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# Absolute Linear Encoder

## Description:

### EMA21 Absolute Magnetic linear encoder

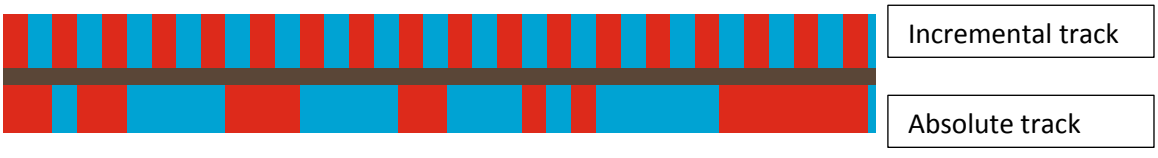
**EMA21:** There are two types of Encoders; linear and Rotary encoders. Linear encoders are used for measuring any linear displacement whereas the rotary encoders are used for measuring the rotary or angular displacement. Further there are two types based on the output; Absolute and Incremental. Absolute Encoders are known for retaining position data even when power is down. Simply speaking when absolute encoder is powered on, it starts transmitting the absolute or true position without any external reference or movement. In case of incremental encoders, as the name suggests don't offer absolute position when powered on and controller or Digital readout system needs to calculate an absolute position with respect to a fixed reference position.

Electronica Mechatronic Systems (India) Pvt Ltd is proud to be first manufacturer in India to design an absolute magnetic linear encoder system based on its proven magnetic encoder technology. This is in analogy with the Government of India's new campaign **"Make in India"**. This gives a lot of advantages to the users in India having such a system manufactured in India like Service and support etc. In the world there are only 5-6 companies who manufacture such Absolute magnetic linear encoders out of these Electronica Mechatronic Systems (India) Pvt Ltd is proud to be the first Indian company in them.

**EMA21, Absolute magnetic linear encoder won FIE FOUNDATION AWARD in IMTEX 2015**

## Principle of operation:

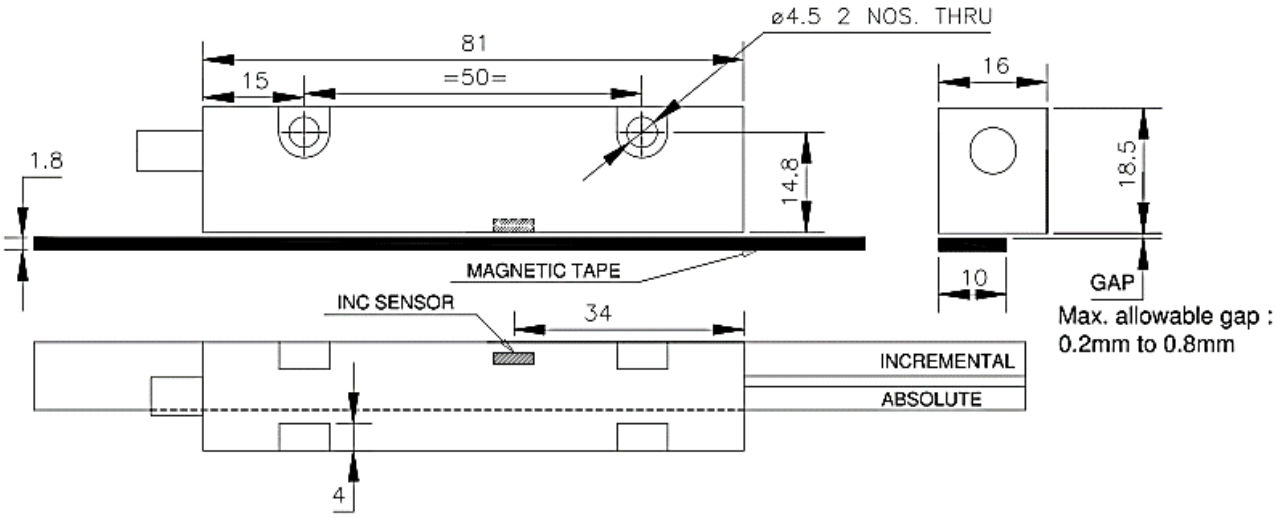
The EMA21 absolute encoder system consist of a magnetic tape and the sensor. The magnetic tape consists of two tracks, one is the incremental track and the other is the absolute coded track. The incremental track gives us the basic resolution of the system and the absolute track gives us the absolute position.




The absolute sensor again has two types of sensors, one to read the incremental track just like our incremental reader heads and the second type is an array of sensors to read the absolute track. The absolute sensors read the absolute position on the magnetic tape and conveys it to a MCU which combines both the incremental information and the absolute information and sends it over the communication lines in either SSI or Biss-C protocol.

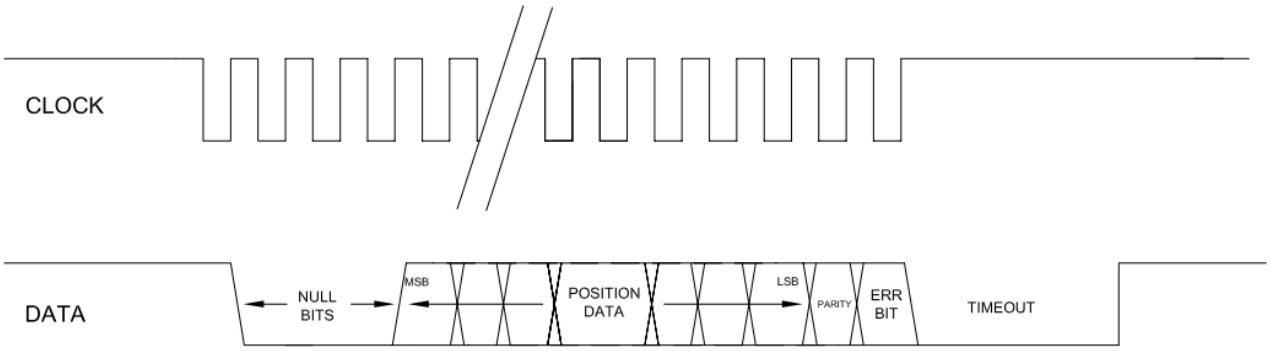
## Specification:

| Sr. no. | Specification | Details |
|---|---|---|
| **Output Specifications** | | |
| 1 | Resolution | 1µ |
| 2 | Absolute Output | SSI – 70KHz to 1.6MHz<br>BiSS C Unidirectional – 100KHz to 10MHz |
| 3 | Incremental Output | 1Vpp Analog output @ 10mtr/sec max<br>Rs422 differential output @ 4Mtr/sec max |
| 4 | Accuracy | ±15µ |
| 5 | Repeatability | ±1 count |
| 6 | Hysteresis | <3µ |
| **Mechanical Specifications** | | |
| 1 | Tape Dimensions | 10mm width, 1.8 thickness |
| 2 | Maximum tape length | 60 Mtrs |
| 3 | Reader Head dimensions<br>(L X W X H) | 80mm X 16mm X 18.5mm |
| **Cable and connector Specifications** | | |
| 1 | Output connector | 12pin round directly from reader head or cable from reader read |
| 2 | Output cable | PUR cable |
| 3 | Output cable options | In case of direct 12pin round connector, extensions leads with mating connector and optional 12 pin round, 15 pin D, flying leads on other end<br>In case of direct cable exit from reader head, 5mtr standard cable length. 12pin round / 15pin D / flying leads options on other end. |
| **Electrical Specifications** | | |
| 1 | Supply Voltage | Option 1: 5V ± 5% standard. Option 2: 6.5V to 28VDC |
| 2 | Operating current | <200mA |
| **Environmental Specifications** | | |
| 1 | Ingress protection class | IP67 |
| 2 | Storage temperature | -20ºC to +85ºC |
| 3 | Operating temperature | -20ºC to +85ºC |
| 4 | Relative humidity | 20% to 80% non-condensing |




# Output:

## SSI:



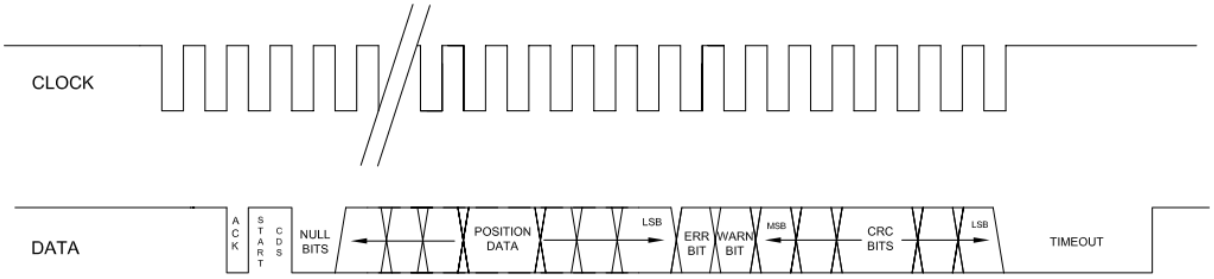

**SSI Output Specifications**:

1. Operating Frequency: 70KHz to 1.6MHz
2. Frame Length: 32bits
3. Timeout / Monoflop Period: 25µs to 30µs

**SSI Frame**: SSI frame is of 32 bits including 4 null bits, 26 position bits, a parity bit and an error bit. Position bits are transmitted from MSB to LSB.

| Null bits (31-28) | Position bits (27-2) (Binary / Grey) | Parity bit(1) (None/Even/ Odd) | Error bit(0) (None/Active High) |
|---|---|---|---|
| 4 | 26 | 1 | 1 |

## BiSS-C (Unidirectional):




**BiSS-C (Uni.) Output Specifications:**

1. Output frequency: 100KHz to 10MHz
2. Frame Length : 36 bits
3. Timeout: 10µs to 15µs

**BiSS-C (Uni.) Frame**: BiSS frame is of 36 bits including two Null bits, 26 bits position data, an error bit, a warning bit followed by 6 CRC bits. Position bits are transmitted from MSB to LSB.

| Null Bits(35-34) | Position Data(33-8) | Error(7) | Warning(6) | CRC(5-0) |
|---|---|---|---|---|
| 2 | 26 | 1 | 1 | 6 |

**Salient Features** (with image, if available):

- Accuracy of ±15µm/meter at 1µm resolution
- Supports measuring speed of 4 m/s at 1µm resolution
- Maximum measuring length available up to 60 mtrs, standard magnetic tapes are 20 mtrs in roll form
- Supports popular industrial absolute protocols like SSI & BiSS-C (unidirectional), additionally supports
- incremental O/P RS422 digital / 1Vpp analog
- Ingress Protection class IP67
- Wide supply range available: Option 1 - 5 VDC &
- Option 2 - 6.5 V to 28 VDC
- Reader head O/P is with cable or with direct connector on housing for ease of installation
- LED indication on reader head to help user during installation & application
- Error O/P in case of absolute code mismatch, higher speed & other such cases...
- IP67 rating enabling use in harshest of the machine tool environments whereas optical systems fail quiet easily in such harsh environment.
- Longer lengths up to 60 meters due to magnetic tape manufacturing capability. Such longer lengths are impossible with optical systems.

This absolute encoder offers popular communication protocols such as -

- SSI with RS422 Digital output
- BiSS C with RS422 Digital output

- SSI with 1Vpp Analog output
- BiSS C with 1Vpp Analog output

Leading Controller manufacturer Siemens also supports SSI protocol for interfacing Absolute encoders. And many others are following them.

Advantages of our EMA21 –

- Cost effective compared to other products available
- Direct connector on the reader head housing gives easier installations
- Wide supply options available: Option 1 – 5V and Option 2 – 6.5V to 28VDC
- All outputs available in the same package
- Since this is all an indigenous development, other custom interfaces can be easily developed as per customer requirements

## Applications:

- Robotics
- Automation
- Dispensing Machines
- Pick & Place Machines
- Length cutting Machines
- Linear Motor Applications
- Special Purpose Machines
- Material Handling Machines