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Encoder Installation Manual
HENGSTLER *brand*
SERIES AI25 SSI/BISS
Class 1 Div. 2 Hazardous Absolute Encoder

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CE

RoHS



1. Preface

These installation instructions are provided for the connection and starting procedure of your Absolute Encoder.

You will get further information from the AI25 EtherNet/IP datasheet, on request, or by download from our Web Site at www.dynapar.com.

2. Safety

Authorized Personnel
The encoder should only be assembled and dismantled by a qualified person, as the unit contains sensitive electronic circuits.

Risk of Injury Due to Rotating Shafts
Hair, jewelry or articles of clothing may become caught in rotating shafts or other parts.

→ Prior to commencing all work, disconnect all power supplies and ensure that the working environment is safe!

Risk of Destruction Due to Static Electricity

The CMOS modules contained in the encoder are very sensitive to high voltages which can occur due to friction of the clothing.

→ Do not touch plug contacts or electronic components!

Risk of Destruction Due to Mechanical Overload
Rigid mounting will give rise to constraining forces which will permanently overload and damage the bearings.

→ Never restrict the freedom of movement of the encoder! Use only the enclosed sheet metal springs or a suitable coupling to secure the unit!

Risk of Destruction Due to Mechanical Shock
Violent shocks, e.g. due to hammer blows, can lead to the destruction of the optical sensing system and the ball bearings.

→ Never use force! Assembly is simple provided that correct procedures are followed.

Risk of Destruction Due to Overloading

→ The unit may only be operated within the limits specified in the technical data.

Fields of Application: industrial Processes and Controls.

→ Over voltage at the connecting terminals must be limited to overvoltage-class-II values (SELV).

→ The connecting cable is not for dragline mounting, only for fixed mounting of the encoder.

→ This encoder is a supply part destined for mounting to other equipment (motor, machine). It is not provided for direct sale to the end customer.

→ Manufacturers integrating this encoder to their facilities are responsible for compliance with CE guidelines and for proper use of the CE mark.

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SPECIFICATIONS

STANDARD OPERATING CHARACTERISTICS:

Code: Absolute, Optical
Resolution Single-turn: 12-22 Bit
Resolution Multi-turn: 12 Bit
Linearity: ± ½ LSB (± 1 LSB for resolution > 13 Bit
Absolute Accuracy: ± 0.01° mechanical (36 arc-sec.)
Repeatability: ± 0.002° mechanical (7.2 arc-sec.)

ELECTRICAL:

Interface: SSI, BiSS
Output Code: Binary, Gray, Gray Excess
Input Voltage: 5 VDC ±10% or 7-30 VDC
Current w/o Load (typ.):
5V: 100 mA (ST), 150 mA (MT);
10-30V: 100 mA (ST), 150 mA (MT)
Permissible Load: max 60mA
Frequency Response (Baud Rate): 500 kHz
Max Pulse Frequency (Incremental): 200KHz
Maximum Transmission Length (SSI/BISS):

Cable Length	Frequency
<50m	<400kHz
<100m	<300kHz
<200m	<200kHz
<400m	<100kHz

ELECTRICAL (cont.):

Control Inputs: Direction
Alarm Output: Alarm bit
Preset Function: Sets encoder to zero output at present mechanical position)
Noise Immunity: Tested to EN61326-1
Electrical Immunity: Tested to EN61326-1
Termination: Cable, radial

MECHANICAL:

Shaft Diameter: 6 mm (Servo Mount), 10 mm (Clamping Mount), 3/8" (Square Flange Mount),
Hubshaft: 10mm, 12 mm, 3/8", 1/2"
Shaft Load (axial/radial): 40N (9lb.) / 60N (13lb.)
Shaft Tolerance (hubshaft only): ± 1.5 mm axial,
± 0.2 mm radial
Shaft Load (hub shaft): Spring Tether Tolerance: Axial ±0.5mm; Radial ±0.05mm
Maximum Shaft Speed: 10,000 RPM (continuous), 12,000 RPM (peak)
Starting Torque: < 1.4 in-oz
Housing Material: Aluminum
Shaft Material: Stainless Steel

MECHANICAL(cont.):

Disc Material: Glass
Weight:
Single-Turn: approx. 9.2 oz (260 g)
Multi-Turn: approx. 11 oz. (310 g)

ENVIRONMENTAL:

Operating Temperature: -40 °C ...+80 °C
Storage Temperature: -40 °C ...+100 °C
Shock: 100G, 1,000 m/s² for 6 msec
Vibration: 10G, 100 m/s² (10 to 2,000 Hz)
Humidity: Up to 75%, (no condensation allowed)
Enclosure Rating: IP64 or IP66

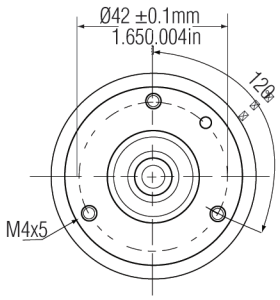
Ordering Information

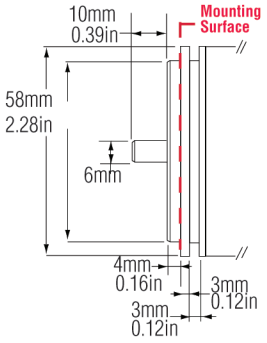
To order, complete the model number with code numbers from the table below:

Code 1: Model	Code 2: Resolution	Code 3 :Mounting	Code 4: Shaft Size	Code 5: Interface	Code 6: Output	Code 7: Termination	Code 8: Options
AI25	☐☐☐☐	☐	☐	☐	☐	☐	☐
AI25 Size25 Absolute Encoder	**0010** 10 Bit ST **0012** 12 Bit ST **0013** 13 Bit ST **0014** 14 Bit ST **0017** 17 Bit ST **0019** 19 Bit ST **0022** 22 Bit ST **1212** 12 Bit MT 12 Bit ST **1213** 12 Bit MT 13 Bit ST **1214** 12 Bit MT 14 Bit ST **1217** 12 Bit MT 17 Bit ST **1219** 12 Bit MT 19 Bit ST **1222** 12 Bit MT 22 Bit ST	Available when Code 4 is 0 or A **0** Servo* Available when Code 4 is 1, 2 or B, C **1** Clamping* **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" Hubshaft **4** 12 mm Hubshaft **5** 1/2" Hubshaft **6** 10mm Hubshaft **w/ shaft seal (IP66)** **A** 6 mm **B** 3/8" **C** 10 mm Available only when Code 2 is ST (Single Turn) **K** 1/4" Hubshaft	**2** SSI Gray **(SG)** **3** SSI Binary **(SB)** **F** SSI Gray (+Sin-Cos 1Vpp) **(SC)** **Q** SSI Binary + high active Preset **(SR)** **P** SSI Gray + high active Preset **(SH)** **E** SSI Binary (+ sin/cos 1Vpp **(SD)** **R** SSI Binary Extended **(SE)** **A** BiSS-B **(BI)** **L** BiSS-B (+SIN-COS 1VPP) **(BC)** **M** BiSS-C **(BE)** **N** BiSS-C (+SIN-COS 1VPP) **(BV)** Available when Code 6 is 2 **H** SSI Gray (+512 PPR Push-Pull Out) **(SM)** **J** SSI Gray (+1024 PPR Push-Pull Out) **(SN)** **K** SSI Gray (+2048 PPR Push-Pull Out) **(SO)**	**0** 5 VDC **2** 7-30 VDC	**1** Cable, radial, 30ft, 12 Pos	**D2**

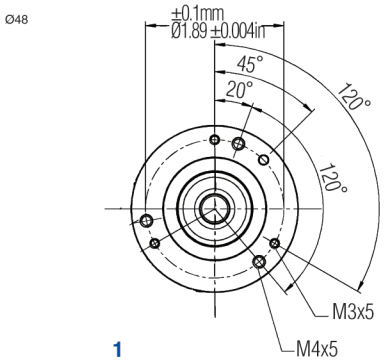
DIMENSIONS

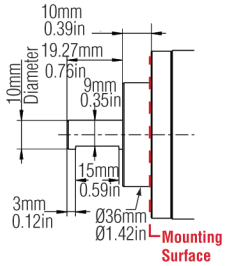
Code 3: Mounting



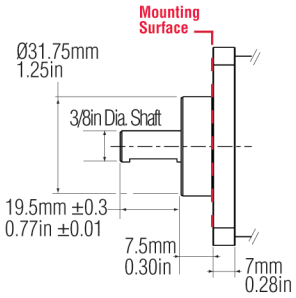


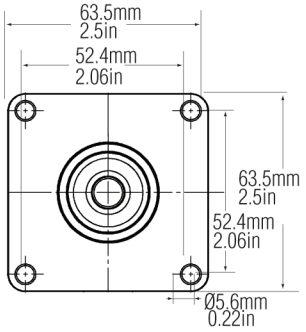
0
Servo



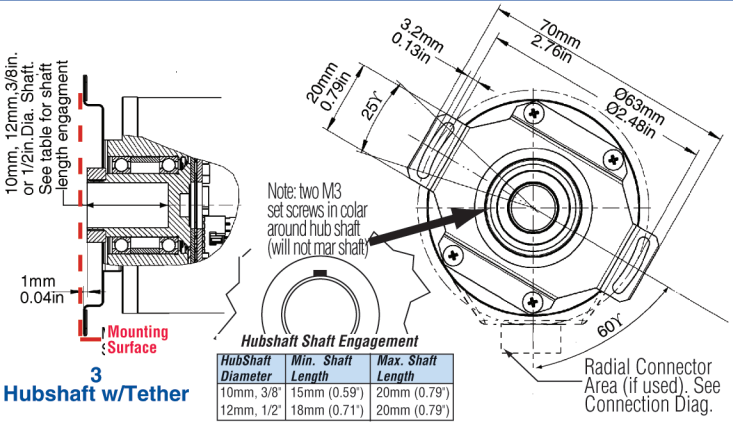


1
Clamping





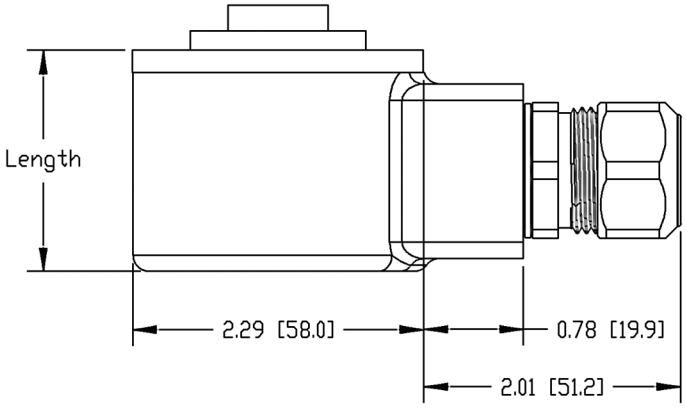
2
Square Flange



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")

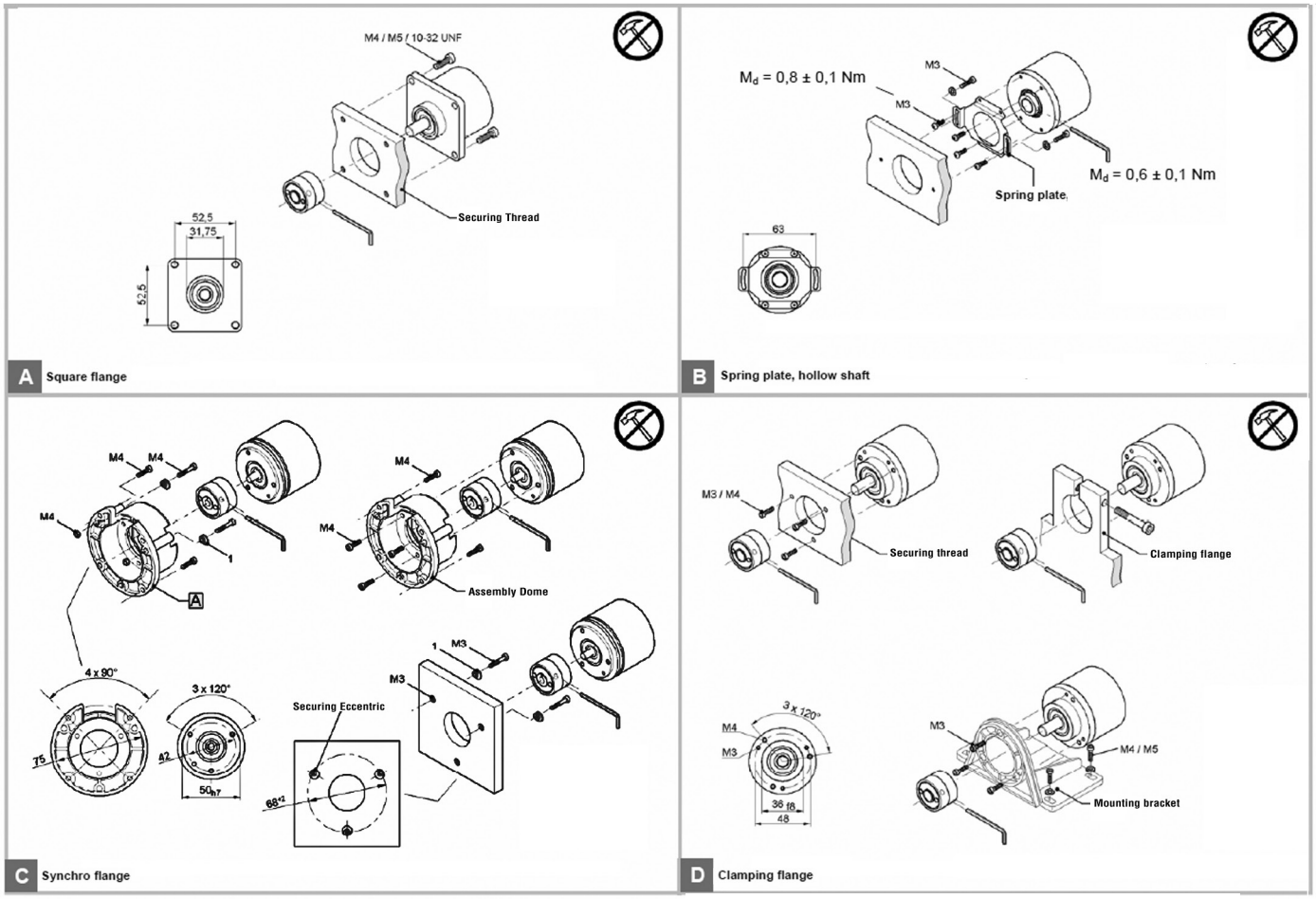
3
Hubshaft w/Tether

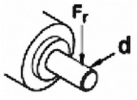


Length (L) Mounting Surface to Rear

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

MOUNTING



MECHANICAL DATA		
d = 6...10 mm: F_r = 80N F_a = 40N		
	- Short term	= 12 000 min^{-1}
	- Continuous Duty	= 10 000 min^{-1}
	-40 ... + 80 °C	
-Vibration - Shock	100 m/s^2 (10 - 2000 Hz) 1000 m/s^2 (6 ms)	

ELECTRICAL DATA		
	Singleturn	**Multiturn**
U_{in}[1] =	5 VDC +/- 10%	7...30VDC
Imax (only Encoder) =	100 mA	150 mA
Imax (incl.Output) = Fuse	1A Middle Slow Blow	1A Middle Slow Blow
- Alarm Output	SSI - Alarm Bit (on request) BiSS - Warning and Alarm Bits	
- Clock Frequency	Refer to Specifications Section for proper Clock Frequency	
- Cable Length	Refer to Specifications section for proper Cable Length	
RoHS Compliant		
		

1) Attention: Connecting the encoder to a DC line voltage without a protective circuit for EMC is not allowed.

ELECTRICAL CONNECTIONS

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

Pair #	Cable Color	Function (Code 5 = H, J, K)	Function (Code 5 = 2, 3, A, M, R)	Function (Code 5 = E, F, L, N)	Function (Code 5 = P, Q)
1	**RED**	VCC (DC 5/7-30 V)	VCC (DC 5/7-30 V)	VCC (DC 5/7-30 V)	VCC (DC 5/7-30 V)
	BLACK	COMMON (0V)	COMMON (0 V)	COMMON (0 V)	COMMON (0 V)
2	**WHITE**	DATA	DATA	DATA	DATA
	BLACK	$\overline{\text{DATA}}$	$\overline{\text{DATA}}$	$\overline{\text{DATA}}$	$\overline{\text{DATA}}$
3	**GREEN**	CLOCK	CLOCK	CLOCK	CLOCK
	BLACK	$\overline{\text{CLOCK}}$	$\overline{\text{CLOCK}}$	$\overline{\text{CLOCK}}$	$\overline{\text{CLOCK}}$
4	**BLUE**	A+ (Incremental)	N.C.	A+ (Sin/Cos)	N.C.
	BLACK	A- (Incremental)	N.C.	A- (Sin/Cos)	N.C.
5	**YELLOW**	B+ (Incremental)	N.C.	B+ (Sin/Cos)	N.C.
	BLACK	B- (Incremental)	N.C.	B- (Sin/Cos)	N.C.
6	**BROWN**	PRESET [3]	0V CONNECTION or SENSE [4]	0V CONNECTION or SENSE [4]	PRESET [3]
	BLACK	DIRECTION [1]	$\overline{\text{DIRECTION}}$ [2]	$\overline{\text{DIRECTION}}$ [2]	DIRECTION [1]

1 Direction: VCC or Unconnected = Descending code values with clockwise (CW) rotation. 0V = Ascending code values with CW rotation.
2 $\overline{\text{Direction}}$: VCC or Unconnected = Ascending code values with clockwise (CW) rotation. 0V = Descending code values with CW rotation.
3 Active High Signal. Signal Level high >70% VCC; Signal Level Low <20% VCC or unconnected. Sets encoder to zero output at present mechanical position.
4 Connected internally to 0V in encoder. Alternative implementation is a ground sensing loop for external voltage regulation.