FT-Sensor

Axia80

Superior Clamping and Gripping

SCHUNK

Imprint

Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

Document number: 1009369

Version: 01.00 | 18/08/2017 | en

Dear Customer,

thank you for trusting our products and our family-owned company, the leading technology supplier of robots and production machines.

Our team is always available to answer any questions on this product and other solutions. Ask us questions and challenge us. We will find a solution!

Best regards,

Your SCHUNK team

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Reg. No. 003496 QM08

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Inhaltsverzeichnis

Glossar

Accuracy

See Measurement Uncertainty.

ADC

Analog-to-digital converter.

Calibration

The act of measuring a transducer's raw response to loads and creating data used in converting the response to forces and torques.

CRC

Cyclic redundancy check.

DINT

A 32-bit data type representing a signed integer.

EEPROM

Electrically erasable programmable read-only memory.

EtherCAT

An industrial automation fieldbus.

F/T

Force/Torque.

Fxy

The resultant force vector comprised of components Fx and Fy.

GPIO

General-purpose input/output.

I2C

Inter-integrated circuit.

IP60

Ingress protection rating "60" designates protection against dust.

ISR

Interrupt service routine.

MAP

The Mounting Adapter Plate (MAP) is the transducer plate that attaches to the fixed surface or robot arm.

MAX. Single-Axis Overload

The largest amount of load in a single axis (all other axes are unloaded) that the transducer can withstand without damage.

MCU

Microcontroller unit.

Overload

The condition where more load is applied to the transducer. This will result in saturation.

PDO

Process Data Object, a protocol for reading and writing real-time process information cyclically.

RAM

Random access memory.

Saturation

The condition where the transducer has a load or signal outside its sensing range.

SDO

Service Data Object, a protocol for reading and writing configuration information acyclically.

STRING(30)

A data type representing (30) characters, using (30) bytes.

STRING(8)

A data type representing (8) characters, using (8) bytes.

UINT

A (16) bit data type representing an unsigned integer.

USINT

An (8) bit data type representing an unsigned integer.

1 Safety

The safety section describes general safety guidelines to be followed with this product, explanation of the notification found in this manual, and safety precaution that apply to the product. More specific notification are imbedded within the sections of the manual where they apply.

1.1 Explanation of Warnings

The warnings included here are specific to the product(s) covered by this manual. It is expected that the user heed all warnings from the robot manufacturer and/or the manufacturers of other components used in the installation.

⚠ DANGER

Danger for persons!

Non-observance will inevitably cause irreversible injury or death.

⚠ CAUTION

Dangers for persons!

Non-observance can cause minor injuries.

⚠ WARNING

Dangers for persons!

Non-observance can lead to irreversible injury and even death.

NOTICE

Material damage!

Information about avoiding material damage.

1.2 General Safety Guidelines

The customer should verify that the transducer selected is rated for maximum loads and torques expected during operation. Because static forces are less than the dynamic forces from the acceleration or declaration of the robot, be aware of the dynamic loads caused by the robot.

1.3 Safety Precautions

⚠ WARNING

Performing maintenance or repair on the sensor, while circuits (e.g. power, water, and air) are energized could result in serious injury.

- Discharge and verify all energized circuits are de-energized in accordance with the customer's safety practices and policies.

NOTICE

Modifying or disassembly of the sensor could cause damage and void the warranty.

- Use the supplied mounting adapter plate and the provided tool side mounting bolt pattern to mount the sensor to the robot and customer tooling to the sensor.
- Refer to Link Zusammenbauzeichnung for more information.

NOTICE

Using fasteners that exceed the customer interface depth penetrates the body of the sensor, damages the electronics, and voids the warranty.

- Refer to Link Zusammenbauzeichnung for more information.

NOTICE

Probing openings in the transducer causes damage to the instrumentation.

- Avoid prying into openings of the transducer.

NOTICE

Exceeding the single-axis overload values of the transducer, causes irreparable damage.

- Do not overload the transducer.

2 Technical Data

Storage and Operating Conditions

Storage Temperature [°C]	-20 to +85
Operating Temperature [°C]	0 to +65

Electrical Specifications

Power Source	DC Power
Voltage [V] min. max.	 12 30
Maximum Power Consumption [W]	1

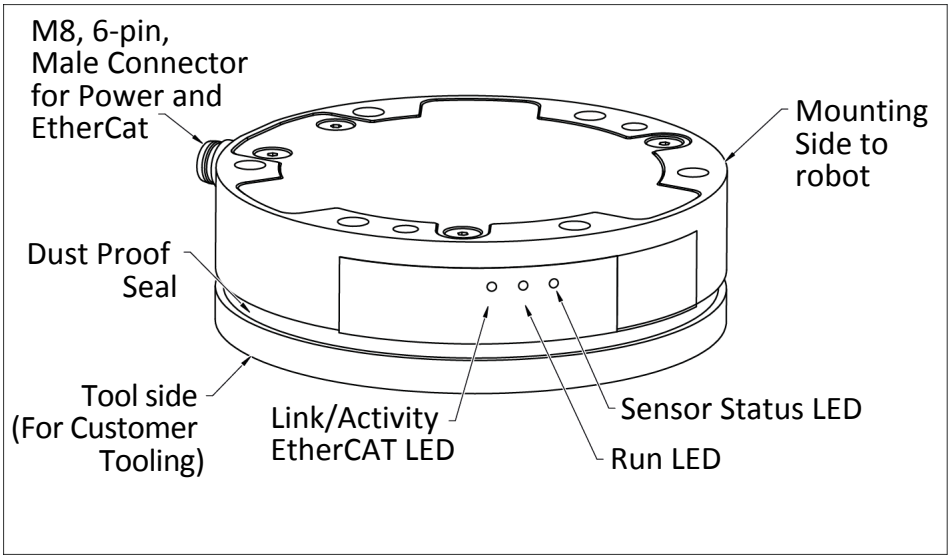
The power supply input is protected from a reversed polarity circuit.

Measurement Ranges

Parameter	Fxy [N]	Fz [N]	Txyz [Nm]
Measurement Range 0	200	360	8
Measurement Range 1	500	900	20

Each sensor is calibrated with these values.

3 Product Overview



The sensor system measures six components of force and torque (Fx, Fy, Fz, Tx, Ty, Tz) and streams data to customer devices that use EtherCAT fieldbus.

The mounting side attaches to a mounting adapter plate, which mounts to the customer robot. The tool side attaches to the customer tooling. Both the mounting and tool sides have a 71.12 mm bolt circle pattern with six M5 tapped holes Link Zusammenbauzeichnung. The sensor is IP60 rated. A M8 6-pin male connector is for power and EtherCAT. For the pin assignments Pin Assignment for the EtherCAT and Power Connection [▶ 16].

The Axia80 sensor provides the following features:

- Resolved force and torque data
- Set bias and clear bias
- Programmable low-pass filtering
- LED indicator for Run, EtherCAT Link, and Transducer Status LED Self-Test Sequence and Functions [▶ 9].

3.1 LED Self-Test Sequence and Functions

The EtherCAT F/T provides (3) LEDs for EtherCAT Link, Run, and Sensor Status. When the user applies power, the sensor completes a self-test, during which the LEDs under firmware control individually turn on.

3.1.1 LED Self-Test Sequence

When the user applies power to the sensor, the sensor completes a self-test, during which the LEDs under firmware control individually turn on in the following sequence:

Sequence Order	LED	State	Duration
1	Sensor Status	Red	Approximately one second for each LED.
2	Run	Red	
3	EtherCAT Link/Activity	Red	
4	Sensor Status	Green	
5	EtherCAT Link/Activity	Green	

The Green Run LED is not tested in the self-test sequence.

3.1.2 EtherCAT Link/Activity LED

One LED signals link/activity on the EtherCAT port as follows:

LED State	Link	Activity	Condition
Off	No	No	No Ethernet connection
Green	Yes	No	Ethernet link/activity is detected.
		Yes[1]	

[1] This LED behavior is different from the standard EtherCAT device Link/Activity LED behavior, which is a flashing green LED.

3.1.3 Run LED

One LED signals the communication status of the EtherCAT sensor interface as follows:

LED State	Description
Off	EtherCAT interface is in the state “INIT”.
Flashing green	EtherCAT interface is in the state “Preoperational”.
Green	EtherCAT interface is in the state “Operational”.

3.1.4 Sensor Status LED

One LED signals the health status of the sensor as follows:

LED State	Description
Off	No power.
Green	Normal operation. The sensor’s electronics are functioning and communicating.
Flashing green	Power-up self testing. At power-up, the sensor completes diagnostic testing to verify internal electronics are functioning.
Amber	Sensing range exceeded.
Red	System error.

4 Installation

⚠ WARNING

Performing maintenance or repair on the sensor when circuits (e.g. power, water, and air) are energized could result in death or serious injury.

- Discharge and verify all energized circuits are de-energized in accordance with the customer's safety practices and policies.

NOTICE

Modification or disassembly of the sensor could cause damage and void the warranty. .

- Use the supplied mounting bolt pattern and the provided tool side mounting bolt pattern to mount the sensor to the robot and customer tooling to the sensor Link Zusammenbauzeichnung

NOTICE

Using fasteners that exceed the customer interface depth penetrates the body of the sensor, damages the electronics, and voids the warranty Link Zusammenbauzeichnung.

NOTICE

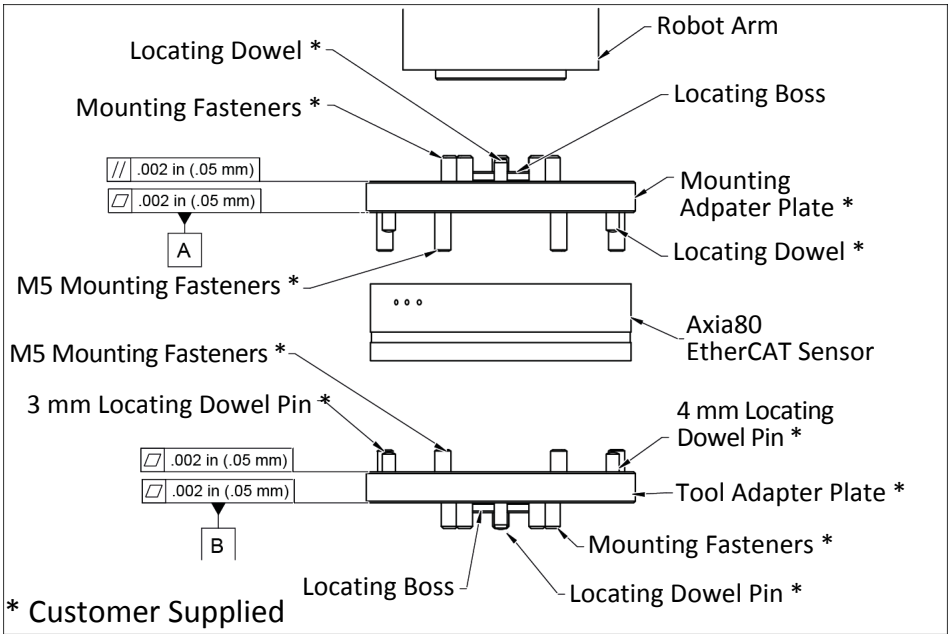
Fasteners may become loose and cause equipment damage

- Do not use fasteners with pre-applied adhesive more than once
- Always apply new thread locker when reusing fasteners.

NOTE

Depending on the maintenance or repair being performed, utilities to the sensor may not need to be disconnected.

4.1 Adapter Plates



The sensor's mounting side attaches to the robot arm, and the sensor's tool side attaches to the customer tooling. If adapter plate(s) are required to interface the sensor to the robot arm and customer tooling, SCHUNK can supply custom robot and tool adapter plates. Refer to Link Zusammenbauzeichnung for technical information on the sensor's mounting features.

NOTE

The customer tool should only touch the tool adapter plate. If the customer tool touches any other part of the sensor, it will not properly sense loads.

NOTE

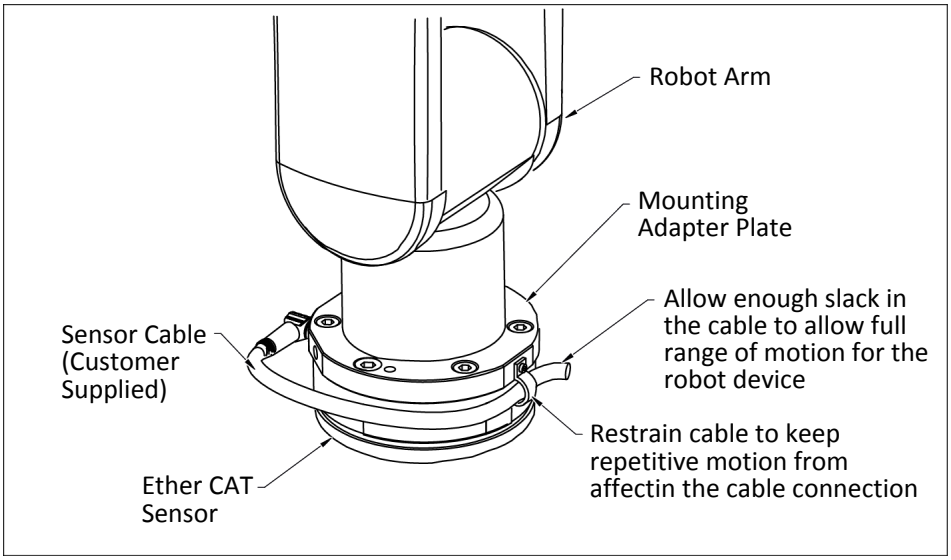
Because the mounting and tool sides of the sensor have identical bolt patterns, the robot mounting and tool adapter plates could be incorrectly installed, and as a result, the Axia80 sensor will not function properly.

If the customer chooses to design and build an adapter plate(s), the following points should be considered:

- The adapter plate(s) should include bolt holes for mounting fasteners as well as dowel pin(s) and a boss for accurate positioning to the robot or customer's device.
- The thickness of the adapter plate(s) must provide sufficient thread engagement for the mounting fasteners.
- The mounting fasteners should not extend through the sensor's housing or interfere with the internal electronics. Link Zusammenbauzeichnung for thread depth, mounting patterns, and other details.

- Do not use dowel pin(s) that exceed length requirements and prevent the adapter plate(s) to mate flush with the robot and customer tooling. Fasteners that exceed length requirements crea`te a gap between the interfacing surfaces and cause damage.
- The adapter plate(s) must not distort from the maximum force and torque values that can be applied to the sensor Link Technische Daten.
- The adapter plate(s) must provide a flat and parallel mounting surface for the sensor.

4.2 Routing the Cable



The routing and bending radius of the cable depends upon the customer application. Unlike motionless applications, where the cable is in a static condition, dynamic applications subject the cable to a repetitive motion. For dynamic applications, restrain the cable at a distance that does not expose and damage the sensor's cable connection from the robot's repetitive motion.

NOTE

The maximum supported cable length is 25 m.

NOTICE

Subjecting the connector to the repetitive motion will cause damage to the connector.

- Restrain the cable close to the connector so that the repetitive motion of the robot does not interfere with the cable connector.
- Do not subject the sensor's cable connector to the repetitive motion of the robot or other device.

NOTICE

Improper routing may cause poor functionality of critical electrical lines, injury to personnel, or damage to equipment. Damage to the sensor or cable from improper routing will void the warranty.

- The cable must withstand the repetitive motions of the robot without failing. The electrical line, especially where attached to the sensor's connector, must be routed to avoid stress failure, sharp bends, or a disconnection from the equipment.
- If the application results in cable rubbing, use a loose, plastic spiral wrap for protection.

NOTICE

A bend radius too small causes the cable to fail from fatigue of the robot's repetitive motion.

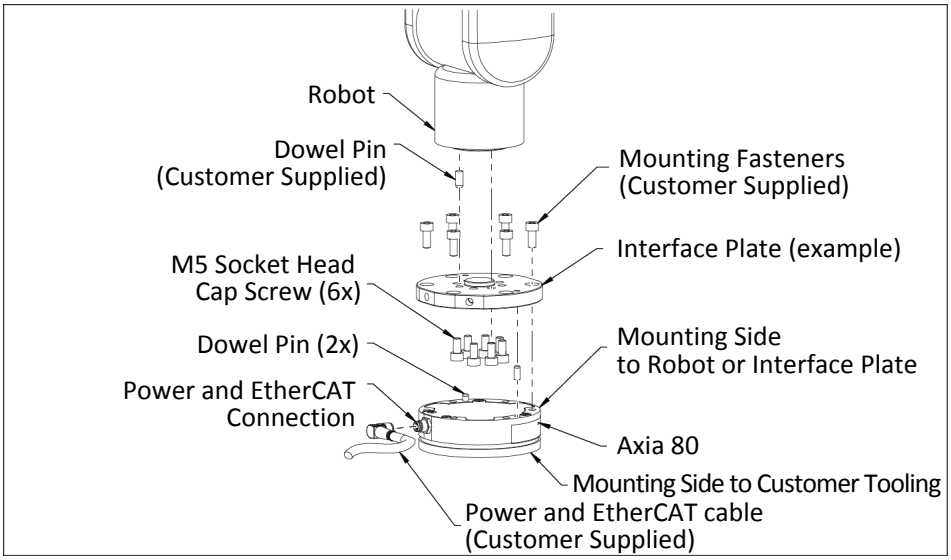
- When routing cables do not bend less than the minimum bending radius specified by the cable's manufacturer.

NOTICE

Do not damage or crush the cable by over tightening tie wraps on the cable.

4.3 Installing the Sensor to the Robot

Tools required: 4 mm hex wrench, torque wrench
Supplies required: Clean rag, Loctite 242® or fasteners with pre-applied adhesive



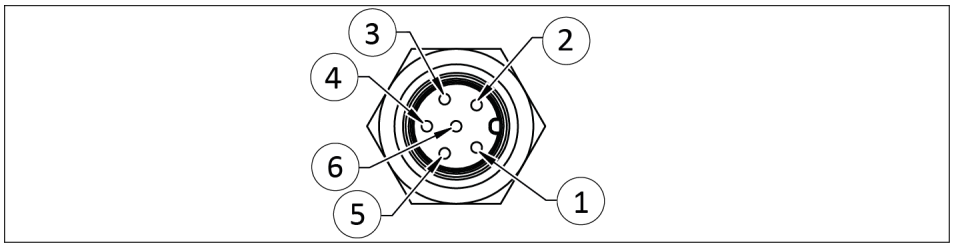
- To attach the mounting adapter plate to the robot, remove the six M5 socket head cap screws that secure the adapter plate to the mounting side of the Axia80 sensor.
- Ensure the mounting surface of the mounting adapter plate and robot are clean and free of debris.
- If applicable, secure the mounting adapter plate to the robot arm with customer supplied fasteners and dowel pin.
- M5x 12 socket head cap screws class 12.9 (6x), with pre-applied adhesive require no additional Loctite for initial installation. When reusing fasteners, always apply Loctite 242 to the M5 socket head cap screws.
- Using a 4 mm hex wrench, secure the sensor to the mounting adapter plate with the six M5x 12 socket head cap screws, class 12.9. Tighten to 9 Nm.
- Once the sensor is installed on the robot, the customer tooling or tool interface plate can be installed.
  NOTICE! The tool must not touch any other part of the sensor except the tool side; otherwise, the sensor will not properly detect loads.
- Connect a power and EtherCAT cable from the sensor's connection to the customer application.
- Properly restrain and route the power and EtherCAT cable Routing the Cable [▶ 13].
- After installation is complete, the sensor is ready for normal operation.

4.4 Removing the Sensor from the Robot

Tools required: 4 mm hex wrench

- Turn off all energized circuits (e.g. electrical).
- Remove the power and EtherCAT cable from the sensor's connection.
- Supporting the customer tooling and/or interface plate, remove the customer supplied screws that attach to the customer tooling to the sensor.
- Supporting the sensor, use a hex wrench to loosen the six M5 socket head cap screws that secure to the sensor to the mounting interface plate or robot.
- Remove the sensor.

4.5 Pin Assignment for the EtherCAT and Power Connection



Pin M8 Male Connector for Power and EtherCAT

Pin Number	Signal
1	TX0+
2	TX0-
3	RX0+
4	RX0-
5	+24 V
6	Ground

The figure and table details show the sensor's power and EtherCAT connector's signals and corresponding pin numbers.

5 Operation

The following section provides information required when using software to operate the EtherCAT Sensor. Communicating with the EtherCAT sensor requires knowledge of EtherCAT standards and operation.

5.1 Sensor Enviroment

NOTICE

Damage to the outer jacketing of the transducer cable could enable moisture or water to enter an otherwise sealed transducer.

- Ensure the cable jacketing is in good condition to prevent transducer damage.

NOTE

Transducers may react to exceptionally strong and changing electromagnetic fields, such as those produced by magnetic resonance imaging (MRI) machines.

To ensure proper operation, the IP60 rating of the transducer must match or exceed the transducer's environment.

5.2 Sample Rate

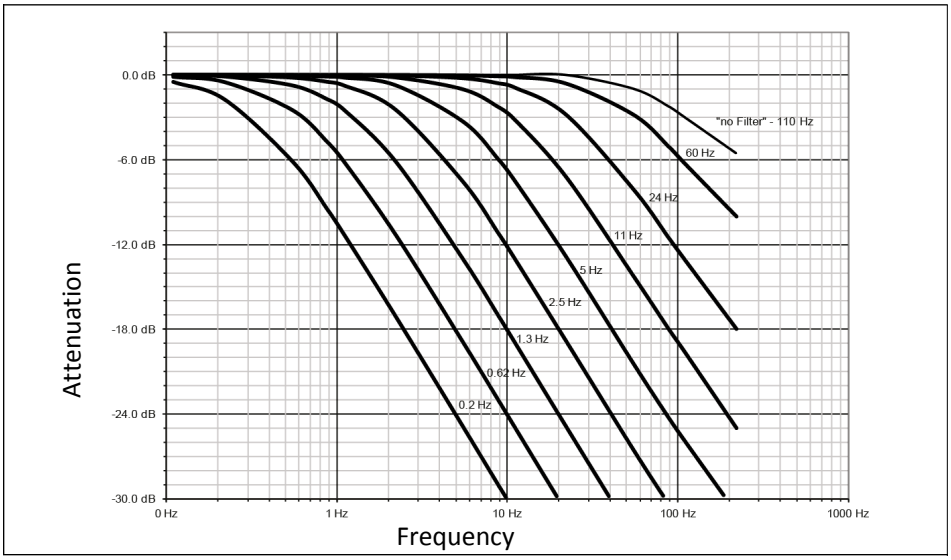
The power-on default sample rate is 975 Hz. The "Sample Rate" field Object 0x7010: Control Codes [▶ 26] controls the current sample rate. The following table lists the rounded and exact sample rates.

Rounded Sample Rate	0.5 kHz	1 kHz	2 kHz	4 kHz
Exact Sample Rate	487 Hz	975 Hz	1990 Hz	3900 Hz

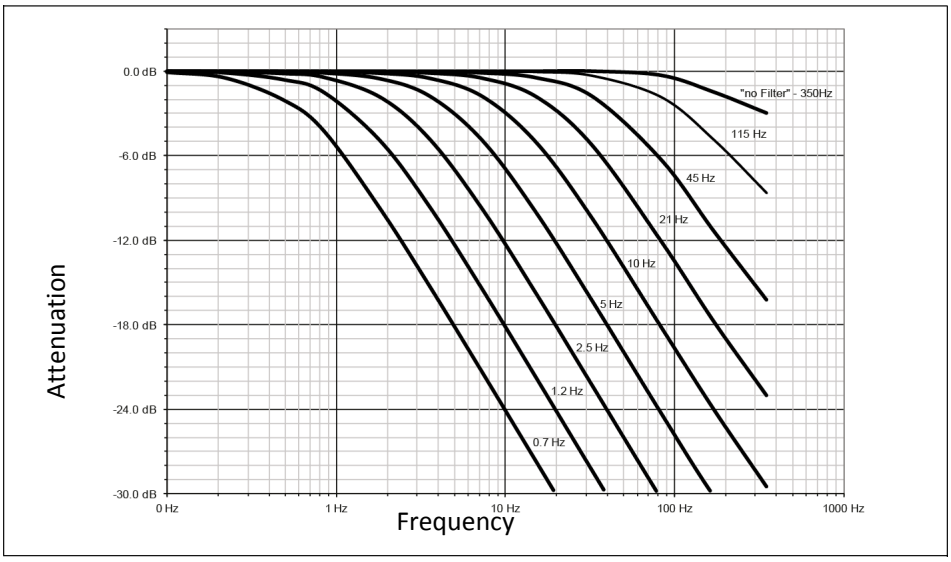
5.3 Low-pass Filter

The power-on default selection is no filtering. The “Filter Selection” field Object 0x7010: Control Codes [▶ 26]: Control Codes controls the current filter selection. The cutoff frequency (i.e. -3 dB frequency) is dependent on the sample rate selection, which is defined in Sample Rate [▶ 17]. The cutoff frequencies for the different sampling rates are listed in the following table and graphs:

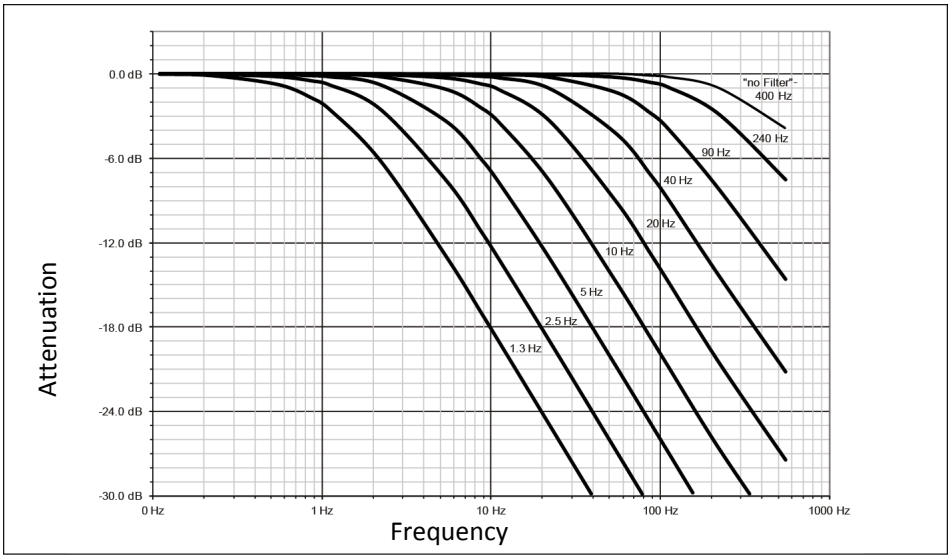
Selected Filter	-3dB Cutoff Frequency (in Hz)			
	at 0.5 kHz Sample Rate	at 1 kHz Sample Rate	at 2 kHz Sample Rate	at 4 kHz Sample Rate
0	200	350	500	1000
1	58	115	235	460
2	22	45	90	180
3	10	21	43	84
4	5	10	20	40
5	2.5	5	10	20
6	1.3	3	5	10
7	0.6	1.2	2.4	4.7
8	0.3	0.7	1.4	2.7



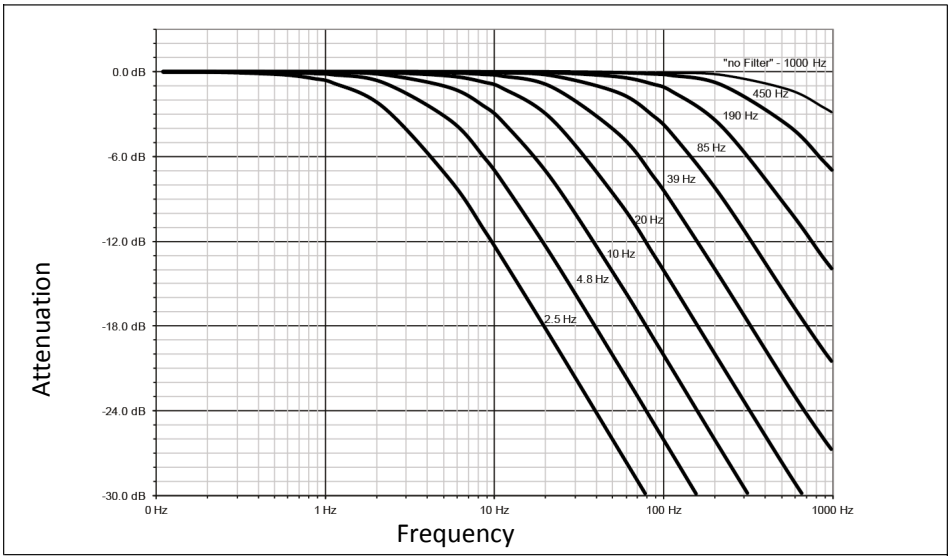
Filter Attenuation at 0.5 kHz Sample Rate



Filter Attenuation at 1 kHz Sample Rate



Filter Attenuation at 2 kHz Sample Rate



Filter Attenuation at 4 kHz Sample Rate

6 EtherCAT Bus Interface

The EtherCAT bus interface enables users to perform the following actions:

- Read the active calibration information matrix, serial number, etc.
- Read the firmware revision
- Read force/torque data
- Read strain gage data and status information
- Set low-pass filter cutoff frequency
- Bias the transducer
- Change the sample rate

6.1 PDO Interface

The PDO interface exchanges data in real time with the F/T sensor.

- TxPDO Map / Output Data
  The TxPDO combines Object 0x6000 : Reading Data [▶ 23], Object 0x6010: Status Code [▶ 24], andObject 0x6020: Sample Counter [▶ 25].
- RxPDO Map / Input Data
  The RxPDO map consists of Object 0x7010: Control Codes [▶ 26].

6.2 EtherCAT Dictionary Objects (SDO Data)

The SDO data configures the sensor and reads the manufacturing and calibration date. This section lists dictionary objects specific to the EtherCAT F/T sensor application; it does not list objects that are a required part of the EtherCAT standard.

6.2.1 Object 0x2021: Calibration

This read-only object contains information about the currently active calibration selected by the “Calibration Selection” field Object 0x7010: Control Codes [▶ 26]. It contains the following fields:

Subindex	Name	Type	Description
0x01	FT Serial	STRING(8)	The FT Serial Number, e.g. “FT01234”.
0x02	Calibration Part Number	STRING(30)	The calibration part number e.g. “SI-120-95”.
0x03	Calibration Family	STRING(8)	Always reads “ECAT”.
0x04	Calibration Time	STRING(30)	The date the sensor was calibrated.
0x05 through 0x2e	Reserved	DINT	Reserved.

Subindex	Name	Type	Description	
0x2f	Force Units	USINT	**Value**	**Unit**
			0	Lbf
			1	N
			2	Klbf
			3	Kn
			4	Kg
0x30	Torque Units	USINT	**Value**	**Unit**
			0	Lbf-in
			1	Lbf-ft
			2	N-m
			3	N-mm
			4	Kg-cm
			5	kN-m
0x31	Max Fx Counts	DINT	The maximum rated value for this axis, in counts.	
0x32	Max Fy Counts			
0x33	Max Fz Counts			
0x34	Max Tx Counts			
0x35	Max Ty Counts			
0x36	Max Tz Counts			
0x37	Counts Per Force	DINT	The calibration counts per force unit.	
0x38	Counts Per Torque	DINT	The calibration counts per torque unit.	
0x39 through 0x56	Reserved	UINT	Reserved.	
0x57	PeakLoadsPosFx	DINT	Peak Loads Positive. All-time peak positive force/ torque loads.	
0x58	PeakLoadsPosFy			
0x59	PeakLoadsPosFz			
0x5a	PeakLoadsPosTx			
0x5b	PeakLoadsPosTy			
0x5c	PeakLoadsPosTz			
0x5d	PeakLoadsNegFx	DINT	Peak Loads Negative. All-time peak negative force/ torque loads.	
0x5e	PeakLoadsNegFy			
0x5f	PeakLoadsNegFz			
0x60	PeakLoadsNegTx			
0x61	PeakLoadsNegTy			
0x62	PeakLoadsNegTz			
0x63 through 0x7c	Reserved			

6.2.2 Object 0x2080: Diagnostic Readings

This read-only object provides firmware version information. The following fields are available in the version object:

Diagnostic Readings

Subindex	Name	Type	Description
0x01	Supply Voltage	UINT16	The voltage of the external power supply x 10.
0x02	Gage Temperature	INT16	The transducer temperature in °C x 10.
0x03	Status Message	STRING(40)	A priority status code error message. Refer to the following Table

Errors in the Diagnostic Readings Status Message

Priority	Text Error Messages
1	Supply voltage out of range.
2	Gage temperature out of range.
3	Calibration checksum error.
4	Gage(s) disconnected: <list>
5	Gage(s) out-of-range: <list>
6	Force/torque out of range.
7	Common error that could be (1) or more of the following: • PHY issue. • ADC write register verify error. • MCU Parameters-RAM CRC error. • I2C EEPROM verify error. • MCU image 0 CRC error. • MCU RAM error. • MCU stack critically low error. • MCU part number or version is incorrect. • MCU watchdog reset. • MCU registers error • MCU program counter error. • ADC no interrupt seen lately. • MCU Stuck GPIO output bits
8	Simulated error.
9	Monitor condition 0.
10	Error (unspecified).
11	No status code errors.

6.2.3 Object 0x2090: Version

This read-only object provides firmware version information. The following fields are available in the version object:

Subindex	Name	Type	Description
0x01	Major	UNIT	Major Version
0x02	Minor	UNIT	Minor Version
0x03	Revision	UNIT	Revision
0x04	Boatloader Version	UDINT	Bootloader Version

6.2.4 Object 0x6000: Reading Data

This read-only object represents the current force/torque or gage data and is mapped into the TxPDO input data. The following fields are present in the reading data:

Subindex	Name	Type	Description
0x01	Fx	DINT	These fields contain the 32-bit F/T result data, in counts per unit.
0x02	Fy		
0x03	Fz		
0x04	Tx		
0x05	Ty		
0x06	Tz		

6.2.5 Object 0x6010: Status Code

This object contains a single DINT value (at subindex 0), with the following bitmap:

Bit Number	Description	Indicates an Error?
0	Gage Temperature Out of Range: This bit becomes active if the gage temperature is outside the expected range of -5 to 70°C.	Yes
1	Supply Out of Range: This bit becomes active if the external power supply voltage is out of the expected range. It remains high until the supply returns to the expected range.	Yes
2	Broken gage error. If any of the strain gages or the wiring to the gages breaks, this error bit is set active. This bit remains set until a power cycle.	Yes
3	Busy Bit. The sensor is performing (1) or more of the following activities that may temporarily affect the F/T data: • Committing a change to Object 0x2021. • Changing the filter time constant. • Changing the calibration in use. • Changing the ADC sampling rate. • Writing to flash memory. • Any ADC ISR overrun.	Yes
4	Reserved.	No
5	Common error bit. This bit indicates that (1) or more of the following errors has occurred: • PHY issue • ADC Write Register Verify error. • MCU Parameters-RAM CRC error. • I2C EEPROM Verify error. • MCU Image 0 CRC error • MCU RAM error. • MCU Stack critically low error. • MCU part number or version is incorrect. • MCU Watchdog reset. • MCU registers error. • MCU Program Counter error. • ADC No interrupt observed. • MCU Stuck GPIO output bits.	Yes
6-15	Reserved.	No

Bit Number	Description	Indicates an Error?
16	Monitor condition 0 output.	No
17-26	Reserved.	No
27	Gage Out of Range. This bit is set whenever a gage sample is outside of the range gageMin-Range to gageMaxRange. This bit stays high for 32 samples after the last such sample to allow time for the sample's effect on the data to abate.	Yes
28	Simulated Error. This bit mirrors the "Simulated Error Control" bit Object 0x7010: Control Codes [▶ 26]. It can be used to test user error handling.	Yes
29	Calibration checksum error: This bit is set if the active calibration has an invalid checksum.	Yes
30	Sensing Range Exceeded1: This bit is set whenever a F/T reading exceeds the calibrated range. This check occurs before digital filtering.	Yes
31	Error: This bit is set whenever any status code bit that indicates an error is set.	Yes
Note: 1. Sensing Range Exceeded is comparable to what previous F/T sensor manuals identified as saturation.		

6.2.6 Object 0x6020: Sample Counter

This object contains a single 32-bit unsigned integer at subindex 0 that increases by one each time an F/T sample (one complete set of gage data) is read.

This number rolls over from 4 294 967 295 (2^{32}-1) to 0 without signalling an error. The sample counter is reset to zero during power up.

6.2.7 Object 0x7010: Control Codes

This object is mapped into the RxPDO for real-time control of the F/T system. It contains the following fields:

Subindex	Name	Type	Description	
0x01	Control 1	DINT	**Bit**	**Function**
			0	1 = Set bias against current load 0 = Use last set bias
			1	Clear Monitor Condition 0 1 = clear 2 = leave alone
			2	1 = clear bias 0 = leave bias unchanged
			3	Reserved
			4-7	The low-pass filter selection 0 = No filtering 1 - 8 = Low-pass Filter [▶ 18]
			8-11	Active calibration 0 = Cal 0 1 = Cal 1 2 through 15 = Reserved.
			12-15	Sample Rate 0 = 487 Hz 1 = 975 Hz 2 = 1990 Hz 3 = 3900 Hz
			16-31	Reserved
0x02	Control 2	DINT	**Bit**	**Function**
			0	Enable checking of Monitor Condition 0
			1-30	Reserved
			31	Simulated Error Control

7 Maintenance

7.1 Periodic Inspection

With industrial-type applications that frequently move the system's cabling, you should check the cable jacket for signs of wear. The Axia80 is IP60 rated and must be kept free of moisture. Debris and dust should be kept from accumulating on or in the sensor.

7.2 Periodic Calibrating

Periodic calibration of the sensor and its electronics is required to maintain traceability to national standards. Follow applicable ISO-9000-type standards for calibration. SCHUNK recommends annual recalibrating, especially for applications that frequently cycle loads applied to the sensor.

8 Troubleshooting

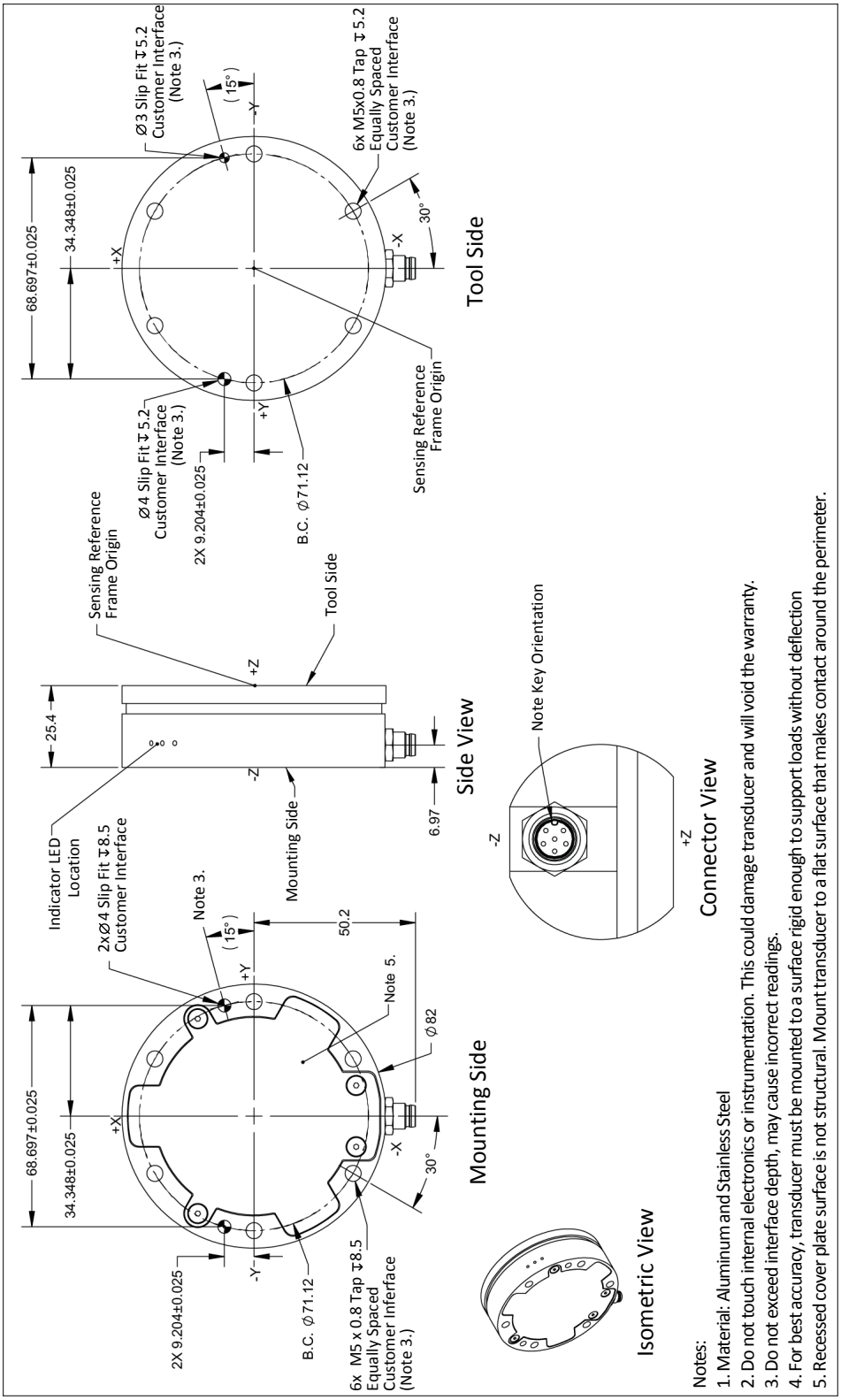
The information in this section should answer many questions that might arise in the field. Customer service is available for problems or questions not addressed in the manuals.

8.1 Errors with Force and Torque Readings

Inaccurate data from the transducer's strain gages can cause errors in force/torque readings. These errors can result in problems with transducer biasing and accuracy. Listed in the following table are the basic problems of inaccurate data.

Problem	Solution
Noise	Jumps in force torque data readings (with the sensor unloaded) greater than 0.05% of full scale counts is abnormal. Noise can be caused by mechanical vibrations and electrical disturbances, possibly from a poor ground. Noise can also indicate component failure within the system. Make sure that the DC supply voltage for the Axia80 sensor has little to no noise superimposed. The sensor should be grounded through installation construction.
Drift	After a load is removed or applied, the raw gage reading does not stabilize but continues to increase or decrease. A shift in the raw gage reading is observed more easily in the resolved data mode using the bias command. Some drift from a change in temperature or mechanical coupling is normal.Mechanical coupling occurs when a tool plate contacts the sensor body, for example, debris between the tool adapter plate and the sensor body or in applications such as hoses and wires attached to a tool.
Hysteresis	When the sensor is loaded and then unloaded, gage readings do not return quickly and completely to their original readings. Hysteresis is caused by mechanical coupling (explained in Drift section) or internal failure.
Sensor not streaming measurement data to the customer devices that use EtherCAT fieldbus.	Verify the sensor is correctly installed. Ensure the robot mounting and tool adapter plates are installed on the proper side of the sensor Installation [▶ 11].

9 Drawings


Ø3 Slip Fit ↧5.2
Customer Interface
(Note 3.)
6x M5x0.8 Tap ↧5.2
Equally Spaced
Customer Interface
(Note 3.)
68.697±0.025
34.348±0.025
Ø4 Slip Fit ↧5.2
Customer Interface
(Note 3.)
2X 9.204±0.025
B.C. Ø71.12
Sensing Reference
Frame Origin
Tool Side
Side View
Sensing Reference
Frame Origin
Tool Side
25.4
Indicator LED
Location
2xØ4 Slip Fit ↧8.5
Customer Interface
Note 3.
Mounting Side
6.97
50.2
Note 5.
Ø82
6x M5 x 0.8 Tap ↧8.5
Equally Spaced
Customer Inferface
(Note 3.)
Mounting Side
Note Key Orientation
Connector View
Isometric View
Notes:
1. Material: Aluminum and Stainless Steel
2. Do not touch internal electronics or instrumentation. This could damage transducer and will void the warranty.
3. Do not exceed interface depth, may cause incorrect readings.
4. For best accuracy, transducer must be mounted to a surface rigid enough to support loads without deflection
5. Recessed cover plate surface is not structural. Mount transducer to a flat surface that makes contact around the perimeter.