FEATURES

- Vision sensor and force sensor with the FANUC robots realize highly automated manufacturing systems in assembling and machining areas.
- Vision sensor can be applied to bin-picking automation.
- Intelligent robot eliminates peripheral equipment conventionally required for part-positioning and rearrangement, and reduces total cost of your system.
- Force control function with the force sensor automates high precision insertion of parts with sensitive control of force applied to a robot end effector.
- Intelligent robot promotes robotization of deburring and polishing by contouring motion with specified pushing force.
- Robot accuracy enhancement product suites improve robot’s positioning accuracy and enhance productive utilization of offline programming system for an actual robot.

Application Examples

- Bin picking
- Visual tracking
- Visual inspection after assembling
- Precise assembling of small parts
- Dimension check of holes (Gage insertion by force control)
- Force controlled deburring
**Integrated Robot Vision iRVision**

**System Configuration and Setup of iRVision**

iRVision function and a dedicated camera port are integrated in the robot controller. The function can easily be set up with graphical user interface on iPendant. iPendant can also serve as a runtime monitoring screen.

### Key Functions

<table>
<thead>
<tr>
<th><strong>2D single-/multi-view vision process function</strong></th>
<th><strong>Depalletizing vision process function</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows the robot to locate a large rigid object precisely by combining the results from multiple snapped images.</td>
<td>Allows a single camera to estimate Z height of each palletized part using the scale information on an image, and outputs X, Y, Z and rotation detected.</td>
</tr>
</tbody>
</table>

#### Fixed Cameras

- **Robot-mounted Camera**

#### Multi-view Measurement

- **Tool Offset**

<table>
<thead>
<tr>
<th><strong>3D single-/multi-view vision process function</strong></th>
<th><strong>Bin picking function</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows the robot to detect 3D position and posture of a target object to recognize a large part by multi-view measurement and to conduct tool offset for gripping errors.</td>
<td>Allows the robot to pick randomly piled objects by the sensor measurement along with avoiding interference.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Visual tracking function (iRPickTool)</strong></th>
<th><strong>Anti-Defect vision process function</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Allows the robot to track objects on moving linear/circular conveyors. Dynamic load balancing among multiple robots is also available.</td>
<td>Allows robotized automation to carry out error-proofing and flaw detection.</td>
</tr>
</tbody>
</table>
### Specifications

<table>
<thead>
<tr>
<th>2D Camera</th>
<th>Image Type</th>
<th>Grayscale / Color</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LED Light for 2D Detection</td>
<td>Red / White / None</td>
</tr>
<tr>
<td></td>
<td>Image Resolution</td>
<td>Grayscale: 1280×1024 / Color: 640×512</td>
</tr>
<tr>
<td></td>
<td>Focal Length [mm]</td>
<td>8 / 12 / 16 / 25</td>
</tr>
<tr>
<td></td>
<td>Outer Dimension [mm]</td>
<td>80×131.8×74</td>
</tr>
<tr>
<td></td>
<td>Mass [kg]</td>
<td>3.2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3D Laser Vision Sensor</th>
<th>Measurement Method</th>
<th>3D measurement with structured laser slit beams</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Measurement Range [mm]</td>
<td>219×175×100</td>
</tr>
<tr>
<td></td>
<td>LED Light for 2D Detection</td>
<td>Red / None</td>
</tr>
<tr>
<td></td>
<td>Outer Dimension [mm]</td>
<td>187.6×145.8×88.7</td>
</tr>
<tr>
<td></td>
<td>Mass [kg]</td>
<td>0.8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3D Vision Sensor 3DV/400, 3DV/600</th>
<th>Measurement Method</th>
<th>3D measurement with a single pattern light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum 3D Points</td>
<td>1104×950</td>
<td></td>
</tr>
<tr>
<td>Measurement Range [mm]</td>
<td>3DV/400: 268×262×500</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3DV/600: 575×499×500</td>
<td></td>
</tr>
<tr>
<td>LED Light for 2D Detection</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Outer Dimension [mm]</td>
<td>154×133×51</td>
<td></td>
</tr>
<tr>
<td>Mass [kg]</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3D Vision Sensor 3DV/1600</th>
<th>Measurement Method</th>
<th>3D measurement with a single pattern light</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum 3D Points</td>
<td>2208×1920</td>
<td></td>
</tr>
<tr>
<td>Measurement Range [mm]</td>
<td>1280×1200×2000</td>
<td></td>
</tr>
<tr>
<td>LED Light for 2D Detection</td>
<td>Blue</td>
<td></td>
</tr>
<tr>
<td>Outer Dimension [mm]</td>
<td>234×198.2×70</td>
<td></td>
</tr>
<tr>
<td>Mass [kg]</td>
<td>3.2</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Common Specifications</th>
<th>LED Power Supply</th>
<th>R-30iB Plus Integrated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Temperature [℃]</td>
<td>0 to 45</td>
<td></td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP67</td>
<td></td>
</tr>
<tr>
<td>Robot Mountable</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Connectable Number</td>
<td>Up to 27</td>
<td></td>
</tr>
</tbody>
</table>
**Key Functions**

- Detects both force and torque applied to a robot end effector in $F_x$, $F_y$, $F_z$, $M_x$, $M_y$ and $M_z$ simultaneously.
- Realizes H7/h7 JIS tolerance insertion.
- Robotizes various application requiring an intentional contact of two objects, such as face matching and contouring.

**Specifications**

<table>
<thead>
<tr>
<th>Items</th>
<th>FS-15iAe</th>
<th>FS-15iA</th>
<th>FS-40iA</th>
<th>FS-100iA</th>
<th>FS-250iA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dimensions</td>
<td>φ90 x 36 mm</td>
<td>φ94 x 43 mm</td>
<td>φ105 x 47 mm</td>
<td>φ155 x 59 mm</td>
<td>φ198 x 85 mm</td>
</tr>
<tr>
<td>Mass</td>
<td>0.31 kg</td>
<td>0.57 kg</td>
<td>0.87 kg</td>
<td>3.2 kg</td>
<td>6.9 kg</td>
</tr>
<tr>
<td>Rated load</td>
<td>$F_x$, $F_y$, $F_z$ 147 N (Fz)</td>
<td>147 N</td>
<td>392 N</td>
<td>980 N</td>
<td>2500 N</td>
</tr>
<tr>
<td>$M_x$, $M_y$, $M_z$</td>
<td>11.8 Nm (Mx,My) 11.8 Nm</td>
<td>39.2 Nm</td>
<td>156 Nm</td>
<td>500 Nm</td>
<td></td>
</tr>
<tr>
<td>Static overload</td>
<td>$F_x$, $F_y$, $F_z$ 1570 N (Fz)</td>
<td>1570 N</td>
<td>3920 N</td>
<td>9800 N</td>
<td>25000 N</td>
</tr>
<tr>
<td>$M_x$, $M_y$, $M_z$</td>
<td>125 Nm (Mx,My) 125 Nm</td>
<td>392 Nm</td>
<td>1560 Nm</td>
<td>5000 Nm</td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>$F_x$, $F_y$, $F_z$ 0.39 N (Fz)</td>
<td>0.39 N</td>
<td>1.0 N</td>
<td>2.0 N</td>
<td>4.9 N</td>
</tr>
<tr>
<td>$M_x$, $M_y$, $M_z$</td>
<td>0.016 Nm (Mx,My) 0.016 Nm</td>
<td>0.029 Nm</td>
<td>0.08 Nm</td>
<td>0.25 Nm</td>
<td></td>
</tr>
<tr>
<td>Accuracy</td>
<td>3% or less</td>
<td>2% or less of the rated load</td>
<td>2% or less of the rated load</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Applicable robot</td>
<td>M-1iA, M-3iA, LR Mate 200iD, M-10iA</td>
<td>M-20iA, M-20iB</td>
<td>M-710iC</td>
<td>R-2000iC</td>
<td></td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0 to 45°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Protection Class</td>
<td>IP67</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Force control performance of a robot depends on the robot type, gripper design/weight, parts shape/weight to be handled as well as parts fixing method. The feasibility and applicability of a force sensor should be determined through testing with the actual production conditions.*

* A part of the above list includes design specifications.
Functions to improve robot accuracy using the integrated vision

<table>
<thead>
<tr>
<th>iRCalibration</th>
<th>Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vision Mastering</td>
<td>Robot positioning accuracy improvement</td>
</tr>
<tr>
<td>Vision Axis Master</td>
<td>Automatic one-axis mastering with vision</td>
</tr>
<tr>
<td>Vision TCP Set</td>
<td>Automatic setting of a tool center point</td>
</tr>
<tr>
<td>Vision Frame Set</td>
<td>Automatic setting of a user frame</td>
</tr>
<tr>
<td>Vision Multi-Cal</td>
<td>Automatic calibration of a multi-arm system</td>
</tr>
<tr>
<td>Vision Shift</td>
<td>Man-hours reduction for robot teaching</td>
</tr>
<tr>
<td>Mastering Recovery</td>
<td>Mastering condition recovery after maintenance operation as mechanical part replacement</td>
</tr>
</tbody>
</table>

Key Functions

**Vision Mastering**

The function calibrates the robot mechanics. It improves the positioning accuracy of a robot, contributing to an accuracy improvement of TCP setting, vision application and easy utilization of offline programs.

**Vision TCP Set**

The function allows you to set a tool frame automatically which was conventionally done by manual operation of the robot. It helps to set TCP accurately.

**Vision Shift / Vision Frame Set**

The function guides the robot to measure reference points on a part or its fixture automatically and adjusts programmed points. It helps to save both time and manpower for robot system relocation and offline program utilization.

It can also be used to set a user frame automatically by the measured reference points data.

**Vision Multi-Cal**

The function calibrates relations between multi-group robots which are under coordinated control. Both two-arm configuration and one-arm and one-positioner configuration are supported. It helps to improve the coordinated motion accuracy.
Basic Configurations

Camera Package
3D Laser Vision Sensor
3D Vision Sensor
USB Camera
(Temporary usage during measurement)

Force Sensor
Force Sensor
R-30iB Plus

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