6-axis force sensor  **ZYXer™**

**Connection method**
- Ethernet
- Analog
- RS-422
- USB 2.0

**Power supply**
- D/A Converter
- D/A Cable
- RS-422 Cable
- Ethernet Converter
- Power supply

**Example installation**
- [www.sinto.com](http://www.sinto.com)
Automation of expert work can be achieved with ZYXer™

Our 6-axis force sensor ZYXer™ is a sensor that simultaneously detects the load (F) along three axes (XYZ) and the moment (M) around each axis. By mounting the sensor on a robotic arm, you can achieve the kind of precise control expected of human manual work.

Among the fastest in the industry
Communication speed: 0.83 msec

Fast communication speed allows for rapid feedback of force sensor detected values with low lag, preventing limitations to the operating speed of the robot.

Industry-leading high precision
Resolution: 1/4000 (rated capacity comparison)

ZYXer™ incorporates strain gauge sensors with finer resolution compared to force sensors with other detection methods, for higher detection accuracy. This makes it possible to achieve ultra-precision action including H7

Highly reliable detection data
Nonlinearity: ±2.0%

Our original design results in smaller differences between actual load and detected value. With low variation in repeated values, ZYXer™ boasts high reliability in terms of traceability.
Our 6-axis force sensor ZYXer™ is a sensor that simultaneously detects the load (F) along three axes (XYZ) and the moment (M) around each axis. By mounting the sensor on a robotic arm, you can achieve the kind of precise control expected of human manual work.

Reproduces the precise actions of a skilled worker

Robot mounted ZYXer™ units detect force in real time with automatic position correction, enabling reliable insertion.

Insertion with manual work
Trying to forcibly insert a hard object can lead to jamming.

Normal robot
Robot repetition results in misalignment beyond tolerance levels, leading to potential damage or stoppage.

Advantages of installing ZYXer™

Labor savings
Solving human resource shortages
ZYXer™ is able to detect the amount of force used by experienced workers to train the robot. The robot then can automate the treatment work with high precision.

Tak’t time reduction
Supports high-speed robotic motion
Equipped with rated moment to withstand high-speed arm motion. Communication speeds are among the fastest in the industry, limiting the occurrence of time lags.

Quality assurance
Reduction of defects with high-precision detection
Since the minimum detection load is very small, it can detect unexpected contact and prevent damage to the hand or workpiece.

Contributions to traceability
Records all 6-axis detected loads
Record the force applied to the robot to enable verification of the conditions/production lot when a malfunction occurs. This is useful for tracking down the cause of malfunctions as well as making improvements.
FPC insertion
Even thin and soft FPC (flexible printed circuitboards) can be reliably inserted using minute force detection. Automated control through rapid feedback for even small changes in force.

Gear phase matching
Detect small forces on gears with high resolution data. Rapid, automatical position correction to achieve high-precision phase alignment.

H7 fitting
Automatically corrects position with quick response to achieve H7/f7 fitting. Corrects even ±0.02mm offset that occurs when only using robot position control.

*For φ32, minimum gap dimension 0.025mm, maximum gap dimension 0.075mm
Realize automation even when difficult for robots

Giving the robot the ability to sense force enables control of the robot arm in response to contact with products, jigs or other objects. Even irregular surface profiling work, which is conventionally difficult to automate, can be robotically automated using the ZYXer™ force sensor.

**Deburring**
Changes in load are used to detect burr residue to ensure the finish of the workpiece. While tracing the product shape, changes in load from burrs are detected.

**Sealing**
Maintaining consistent distance between surface and nozzle, the robot traces along the surface shape to achieve a beautiful finish.

**Remote operation**
The robot reproduces the amount of force by the worker while also giving the worker feedback of the actual load on the robot, simulating contact for the remote worker.

**Machine operation assistance**
Control operation with detection of operator force. Even when moving heavy loads, the motion is assisted to lessen the burden.

**Buffing**
Trace along uneven polished surfaces to buff with consistent force.

**Picking**
Picking is possible without damaging the products or robot hand.

**Screwing**
Ensure screw tightening to the required torque.

**Measuring center of gravity**
Measure mass and center of gravity of a product being held by the robot.

Even more powerful when paired with a vision sensor

<table>
<thead>
<tr>
<th>Characteristics of the vision sensor (camera)</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗ Enables understanding of position using photography</td>
</tr>
<tr>
<td>✗ Unable to support changes after photographs</td>
</tr>
<tr>
<td>✗ Low precision, vulnerable to environmental light and dust</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Characteristics of the force sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>✗ Detects contact and gripping errors</td>
</tr>
<tr>
<td>✗ Not affected by outside disturbances</td>
</tr>
<tr>
<td>✗ Unable to prevent contact in advance</td>
</tr>
</tbody>
</table>

Combined

**Example use: Picking**
The vision sensor enables rapid selection among target objects and the force sensor prevents excessive contact with the gripped object. This gentle picking work prevents defects resulting from screw thread damage.
Easy installation for reduced burden on the customer

Even when using the force sensor for the first time, connection and setup is easy. We offer a variety of software to match each use scenario, including support for robot teaching offline.

Simple instruction with offline teaching software

Use the teaching pendant and adjust the motion while visually checking for collision with the product. This results in differences in the amount of trial and error based on experience, as well as potentially dangerous situations.

By combining with a ZYXer™ double output module, force data can be viewed on a computer in real time. Automatically adjusts even the slightest misalignment between the CAD simulation and the actual object. This greatly reduces the burden of teaching with the pendant.

Support for robots from many manufacturers

We have experience with installations for many robot manufacturers. With our original design and strain gauge sensors, we offer excellent resolution and high speed communication compared to sensors using other detection methods.

Our standard model includes a built-in amplifier. This results in tidier wiring by eliminating an extra connection to the amp and also reduces electrical noise, optimal for precision work.

Force control programs provided

We provide basic operating programs with force control for major applications including fitting and phase matching. Installation is easy.
Even when using the force sensor for the first time, connection and setup is easy. We offer a variety of software to match each use scenario, including support for robot teaching offline. We can offer designs optimized for customers’ applications including supported loads and resolution. We handle requests not only for changing sensor specifications for different sizes or output methods, but also for adding software functions such as monitoring software.

**Improve teaching and traceability**

- **Double output model**
  This model can be used for force control and monitoring on a computer when attached to a robot. Visualization of force data during control is possible.

- **Hollow model**
  Since there is a hole through the center, wires and pipes for the robot hand can be passed through the center space.

**Store wires tidily**

- **Double output model**
  This model can be used for force control and monitoring on a computer when attached to a robot. Visualization of force data during control is possible.

**Measure the weight of a small car**

- **Ultra heavy model**
  Rated capacity $F_z: 14,000N$. Capable of heavy-weight tasks such as detecting force for conveyance of objects heavier than 1 ton and assisting with installation of tires for heavy machinery.

- **Ultra-high precision model**
  Minimum detectable load 0.005N. Able to detect even slight changes in mass at the level of 0.5g, automating minute work such as FPC insertion.

**Quality judgment based on load change**

- **Quality judgment monitoring software**
  In addition to robot control, it monitors load changes and displays alerts such as a failure indicator when beyond the specified range.

**Measure balance variation**

- **Force plate**
  Capable of measuring variation in center of gravity when people get on. This can be used in sports for golf swings or kicking off, or in rehabilitation such as walking analysis.
From small to large capacity, proposals that match your application

<table>
<thead>
<tr>
<th>Model number</th>
<th>ZYX 080A501Z</th>
<th>ZYX 080A501</th>
<th>ZYX 100A102</th>
<th>ZYX 100S202</th>
<th>ZYX 125A102</th>
<th>ZYX 125S202</th>
<th>ZYX 160A302</th>
<th>ZYX 160S202</th>
<th>ZYX 200A352</th>
<th>ZYX 200S902</th>
<th>ZYX 200S902</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>φ80×H25</td>
<td>φ80×H22</td>
<td>φ100×H30</td>
<td>φ125×H35</td>
<td>φ160×H40</td>
<td>φ200×H40</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fixed frame capacity</td>
<td>Fx Fy</td>
<td>±500N/R.C.</td>
<td>±500N/R.C.</td>
<td>±1,000N</td>
<td>±1,000N</td>
<td>±2,000N</td>
<td>±1,000N</td>
<td>±1,000N</td>
<td>±2,000N</td>
<td>±3,000N</td>
<td>±3,500N</td>
</tr>
<tr>
<td></td>
<td>Fz</td>
<td>±200N/R.C.</td>
<td>±200N/R.C.</td>
<td>±400N/m</td>
<td>±400N/m</td>
<td>±450N/m</td>
<td>±100N/m</td>
<td>±75N/m</td>
<td>±200N/m</td>
<td>±120N/m</td>
<td>±260N/m</td>
</tr>
<tr>
<td>Overload allowance</td>
<td>R.C.</td>
<td>±500% R.C.</td>
<td>±200% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
<td>±500% R.C.</td>
</tr>
<tr>
<td>Mass</td>
<td>Approx. 320g</td>
<td>Approx. 280g</td>
<td>Approx. 650g</td>
<td>Approx. 500g</td>
<td>Approx. 1.4kg</td>
<td>Approx. 2.4kg</td>
<td>Approx. 4.3kg</td>
<td>Approx. 2.6kg</td>
<td>Approx. 7.3kg</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Body materials</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td>Aluminum alloy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>External shape diagram</td>
<td></td>
<td><img src="image1.png" alt="Shape Diagram" /></td>
<td><img src="image2.png" alt="Shape Diagram" /></td>
<td><img src="image3.png" alt="Shape Diagram" /></td>
<td><img src="image4.png" alt="Shape Diagram" /></td>
<td><img src="image5.png" alt="Shape Diagram" /></td>
<td><img src="image6.png" alt="Shape Diagram" /></td>
<td><img src="image7.png" alt="Shape Diagram" /></td>
<td><img src="image8.png" alt="Shape Diagram" /></td>
<td><img src="image9.png" alt="Shape Diagram" /></td>
<td><img src="image10.png" alt="Shape Diagram" /></td>
</tr>
</tbody>
</table>

- **Nonlinearity**: ±2.0% R.O.
- **Other-axis interference**: ±3.0% R.O.
- **Hysteresis**: ±0.2% R.O.
- **Temperature characteristics**: ±0.3% R.O./°C

If you do not see what you are looking for in our product lineup, please feel free to contact us. Free rental machines are also available. The ZYX080A501 model has IP67 (waterproof and dustproof standard) and both CE and UL certification.

---

**Connection method**

- **RS-422**: Supports four kinds of cable. RS-422 Cable, Ethernet, Analog, USB2.0

---

**Example installation video:**

[QR Code Image]

ZYXer™ and ZYXerPath are designation of Sintokogio, Ltd.

SINTOKOGIO, LTD.

3-28-12, Meiki
Nakamura-ku, Nagoya 450-6424, Japan
Tel +81 52 562 9211 Fax +81 52 586 2279

www.sinto.com