# AEDR-8300-1Wx Encoders
## Reflective Surface Mount Optical Encoder

**Avago**
TECHNOLOGIES

## Data Sheet

### Description

The AEDR-8300-1Wx is the smallest optical encoder employing reflective technology for motion control purposes. The encoder houses an LED light source and a photo-detecting circuitry in a single package.

The AEDR-8300-1Wx offers two-channel quadrature digital outputs. Being TTL compatible, the outputs of the AEDR-8300-1Wx can be interfaced directly with most of the signal processing circuitries. Hence the encoder provides great design-in flexibility and easy integration into existing systems. The AEDR-8300-1Wx could yields encoding resolution at 212 lines per inch (LPI) which is 8.35 lines per mm.

The AEDR-8300-1Wx provides motion sensing at a competitive cost, making it ideal for high volume applications. Its small size and surface mount package make it ideal for many consumer products, particularly where space and weigh are primary design constraint.

### Features

- Reflective technology
- Surface mount leadless package
- Two channel quadrature outputs for direction sensing
- TTL compatible output
- Single 3.3 V to 5 V supply
- -20° C to 85° C absolute operating temperature
- Encoding resolution: 212 (lines/inch) or 8.35 (lines/mm)

### Applications

Ideal for high volume applications:
- Printers
- Copiers
- Card readers
- Scanners
- Cameras
- Motor Solutions
- Automated Wheel-chair
- Vending Machines
- Low Servo Systems
- ATM Machines
- Textile Machines
- Industrial Sewing Machines
- Consumer Product Applications

## Theory of Operation

The AEDR-8300-1Wx combines an emitter and a detector in a single surface mount leadless package. When used with a codewheel or linear codestrip, the encoder translates rotary or linear motion into digital outputs. As seen in the block diagram, the AEDR-8300-1Wx consists of three major components: a light emitting diode (LED) light source, a detector IC consisting photodiodes and lens to focus light beam from the emitter as well as light falling on the detector.

## Block Diagram of AEDR-8300-1Wx
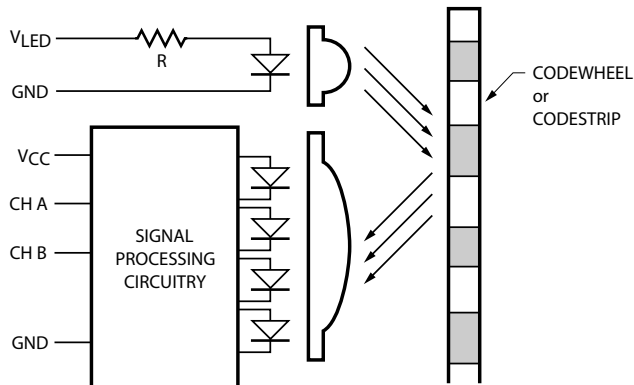


The operation of the encoder is based on the principle of optics where the detector photodiodes sense the absence and presence of light. In this case, the rotary/linear motion of an object being monitored is converted to equivalent light pattern via the use of codewheel/codestrip. As shown in the above diagram, the reflective area (window) of the codewheel (or codestrip) reflects light back to the photodetector IC, whereas no light is reflected by the non-reflective area (bar). An alternating light and dark patterns corresponding to the window and bar fall on the photodiodes as the codewheel rotates. The moving light pattern is exploited by the detector circuitry to produce digital outputs representing the rotation of the codewheel. When the codewheel is coupled to a motor, the encoder outputs are then a direct representation of the motor rotation. The same concept applies to the use of a codestrip to detect linear motion.

## Definitions

**State Width (S):** The number of electrical degrees between a transition in Channel A and the neighboring transition in Channel B. There are 4 states per cycle, each nominally 90°e.

**State Width Error ($\Delta$S):** The deviation of state width, in electrical degree, from its ideal value of 90°e.

**Phase ($\phi$):** The number of electrical degrees between the center of high state of Channel A and the center of high state of Channel B. Nominally 90°e.

**Phase Error ($\Delta\phi$):** The deviation of phase, in electrical degree, from its ideal value of 90°e.

**Pulse Width (P):** The duration of high state of the output, in electrical degree, within one cycle. Nominally 180°e or half a cycle.

**Pulse Width Error ($\Delta$P):** The deviation of pulse width, in electrical degree, from its ideal value of 180°e.

**Count (N):** The number of window and bar pair per revolution (CPR) of codewheel. For linear codestrip, defined as the number of window and bar pair per unit length (lines per inch [LPI] or lines per mm [LPmm]).

**One Cycle (C):** 360 electrical degrees (°e). Equivalent to one window and bar pair.

**One Shaft Rotation:** 360 mechanical degrees. Also equivalent to N counts (codewheel only).

**Line Density:** The number of window and bar pair per unit length, expressed in either lines per inch (LPI) or lines per mm (LPmm).

**Optical radius (Rop):** The distance between the codewheel center and the centerline between the two domes of the encoder.

**Gap (G):** The distance from surface of the encoder to the surface of codewheel or codestrip.

**Radial and Tangential Misalignment Error ($E_R$, $E_T$):** For rotary motion, mechanical displacement in the radial and tangential directions relative to the nominal alignment.

**Angular Misalignment Error ($E_A$):** Angular displacement of the encoder relative to the tangential line.

**Specular Reflectance ($R_f$):** The amount of incident light reflected by a surface. Quantified in terms of the percentage of incident light. A spectrometer can be used to measure specular reflectance of a surface (contact factory for more information).