BOTA Systems develops state of the art sensing technology for companies and institutes. In BOTA Systems, we bring to life the most compact and yet powerful force torque sensors. High performance and cost effective, our sensors serve efficiently robots that need to interact with humans and their environment. High overload values, as result of a series of design optimization, make them an impact robust sensing module with integrated electronics. Our technology was initially developed for quadruped robots, intended for measuring the ground reaction forces when walking and running at harsh environments. Offering these features and built to be reliable, BOTA Systems technology can be used for robotic arms, construction robots, exoskeletons or prosthetic devices, force plates, robotic surgery platforms, underwater force sensing. Our products are made in Switzerland.
OUR TECHNOLOGY

Static and dynamic force torque measurement devices measure strain induced from the applied forces/torques using resistive, capacitive and optical technologies. Among these technologies, the most mature, that offers the most reliable and predictable measurements, is the resistive strain gauges. Compared to the other technologies, resistive strain gauges can be used on steel, aluminum or titanium in a very effective way. Our sensors are manufactured with special aluminum alloy with long term stability of elasticity, high yield strength and are heat treated to deliver excellent creep characteristics for long term reliable measurements. To avoid accumulated errors that cannot be controlled by software, we minimize hardware nonlinearities. Temperature and gain offset compensation, ratio-metric voltage conversion, symmetrical loading, EMI shielding, parasitic capacitance and inductance compensation are utilized to minimize errors and maximize signal-to-noise ratio.

KEY ADVANTAGES OF OUR TECHNOLOGY:

✓ High overload values on very compact and lightweight structure
✓ High stiffness transducer with high bandwidth
✓ Drift from temperature change is compensated on the hardware
✓ Drift from mechanical creep is negligible due to metallic force transducer
✓ Re-calibration is not needed
✓ Repeatable and accurate measurements
✓ Long-life duration

BOTA SYSTEMS SENSING TECHNOLOGY

THE MOST RELIABLE METHOD TO MEASURE FORCE & TORQUE

KEY FEATURES:

✓ Highly integrated electronics with DAQ, IMU and temperature sensors
✓ Ultra-low-noise signal at high output rates
✓ No other components are required for analog or digital signal conversion
✓ The signal output is directly connected to EtherCAT, USB or RS422/RS485 ports
✓ Dust and water resistance
✓ Precise contact detection
✓ Gravity and Inertial compensation
✓ Plug & Play
**WE GIVE MACHINES THE SENSE OF TOUCH**

**APPLICATIONS**

- Insertion
- Finishing
- Precision Assembly
- Product testing and inspection

**TECHNICAL SPECIFICATIONS**

Serial

- The best value for money solution for force feedback applications for collaborative robots. Its USB or RS422/RS485 output can deliver up to 1000 samples per second. A compact dustproof and waterproof package with an integrated ISO 9409-1-50-4-M6 mounting flange. Only fasteners are needed to integrate on UR

- Negligible temperature drift
- High impact robustness
- Noise level better than 0.01% of nominal range
- Up to 1000 Hz update rate
- Enhances your robot with the sense of touch
- Precise contact force detection
- Path recording through hand guiding
- High tolerance assembly
- Easy integration of 3D Camera
- Plug & Play

- Range \((F_{xy}, F_z, M_{xy}, M_z)\):
  - 700 N, 1200 N, 15 Nm, 15 Nm
  - 2500 N, 4500 N, 35 Nm, 40 Nm
- Noise free resolution (100Hz)*:
  - 0.15 N, 0.1 N, 0.003 Nm, 0.001 Nm
- Weight:
  - 220 g
- Size (DxL):
  - 70 x 35 mm
- Communication:
  - USB, RS422/RS485
- Sampling rate (max.):
  - 1000 Hz
- Ingress Protection:
  - dustproof and waterproof

EtherCAT

- Lightweight advanced applications for industrial automation and mobile robotics that require ultra-accurate force torque measurements without bulky electronics. It is integrated with 6-DoF IMU, temperature sensors it is up to IP67 (waterproof and dustproof) and a big range of power supply from 9 to 70 V

- Range \((F_{xy}, F_z, M_{xy}, M_z)\):
  - 700 N, 1200 N, 15 Nm, 15 Nm
  - 2500 N, 4500 N, 35 Nm, 40 Nm
- Noise free resolution (100Hz)*:
  - 0.15 N, 0.1 N, 0.003 Nm, 0.001 Nm
- Weight:
  - 220 g
- Size (DxL):
  - 70 x 35 mm
- Communication:
  - CANopen over EtherCAT
- Sampling rate (max.):
  - 1000 Hz
- Ingress Protection:
  - dustproof and waterproof
The mounting flange of the sensor is the same for both sides. The pattern of the mounting flange is of ISO 9409-1:2011-06. Bolts of 10.9 equivalent or stronger bolts should be used. For the robot’s mounting surface please use the bolts provided with the sensor or ask info@botasys.com for details.

MECHANICAL DIMENSIONS

M8 Connector Pinout

<table>
<thead>
<tr>
<th>Power Supply</th>
<th>Serial</th>
<th>EtherCAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 V, 1.0W</td>
<td>PIN3: V-</td>
<td>PIN3: V-</td>
</tr>
<tr>
<td>Operating temperature</td>
<td>PIN5: RX+</td>
<td>PIN5: RX+</td>
</tr>
<tr>
<td>0 – 55 Celsius</td>
<td>PIN6: TX+</td>
<td>PIN6: TX+</td>
</tr>
<tr>
<td>PIN7: V+ (5V)</td>
<td>PIN8: RX</td>
<td>PIN7: V+ (9-70V)</td>
</tr>
</tbody>
</table>

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E-mail: info@botasys.com
Rokubi
Compact force torque sensor for limited space and payload

- Negligible temperature drift
- High impact robustness
- Noise level better than 0.01% of nominal range
- Up to 1000 Hz update rate
- Enhances your robot with the sense of touch
- Precise contact force detection
- Path recording through hand guiding, high tolerance assembly
- Plug & Play

WE GIVE MACHINES
THE SENSE OF TOUCH

APPLICATIONS

Aerial manipulation
Insertion
Finishing
Precision Assembly
Assistive devices

TECHNICAL SPECIFICATIONS

**Serial**
Game - Changing 6-Axis Force Torque Sensor for automation and robotics industry. Its USB or RS422/RS485 output can deliver up to 1000 samples per second. It is integrated with electronics in a very compact, dust-proof and waterproof package. An innovative product that delivers high quality measurements at a hard to compete price point.

- Range (F_xy, F_z, M_xy, M_z) 700 N, 1200 N, 15 Nm, 15 Nm
- Overload (F_xy, F_z, M_xy, M_z) 2500 N, 4500 N, 35 Nm, 40 Nm
- Noise free resolution 0.15 N, 0.1 N, 0.003 Nm, 0.001 Nm
- Weight 120 g
- Size (DxL) 48 x 32 mm
- Communication USB, RS422/RS485
- Sampling rate (max.) 1000 Hz
- Ingress Protection dustproof and waterproof

**EtherCAT**
Industrial Premium lightweight 6-Axis Force Torque Sensor integrated with IMU for advanced applications in automation and robotics industry. Its EtherCAT output can deliver up to 1000 Samples per second. It is integrated with a 6-DoF IMU, Temperature sensors, IP67 and a big range of power supply from 9 to 70 V

- Range (F_xy, F_z, M_xy, M_z) 700 N, 1200 N, 15 Nm, 15 Nm
- Overload (F_xy, F_z, M_xy, M_z) 2500 N, 4500 N, 35 Nm, 40 Nm
- Noise free resolution 0.15 N, 0.1 N, 0.003 Nm, 0.001 Nm
- Weight 120 g
- Size (DxL) 40 x 32 mm
- Communication CANopen over EtherCAT
- Sampling rate (max.) 1000 Hz
- Ingress Protection dustproof and waterproof

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E-mail: info@botasys.com
**Axial connector**

Alternative robot mounting surface

**Side connector**

Alternative robot mounting surface

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**MECHANICAL DIMENSIONS**

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**M8 Connector Pinout**

<table>
<thead>
<tr>
<th>PIN</th>
<th>Function</th>
<th>Serial Pinout</th>
<th>EtherCAT Pinout</th>
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<tbody>
<tr>
<td>PIN1</td>
<td>RX-</td>
<td>PIN3: V-</td>
<td>PIN3: V-</td>
</tr>
<tr>
<td>PIN2</td>
<td>RX+</td>
<td>PIN2: V-</td>
<td>PIN2: V-</td>
</tr>
<tr>
<td>PIN3</td>
<td>RX+</td>
<td>PIN4: TX-</td>
<td>PIN4: TX-</td>
</tr>
<tr>
<td>PIN4</td>
<td>TX+</td>
<td>PIN5: RX-</td>
<td>PIN5: RX+</td>
</tr>
<tr>
<td>PIN5</td>
<td>-</td>
<td>PIN6: TX+</td>
<td>PIN6: TX+</td>
</tr>
<tr>
<td>PIN6</td>
<td>-</td>
<td>PIN7: V+ (5V)</td>
<td>PIN7: V+ (9-70V)</td>
</tr>
<tr>
<td>PIN7</td>
<td>V+ (5V)</td>
<td>PIN7: V+ (9-70V)</td>
<td>PIN7: V+ (9-70V)</td>
</tr>
</tbody>
</table>

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**Power Supply**

- **Serial**: 5 V, 1.0W
- **EtherCAT**: 9 – 70 V, 1.5W

**Operating temperature**

- **Serial**: 0 – 55 Celsius
- **EtherCAT**: 0 – 55 Celsius

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**Communication**

- **Serial**: USB, RS422/RS485
- **EtherCAT**: CANopen over EtherCAT

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