (approximately 30%). Reduced waiting time for robot tray entry (improvement effect: 0.45 sec). The operating time per cycle is:

- Ver. 2.0: 3.70 sec
- Ver. 3.0: 3.25 sec (12% improvement)
MELFA-3D Vision 3.0

Features

Expansion of applicable work
Improved recognition technology for a wide variety of workpieces

Challenges
Depending on the camera performance and disturbance factors, some items cannot be recognized depending on the workpiece. There were times when 3D Vision applications were not feasible.

- Lack of ability to deal with workpieces that are difficult to handle (black, matte, glossy etc.)

Solution
- Strong against disturbance light by adopting infrared light
- HDR support for scenes with large contrast (dedicated software)

A wide variety of workpieces can be recognized
Expanding the scope of 3D Vision applications by expanding the number of applicable workpieces
MELFA-3D Vision 3.0

Features

Work supply support
(production efficiency improvement)

Efficient supply work is realized by the work residual capacity estimation function

Challenges

In the bulk loading process, the reduction of workpieces is not constant. It was necessary to check the remaining amount of work each time and perform the supply work

Work supply could not be carried out efficiently

solution

In real time by calculating the remaining work rate. Timing of work supply can be judged!

Efficient work supply through visualization of remaining work

Contributing to Improvement of Yield in Bulk Picking Process
MELFA-3D Vision 3.0

Features

Automatic calibration function
(reduced start-up time)

Automation of robot calibration simplifies startup work

Challenges

Manual calibration work (image position instruction, etc.), etc. this may be confusing for first-time 3D Vision users

Robotic calibration is time-consuming

solution

With MELFA-3D Vision 3.0 software, Automates robotic calibration tasks (Image position instruction → button execution only)

Automatic Calibration Function Easy Start-up

Improved convenience for customers who are introducing 3D Vision for the first time
**Features**

**SmartPlus/Automatic recognition parameter generation function (reduced start-up time)**

Automatic generation of recognition parameters simplifies startup work.

**Challenges**

I want to use modelless recognition function (*), but setting parameters is complicated.

(*) Register the pawl/suction pad shape of the hand and insert the pawl. Method for gripping workpiece by searching Adsorbable part of pad.

**easily setting the modelless recognition function**

Optional SmartPlus (MELFA 3D Vision extension)
Highly difficult sensor parameter adjustment work is automated.

**solution**

Allows anyone to easily adjust parameters on par with experts.

The task of adjusting recognition parameters is automated by our unique AI technology.

Flexible support for irregular workpieces by using modelless recognition technology.

---

**Configuration work image**

**STEP 1**

*Import model of workpiece*

Import a 3D model of the workpiece.

**STEP 2**

*Set learning conditions*

Set the bin size and conditions required for learning.

1. Adjust the grasp position of the model workpiece.
2. Configure the learning conditions parameter.

**STEP 3**

*Automatic adjustment*

Adjustment of recognition parameter.

Randomly stacked parts are replicated in a simulation. The most suitable parameter is selected and adjusted.

**STEP 4**

*Parameter optimization*

Adjust sensor parameters.

---

**Note**

Model-less recognition does not usually require a 3D model. However, a 3D model of the workpiece is required for this function.
MELFA -3D Vision 3.0
Product Structure

Features

■ standard product configuration

MELFA-3D Vision 3.0
【Name: 3F -53 U-WINM】

• MELFA -3 D Vision Software
  ※Available via USB dongle (licensed)

• Owner's Manual, Quick Start Guide
  Sample Programs, Software Use Agreement

■ Customer ordered goods (recommended by Mitsubishi Electric)

Camera head

PoE LAN Cable
AD00268

general-purpose
PC

Calibration plates
AL00065, AL00091
※Ceramic material with heat resistant expansion

■ Corresponding sensor

Recommended Manufacturer: ENSENSO

<table>
<thead>
<tr>
<th>Model number</th>
<th>Field of view (mm)</th>
<th>Work Distance (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>N35-804-16-IR</td>
<td>388 × 291 ~ 860 × 645</td>
<td>480 ~ 1000</td>
</tr>
<tr>
<td>N35-806-16-IR</td>
<td>287 × 215 ~ 435 × 326</td>
<td>350 ~ 550</td>
</tr>
<tr>
<td>N35-808-16-IR</td>
<td>231 × 173 ~ 290 × 217</td>
<td>280 ~ 360</td>
</tr>
<tr>
<td>N35-1204-16-IR</td>
<td>315 × 236 ~ 431 × 323</td>
<td>600 ~ 850</td>
</tr>
<tr>
<td>N35-1604-20-IR</td>
<td>248 × 186 ~ 268 × 201</td>
<td>700 ~ 800</td>
</tr>
</tbody>
</table>

SmartPlus
3DVS extension function
target
## MELFA -3D Vision 3.0
Product Structure

### Basic Specifications

<table>
<thead>
<tr>
<th>Items</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Compatible Robot</strong> Note 1</td>
<td>RV-F, RH-FH Series, RV-FR, RH-FRH Series RV-CR, RH-CRH Series, RV-AS Series</td>
</tr>
<tr>
<td>robot programming language</td>
<td>MELFA-BASIC VI or MELFA-BASIC V</td>
</tr>
<tr>
<td><strong>robot controller</strong></td>
<td>MELFA -3D Vision Specific Commands</td>
</tr>
<tr>
<td><strong>Connection Settings</strong></td>
<td>Up to 2</td>
</tr>
<tr>
<td>Number of camera head settings</td>
<td>Up to 4</td>
</tr>
<tr>
<td>Number of robot settings</td>
<td>Up to 4</td>
</tr>
<tr>
<td><strong>Calibration</strong></td>
<td>Up to 15</td>
</tr>
<tr>
<td>contactless calibration</td>
<td>Applicable to fixed cameras and hand eyes</td>
</tr>
<tr>
<td>contact calibration</td>
<td>Applicable to fixed cameras</td>
</tr>
<tr>
<td><strong>Measurement</strong> Note 2</td>
<td>An imaging command is given to a camera head, and a distance image from the imaged pattern image is calculated.</td>
</tr>
<tr>
<td>measurement time</td>
<td>Approximately 0.8 seconds Note 3</td>
</tr>
<tr>
<td>number of measurement points</td>
<td>1.3 million</td>
</tr>
<tr>
<td>measurement sensitivity</td>
<td>Selectable HDR measurement</td>
</tr>
<tr>
<td>Measurement accuracy improvement function Note 4</td>
<td>ENSENSO Accuracy Enhancement Technology &quot;FLEXVIEW&quot; Selectable</td>
</tr>
</tbody>
</table>

**Note 1)** Not applicable to wiring interior specifications of vertical multi-joint RV-F series or RV-FR series.

**Note 2)** Shielding measures may be required in order to be affected by ambient light. If the work distance is long, the projector light will be weak. Easier to be affected by ambient light. The workpiece of transparent or specular objects may not be measurable or difficult to measure. Measurements/ recognition may be difficult for high gloss objects, black objects, dark objects, and workpieces with complex surface shapes.

**Note 3)** Enter the standard time under the best conditions. Standard time may be exceeded depending on conditions such as control unit performance, ambient environment, workpiece, processing parameters, number of registered jobs, etc.

**Note 4)** Specify the number of images to be used for Flex View, the addition average algorithm of ENSENSO cameras. The larger the value, the smaller the change of the luminance value, and the longer the measurement time.
# MELFA -3D Vision 3.0

## Product Structure

<table>
<thead>
<tr>
<th>Items</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Job</strong></td>
<td></td>
</tr>
<tr>
<td>Number of registered jobs</td>
<td>Up to 250</td>
</tr>
<tr>
<td>Modelless recognition</td>
<td>Register the shape of the pawl/suction pad of the hand, and insert the pawl into the gap. Recognition method for gripping workpiece by recognizing suction position of suction pad.</td>
</tr>
</tbody>
</table>
| Output information of the recognition result | Posture output 6: Work position in camera coordinates (XYZ)  Note 4  
Attitude Output "1 ~ 6": Robot Coordinate Work Position (XYZABC)  Note 4 |
| Recognition time             | Approximately 0.5 seconds  Note 3                                                    |
| **Model matching recognition**  | Recognition method for grasping workpiece by registering shape by 3D-CAD model of workpiece and recognizing workpiece matching 3D-CAD model. |
| Work registration size/piece | Up to 8.5 million bytes (8.1 MB)                                                     |
| Work 3D - CAD Data Format    | STL, OBJ, and PLY formats                                                             |
| Number of work registrations | Up to 250                                                                             |
| Number of work parameter registrations per work | Up to 10                                                                             |
| Number of Worklists          | Up to 250                                                                             |
| Recognized items per worklist | Up to 100                                                                            |
| Output information of the recognition result | Work Position in Robot Coordinates (XYZABC) Note 3  |
| Recognition time             | Approximately 1.0 seconds  Note 3                                                    |

---

**Note 3:** Enter the standard time under the best conditions. Depending on the conditions such as the performance of the control unit used, the surrounding environment, the workpiece, the processing parameters, the number of job registrations, etc., standard time may be exceeded.

**Note 4:** See separate manual for attitude output. In the case of picking with modelless recognition, it may be necessary to use a two-dimensional vision sensor together.

**Note 5:** Not compatible with horizontal multi-articulated RH-F series or RH-FR series.
# MELFA -3D Vision 3.0 Basic Specifications

## Basic Specifications

<table>
<thead>
<tr>
<th>Items</th>
<th>Function Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Job</strong></td>
<td></td>
</tr>
<tr>
<td>Automatic adjustment of recognition parameters</td>
<td>When adjusting for modelless recognition, our unique AI and simulation technologies automate the adjustment of recognition parameters that require specialized knowledge.</td>
</tr>
<tr>
<td><strong>Work registration size/piece</strong></td>
<td>Up to 8.5 million bytes (8.1 MB)</td>
</tr>
<tr>
<td><strong>Work 3D - CAD Data Format</strong></td>
<td>STL, OBJ, and PLY formats</td>
</tr>
<tr>
<td><strong>adjustment time</strong></td>
<td>Approximately 10 to 60 minutes Note 9</td>
</tr>
</tbody>
</table>

### Items Specifications

<table>
<thead>
<tr>
<th>Items</th>
<th>Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>External dimensions mm x mm x mm</strong></td>
<td>62.1 x 17.0 x 10.0</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>9.0g</td>
</tr>
<tr>
<td><strong>activation feature</strong></td>
<td>Execute the application activation process. Note 1</td>
</tr>
<tr>
<td><strong>dust-proof and drip-proof performance</strong></td>
<td>None Note 2</td>
</tr>
<tr>
<td><strong>Guaranteed operating temperature/humidity</strong></td>
<td>0 °C to + 50 °C/0 ~ 85% RH Note 3</td>
</tr>
<tr>
<td><strong>Storage temperature/humidity</strong></td>
<td>-20 °C to + 85 °C/0 ~ 85% RH Note 3</td>
</tr>
</tbody>
</table>

Note 1) This product periodically reads the license for the USB dongle and performs the application activation process. The USB dongle must remain inserted into the control unit when using the MELFA -3D Vision 3.0. Note 2) Not applicable to oil mist environment. Note 3) The condition is that there are no external factors such as condensation or static electricity.

---

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**USB Dongle Body**