

## GEM-E 24V

### P-Type Abs Encoder

25 Bit Multi-Turn Absolute Kit Encoder SSI with  
1024 Sin/Cos Incremental Signal

## Data Sheet



### Description

The Multiturn Absolute kit encoder is a feedback device that has the capability to generate a unique binary 'word' for each encoder shaft position. The encoder also has the unique feature of being able to provide positional information upon power up without the need for codewheel movement, unlike incremental encoders, which need codewheel movement to provide positional information.

The kit encoder IC consists of a single turn absolute encoder module and a multiturn absolute encoder module.

The OPTO-ASIC within the single turn absolute encoder module is accompanied with precision amplifiers plus additional circuitry, and a special multi-track codewheel that rotates between the emitter and detector IC. The multiturn module consists of an LED circuit board, a photodetector circuit board, and gear train arranged in between the PCBs

These 2 main components are contained within a strong housing fitted with bearings to produce an IP rated encoder capable of working in harsh conditions.

### Specifications

This kit encoder is available in the following versions:

- 25-bit 10 mm solid shaft with Gray output code
- 25-bit 10 mm solid shaft with Binary output code

#### Note:

For different additional features, please contact factory for details.

### Features

- 1024 Sin/Cos incremental signal
- Maximum 25-bit resolution / 13-bit Single Turn (8192 step per revolution; 12 bit Multiturn (4096 revolutions)
- Optical, multi-turn absolute encoder with Ø58.4 mm, and typical height 53 mm.
- Operating temperatures of -10°C to +85°C
- 10 mm shaft diameter
- Built-in line driver & receiver
- Integrated highly collimated illumination system
- Ingress Protection 40 rating
- Comes with 1 m long cable

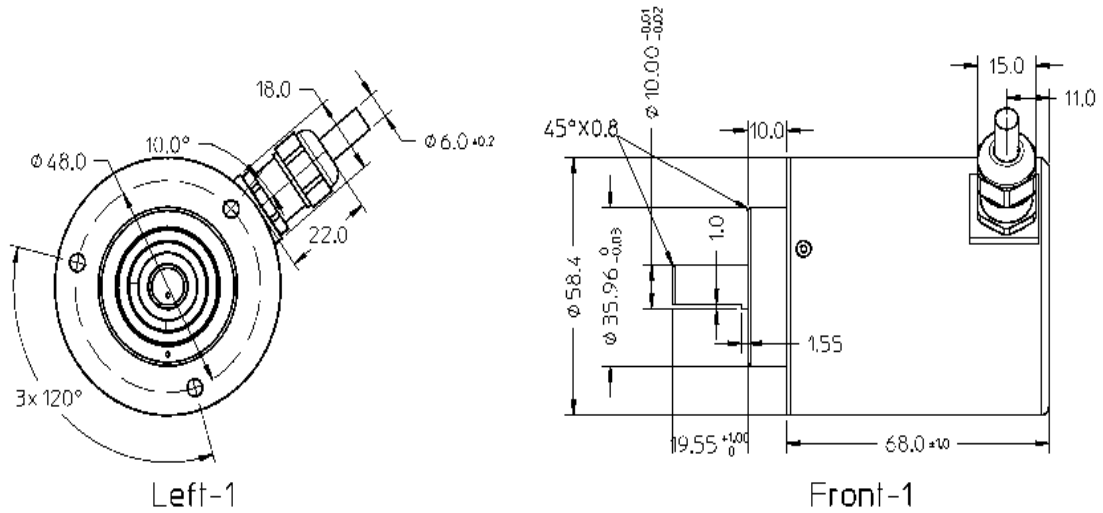
### Benefits

- No battery or capacitor required for position detection during power failure
- Immediate position detection on power up

### Applications

- Robotics
- Cost effective solution for direct integration into OEM systems
- Linear positioning system

## Package Dimensions



### Notes:

1. Reference Mark
2. M4x0.7 – 8 depth
3. 3rd Angle Projection
4. Dimensions are in millimeters
5. Unless otherwise specified, all tolerances are within  $\pm 0.5$  mm

**Figure 1. Package dimensions**

### Device Selection Guide 1

Part Number	Resolution	Operating Temperature (C)	Output Communication	Output Code	DC Supply Voltage (V)
AEAS-7H00-A25SG	25 bit (13 bit ST + 12 bit MT) <sup>2</sup>	-10 to +85	SSI +1024 Sine/ Cosine Incremental	Gray	24V
AEAS-7H00-A25SB	25 bit (13 bit ST + 12 bit MT) <sup>2</sup>	-10 to +85	SSI +1024 Sine/ Cosine Incremental	Binary	24V

### Notes:

1. For other options of Multiturn Absolute Encoder, please refer to factory
2. ST: Single Turn; MT : Multiturn

### Absolute Maximum Ratings 1, 2

Parameter	Symbol	Limits	Units
DC Supply Voltage	V <sub>CC</sub>	24.0 ±10%	V
Output Voltage	V <sub>O</sub>	5 ± 10%	V
Input Voltage	V <sub>I</sub>	-0.5 to +5.5	V
Relative Air Humidity (Non-Condensing)	RH	85	%
Shaft Load		axial 40, (SRPM<6000 1/min), radial 60, at the shaft end	N
Starting torque		< 1at 20°C	Ncm
Encoder Shaft Speed	S <sub>RPM</sub>	Max 12000	rpm
Storage Temperature	T <sub>stg</sub>	-35 to 85	°C

Notes:

1. Stresses greater than those listed under Absolute Maximum Ratings may cause permanent damage to the device. This is stress rating only and functional operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.
2. Exposure to absolute maximum rating conditions for extended periods may affect reliability.
3. This device meets the ESD ratings of the IEC61000-4-2 Level 1 (2KV).

### Recommended Operating Condition

Parameter	Symbol	Value	Units	Notes
DC Supply Voltage	V <sub>CC</sub>	24.0 ±10%	V	
Ambient Temperature	T <sub>amb</sub>	-10 to +85	°C	
SSI Serial Clock	f <sub>SRCLK</sub>	0.5 to 4	MHz	
Encoder Shaft Speed	S <sub>RPM</sub>	10000 or below	rpm	1, 2

Notes:

1. As unique coded gear-wheels techniques are implemented to generate unambiguous positional information, the interactions between these high wear resistant gear wheels are subjected to mechanical wear and tear.
2. Mechanically permissible speed.

### Electrical Characteristics

Parameter	Symbol	Value			Units	Notes
		Min	Typical	Max		
Frequency of Sinusoidal Incremental signal	f <sub>SIN</sub> , f <sub>COS</sub>			250	kHz	
Output Voltage of Sinusoidal Incremental signal (Peak-to-Peak)	V <sub>pp, SIN</sub> V <sub>pp, COS</sub>		1		V	
Output Offset voltage	V <sub>oo, SIN/COS</sub>		2.5		V	

## DC Characteristics

DC Characteristics over Recommended Operating Range, typical at 25 °C

Parameter	Symbol	Condition	Value			Units	Notes
			Min	Typ.	Max		
Output High Voltage	$I_{OH}$	$I_{OH} = -8\text{mA}$	2.4			V	1
Output Low Voltage	$I_{OL}$	$I_{OH} = 8\text{mA}$			0.4	V	1
Input High Voltage	$V_{IH}$		2			V	2
Input Low Voltage	$V_{IL}$			0.8		V	2
$V_{CC}$ Supply Current	$I_{CC}$			150		mA	

Notes:

1. Only applicable for STROBE output.
2. Only applicable for MSBINV input.
3. RS-422 differential line driver for DATA output.
4. RS-422 differential line receiver for SRCLK input.

## Timing Characteristics

Timing Characteristics over Recommended Operating Range, typical at 25 °C

Parameter	Symbol	Condition	Value			Units	Notes
			Min	Typ.	Max		
Input Transition Rise/Fall Time	$t_R / t_F$	0.8V/2.0V			10	ns	1
SRCLK Frequency	$f_{SRCLK}$		0.5		4	MHz	2
SRCLK Low-time	$t_{LSRCLK}$		110			ns	
SRCLK High-time	$t_{HSRCLK}$		70			ns	
Data Latch time	$t_{LATCH}$			35		us	3
Lapse time between words	$t_{LT}$		40			us	3, 4

Notes:

1. Only applicable for MSBINV input.
2. SRCLK low-time =  $0.50/f_{SRCLK}$ ; high-time =  $0.50/f_{SRCLK}$ .
3. Refer to Figure 2 for timing description.
4. Valid data on falling edges of SRCLK with STROBE is high.

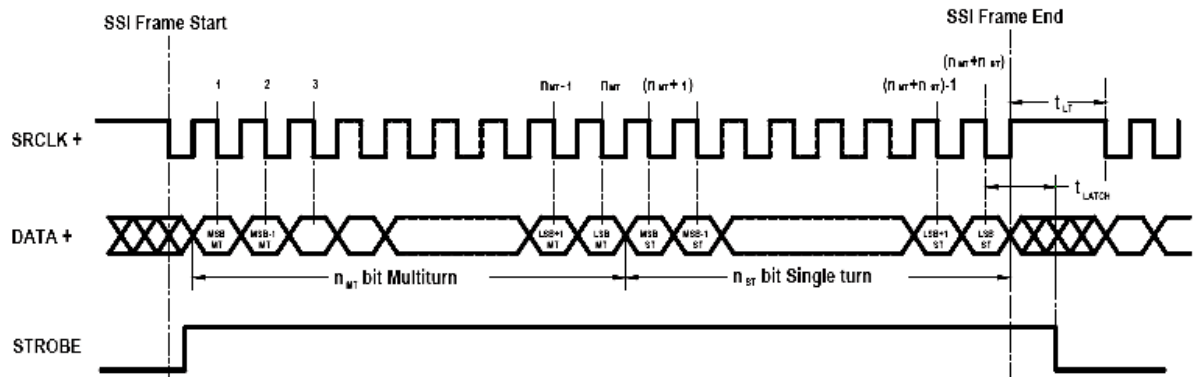


Figure 2. Timing Characteristics of STROBE, SRCLK and DATA

## Electrical Connections

Pin	Colors	Description
1	Red	VCC, Positive Supply 24V
2	Black	GND, Ground
3	Orange	DATA+
4	Yellow	DATA -
5	White	SRCLK+
6	Grey	SRCLK -
7	Blue	MSBINV
8	Green	STROBE
9	Yellow/Black	COS+, differential Cosine Signal +
10	Orange/Black	COS-, differential Cosine Signal -
11	Blue/Black	SIN+, differential Sine Signal +
12	Green/Black	SIN- , differential Sine

Figure 3. Pin Configuration

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Feb, 2008

