SensONE Gen A Series Datasheet

Key Features

- Compact & Lightweight
- Dust & Water Resistant
- Software Developement KIt
- High Precision Low Drift
- Versatile, Low Latency Connectivity
- Robust multi-orientation connector

Configurations

Ordering number	Description
BFT-SENS-IND2-B4	T15 SensONE Gen A 6-axis F/T sensor with Industrial interface
BFT-DENS-IND2-B4	T5 high sensitivity SensONE Gen A 6-axis F/T sensor with Industrial interface
BFT-SENS-CAT2-B4	T15 SensONE Gen A 6-axis F/T sensor with EtherCAT interface
BFT-DENS-CAT2-B4	T5 high sensitivity SensONE Gen A 6-axis F/T sensor with EtherCAT interface

Technical Specifications

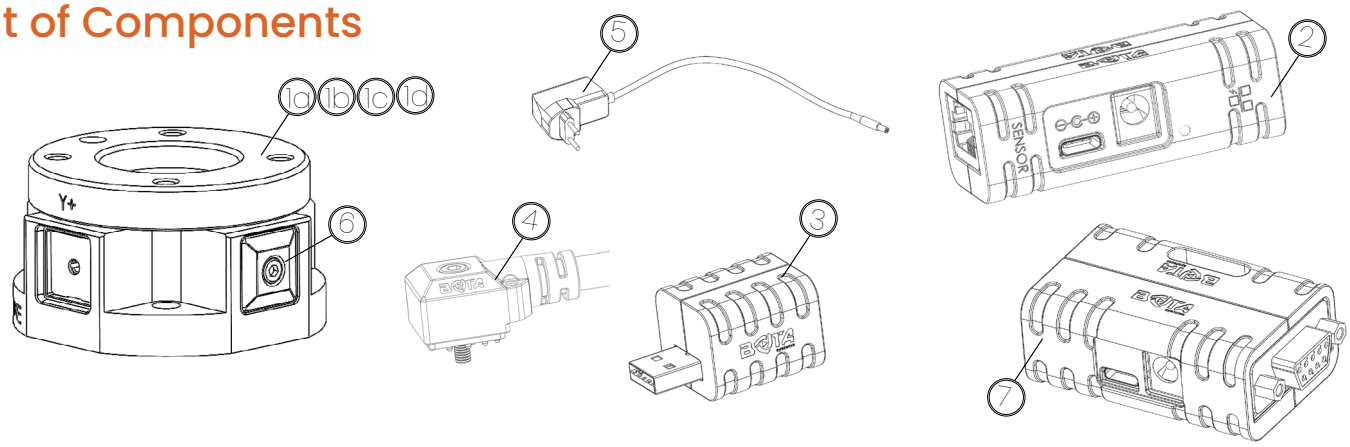
Please refer to the table for all sensor specifications. For additional information, feel free to consult our team of engineers at info@botasys.com.

		F_x	F_y	F_z	M_x	M_y	M_z
Range	**T15**	500 N	500 N	1200 N	15 Nm	15 Nm	12 Nm
	T5	400 N	400 N	500 N	5 Nm	5 Nm	8 Nm
Overload limit*	**T15**	2500 N	2500 N	4500 N	35 Nm	35 Nm	40 Nm
	T5	1000 N	1000 N	2000 N	12 Nm	12 Nm	15 Nm
NFR**	**T15**	100 mN	100 mN	70 mN	2.1 mNm	2.1 mNm	0.6 mNm
	T5	55 mNm	55 mNm	28 mNm	0.7 mNm	0.7 mNm	0.24 mNm
Accuracy		<2.0%	<2.0%	<2.0%	<2.0%	<2.0%	<2.0%
Nonlinearity		<2.0%	<2.0%	<2.0%	<2.0%	<2.0%	<2.0%
Drift		<100 mN/h	<100 mN/h	<500 mN/h	<3 mNm/h	<3 mNm/h	<3 mNm/h
Size (D x L) and Weight		70 mm x 35 mm / 235 grams					
Ingress Protection		Dust and water resistant					
Operating Temperature		0°C – 55°C					

	Industrial	EtherCAT
Communication	Ethernet 100 mbps, RS422/485/232, USB	EtherCAT in/out, USB
Maximum sampling rate	3800 Hz	
IMU, Max Acceleration, Angular rate	6 DoF IMU 6 DoF accelerometer & Gyroscope, ±16g & ±2000°/sec	
Power supply	5 – 60 V (Max 75 V), 2.5 W	

* Overload limit values are simulated using FEA methods. Real-life results may deviate from simulation results.
** NFR (noise-free resolution) refers to (6σ) peak-to-peak noise distribution of sensor signal at 100 Hz.

List of Components



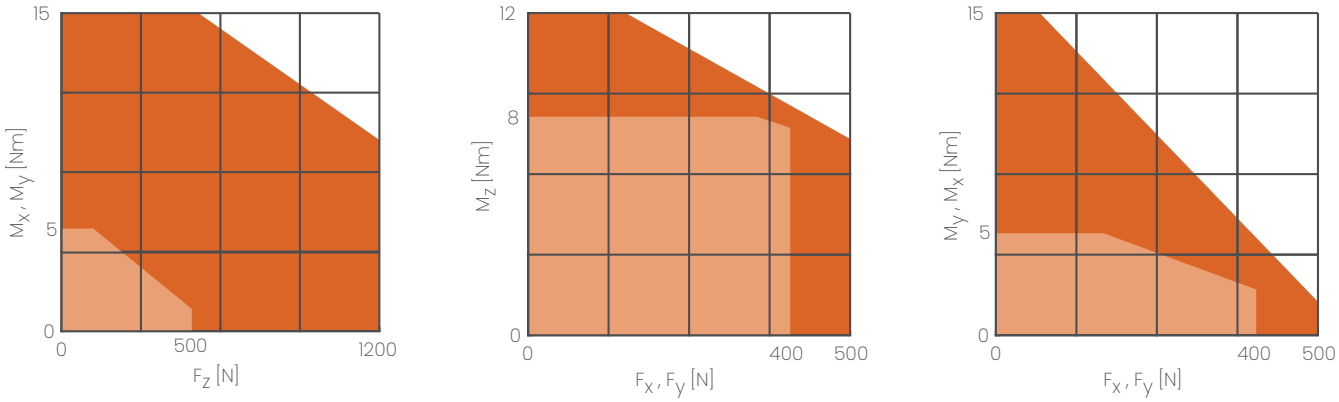
#	Ordering Number	Description	Included in configuration
1a	BFT-SENS-IND2-B4	T15 SensONE Gen A 6-axis F/T sensor with Industrial interface	BFT-SENS-IND2-B4
1b	BFT-SENS-CAT2-B4	T15 SensONE Gen A 6-axis F/T sensor with EtherCAT interface	BFT-SENS-CAT2-B4
1c	BFT-DENS-IND2-B4	T5 SensONE Gen A 6-axis F/T sensor with Industrial interface	BFT-DENS-IND2-B4
1d	BFT-DENS-CAT2-B4	T5 SensONE Gen A 6-axis F/T sensor with EtherCAT interface	BFT-DENS-CAT2-B4
2	ACC-NET-POE	Ethernet & EtherCAT cable adapter for Gen A Sensors	All configurations
3	ACC-NET-USB	USB cable adapter for Gen A Sensors	All configurations
4	ACC-RJ45-B4-3M	3.0m B4LP™ Sensor Cable Accessory	All configurations
5	ACC-SS-12V-12W-PSU	Sensor Power Supply (PSU)	All configurations
6	ACC-B4-COVER	B4LP™ Connector Cover	All configurations
7	ACC-NET-SER	Serial cable adapter for Gen A Sensors	Purchase separetly

Combined Loading Graphs

During single-axis loading, the sensor can operate up to its normal range. Above the sensor's normal range, the readings become inaccurate. The sensor should not work outside of its normal operating range.

When more than one axis is loaded, it becomes a combined loading, and the range of the sensor reduces.

The following graphs represent the combined loading scenarios, and the orange area represents the sensor's normal operating range.



T15 SensONE 6-axis F/T sensor [BFT-SENS-XXX]

T5 SensONE 6-axis F/T sensor [BFT-DENS-XXX]

Sensor Interface

Cable Pinout

The sensor features the new B4LP™ connector (Bota 4-orientation Low Profile), developed by Bota Systems. The cable is pre-attached but can be unscrewed and reattached in any of four orientations. The other end of the cable has an RJ45 connector with a proprietary pinout.

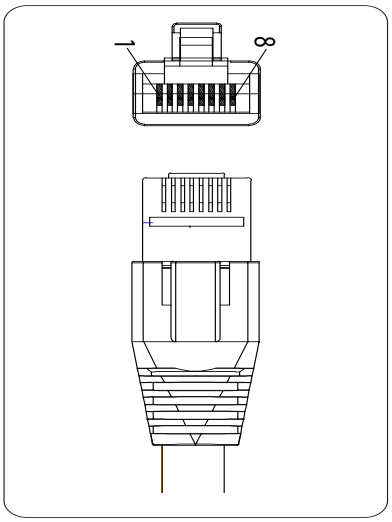
Do not connect it to a standard Ethernet port—it is not Ethernet-compatible.

Gen A sensors support multiple communication interfaces. The B4LP cable must be plugged into the appropriate sensor port:

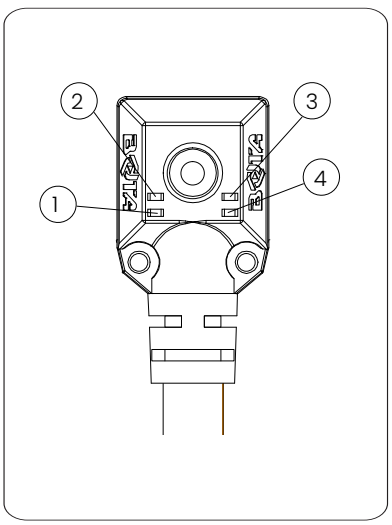
- **ECAT** – EtherCAT
- **ENET** – Ethernet (Modbus TCP or Bota Socket)
- **SERIAL** – Serial communication (supports RS232, RS422, RS485, with selectable termination)

All ports also support USB, which can be used for sensor configuration and as primary communication interface. Sensor setup can be managed through the Bota Configuration Tool, a web-based interface used to select the desired communication interface and protocol (e.g., RS232, RS485, or EtherCAT), Ethernet IP address or Modbus ID, etc and adjust other system-level settings like output rate and sensor offsets.

Pin	Wire color	ENET / ECAT	Serial RS422	Serial RS485	Serial RS232
1	White-Orange	TX +	TX +	(A) TX/RX +	
2	Orange	TX -	TX -	(B) TX/RX -	RX
3	White-Green	RX +	RX +		TX
4	Blue	USB -	USB -	USB -	USB -
5	White-Blue	USB +	USB +	USB +	USB +
6	Green	RX -	Rx -		
7	White Brown	5-60V Input	5-60V Input	5-60V Input	5-60V Input
8	Brown	GND	GND	GND	GND
SH	Shield	Shield	Shield	Shield	Shield



LED	LED color	Ethernet	Serial	EtherCAT
1	Green	State	State	RUN
2	Red	Errors	Errors	ERR
3	Orange	Activity	Sensor Transmitting	-
4	Green	Link	Sensor Receiving	Link/Activity

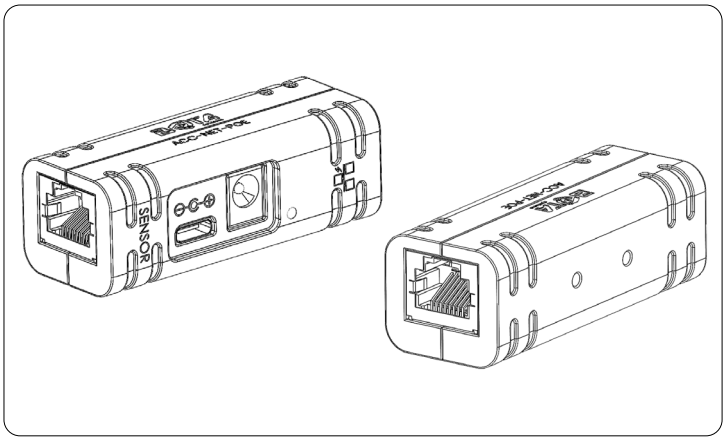


Cable Adapters

ACC-NET-POE

This adapter is used for Ethernet or EtherCAT communication, it plugs directly to the sensor cable and provide Ethernet base communication. Additionally the adapter provides a USB connection to configure and read data from the sensor. The sensor can be powered through: a) the USB-C connection, b) the 2.1mm DC jack, c) PoE 802.3af the Ethernet port.

The correct communication interface should be selected using the configuration tool and the sensor cable should be connected ONLY to ECAT or ENET labeled connector.

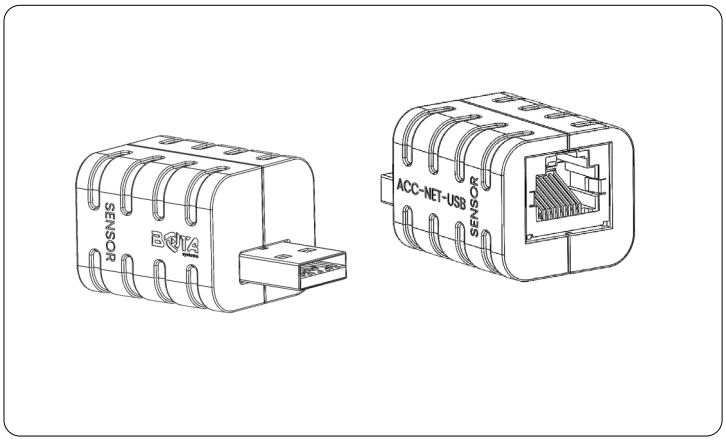


ACC-NET-USB

This adapter is used for USB communication that is available for all Gen A sensors. it plugs directly to the sensor cable and provides a USB-A male connector to configure and read data from the sensor. The sensor is powered through the USB connection, no external power is required.

If the sensor is only going to be used with USB select "Disabled - USB only" as Primary communication interface on the sensor configuration tool.

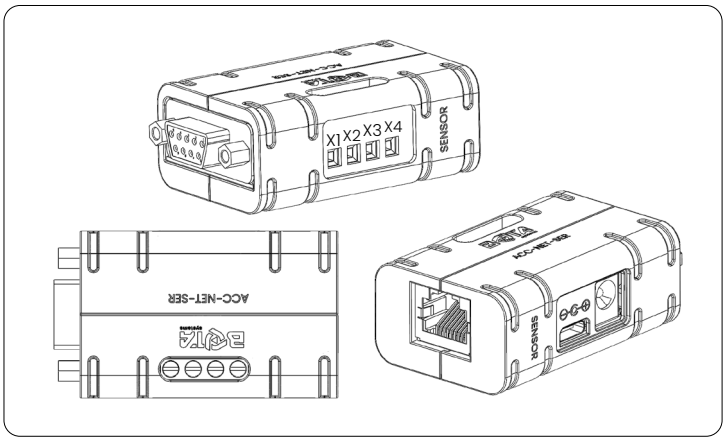
This adapter will work with the sensor cable plugged in all connectors labeled: ECAT, ENET, SERIAL



ACC-NET-SER (Purchase Separately)

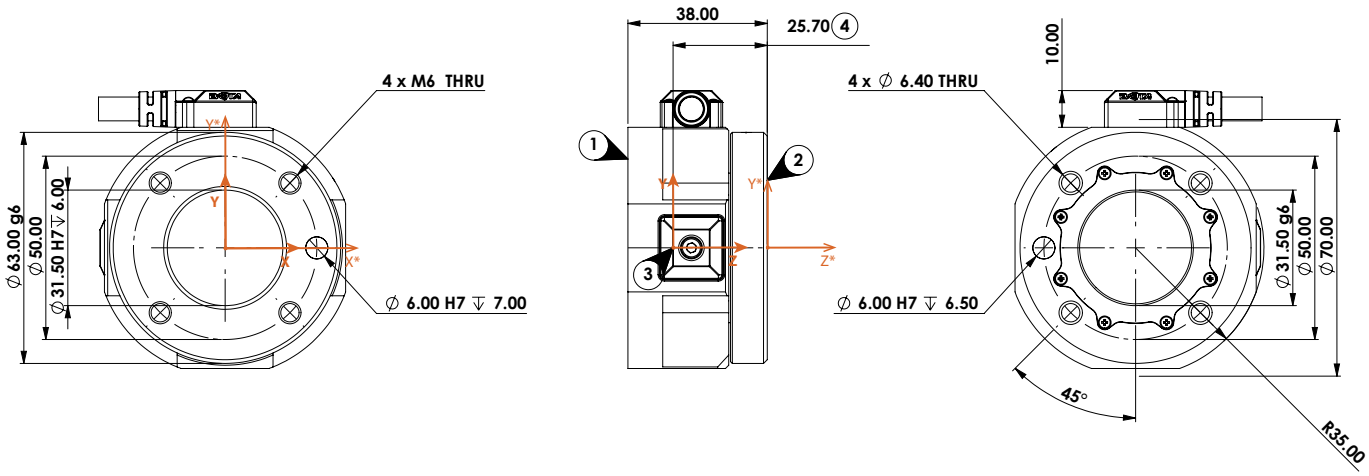
This adapter is used for Serial Only communication, it plugs directly to the sensor cable and provide RS422/485/232 communication. Additionally the adapter provides a USB connection to configure and read data from the sensor. The sensor can be powered through: a) the USB-C connection, b) the 2.1mm DC jack.

The communication interface should be selected using the sensor configuration tool and the sensor cable should ONLY be connected to SERIAL labeled connector.



#	Description
X1	RS422 TX+/RS485 A
X2	RS422 TX-/RS485 B/RS232 RX
X3	RS422 RX+/RS232 TX
X4	RS422 RX-

Mechanical Dimensions



SensONE Gen A by Bota Systems AG

1. Robot mounting side
2. Tool mounting side
3. 6-DoF IMU location
4. Distance between IMU and F/T sensor coordinate systems

NOTE: Cable diameter is 6.5mm

BFT-SENS-IND2-B4
BFT-SENS-CAT2-B4
BFT-DENS-IND2-B4
BFT-DENS-CAT2-B4

Crosstalk

Crosstalk in multi-axis force-torque sensors refers to the measurements in other axes when the sensor is excided only in a single axis. Crosstalk is reported as the percentile deviation from reference with respect to the full scale of that axis. Bota Systems provides a crosstalk certificate for your sensor tested according to ISO 21612:2021 standard upon request. An exemplary crosstalk table is provided below as a reference.

Affected axis	F_x	F_y	F_z	M_x	M_y	M_z
F_x (%)	-	0.00	0.05	0.02	1.17	0.18
F_y (%)	0.01	-	0.07	1.40	0.12	2.08
F_z (%)	0.08	0.03	-	1.66	0.32	0.01
M_x (%)	0.03	0.67	0.09	-	0.03	0.13
M_y (%)	0.13	0.36	0.22	0.85	-	0.07
M_z (%)	0.23	0.06	0.03	0.67	0.68	-

Signal Noise

Signal noise is any unwanted modification that may arise during capture, storage, transmission, processing, or conversion of a communication signal. The upper limits for the standard deviation of noise distribution are reported in the following tables.

Sampling rate		F_x	F_y	F_z	M_x	M_y	M_z
100 Hz	T15	16 mN	16 mN	11 mN	0.35 mNm	0.35 mNm	0.10 mNm
	T5	8.8 mN	8.8 mN	3.85 mN	0.12 mNm	0.12 mNm	0.04 mNm
250 Hz	T15	25 mN	25 mN	20mN	0.46 mNm	0.46 mNm	0.15 mNm
	T5	13.75 mN	13.75 mN	7.0 mN	0.16 mNm	0.16 mNm	0.06mNm
1000 Hz	T15	46 mN	46 mN	36 mN	0.95 mNm	0.95 mNm	0.30 mNm
	T5	25.3 mN	25.3 mN	12.6 mN	0.33 mNm	0.33 mNm	0.12 mNm
2133 Hz	T15	70 mN	70 mN	55 mN	1.40 mNm	1.40 mNm	0.45 mNm
	T5	38.5 mN	38.5 mN	19.25 mN	0.49 mNm	0.49 mNm	0.18 mNm
3840 Hz	T15	100 mN	100 mN	80 mN	2.0 mNm	2.0 mNm	0.61 mNm
	T5	55 mN	55 mN	28 mN	0.7 mNm	0.7 mNm	0.24 mNm

Software

Integration

Bota Systems offers a complete software suite for rapid integration.
C++ and Python drivers are available for seamless integration into existing codebases or systems. A ROS 2 driver is also provided, built on the ROS 2 control framework for quick deployment. This driver includes pre-configured settings for the sensor.

Get Started!

Sensor configuration tool

A web based application sensor configuration tool is available for setting up and commissioning your sensor in no time without the the need for drivers or installs. Setup the communication protocol, filtering, update rate and all other parameters of the sensor in no time without the need for reading the manual.

For more information, please refer to the user manual.