ACURO Encoders absolutos

Método de codificación en encoders absolutos

Absolute and incremental encoders share the same optical principle – a coded disk interrupts a beam of light between a photo- emitter and receiver. However, incremental encoders use the disk's track to produce a specific number of on/off pulses per revolution. To relate the pulses to physical position, they must be accumulated by a counter. The count is subject to loss during a power interruption or corruption by electrical transients.

The difference between incremental and absolute encoders is analogous to the difference between a stop watch and a clock.

A stop watch measures the incremental time that elapses between its start and stop, much as an incremental encoder will provide a known number of pulses relative to an amount of movement. If you knew the actual time when you started the watch, you can tell what time it is later by adding the elapsed time value from the stop watch. For position control, adding incremental pulses to a known starting position will measure the current position.

When an absolute encoder is used, the actual position will constantly be transmitted, just as a clock will tell you the current time.

An absolute encoder's disk features multiple tracks and multiple emitters and receivers. Position is transmitted as a distinct digital value for each position in the rotation. If power is lost, it's output will be absolutely correct whenever power is restored. And electrical transients can only produce transient data-errors, usually too brief to effect the dynamics of a control system.

The encoder's output is a multi-bit digital "word" based on the exact rotational position of the its shaft. A counting circuit is not required to track position since the encoder will provide the correct information upon returning from a power-down event. After power is restored, the position can be immediately read out. It is not necessary to move to a reference position as with incremental type encoders.

Absolute shaft encoders, also known as shaft-angle encoders, are by no means used only to detect angular positions. They are also suitable for linear movements that can be converted into rotary movements by a toothed belt, drive pinion, or wire winch.

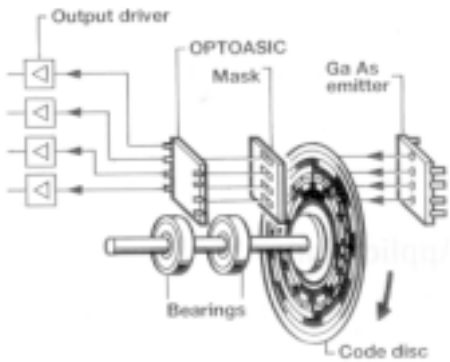
In this catalog, you'll find absolute encoders that offer anywhere from .5° output (720 Counts Per Revolution) to extremely high precision units featuring 16,384 CPR.

SINGLE VS. MULTI-TURN

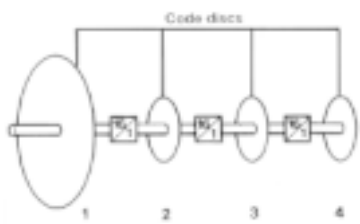
The basis of any absolute encoder is to provide a unique output based on shaft position. However, for a single-turn device, the output codes are repeated for every revolution of the encoder's shaft. The is no data provided to indcate if the encoder had made one revolution - or 1000 revolutions.

With multi-turn absolute encoders, the output is unique for each shaft position, through every rotation, up to 4096 revolutions.

Absolute shaft encoders using an optical scanning principle to resolve several tracks of line markings on a code disc. Scanned in parallel, these tracks provide data transmitted as a distinct digital value or "word" for each angular position of its shaft's rotation. The tracks utilize "Gray Code", which has the advantage that only one output bit changes for each increment. This prevents reading errors. Optical absolute shaft encoders with a mechanical multiturn capability have additional discs, besides the disc for measuring 360°, for resolving multiple revolutions.



Multiple code disks are used to distinguish position for each revolution of the shaft



Benefits of Using an Absolute Encoder

No need to physically move a machine to a "home position" to reestablish a reference point: This can provide significant time savings during machine change over, and lets positioning be based on a point to point method without the necessity of passing through the home position.

Will not lose position during loss of power. In addition to the time savings and convenience gained through the elimination of referencing at power-up, added safety is achieved for applications where loss of position can be hazardous.

Decreased susceptibility to EMI: All signal wiring can be subject to the influence of electrical interference or "noise". If a stray noise induced pulse is transmitted by an incremental encoder, positioning will always be inaccurate by that amount. Subsequent stray pulses will cause the error to accumulate. Systems using an absolute encoder may produce a fleeting inaccurate reading due to a noise transient, but the correct absolute position will be regained at the next reading.

Increased Flexibility: Some of our absolute encoders offer field programmable features. Typical features are:

- *offset-value* – allows the encoder's output data to be shifted in relation to machine mechanical position
- *output-scaling* – calibrates resolution by reducing counts-per-revolution to a value that might provide a simplified interface with your position control system.

INDUSTRIAL BUS INTERFACE

Absolute encoders are available with parallel outputs which require a cable connection with many conductors (one for each bit). New technology has simplified wiring by incorporating serial data that complies with popular industrial networks.

Dynapar brand encoders are offered with interfaces for the three most common buses worldwide. While each bus provides the same basic benefits, there are important differences between the three. Listed below is a brief overview to assist you with choosing the bus that best fits your application.

DeviceNet Based on the Controller Area Network (CAN) which was developed by Bosch for use in automobiles as a communication system with Anti-lock brakes. Commercialized for industrial used by Allen-Bradley/Rockwell, this bus is now administered by the Open Device Vendor Association. The basic trunkline-dropline topology provides separate twisted pair wires for both signal and power distribution, enabling 24 VDC devices to be powered directly from the bus. End to end network distance varies with data rate and cable size (thick vs. thin). The 0-8 byte data packet is ideal for low end devices with small amounts of I/O that must be exchanged frequently.

Profibus An open communication standard developed by the European Community (European Common Standard EC50170), Profibus was adopted by Siemens for use as their remote I/O network. There are 2 variations of Profibus: FMS which is used for upper level cell to cell communication, and Profibus DP which is optimized for data transfer with local field devices like valves, drives and encoders. DP is very well suited for applications that require high speed transmission of fairly large amounts of information (512 bits of input data and 512 bits of output data over 32 nodes in 1 msec).

Interbus Designed by Phoenix contact in the mid '80s, Interbus is the longest standing open industrial network. A true token ring topology, Interbus is actually divided into 2 buses. The remote bus is an RS-485 transmission medium with length capabilities up to 13 km. The local or peripheral bus enables connection of up to 8 devices within a 10 m range. Although transmitted at a moderate baud rate of 500 Kbps, the low overhead structure makes this an ideal choice for high speed, deterministic transmission of small amounts of data over long distances.

BiSS BiSS is a new, fully-digital and bi-directional sensor interface. It defines communication between one master and several slaves (sensors) in industrial control systems. BiSS manifests a new standard in technology and is available license-free. Due to its high performance, it constitutes an efficient alternative to the standard combination of data interface and analog sine/cosine incremental output. Requiring only 6 wires BiSS does not require any hardware for analog signals - and therefore, helps to reduce system costs. Self-configuration allows "plug+play" and keeps the system in an operable condition even after a power failure. *For detailed information on BiSS and support, please visit www.biss-ic.de*

SSI The SSI bus is the Synchronous Serial Interface bus. This bus was originally developed for transmitting absolute encoder information over a synchronous serial interface. In Europe, this bus design as been adopted as a standard for information transfer. The interface uses a signal clock originating at the SSI of the MPU or PLC or other processor to transfer the serial data bits so that the client processor has control of the bus speed and rate of arrival of new readings.

BUS NETWORK COMPARISON

	DeviceNet	Profibus	Interbus	BiSS	SSI
Topology	Linear (trunkline/dropline)	Linear (trunkline/dropline)	Closed Loop	Point to Point	Point to Point
Comm. System	Master/Slave	Multimaster (Producer/Consumer)	Master/Slave	Master/Slave	Master/Slave
Data Exchange	Polled, Change of State, Cyclic	Polled	Polled	Synchronous	Synchronous
Max. Length	500 m	1200 m (w/repeaters)	13 km	400 m	400 m
Max. Nodes	64	126	512	8 Slaves	1
Data Packet	0 - 8 bytes	244 bytes	flexible	N/A	N/A
Trans. Speed	125 Kbps @ 500 m 250 Kbps @ 250 m 500 Kbps @ 100 m	9.6 Kbps to 12 Mbps	500 Kbps	10 Mbps	400 kHz @ 50 m 300 kHz @ 100 m 200 kHz @ 200 m 100 kHz @ 400 m 70 kHz to 1.5 mHz
Trans. Media	2 wire twisted pair with 2 wire bus power cable w/drain wire	2 wire twisted pair w/shield	Twisted w/drain Local: 3 pair Remote: 5 pair	2 Twisted Pair	2 Twisted Pair

Bus networks are considered the perfect vehicle for two way communication with an encoder, providing a variety of programmable features including resetting the encoder's position to match your machine. Most of these features are easily accessible via bus management software with the Danaher Controls data file.

In addition conformation of proper encoder operation can be acquired along with potential areas of corrective action should a malfunction occur.

ACURO Absolute Encoder Selection Guide

Our Absolute encoders offer a wide range of single- or multi- turn resolutions and all popular output options. This Selector Guide can assist you in determining the type of encoder that best fits your application requirements. Condensed description and specification information is provided. Complete information is available on the referenced page number that appears below each product's picture.

Type	AI25 - DeviceNet Output	AI25 - Profibus Output	AI25 - Interbus Output	AI25 - BiSS Output
				
Page Number	4.04	4.06	4.08	4.10
Description and Features	■ Single- or Multi- Turn ■ Resolution to 14 Bits ■ 4096 multi-turn revs ■ Short installation depth ■ Solid shaft and hollow shaft versions ■ DeviceNet Interface	■ Single- or Multi- Turn ■ Resolution to 14 Bits ■ 4096 multi-turn revs ■ Short installation depth ■ Solid shaft and hollow shaft versions ■ Profibus Interface	■ Single- or Multi- Turn ■ Resolution to 12 Bits ■ 4096 multi-turn revs ■ Short installation depth ■ Solid shaft and hollow shaft versions ■ Interbus Interface	■ Single- or Multi- Turn ■ Resolution to 17 Bits ■ 4096 multi-turn revs ■ Short installation depth ■ Solid shaft and hollow shaft versions ■ BiSS Interface
Electrical Specifications				
Single-Turn Resolution:	10, 12, 13, 14 bits	10, 12, 13, 14 bits	10, 12 bits	10, 12, 13, 14, 17 bits
Multi-Turn Resolution:	12 bits	12 bits	12 bits	12 bits
Input Power:	10 to 30 VDC; 220 mA, Max. (plus output load)	10 to 30 VDC; 220 mA, Max. (plus output load)	10 to 30 VDC; 250 mA, Max. (plus output load)	5 VDC -5%/+10% or 10-30 VDC 100 mA, Max. (plus output load)
Available Output Types:	DeviceNet	Profibus	Interbus	BiSS
Terminations:	Bus Cover with connector options*	Bus Cover with connector options*	Bus Cover with connector options*	Bus Cover with connector options*
Mechanical Specifications				
Overall Size:	2.28" (58mm) body diameter See dimensional drawings*	2.28" (58mm) body diameter See dimensional drawings*	2.28" (58mm) body diameter See dimensional drawings*	2.28" (58mm) body diameter See dimensional drawings*
Shaft Size:	6mm to 3/8" dia. See models*; 10mm, 12 mm, 3/8", 1/2" hubshaft	6mm to 3/8" dia. See models*; 10mm, 12 mm, 3/8", 1/2" hubshaft	6mm to 3/8" dia. See models*; 10mm, 12 mm, 3/8", 1/2" hubshaft	6mm to 3/8" dia. See models*; 10mm, 12 mm, 3/8", 1/2" hubshaft
Max. Shaft Speed:	10,000 RPM (continuous), 12,000 RPM (peak)	10,000 RPM (continuous), 12,000 RPM (peak)	10,000 RPM (continuous), 12,000 RPM (peak)	10,000 RPM (continuous), 12,000 RPM (peak)
Max. Shaft Load:	6mm shaft: 13lb axial, 24lb radial 10mm shaft: 24lb axial, 35lb radial	6mm shaft: 13lb axial, 24lb radial 10mm shaft: 24lb axial, 35lb radial	6mm shaft: 13lb axial, 24lb radial 10mm shaft: 24lb axial, 35lb radial	6mm shaft: 13lb axial, 24lb radial 10mm shaft: 24lb axial, 35lb radial
Mounting:	Square, Clamp, Servo, Hubshaft with flexible tether	Square, Clamp, Servo, Hubshaft with flexible tether	Square, Clamp, Servo, Hubshaft with flexible tether	Square, Clamp, Servo, Hubshaft with flexible tether
Environmental Specifications				
Operating Temperature:	–40° to +85°C	–40° to +85°C	–40° to +85°C	–40° to +100°C
Enclosure Rating:	IP64 or IP67	IP64 or IP67	IP64 or IP67	IP64 or IP67

*Information on product pages

AI25 - SSI Output	AI25 - Parallel Output	AD25 - Drive		
 4.12	 4.16	 4.20		
■ Single- or Multi- Turn ■ Resolution to 17 Bits ■ 4096 multi-turn revs ■ Short installation depth ■ Solid shaft and hollow shaft versions ■ SSI Interface	■ Single- or Multi- Turn ■ Resolution to 17 Bits ■ 4096 multi-turn revs ■ Short installation depth ■ Solid shaft and hollow shaft versions ■ Parallel Interface	■ For high performance BLDC Motors ■ Resolution to 17 Bits ■ 4096 multi-turn revs ■ Safety through self-diagnostics ■ -15°C to +120°C Operation ■ BiSS or SSI Interface		
10, 12, 13, 14, 17 bits 12 bits 5 VDC -5%/+10% or 10-30 VDC 100 mA, Max. (plus output load) SSI Bus Cover with connector options*	10, 12, 13, 14 bits, 360 PPR, 720 PPR 12 bits 5 VDC -5%/+10% or 10-30 VDC 300 mA, Max. (plus output load) Parallel 1.5m Cable; Connector: Conin, MS, sub-D*	BiSS: 22 bits, SSI: 13 bits 12 bits 5 VDC -5%/+10% 85 mA, Max. (plus output load) BiSS or SSI 1 ft. Cable (30 cm)		
2.28" (58mm) body diameter See dimensional drawings* 6mm to 3/8" dia. See models*; 10mm, 12 mm, 3/8", 1/2" hubshaft 10,000 RPM (continuous), 12,000 RPM (peak) 6mm shaft: 13lb axial, 24lb radial 10mm shaft: 24lb axial, 35lb radial Square, Clamp, Servo, Hubshaft with flexible tether	2.28" (58mm) body diameter See dimensional drawings* 6mm to 3/8" dia. See models*; 10mm, 12 mm, 3/8", 1/2" hubshaft 10,000 RPM (continuous), 12,000 RPM (peak) 6mm shaft: 13lb axial, 24lb radial 10mm shaft: 24lb axial, 35lb radial Square, Clamp, Servo, Hubshaft with flexible tether	2.28" (58mm) body diameter See dimensional drawings* 10 mm Tapered solid shaft or Tapered hub shaft 12,000 RPM (continuous), 15,000 RPM (peak, ST only) 5 lb axial, 20 lb radial Designed for integration into BLDC servomotors		
–40° to +100°C IP64 or IP67	–40° to +100°C IP64 or IP67	-15°C to +120°C Operation IP40		

*Information on product pages

Series AI25 DeviceNet Interface

- *Up to 14 Bit single-turn resolution*
- *4096 revolutions of multi-turn resolution*
- *Short installation depth*
- *Safety through self-diagnostics*
- *Solid shaft and hollow shaft versions*
- *-40° C to +85° C Operating temperature*

CE

ACURO

APPLICATION/INDUSTRY

The Dynapar brand ACURO Absolute Encoder offers a modern full-feature design equipped with DeviceNet interface.

DESCRIPTION

The ***Acuro AI25*** optical absolute industrial encoder is available in a single-turn or multi-turn version. The multi-turn design is based on a reliable high-speed gear with optical scanning and the latest generation of OptoASIC technology.

The mechanical concept is based on a double ball bearing design, which is available as a solid-shaft or hollow-shaft version in common shaft diameters.

FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Single-turn Resolution: 10, 12, 13, 14 Bit
Multi-turn Resolution: 12 bit
Linearity: +/- 1/2 LSB
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)
Code format: Binary

ELECTRICAL

Connection: Bus Cover with spring terminal clamps
Supply voltage: 10-30 VDC
Intrinsic current consumption: 200 mA (ST), 220 mA (MT)
Baud Rate: 125, 250, 500 kBaud
Interface: CAN Highspeed according to ISO/DIS 11898,CAN Specification 2.0 B (11 and 29 bit identifier)
Protocol: According to DeviceNet V2.0
Transfer mode:
Poll mode
Bit strobe (time-synchronous for all devices)
Change of State (automatic after change of values)
Cyclic, with adjustable cycle timer

MECHANICAL

Shaft diameter:
Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Maximum shaft load:
6 mm shaft: 13 lb axial, 24 lb radial
10 mm shaft: 24 lb axial, 35 lb radial
Maximum shaft speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting torque: < 1.4 in-oz
Body Diameter: 58 mm, nominal
Weight (approx.): 350 g ST, 400 g MT
Shaft tolerance (hubshaft only): +/- 1.5 mm axial, +/- 0.2 mm radial
Flange configurations: Square, Clamp, Servo, Hubshaft with flexible tether
Bearing life:
1 x 10^{10} revolutions at 35% full rated shaft load
1 x 10^{9} revolutions at 75% full rated shaft load
1 x 10^{8} revolutions at 100% full rated shaft load

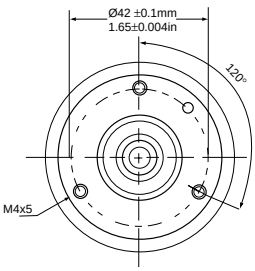
ENVIRONMENTAL

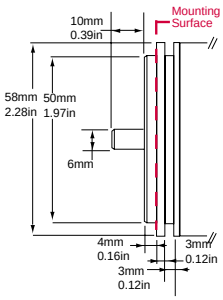
Operating Temperature: -40 to 85° C
Storage Temperature: -40 to 100° C
Enclosure Rating: IP64 or IP67
Shock: 1,000 m/s² (6 ms)
Vibration: 100 m/s² (10 to 2,000 Hz)

Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AI25	☐☐☐☐	☐	☐	☐	☐	☐
AI25 Size25 Acuro Absolute Encoder	**Single-Turn** **0010** 10 Bit **0012** 12 Bit **0013** 13 Bit **0014** 14 Bit **Multi-Turn** **1212** 12 Bit Multi-Turn, 12 Bit Single-Turn **1213** 12 Bit Multi-Turn, 13 Bit Single-Turn **1214** 12 Bit Multi-Turn, 14 Bit Single-Turn	Available when Code 4 is 0 or A **0** Servo* Available when Code 4 is 2 or C **1** Clamping* Available when Code 4 is 1 or B **2** Square flange** Available when Code 4 is 3, 4, 5 or 6 **3** Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	**w/o shaft seal (IP64)** **0** 6 mm **1** 3/8" **2** 10 mm **3** 3/8" Hub Shaft **4** 12 mm Hubshaft **5** 1/2" Hubshaft **6** 10 mm Hub Shaft **w/ shaft seal (IP67)** **A** 6 mm **B** 3/8" **C** 10 mm	**9** Devicenet	**2** 10-30 VDC	**F** Bus Cover 1 M12, 5-Pole Connector **G** Bus Cover 2 Strain Relief Exits and 1 M12, 5-Pole Connector (for Tico display). Internal T-coupler included **L** Bus Cover 2 Strain Relief Exits. Internal T-coupler included

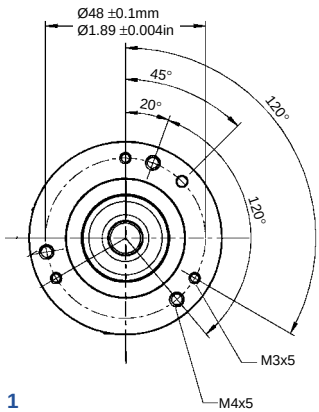
Series AI25 DeviceNet Interface

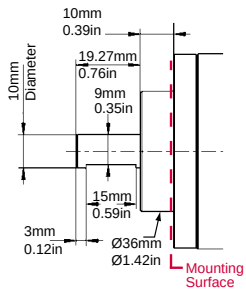
Code 3: Mounting



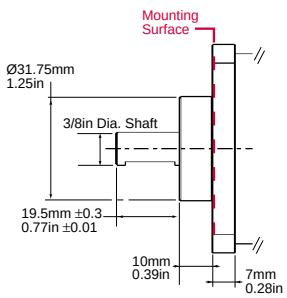


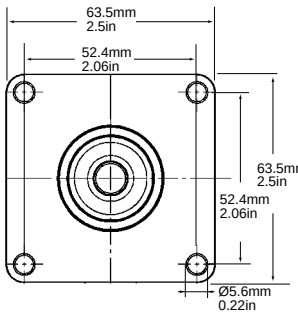
0
Servo



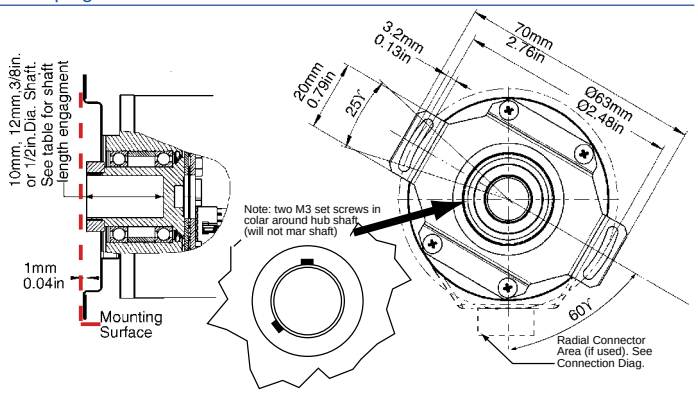


1
Clamping





2
Square Flange

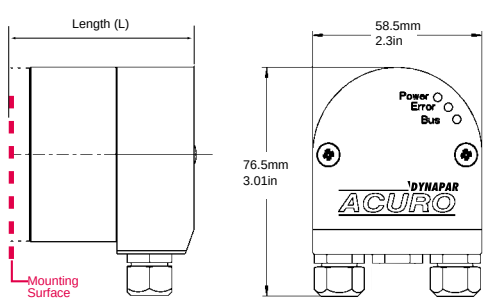


3
Hubshaft w/Tether

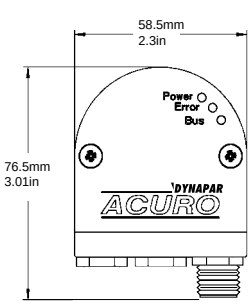
Hubshaft Shaft Engagement

HubShaft Diameter	Min. Shaft Length	Max. Shaft Length
10mm, 3/8"	15mm (0.59")	20mm (0.79")
12mm, 1/2"	18mm (0.71")	20mm (0.79")

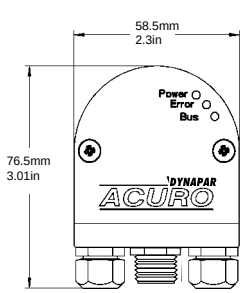
Code 7: Connector



L
2 Strain Relief Exits



F
1 M12, 5-Pole Connector



G
2 Strain Relief Exits
1 M12, 5-Pole Connector*

*M12, 5-Pole Connector used to interface Hengstler Tico 731 LCD display

Length (L) Mounting Surface to Rear
For connector types L, F and G

Mount (Code 3)	**Single-Turn**	**Multi-Turn**
(**0**) Servo	63.3/2.49	72.3/2.85
(**1**) Clamping	62.3/2.45	71.3/2.81
(**2**) Square Flng	64.8/2.55	73.8/2.91
(**3**) Hubshaft	72.2/2.84	81.2/3.2

Series AI25 Profibus Interface

- *Up to 14 Bit single-turn resolution*
- *4096 revolutions of multi-turn resolution*
- *Short installation depth*
- *Safety through self-diagnostics*
- *Solid shaft and hollow shaft versions*
- *-40° C to +85° C Operating temperature*

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ACURO

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FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Single-turn Resolution: 10, 12, 13, 14 Bit
Multi-turn Resolution: 12 bit
Linearity: +/- 1/2 LSB
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)
Code format: Binary

ELECTRICAL

Connection: Bus Cover with spring terminal clamps
Supply voltage: 10-30 VDC
Intrinsic current consumption: 200 mA (ST), 220 mA (MT)
Baud Rate: 12 Mbaud
Interface: Profibus-DP, Encoder Profile
Programmable: According to Class 2
Special Functions: Speed, Acceleration

MECHANICAL

Shaft diameter:
Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Maximum shaft load:
6 mm shaft: 13 lb axial, 24 lb radial
10 mm shaft: 24 lb axial, 35 lb radial
Maximum shaft speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting torque: < 1.4 in-oz
Weight (approx.): 350 g ST, 400 g MT
Shaft tolerance (hubshaft only): +/- 1.5 mm axial, +/- 0.2 mm radial
Flange configurations: Square, Clamp, Servo, Hubshaft with flexible tether
Bearing life:
1 x 10^{10} revolutions at 35% full rated shaft load
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ENVIRONMENTAL

Operating Temperature: -40 to 85° C
Storage Temperature: -40 to 100° C
Enclosure Rating: IP64 or IP67
Shock: 1,000 m/s² (6 ms)
Vibration: 100 m/s² (10 to 2,000 Hz)

Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AI25	☐☐☐☐	☐	☐	☐	☐	☐
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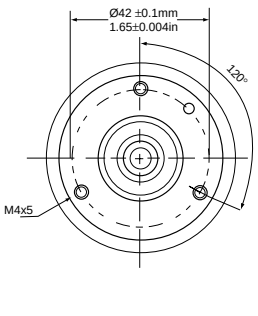
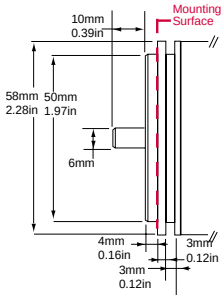
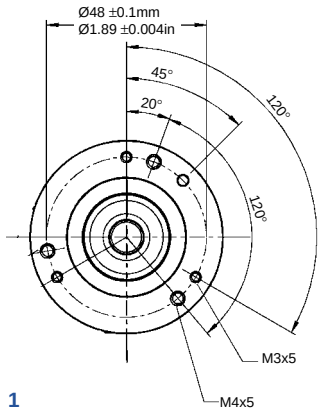
Series AI25 Profibus Interface

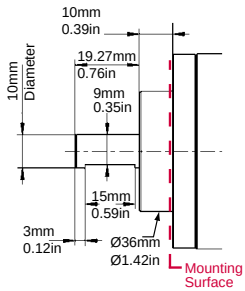
Code 3: Mounting



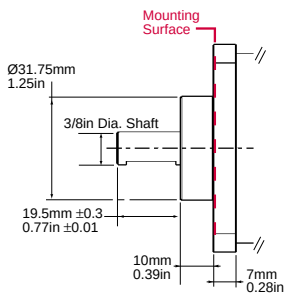


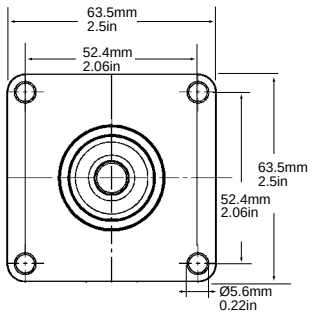
0
Servo



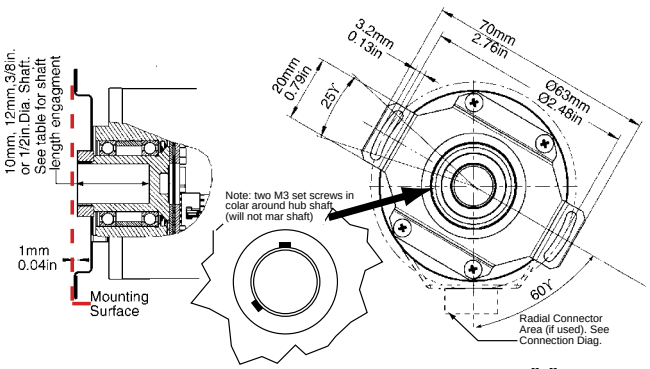


1
Clamping





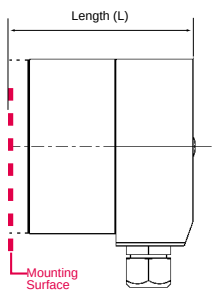
2
Square Flange

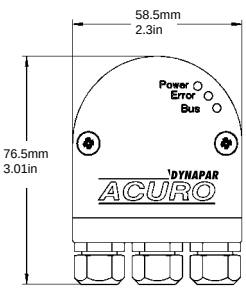


3
Hubshaft w/Tether

HubShaft Diameter	Min. Shaft Length	Max. Shaft Length
10mm, 3/8"	15mm (0.59")	20mm (0.79")
12mm, 1/2"	18mm (0.71")	20mm (0.79")

Code 7: Connector

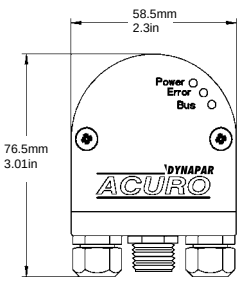




E
3 Strain Relief Exits

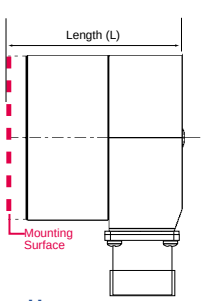
Length (L) Mounting Surface to Rear
For connector types E, G, H & L

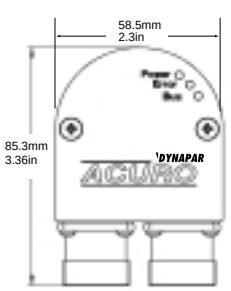
Mount (Code 3)	Single-Turn	Multi-Turn
(**0**) Servo	63.3/2.49	72.3/2.85
(**1**) Clamping	62.3/2.45	71.3/2.81
(**2**) Square Flng	64.8/2.55	73.8/2.91
(**3**) Hubshaft	72.2/2.84	81.2/3.2



G
2 Strain Relief Exits
1 M12, 5-pole Connector*

*M12, 5-pole Connector used to interface Hengstler Tico 731 LCD display





H
Double Conin

Series AI25 Interbus Interface

- *Up to 12 Bit single-turn resolution*
- *4096 revolutions of multi-turn resolution*
- *Short installation depth*
- *Safety through self-diagnostics*
- *Solid shaft and hollow shaft versions*
- *-40° C to +85° C Operating temperature*

CE

ACURO

APPLICATION/INDUSTRY

The Dynapar brand ACURO Absolute Encoder offers a modern full-feature design equipped with Interbus interface.

DESCRIPTION

The ***Acuro AI25*** optical absolute industrial encoder is available in a single-turn or multi-turn version. The multi-turn design is based on a reliable high-speed gear with optical scanning and the latest generation of OptoASIC technology.

The mechanical concept is based on a double ball bearing design, which is available as a solid-shaft or hollow-shaft version in common shaft diameters.

FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Single-turn Resolution: 10, 12 Bit
Multi-turn Resolution: 12 bit (only available with 12 bit ST resolution)
Linearity: +/- 1/2 LSB
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)
Code format: 32 Bit Binary

ELECTRICAL

Connection: Bus Cover with spring terminal clamps; cable with connector
Supply voltage: 10-30 VDC
Intrinsic current consumption: 220 mA (ST), 250 mA (MT)
Baud Rate: 500 kBaud according to ENCOM
Interface: Interbus, ENCOM Profile K3 (parameterizable)
Programmable: Direction, scaling factor, preset, offset

MECHANICAL

Shaft diameter:
Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Maximum shaft load:
6 mm shaft: 13 lb axial, 24 lb radial
10 mm shaft: 24 lb axial, 35 lb radial
Maximum shaft speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting torque: < 1.4 in-oz
Weight (approx.): 350 g ST, 400 g MT
Shaft tolerance (hubshaft only): +/- 1.5 mm axial, +/- 0.2 mm radial
Flange configurations: Square, Clamp, Servo, Hubshaft with flexible tether
Bearing life:
1 x 10^{10} revolutions at 35% full rated shaft load
1 x 10^{9} revolutions at 75% full rated shaft load
1 x 10^{8} revolutions at 100% full rated shaft load

ENVIRONMENTAL

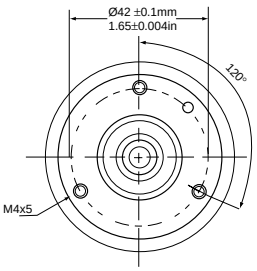
Operating Temperature: -40 to 85° C
Storage Temperature: -40 to 100° C
Enclosure Rating: IP64 or IP67
Shock: 1,000 m/s² (6 ms)
Vibration: 100 m/s² (10 to 2,000 Hz)

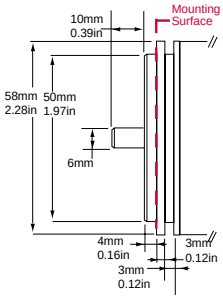
Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AI25	☐☐☐☐	☐	☐	☐	☐	☐
AI25 Size25 Acuro Absolute Encoder	**Single-Turn** **0010** 10 Bit **0012** 12 Bit **Multi-Turn** **1212** 12 Bit Multi-Turn, 12 Bit Single-Turn	Available when Code 4 is 0 or A **0** Servo* Available when Code 4 is 2 or C **1** Clamping* Available when Code 4 is 1 or B **2** Square flange** Available when Code 4 is 3, 4, 5 or 6 **3** Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	**w/o shaft seal (IP64)** **0** 6 mm **1** 3/8" **2** 10 mm **3** 3/8" Hub Shaft **4** 12 mm Hubshaft **5** 1/2" Hubshaft **6** 10 mm Hub Shaft **w/ shaft seal (IP67)** **A** 6 mm **B** 3/8" **C** 10 mm	**5** Interbus K3	**2** 10-30 VDC	**E** Bus Cover 3 Strain Relief Exits. Internal T-coupler included **G** Bus Cover 2 Strain Relief Exits and 1 M12, 5-Pole Connector (for Tico display). Internal T-coupler included **H** Double Conin. Internal T-coupler included

ACURO ABSOLUTE

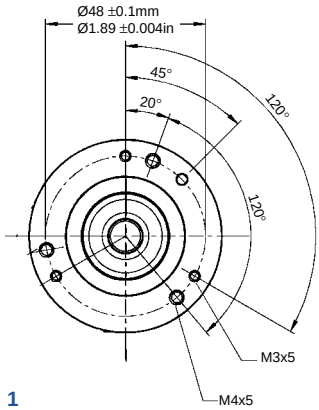
Series AI25 Interbus Interface

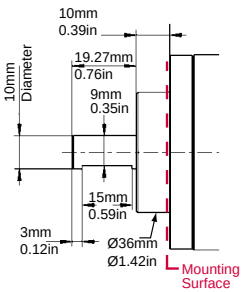
Code 3: Mounting



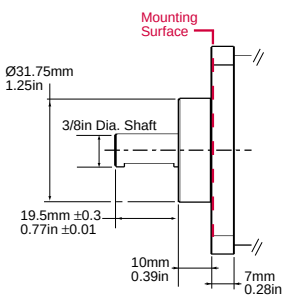


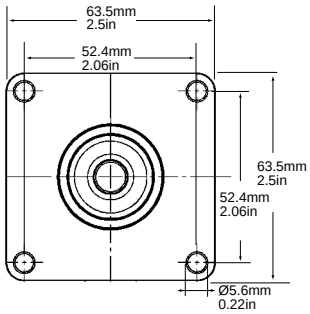
0
Servo



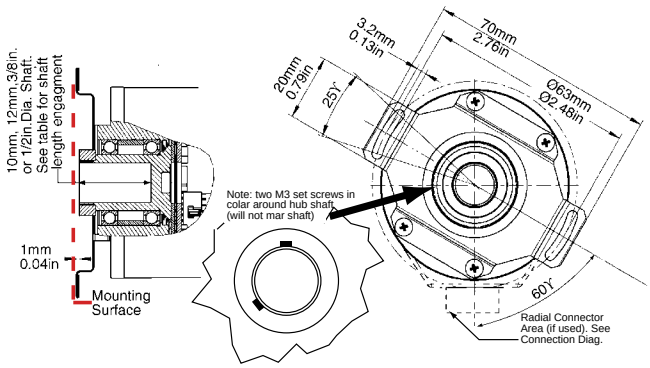


1
Clamping





2
Square Flange

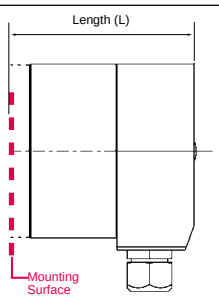


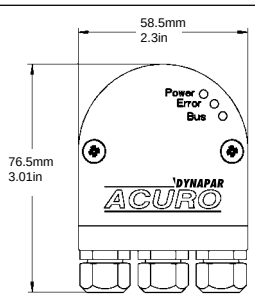
3
Hubshaft w/Tether

Hubshaft Shaft Engagement

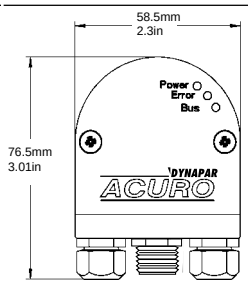
HubShaft Diameter	Min. Shaft Length	Max. Shaft Length
10mm, 3/8"	15mm (0.59")	20mm (0.79")
12mm, 1/2"	18mm (0.71")	20mm (0.79")

Code 7: Connector



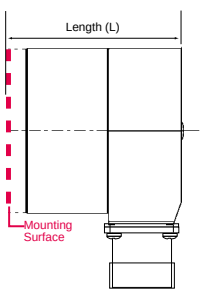


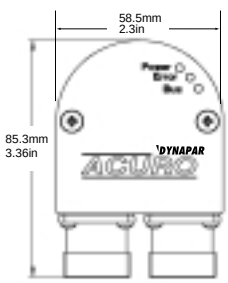
E
3 Strain Relief Exits



G
2 Strain Relief Exits
1 M12, 5-pole Connector*

*M12, 5-pole Connector used to interface Hengstler Tico 731 LCD display





H
Double Conin

Length (L) Mounting Surface to Rear
For connector types E, and H

Mount (Code 3)	Single-Turn	Multi-Turn
(**0**) Servo	63.3/2.49	72.3/2.85
(**1**) Clamping	62.3/2.45	71.3/2.81
(**2**) Square Flng	64.8/2.55	73.8/2.91
(**3**) Hubshaft	72.2/2.84	81.2/3.2

Series AI25 BiSS Interface

- *Up to 17 Bit single-turn resolution*
- *4096 revolutions of multi-turn resolution*
- *Short installation depth*
- *Safety through self-diagnostics*
- *Solid shaft and hollow shaft versions*
- *-40° C to +100° C Operating temperature*

CE

ACURO

APPLICATION/INDUSTRY

The Dynapar brand ACURO Absolute Encoder offers a modern full-feature design equipped with BiSS interface.

DESCRIPTION

The ***Acuro AI25*** is available in a single-turn or multi-turn versions. Its multi-turn design is based on a reliable high-speed gear with optical scanning and the latest generation of OptoASIC technology.

Mechanical concept is based on a double ball bearing design, and is available as a solid-shaft or hollow-shaft version in common shaft diameters.

BiSS is a new, fully-digital and bi-directional sensor interface. It defines communication between one master and several slaves (sensors) in industrial control systems. BiSS manifests a new standard in technology and is available license-free. Due to its high performance, it constitutes an efficient alternative to the standard combination of data interface and analog sine/cosine incremental output.

BiSS needs only 6 wires and does not require any hardware for analog signals - and therefore, helps to reduce system costs.

Self-configuration allows "plug+play" and keeps the system in an operable condition even after a power failure. *For detailed information on BiSS and support, please visit www.biss-ic.de*

FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Single-turn Resolution: 10, 12, 13, 14, 17 Bit
Multi-turn Resolution: 12 bit (only available with 12, 13, 14 or 17 bit ST resolution)
Linearity: +/- 1/2 LSB
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)
Code format: Binary, Gray, Gray Excess, parameterization through *AcuroSoft*
Parameterization: Resolution code type, sense of rotation, warning, alarm

ELECTRICAL

Connection: Cable, M23 - 12 pole Conin connector, M12 - 8-pole connector
Supply voltage: 5 VDC -5%/+10% or 10-30 VDC
Intrinsic current consumption: 50 mA (ST), 100 mA (MT) not including output current
Output current: 60 mA per bit, short circuit protected
Frequency response: 500 kHz
Maximum cable length: 400 m
Control Inputs: Direction
Alarm output: Warning and Alarm bits
Status LED: Green = OK, Red = Alarm (IP64 only)
Preset Switch: Sets encoder to zero output at present mechanical position (IP64 only)

BiSS Benifits

- All digital interface eliminates the costs of interpolation electronics
- Offers transmission reliability through a 4-bit cyclic redundancy check (CRC)
- Represents the only fully digital, open motor feedback interface for real-time applications

MECHANICAL

Shaft diameter:
Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Maximum shaft load:
6 mm shaft: 13 lb axial, 24 lb radial
10 mm shaft: 24 lb axial, 35 lb radial
Maximum shaft speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting torque: < 1.4 in-oz
Weight (approx.): 350 g ST, 400 g MT
Shaft tolerance (hubshaft only): +/- 1.5 mm axial, +/- 0.2 mm radial
Flange configurations: Square, Clamp, Servo, Hubshaft with flexible tether
Bearing life:
1 x 10^{10} revolutions at 35% full rated shaft load
1 x 10^{9} revolutions at 75% full rated shaft load
1 x 10^{8} revolutions at 100% full rated shaft load

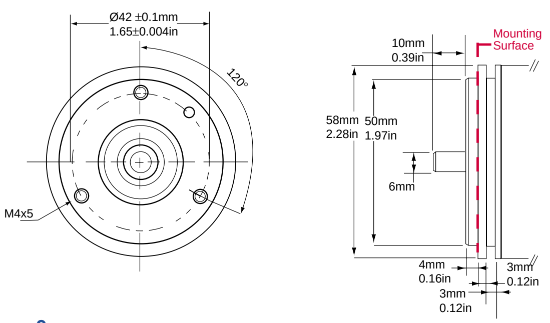
ENVIRONMENTAL

Operating Temperature: -40 to 100° C
Storage Temperature: -40 to 100° C
Enclosure Rating: IP64 or IP67
Shock: 1,000 m/s² (6 ms)
Vibration: 100 m/s² (10 to 2,000 Hz)

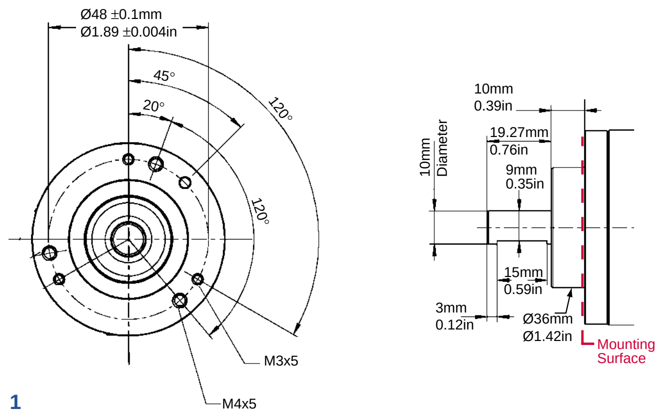
Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AI25	☐☐☐☐	☐	☐	☐	☐	☐
AI25 Size25 Acuro Absolute Encoder	**Single-Turn** **0010** 10 Bit **0012** 12 Bit **0013** 13 Bit **0014** 14 Bit **0017** 17 Bit **Multi-Turn** **1212** 12 Bit Multi-Turn, 12 Bit Single-Turn **1213** 12 Bit Multi-Turn, 13 Bit Single-Turn **1214** 12 Bit Multi-Turn, 14 Bit Single-Turn **1217** 12 Bit Multi-Turn, 17 Bit Single-Turn	Available when Code 4 is 0 or A **0** Servo* Available when Code 4 is 2 or C **1** Clamping* Available when Code 4 is 1 or B **2** Square flange** Available when Code 4 is 3, 4, 5 or 6 **3** Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	**w/o shaft seal (IP64)** **0** 6 mm **1** 3/8" **2** 10 mm **3** 3/8" Hub Shaft **4** 12 mm Hubshaft **5** 1/2" Hubshaft **6** 10 mm Hub Shaft **w/ shaft seal (IP67)** **A** 6 mm **B** 3/8" **C** 10 mm	**A** BiSS	**0** 5 VDC **2** 10-30 VDC	**0** 1.5m axial cable **1** 1.5m radial cable **2** M23 Conin 12 pin axial CW **3** M23 Conin 12 pin radial CW **C** M12 , 8-pole connector axial **D** M12 , 8-pole connector radial

Series AI25 BiSS Interface

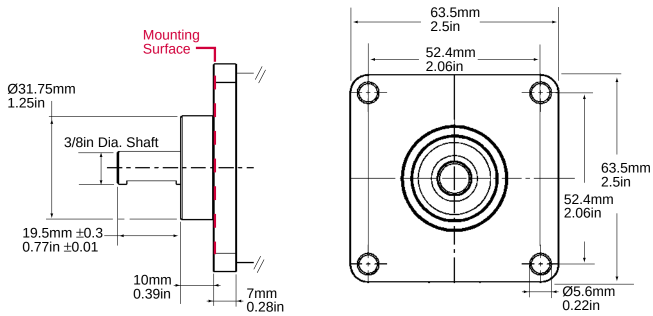
Code 3: Mounting



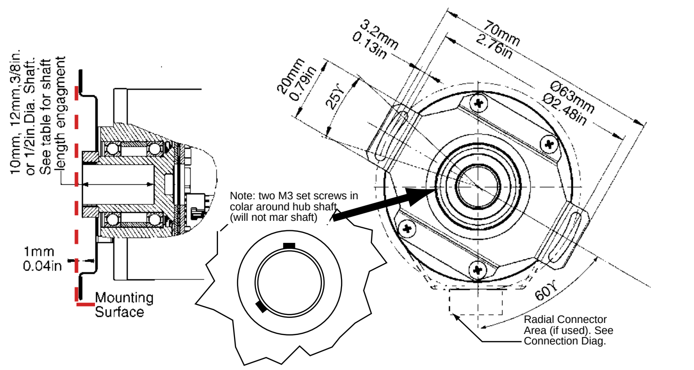
0
Servo



1
Clamping



2
Square Flange

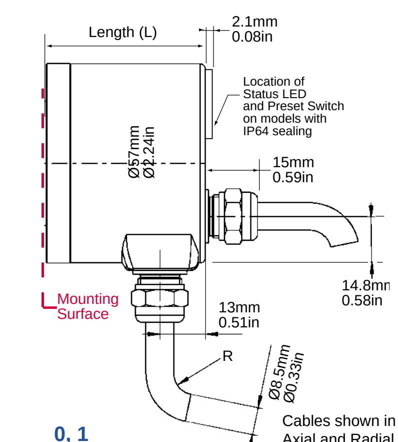


3
Hubshaft w/Tether

Hubshaft Shaft Engagement

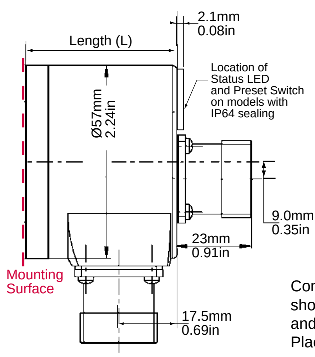
HubShaft Diameter	Min. Shaft Length	Max. Shaft Length
10mm, 3/8"	15mm (0.59")	20mm (0.79")
12mm, 1/2"	18mm (0.71")	20mm (0.79")

Code 7: Connector



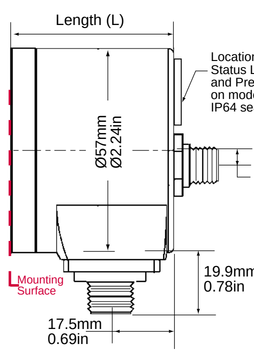
Cables shown in Axial and Radial Placement

0, 1
2 1.5M Cable



Connectors shown in Axial and Radial Placement

2, 3
Conin 12 Pin Connector



Connectors shown in Axial and Radial Placement

C, D
M12 , 8-pole Connector

Length (L) Mounting Surface to Rear

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	46.5/1.83	46.5/1.83
(1) Clamping	45.5/1.79	45.5/1.79
(2) Square Flng	45.5/1.79	45.5/1.79
(3) Hubshaft	53.4/2.1	53.4/2.1

Length (L) Mounting Surface to Rear

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	46.5/1.83	46.5/1.83
(1) Clamping	45.5/1.79	45.5/1.79
(2) Square Flng	45.5/1.79	45.5/1.79
(3) Hubshaft	53.4/2.1	53.4/2.1

Length (L) Mounting Surface to Rear

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	46.5/1.83	46.5/1.83
(1) Clamping	45.5/1.79	45.5/1.79
(2) Square Flng	45.5/1.79	45.5/1.79
(3) Hubshaft	53.4/2.1	53.4/2.1

Series AI25 SSI Interface

- *Up to 17 Bit single-turn resolution*
- *4096 revolutions of multi-turn resolution*
- *Short installation depth*
- *Safety through self-diagnostics*
- *Solid shaft and hollow shaft versions*
- *-40° C to +100° C Operating temperature*

CE

ACURO

APPLICATION/INDUSTRY

The Dynapar brand ACURO Absolute Encoder offers a modern full-feature design equipped with SSI interface.

DESCRIPTION

The ***Acuro AI25*** optical absolute industrial encoder is available in a single-turn or multi-turn version. The multi-turn design is based on a reliable high-speed gear with optical scanning and the latest generation of OptoASIC technology.

The mechanical concept is based on a double ball bearing design, which is available as a solid-shaft or hollow-shaft version in common shaft diameters.

FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Single-turn Resolution: 10, 12, 13, 14, 17 Bit
Multi-turn Resolution: 12 bit (only available with 12 or 13 bit ST resolution)
Linearity: +/- 1/2 LSB
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)
Code format: Binary, Gray, Gray Excess, parameterization through *AcuroSoft*
Parameterization: Resolution code type, sense of rotation, warning, alarm

ELECTRICAL

Connection: Cable, M23 - 12 pole Conin connector, M12- 8-pole connector
Supply voltage: 5 VDC -5%/+10% or 10-30 VDC
Intrinsic current consumption: 50 mA (ST), 100 mA (MT) not including output current
Output current: 60 mA per bit, short circuit protected
Frequency response: 500 kHz
Maximum cable length: 400 m
Control Inputs: Direction
Alarm output: Alarm bit
Status LED: Green = OK, Red = Alarm (IP64 only)
Preset Switch: Sets encoder to zero output at present mechanical position (IP64 only)

MECHANICAL

Shaft diameter:
Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Maximum shaft load:
6 mm shaft: 13 lb axial, 24 lb radial
10 mm shaft: 24 lb axial, 35 lb radial
Maximum shaft speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting torque: < 1.4 in-oz
Weight (approx.): 350 g ST, 400 g MT
Shaft tolerance (hubshaft only): +/- 1.5 mm axial, +/- 0.2 mm radial
Flange configurations: Square, Clamp, Servo, Hubshaft with flexible tether
Bearing life:
1 x 10^{10} revolutions at 35% full rated shaft load
1 x 10^{9} revolutions at 75% full rated shaft load
1 x 10^{8} revolutions at 100% full rated shaft load

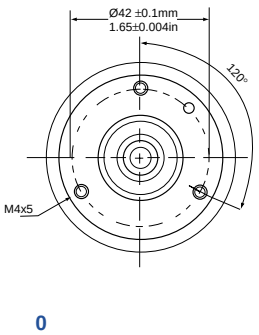
ENVIRONMENTAL

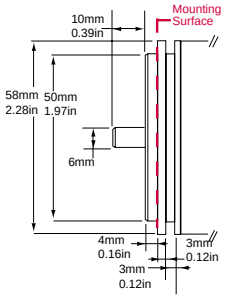
Operating Temperature: -40 to 100° C
Storage Temperature: -40 to 100° C
Enclosure Rating: IP64 or IP67
Shock: 1,000 m/s² (6 ms)
Vibration: 100 m/s² (10 to 2,000 Hz)

Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AI25	☐☐☐☐	☐	☐	☐	☐	☐
AI25 Size25 Acuro Absolute Encoder	**Single-Turn** **0010** 10 Bit **0012** 12 Bit **0013** 13 Bit **0014** 14 Bit **0017** 17 Bit **Multi-Turn** **1212** 12 Bit Multi-Turn, 12 Bit Single-Turn **1213** 12 Bit Multi-Turn, 13 Bit Single-Turn	Available when Code 4 is 0 or A **0** Servo* Available when Code 4 is 2 or C **1** Clamping* Available when Code 4 is 1 or B **2** Square flange** Available when Code 4 is 3, 4, 5 or 6 **3** Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	**w/o shaft seal (IP64)** **0** 6 mm **1** 3/8" **2** 10 mm **3** 3/8" Hub Shaft **4** 12 mm Hubshaft **5** 1/2" Hubshaft **6** 10 mm Hub Shaft **w/ shaft seal (IP67)** **A** 6 mm **B** 3/8" **C** 10 mm	**2** SSI Gray **3** SSI Binary	**0** 5 VDC **2** 10-30 VDC	**0** 1.5m axial cable **1** 1.5m radial cable **2** M23 Conin 12 pin axial CW **3** M23 Conin 12 pin radial CW **C** M12 , 8-pole connector axial **D** M12 , 8-pole connector radial

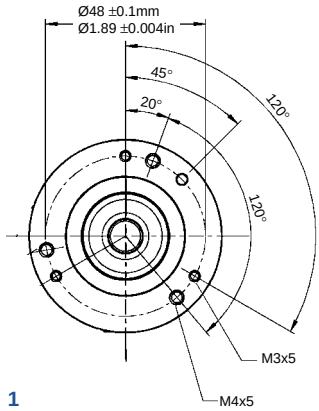
Series AI25 SSI Interface

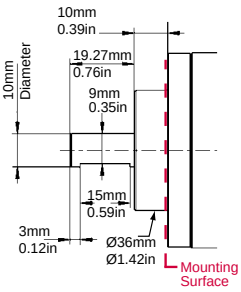
Code 3: Mounting



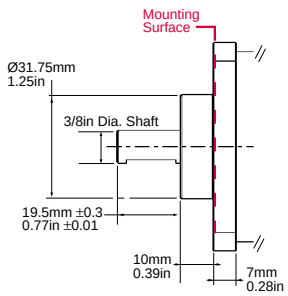


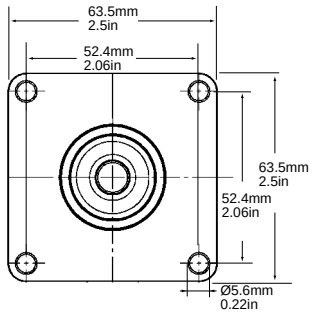
0
Servo



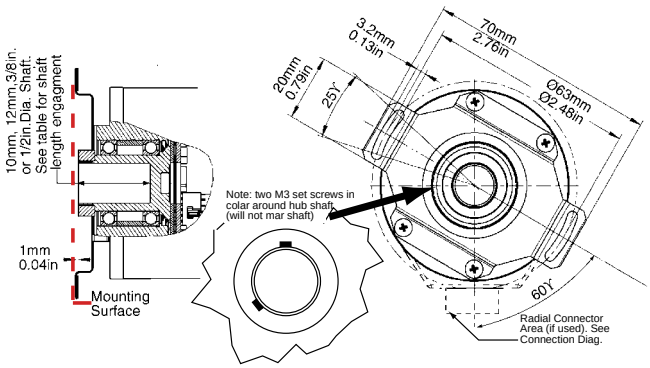


1
Clamping





2
Square Flange

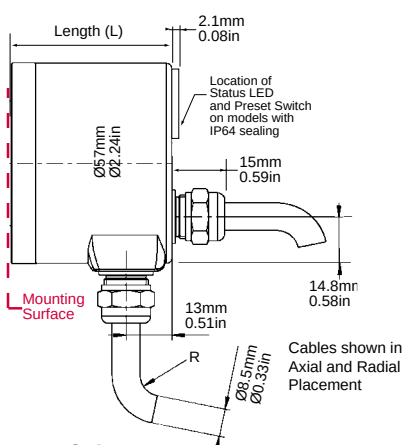


3
Hubshaft w/Tether

Hubshaft Shaft Engagement

HubShaft Diameter	Min. Shaft Length	Max. Shaft Length
10mm, 3/8"	15mm (0.59")	20mm (0.79")
12mm, 1/2"	18mm (0.71")	20mm (0.79")

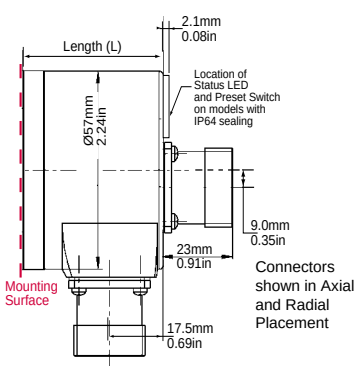
Code 7: Connector



0, 1
2 1.5M Cable

Length (L) Mounting Surface to Rear

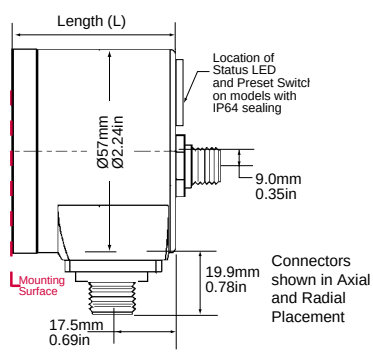
Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	46.5/1.83	46.5/1.83
(1) Clamping	45.5/1.79	45.5/1.79
(2) Square Flng	45.5/1.79	45.5/1.79
(3) Hubshaft	53.4/2.1	53.4/2.1



2, 3
Conin 12 Pin Connector

Length (L) Mounting Surface to Rear

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	46.5/1.83	46.5/1.83
(1) Clamping	45.5/1.79	45.5/1.79
(2) Square Flng	45.5/1.79	45.5/1.79
(3) Hubshaft	53.4/2.1	53.4/2.1



C, D
M12 , 8-pole Connector

Length (L) Mounting Surface to Rear

Mount (Code 3)	Single-Turn	Multi-Turn
(0) Servo	46.5/1.83	46.5/1.83
(1) Clamping	45.5/1.79	45.5/1.79
(2) Square Flng	45.5/1.79	45.5/1.79
(3) Hubshaft	53.4/2.1	53.4/2.1

Series AI25 SSI Interface

SSI Data Format

Bits	T1 - T10	T11	T12	T13	T14	T15	T16	T17	T18	T19
10	S9 - S0	0	0	0	0	S9	S8	S7	S6	S5
12	S11 - S2	S1	S0	0	0	S11	S10	S9	S8	S7
13	S12 - S3	S2	S1	S0	0	S12	S11	S10	S9	S8
14	S13 - S4	S3	S2	S1	S0	0	S13	S12	S11	S10
17	S16 - S7	S6	S5	S4	S3	S2	S1	S0	0	S16
Bits	**T1 - T12**	**T13 - T21**	**T22**	**T23**	**T24**	**T25**	**T26**	**T27**	**T28**	**T29**
1212	M11 - M0	S11 - S3	S2	S1	S0	0	0	M11	M10	M9
1213	M11 - M0	S12 - S4	S3	S2	S1	S0	0	M11	M10	M9

S9, S8 Data Bits for resolution per turn.
M11, M10 Data Bits for number of turns.
T1, T2 SSI Clock number

S9 - S0 Data Bits S9, S8, S7, S6, S5, S4, S3 Etc.
M11- M0 Turn Data Bits M11, M10, M9, M8, Etc.

Electrical Connections 12 pin CONIN

Wire Color	Pin	Function
Brown	1	0V
Pink	2	Data
Yellow	3	Clock
——	4	N.C.
Blue	5	$\overline{\text{Direction}}$
Red	6	N.C.
Violet	7	N.C.
White	8	5V/10-30V
——	9	N.C.
Gray	10	$\overline{\text{Data}}$
Green	11	$\overline{\text{Clock}}$
Black	12	0 V Data

12 pin CONIN Connector **Part Number: G3 539 202**
Bulk Cable (sold by the meter) **Part Number: G3 280 220**
Cable Assembly (with Connector)
3 meters **Part Number: G1 542 003**
5 meters **Part Number G1 542 004**
10 meters **Part Number: G1 542 005**

Electrical Connections 8 pin M12

Wire Color	Pin	Function
White	1	5/10-30 Volt
Brown	2	0 Volt
——	3	N.C.
Green	4	$\overline{\text{Clock}}$
Pink	5	Data
Yellow	6	Clock
Blue	7	$\overline{\text{Direction}}$
Gray	8	$\overline{\text{Data}}$

8 pin M12 Connector **Part Number: G3 539 597**
Bulk Cable (sold by the meter) **Part Number: G3 280 251**
Cable Assembly (with Connector)
3 meters **Part Number: G1 565 329**
5 meters **Part Number G1 565 330**
10 meters **Part Number: G1 565 331**

Notes

Series AI25 Parallel Interface

- *Up to 14 Bit single-turn resolution*
- *4096 revolution multi-turn resolution*
- *Short installation depth*
- *Safety through self-diagnostics*
- *Solid shaft and hollow shaft versions*
- *-40° C to +100° C Operating temperature*

CE

ACURO

APPLICATION/INDUSTRY

The Dynapar brand ACURO Absolute Encoder offers a modern full-feature design equipped with Parallel interface.

DESCRIPTION

The Acuro AI25 optical absolute industrial encoder is available in a single-turn or multi-turn version. The multi-turn design is based on a reliable high-speed gear with optical scanning and the latest generation of OptoASIC technology.

The mechanical concept is based on a double ball bearing design, which is available as a solid-shaft or hollow-shaft version in common shaft diameters.

FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- Additional field-bus and point-to-point interfaces available

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Single-turn Resolution: 10, 12, 13, 14 Bit, 360 PPR, 720 PPR
Multi-turn Resolution: 12 bit (only available with 12 bit ST resolution)
Absolute Accuracy: ±0.01° mechanical (36 arc-sec.)
Repeatability: ±0.002° mechanical (7.2 arc-sec.)
Code format: Binary, Gray, Gray Excess

ELECTRICAL

Connection: Cable, Conin Connector, MS Connector, Cable with Sub-D Connector (MT only)
Supply voltage: 5 VDC -5%/+10%, or 10-30 VDC
Intrinsic current consumption: 200 mA (ST), 300 mA (MT)
Output current: 30 mA per bit, short circuit protected
Frequency response: 500 kHz on single-turn, 1.5m cable*
Alarm output: NPN open collector max 5 mA
Maximum cable length: 100 m

*Data refresh rate: 70µsec is for multi-turn and single-turn with preset

Control Inputs

Input	Logic Level	Function
Direction	1	Ascending code values when turning clockwise
	0	Descending code values when turning clockwise
Latch	1	Encoder data continuously changing at output
	0	Encoder data stored and constant at output
Tristate (ST)	1	Outputs active
	0	Outputs at high impedence (Tristate mode)
Tristate (MT)	1	Outputs at high impedence (Tristate mode)
	0	Outputs active

Status LED: Green = OK, Red = Alarm (IP64 only, not available on connector type J)
Preset Switch: Sets encoder to zero output at present mechanical position (Multi-turn IP64 only, not available on connector type J)
Control Inputs: Latch, Direction, Tri-state (see table below)

MECHANICAL

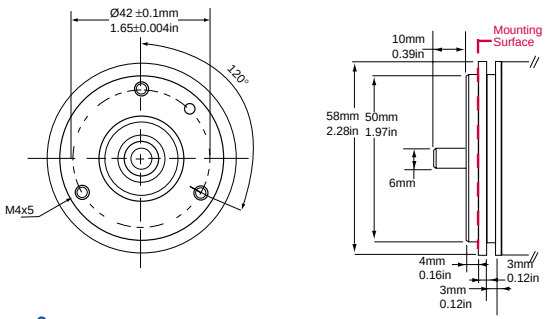
Shaft diameter:
Shaft: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount)
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Maximum shaft load:
6 mm shaft: 13 lb axial, 24 lb radial
10 mm shaft: 24 lb axial, 35 lb radial
Maximum shaft speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting torque: < 1.4 in-oz
Weight (approx.): 350 g ST, 400 g MT
Shaft tolerance (hubshaft only): +/- 1.5 mm axial, +/- 0.2 mm radial
Flange configurations: Square, Clamp, Servo, Hubshaft with flexible tether
Bearing life:
1 x 10^{10} revolutions at 35% full rated shaft load
1 x 10^{9} revolutions at 75% full rated shaft load
1 x 10^{8} revolutions at 100% full rated shaft load

ENVIRONMENTAL

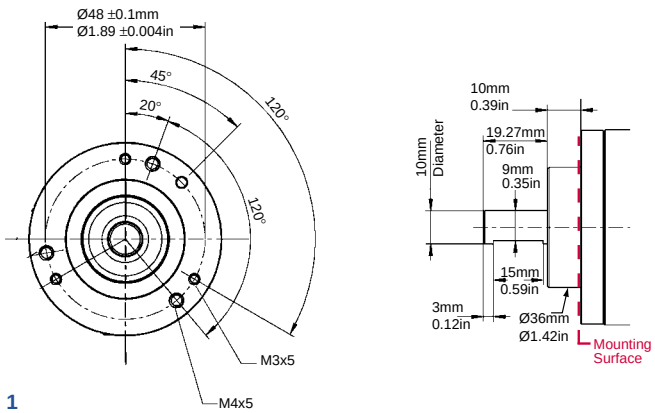
Operating Temperature: -40 to 100° C
Storage Temperature: -40 to 100° C
Enclosure Rating: IP64 or IP67
Shock: 1,000 m/s² (6 ms)
Vibration: 100 m/s² (10 to 2,000 Hz)

Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AI25	☐☐☐☐	☐	☐	☐	☐	☐
AI25 Size25 Acuro Absolute Encoder	**Single-Turn** **0010** 10 Bit **0012** 12 Bit **0013** 13 Bit **0014** 14 Bit **0360** 360 PPR (Gray excess) **0720** 720 PPR (Gray excess) Available when Code 6 is 2 **Multi-Turn** **1212** 12 Bit Multi-Turn, 12 Bit Single-Turn	Available when Code 4 is 0 or A **0** Servo* Available when Code 4 is 2 or C **1** Clamping* Available when Code 4 is 1 or B **2** Square flange** Available when Code 4 is 3, 4, 5 or 6 **3** Hubshaft w/tether† * 58mm Dia. ** 2.5" Square † 63mm BC	**w/o shaft seal (IP64)** **0** 6 mm **1** 3/8" **2** 10 mm **3** 3/8" Hub Shaft **4** 12 mm Hubshaft **5** 1/2" Hubshaft **6** 10 mm Hub Shaft **w/ shaft seal (IP67)** **A** 6 mm **B** 3/8" **C** 10 mm	**0** Parallel Binary **1** Parallel Gray	**0** 5 VDC **2** 10-30 VDC	**0** 1.5m axial cable **1** 1.5m radial cable Available when Code 2 is 00XX, 0360 or 0720 **6** M23 Conin 17 pin axial CW **7** M23 Conin 17 pin radial CW **J** 17 pin MS axial * **K** 19 pin Bayonet radial Available when Code 2 is 1212 **A** Cable 1.5m radial w/ 37 pin sub-D **B** Cable 1.5m axial w/37 pin sub-D * Status LED and Preset Switch features not available with "**J**"

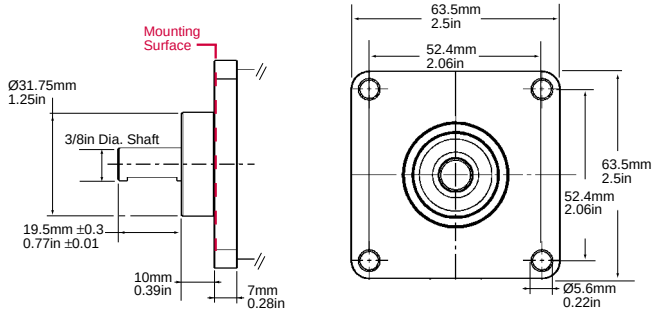
Code 3: Mounting



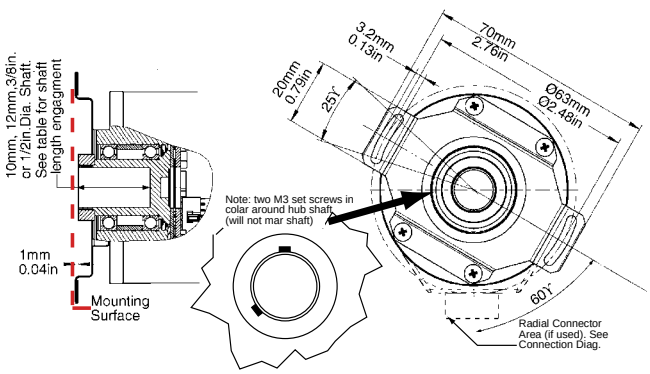
0
Servo



1
Clamping



2
Square Flange

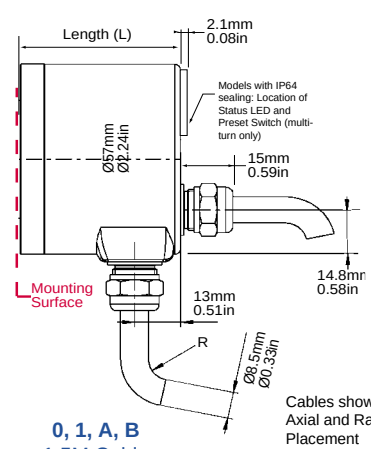


3
Hubshaft w/Tether

Hubshaft Shaft Engagement

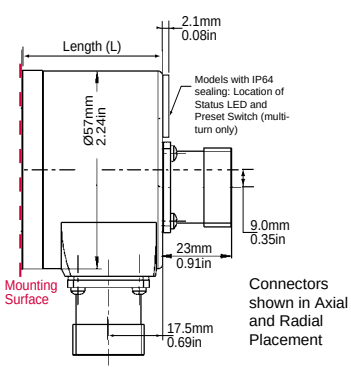
HubShaft Diameter	Min. Shaft Length	Max. Shaft Length
10mm, 3/8"	15mm (0.59")	20mm (0.79")
12mm, 1/2"	18mm (0.71")	20mm (0.79")

Code 7: Connector



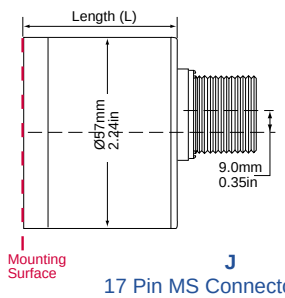
Cables shown in Axial and Radial Placement

0, 1, A, B
1.5M Cable

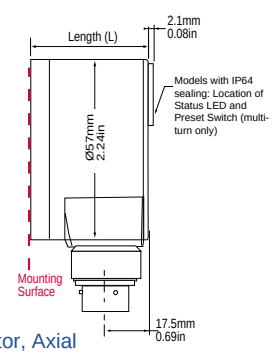


Connectors shown in Axial and Radial Placement

6, 7
Conin 12/17 Pin Connector



J
17 Pin MS Connector, Axial



K
19 Pin Bayonet Connector, Axial

Length (L) Mounting Surface to Rear

Mount (Code 3)	Single-Turn	Multi-Turn
(**0**) Servo	46.5/1.83	60.2/2.37
(**1**) Clamping	45.5/1.79	59.2/2.33
(**2**) Square Flng	45.5/1.79	59.2/2.33
(**3**) Hubshaft	49.9/1.96	67.1/2.64

CONNECTOR WIRING

Series AI25 Parallel Interface

Explanation of Terms		
Tristate	+UB = 0 V[2] =	Outputs at high impedance (Tristate mode) Outputs active
$\overline{\text{Tristate}}$	+UB[2] = 0 V =	Outputs active Outputs at high impedance (Tristate-Mode)
$\overline{\text{Latch}}$	+UB[2] = 0 V =	Encoder data continuously changing at output Encoder data stored and constant at output
$\overline{\text{Direction}}$	+UB[2] = 0 V =	Ascending code value when turning cw Descending code value when turning cw
N.C.	=	Not Connected
LSB	=	Least Significant Bit
MSB	=	Most Significant Bit
S0, S1, ...	=	Data bits for resolution per turn
M0, M1, ... (Multiturn)	=	Data bits for number of turns

2) Or unattached (floating)

PVC-cable (Singleturn) 9-12 Bit			
Color	**9 Bit / 360 [3]**	**10 Bit/720 [3]**	**12 Bit**
brn/gry	N.C.	N.C.	S0 (LSB)
red/blu	N.C.	N.C.	S1
vio	N.C.	S0 (LSB)	S2
wht/brn	S0 (LSB)	S1	S3
wht/grn	S1	S2	S4
wht/yel	S2	S3	S5
wht/gry	S3	S4	S6
wht/pnk	S4	S5	S7
wht/blu	S5	S6	S8
wht/red	S6	S7	S9
wht/blk	S7	S8	S10
brn/grn	S8 (MSB)	S9 (MSB)	S11 (MSB)
yel	$\overline{\text{Tristate}}$ D0...D8	$\overline{\text{Tristate}}$ D0...D9	$\overline{\text{Tristate}}$ D0.. D11
pnk	$\overline{\text{Latch}}$ [4]	$\overline{\text{Latch}}$ [4]	$\overline{\text{Latch}}$ [4]
grn	$\overline{\text{Direction}}$	$\overline{\text{Direction}}$	$\overline{\text{Direction}}$
blk	0 V	0 V	0 V
red	5/10...30VDC	5/10...30VDC	5/10...30VDC
brn	$\overline{\text{Alarm}}$	$\overline{\text{Alarm}}$	$\overline{\text{Alarm}}$

3) Increments 4) Binary Only

Connector 17pol. (CONIN) 9-12 Bit			
Pin	**9 Bit / 360 [3]**	**10 Bit / 720 [3]**	**12 Bit**
1	S0 (LSB)	S0 (LSB)	S0 (LSB)
2	S1	S1	S1
3	S2	S2	S2
4	S3	S3	S3
5	S4	S4	S4
6	S5	S5	S5
7	S6	S6	S6
8	S7	S7	S7
9	S8 (MSB)	S8	S8
10	N.C.	S9 (MSB)	S9
11	N.C.	N.C.	S10
12	$\overline{\text{Tristate}}$ S0...S8	$\overline{\text{Tristate}}$ S0...S9	S11 (MSB)
13	$\overline{\text{Latch}}$ [4]	$\overline{\text{Latch}}$ [4]	$\overline{\text{Latch}}$ [4]
14	$\overline{\text{Direction}}$	$\overline{\text{Direction}}$	$\overline{\text{Direction}}$
15	0 V	0 V	0 V
16	5/10...30VDC	5/10...30VDC	5/10...30VDC
17	$\overline{\text{Alarm}}$	$\overline{\text{Alarm}}$	$\overline{\text{Alarm}}$

3) Increments 4) Binary Only

Connector 17pol. (CONIN) 13-14 Bit		
Pin	**13 Bit**	**14 Bit**
1	S12 (MSB)	S13 (MSB)
2	S11	S12
3	S10	S11
4	S9	S10
5	S8	S9
6	S7	S8
7	S6	S7
8	S5	S6
9	S4	S5
10	S3	S4
11	S2	S3
12	S1	S2
13	S0 (LSB)	S1
14	$\overline{\text{Direction}}$	S0 (LSB)
15	0 V	0 V
16	5/10...30VDC	5/10...30VDC
17	$\overline{\text{Latch}}$ (Binarycode) $\overline{\text{Alarm}}$ (Graycode)	$\overline{\text{Latch}}$ (Binarycode) $\overline{\text{Alarm}}$ (Graycode)

TPE-cable (Multiturn 13-14 Bit) 37 pol. Sub-D		
Color	**Pin**	
brn	2	S0
grn	21	S1
yel	3	S2
gry	22	S3
pnk	4	S4
vio	23	S5
gry/pnk	5	S6
red/blu	24	S7
wht/grn	6	S8
brn/grn	25	S9
wht/yel	7	S10
yel/brn	26	S11
wht/gry	8	M0
gry/brn	27	M1
wht/pnk	9	M2
pnk/brn	28	M3
wht/blu	14	M4
brn/blu	33	M5
wht/red	15	M6
brn/red	34	M7
wht/blk	16	M8
brn/blk	35	M9
gry/grn	17	M10
yel/gry	36	M11
pnk/grn	18	$\overline{\text{Alarm}}$
yel/pnk	10	$\overline{\text{Direction}}$
grn/blu	30	$\overline{\text{Latch}}$
yel/blu	12	Tristate
red	13	10...30 VDC
wht	31	10...30 VDC
blu	1	0 V
blk	20	0 V

MS style 17 pin connectors					
Pin	Function 12 Bit 4096 CPR	Function 10 Bit 1024 CPR	107865 Cable Accessory* Color Code	14 BIT	13 BIT
A	Vin		Red	D13 (MSB)	D12 (MSB)
B	N.C.		Violet	D12	D11
C	Latch (binary only)		Green	D11	D10
D	Direction		Orange	D10	D9
E	S1	N.C.	White	D9	D8
F	S3	S1	White/Brown	D8	D7
G	S5	S3	White/Orange	D7	D6
H	S7	S5	White/Green	D6	D5
J	S8	S6	White/Blue	D5	D4
K	S9	S7	White/Violet	D4	D3
L	S11 (MSB)	S9 (MSB)	White/Black/Brown	D3	D2
M	GND		Black	D2	D1
N	S4	S2	White/Red	D1	D0 (LSB)
P	S0 (LSB)	N.C.	Gray	D0 (LSB)	Direction
R	S2	S0 (LSB)	White/Black	GND	GND
S	S6	S4	White/Yellow	Latch	Latch
T	S10	S8	White/Grey	Vin	Vin
	10ft Cable # 107865-0010			NA	
Mating Connector: MS 17 pin style MS3106A-20-29S part # MCN-N8					
*This is a mating connector/cable assembly. Color coding information is provides here for reference					

PVC-cable (Singleturn 13-14 Bit)		
Color	13 Bit	14 Bit
gry/pnk	N.C	S0 (LSB)
brn/yel	S0 (LSB)	S1
brn/gry	S1	S2
red/blu	S2	S3
vio	S3	S4
wht/brn	S4	S5
wht/grn	S5	S6
wht/yel	S6	S7
wht/gry	S7	S8
wht/pnk	S8	S9
wht/blu	S9	S10
wht/red	S10	S11
wht/blk	S11	S12
brn/grn	S12 (MSB)	S13 (MSB)
yel	$\overline{\text{Tristate S0...S12}}$	$\overline{\text{Tristate S0...S13}}$
pnk	$\overline{\text{Latch}}$ [4]	$\overline{\text{Latch}}$ [4]
grn	$\overline{\text{Direction}}$	$\overline{\text{Direction}}$
blk	0 V	0 V
red	5/10...30VDC	5/10...30VDC
brn	$\overline{\text{Alarm}}$	$\overline{\text{Alarm}}$

4) Binary Only

Bayonet style 19 pin connectors							
Pin	Function 14 Bit 16384 CPR	112077 Cable Accessory* Color Code	Function 13 it 8192 CPR	112076 Cable Accessory* Color Code	Function 12 Bit 4096 CPR	Function 10 Bit 1024 CPR	110158 Cable Accessory* Color Code
A	S13 (MSB)	White/Black/Brown	S12	White/Black/Brown	S11 (MSB)	S9 (MSB	White/Black/Brown
B	S12	White/Grey	S11	White/Grey	S10	S8	White/Grey
C	S11	White/Violet	S10	White/Violet	S9	S7	White/Violet
D	S10	White/Blue	S9	White/Blue	S8	S6	White/Blue
E	S9	White/Green	S8	White/Green	S7	S5	White/Green
F	S8	White/Orange	S7	White/Orange	S6	S4	White/Orange
G	S7	White/Yellow	S6	White/Yellow	S5	S3	White/Yellow
H	S6	White/Red	S5	White/Red	S4	S2	White/Red
J	S5	White/Brown	S4	White/Brown	S3	S1	White/Brown
K	S4	White/Black	S3	White/Black	S2	S0 (LSB)	White/Black
L	S3	Brown	S2	Blue	S1	N.C.	White
M	S2	Blue	S1	White	S0 (LSB)	N.C.	Grey
N	S1	White	S0 (LSB)	Grey	N.C	N.C.	
P	S0 (LSB)	Grey	GND	Black	GND		Black
R	Direction	Orange	Direction	Orange	Direction		Orange
S	Case	Violet	Case	Violet	Case		Violet
T	GND	Black	GND	Yellow	GND		Yellow
U	Latch	Green	Latch	Green	Latch (binary only)		Green
V	Vin	Red	Vin	Red	Vin		Red
10ft Cable # 112077-0010			**10ft Cable #** 112076-0010		**10ft Cable** # 110158-0010		
Mating Connector: 19 pin Bayonet style PT06E-14-19S part # 606219-0001							

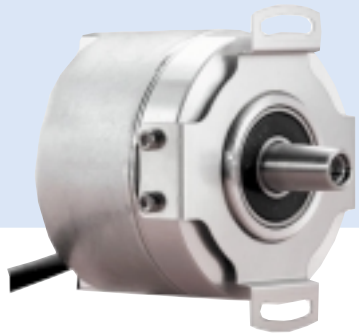
*This is a mating connector/cable assembly. Color coding information is provided here for reference

Series AD25 Drive

- *For high performance BLDC Motors*
- *Up to 22 Bit Single-turn Resolution*
- *4096 Revolutions of Multi-turn Resolution*
- *Safety through self-diagnostics*
- *Data storage on the encoder*
- *Tapered Shaft*
- *-15°C to +120°C Operation*

CE

ACURO



APPLICATION/INDUSTRY

Fully digital position information with up to 22 Bit Single-turn + 12 Bit Multi-turn resolution for speed and position applications.

DESCRIPTION

The ***Acuro AD25*** is an optical absolute encoder with an optical multi-turn gearbox (non magnetic). Double ball bearing design with flexible spring tether as a torque support. Designed for integration into BLDC servomotors for demanding applications such as CNC, precision positioning and high quality printing. Low current consumption of 85 mA contributes to lowering the drive cost.

The ***AD25*** features new, fully digital technology ... Conventional top of the range absolute encoders for motor feedback still provide analog sinusoidal signals to feedback the speed and position of the motor. This information is transmitted over a bidirectional synchronous interface with a variable clock rate up to 10 MHz, resulting in over 4 million measuring steps.

BiSS Interface

BiSS is a new, fully-digital and bi-directional sensor interface. It defines communication between one master and several slaves (sensors) in industrial control systems. BiSS manifests a new standard in technology and is available license-free. Due to its high performance, it constitutes an efficient alternative to the standard combination of data interface and analog sine/cosine incremental output.

BiSS needs only 6 wire, does not require any hardware for analog signals (cables and drive interpolation electronics) - and therefore, helps to reduce system costs.

Self-configuration capabilities allow "plug+play" and keep the system in an operable condition even after a power failure. For more detailed information on BiSS and implementation support please visit www.biss-ic.de

FEATURES AND BENEFITS

- Compact design to save valuable space
- Low power consumption
- Fast delivery of any model variant
- High Speed digital interface BiSS
- Downward compatible (SSI + sincos)
- PCB connector

SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS

Supply Voltage: 5 VDC, +10% / –5%
Current Consumption (w/o output current):
Single-turn: ≤ 45 mA (at 5V)
Multi-turn: ≤ 85 mA (at 5V)
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)
Connection: 1 ft. Cable (30 cm)
Incremental Signals (SSI models only)
Resolution: 2048
Format: A, B Quadrature,1 Vpp Sine wave
SSI Interface
Resolution:
Single-turn: 13 Bits
Multi-turn resolution: 12 Bits
Interface:
Number of lines: 4 unidirectional (2 for clock; 2 for data)
Electrical Interface: RS 422
Transmission speed: 70 kHz to 2 MHz per SSI definition
BiSS Interface
Resolution:
Single-turn resolution: 22 Bits
Multi-turn resolution: 12 Bits
Interface:
Signals: Clock unidirectional (from master to encoder); Data unidirectional (from encoder to master)
Electrical Interface: RS 422
Number of lines: 4 unidirectional (2 for clock and 2 for data)
Transmission speed: 70 kHz – 10 MHz
Transmission security: 1 start bit, 1 stop bit, 4 Bit CRC
Diagnostic functions: possible failure modes are constantly checked with the following functions
LED current sensing: Pollution, condensation, over-temperature
Single-step check: Disk pollution or damage, condensation, mechanical overload
Temperature monitoring: Warning message if the user-defined limits have been reached/ exceeded

For further information on the BiSS interface please consult: http://www.biss-ic.de/

MECHANICAL

Shaft Size:
Tapered solid shaft: 10 mm diameter; Cone 1:10
Tapered hub shaft: 10 mm diameter; Cone 1:10
Shaft Loading: 5 lb axial, 20 lb radial
Shaft Speed: 12,000 RPM (continuous), 15,000 RPM (peak-ST only)
Starting Torque: < 1.4 in-oz
Weight: 6.2 oz.
Diameter: 2.28"
Length: 1.85"

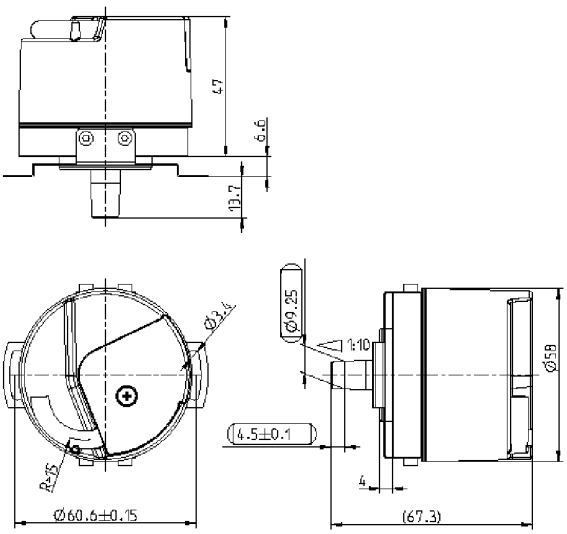
ENVIRONMENTAL

Operating Temperature: -15 to +120° C
Storage Temperature: -25 to +85° C (due to packaging)
Enclosure Rating: IP40
Shock: 100 g's for 6 msec duration
Vibration: 10 g's (10 to 2000 Hz)

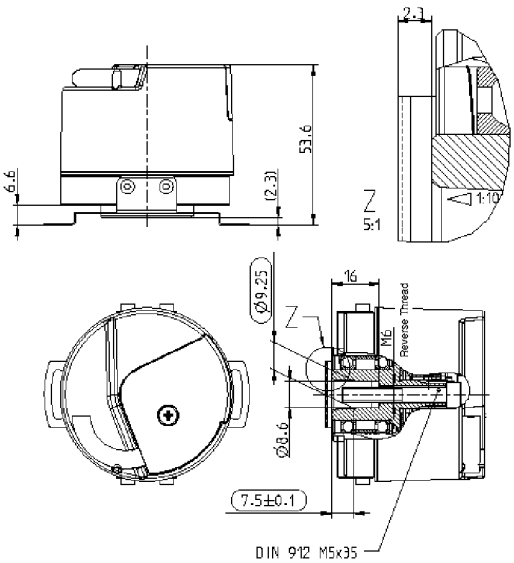
Code 1: Model	Code 2: Bits	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Protocol	Code 6: Electrical	Code 7: Connector
AD25	☐☐☐☐	☐	☐	☐	☐	☐
AD25 Size25 Acuro Absolute Encoder	**Single-Turn** **0013** 13 Bit **0022** 22 Bit **Multi-Turn** **1213** 12 Bit Multi-Turn, 13 Bit Single-Turn **1222** 12 Bit Multi-Turn, 22 Bit Single-Turn	**4** Spring Tether	**Y** 10mm Shaft (10:1 Taper) **Z** 10mm Hub Shaft (10:1 Taper)	Available when Code 2 is 0022 or 1222 **A** BiSS Available when Code 2 is 0013 or 1213 **F** SSI-Gray Code, + 1Vpp	**0** 5 VDC	**M** Drive cable, 1 foot (30 cm)

Series AD25 Drive

Code 4: Shaft Size



Y
10mm (10:1 taper) Shaft



Z
10mm Hub Shaft

Electrical Connections

Row b	U_p	Clock	B -	0V (U_n)*	A -	Data
Row a	$\overline{\text{Data}}$	A +	0V Sensor	B +	$\overline{\text{Clock}}$	Up - Sensor
PIN	1	2	3	4	5	6

PIN	1b	2b	3b	4b	5b	6b
Name	Power Supply	Clock	B -	0 V (U_n)	A -	Data
Signal	**Up**	**Clk**	**B -**	**0 V**	**A -**	**Dat**
Color	Gray/Pink	White	Red	White/Green	Yellow	Black

PIN	1a	2a	3a	4a	5a	6a
Name	$\overline{\text{Data}}$	A +	0 V -Sen	B +	$\overline{\text{Clock}}$	U_p Sensor
Signal	**$\overline{\text{Dat}}$**	**A +**	**0V - Sen**	**B +**	**$\overline{\text{Clk}}$**	**U_p-Sen**
Color	Violet	Green	Brown/Green	Blue	Brown	Blue/Red

U_p = power Supply
Sensor is connected to Power Supply and 0 V (U_n)
Shield connected to case

Notes