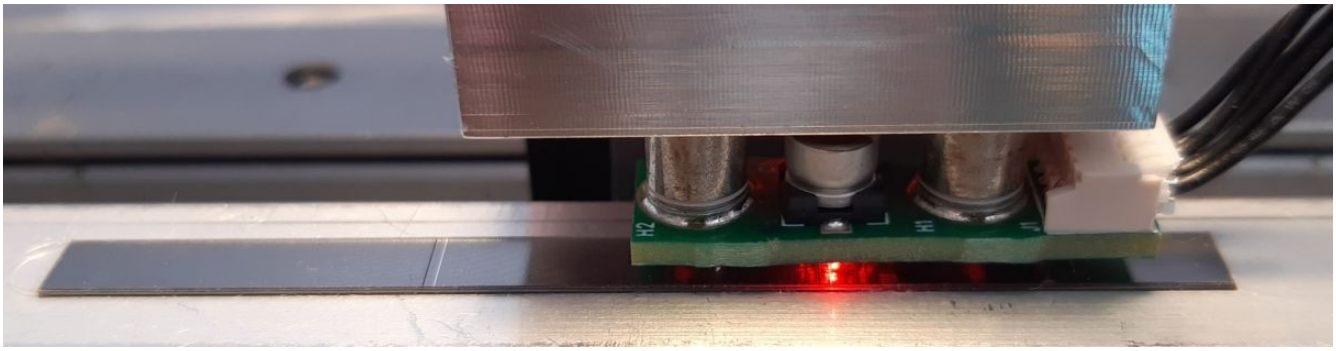
Wedge Motion

www.wedgemotion.com

WMEL linear encoder



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Introduction

Wedge Motion's WMEL linear optical encoder measures the position of mechanical parts with micrometric precision. The product includes:

- a printed circuit board WMEL-8710
- a cable to connect the printed circuit board
- an optical ruler WMEL-LP80, also known as an optical scale or code strip, of length adapted to the customer's needs

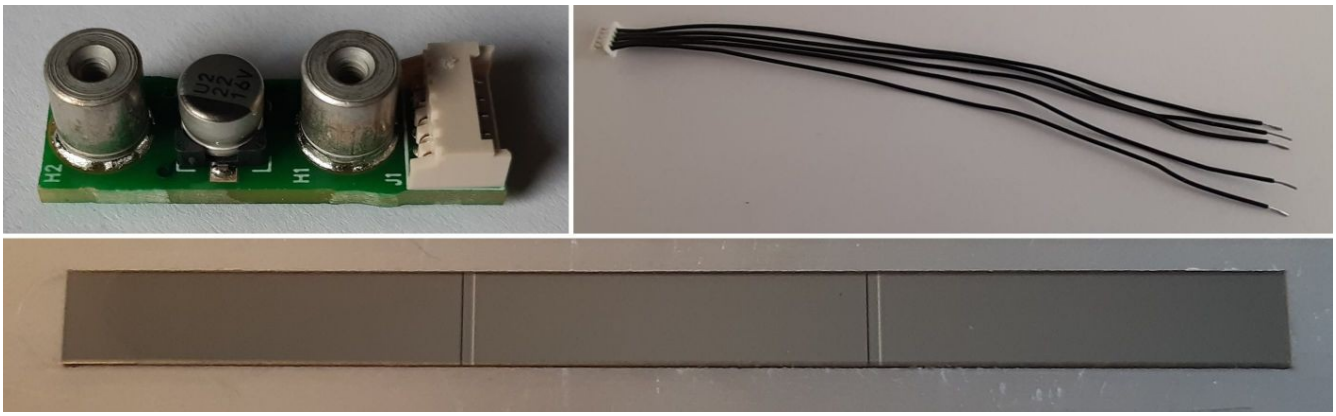

Fig.1: Printed circuit board WMEL-8710, cable and optical ruler WMEL-LP80-PET

Specifications

Encoder resolution: 1.25µm
Encoder extrapolation: 16x
TTL compatible digital output channels: CHA, CHB and index
Supply: 5V (±10%).

Optical ruler specifications: 80µm per line pair or 317.5 line pairs per inch

Length of optical ruler: according to order, tolerance of ±1mm.
Minimum and maximum length of the ruler:

- 10mm to 300mm for plastic ruler
- 10mm to 150mm for glass ruler

Optical ruler width: 6mm
Optical ruler thickness (mounted with adhesive): 0.30 – 0.35mm

Note: please consult us for other lengths.
Note: The thickness of the optical scale, mounted, depends on the adhesive used.

Printed circuit board WMEL-8710

The WMEL-8710 printed circuit board incorporates the AEDR-8710 integrated circuit from Broadcom (formely Avago Technologies). This electro-optical component is a reflective optical ruler decoder.
The decoder is of the incremental type with TTL compatible digital output channels (CHA, CHB and Index) and 5V power supply (±10%).

For more information on this component, please consult the Broadcom documentation on their website : www.broadcom.com/products/motion-control-encoders/incremental-encoders/reflective-encoders/aedr-871x

The following figure gives the overall dimensions of the printed circuit board. It is mounted and positioned with 2 threaded inserts (M2). The electrical connection is made via a 5-pin connector (Molex, Picoblade series, part number 053048-0510).

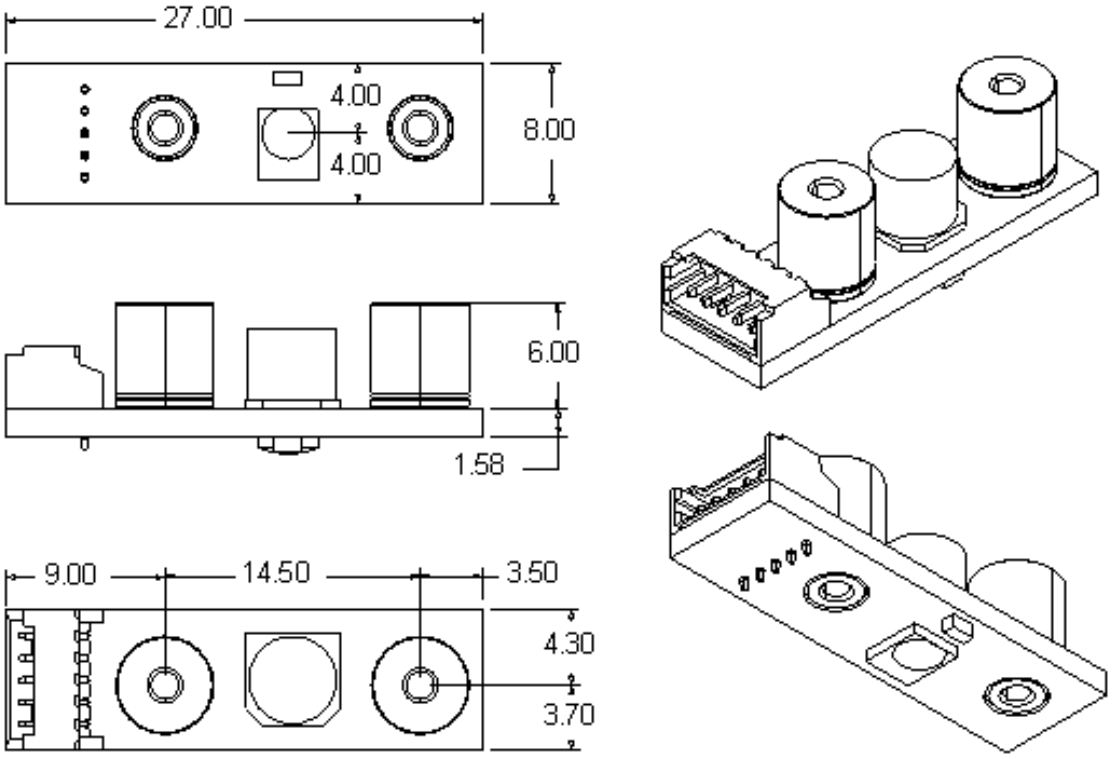

Fig.2: Printed circuit board WMEL-8710

**CAUTION*: *Always handle the printed circuit board so as not to damage or scratch the lens of the AEDR-8710 component. Any scratching of the optical lens can affect the operation of the encoder.*

The following table and figure give the positions and designations of each pin on the printed circuit board connector.

Position	Designation
1	5V
2	CHA
3	CHB
4	Index
5	0V

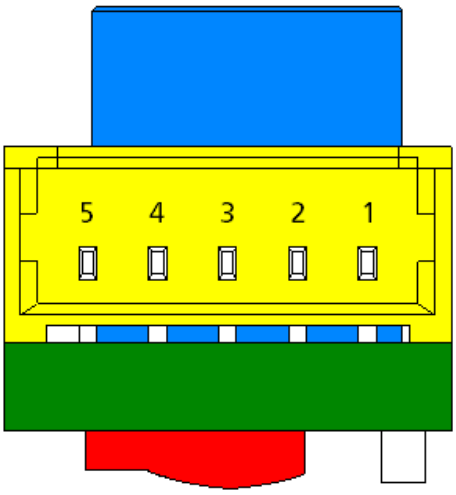

Fig.3: Connector in yellow

The following diagram, taken from the Broadcom's datasheet, shows the signals A and B (in quadrature with respect to each other) and the index.

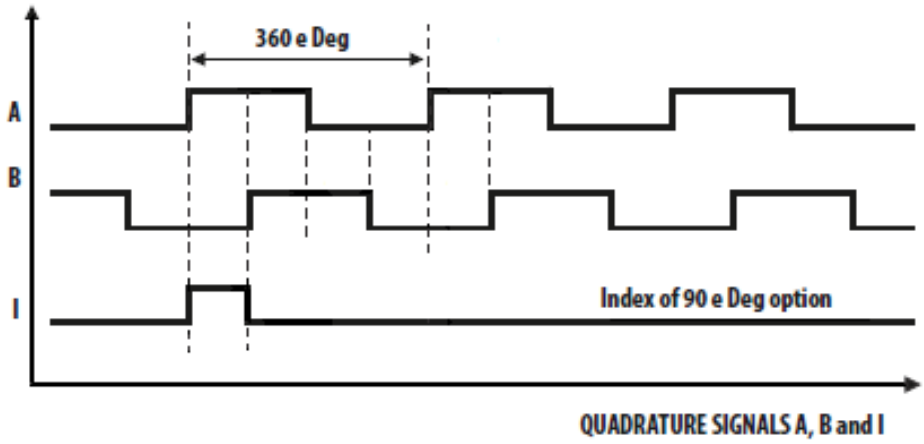

Fig.4: Extract from the AEDR-871x datasheet

Cable for circuit board

A pre-assembled cable (Molex, length 150mm, part number 15134-0502) is provided to connect to the PCB.

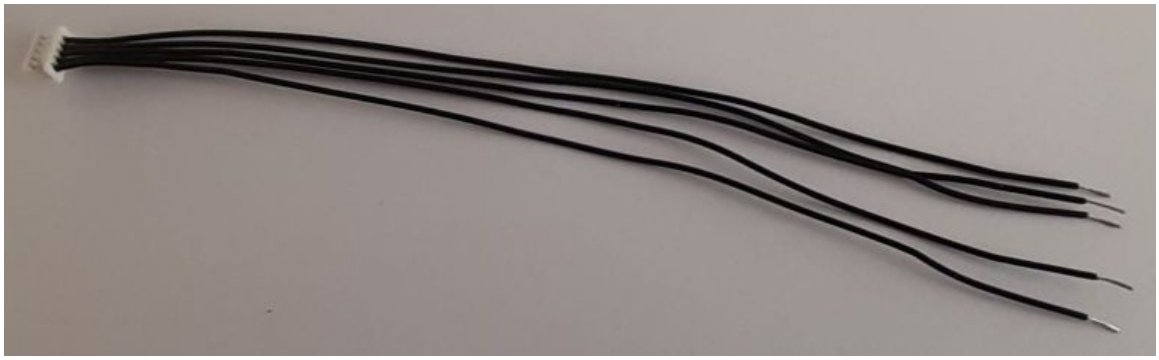

Fig.5: Pre-assembled cable

It is also possible to purchase pre-assembled cables directly from Molex that are shorter or longer, for example: part number 15134-0500 (50mm) or part number 15134-0503 (300mm). The unwired connector, part number 151021-0500 (Molex, Picoblade series, 1.25mm, 5 pins), is also available from distributors.

Optical ruler WMEL-LP80

The WMEL-LP80 optical ruler conforms to the AEDR-8710 component specifications and recommendations from Broadcom.

It is formed by a succession of reflective and non-reflective lines, each having a width of 40µm. A pair of lines therefore measures 80µm, which corresponds to 317.5 LPI (line pairs per inch). To the naked eye, the ruler has a uniform appearance because these patterns are too small to be visible.

Wedge Motion supplies rulers in PET (polyethylene terephtalate, also called Mylar) or glass. PET rulers are self-adhesive and ready to use.

**CAUTION: Please handle the optical rulers with care. Any scratches or dirt can affect the operation of the encoder. Glass rulers are fragile and can break easily.*

The rulers also include patterns for the index signal. This pattern is made up 2 wider reflective and non-reflective bands. The index patterns are visible to the naked eye. They are inserted every 20mm, according to the figure below.

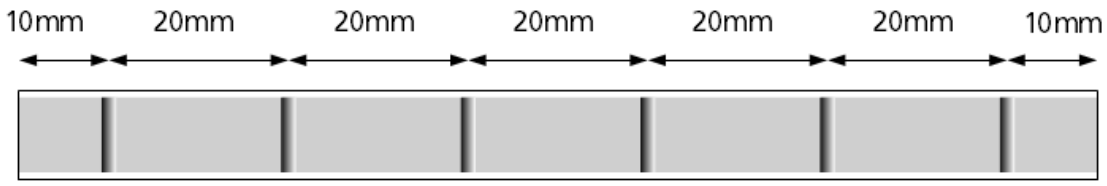

Fig.6: WMEL-LP80-PET-120mm ruler, suitable for 110m displacement
Index marks are not drawn to scale

Ordering instructions

Encoder and ruler are commonly sold together but can also be ordered separately. Please order the printed circuit board and the ruler according to the following color model:

- WMEL-8710
- WMEL-LP80-[ ]-[ ]mm

Ruler type and length:
PET : plastic ruler with adhesive, ready to mount
GLASS : glass ruler without adhesive

[ ] : total ruler length in millimeters

**CAUTION: For ordering a desired displacement of length L, add 5mm on each end of the ruler for an additional length of 10mm. Therefore, for a displacement of length L, order a ruler of length L + 10mm.*

Order example: WMEL-8710 + WMEL-LP80-PET-120mm

The order includes:

- Printed circuit board + connection cable
- Optical ruler:
  - plastic material
  - 317.5LPI
  - total length 120mm (110mm effective displacement)

Mounting of printed circuit board WMEL-8710

The printed circuit board is assembled using 2 threaded inserts (M2). The proper operation of the encoder depends on the correct alignment of the printed circuit board in relation to the optical ruler. The following table gives the alignment tolerances for the 5 possible degrees of freedom.

	Tolerances
Vertical clearance	From 0.5mm to 1mm according to Broadcom documentation
Lateral alignment	The axis of the ruler must be aligned with the center of the optical lens, tolerance of ±1mm
Pitch	±1°
Roll	±1°
Yaw	±1°

**CAUTION: When mounting the printed circuit board, do not damage or scratch the decoder lens or the optical ruler.*

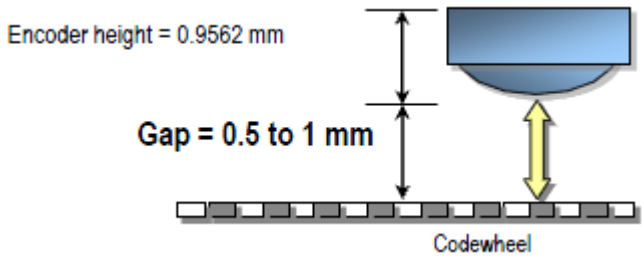

Fig.7: Vertical clearance according to the AEDR-871x datasheet

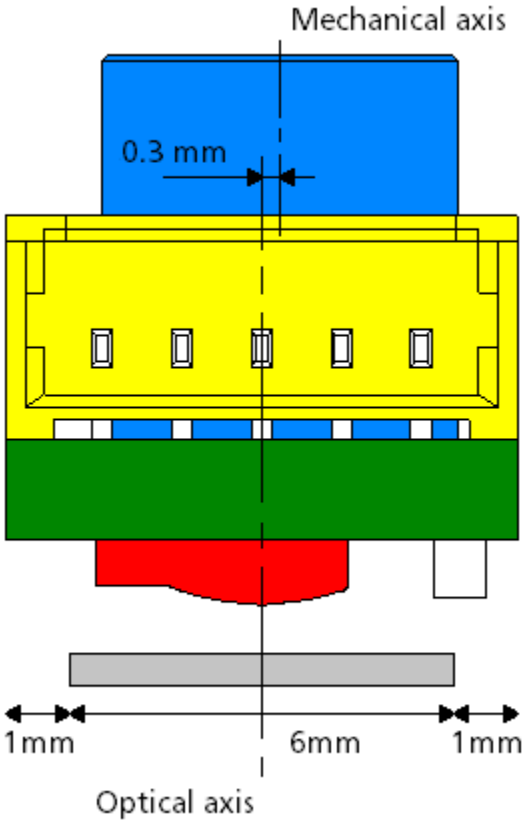

Fig.8: The center of the lens of the AEDR-8710 (red) is aligned with the axis of the ruler (gray)

Note: The threaded inserts (in blue in the figure above) are slightly offset laterally with respect to the central axis of the printed circuit board.

It is also necessary to orient the index mark correctly in relation to the printed circuit board.

Fig.9: Correct orientation between printed circuit board and optical ruler

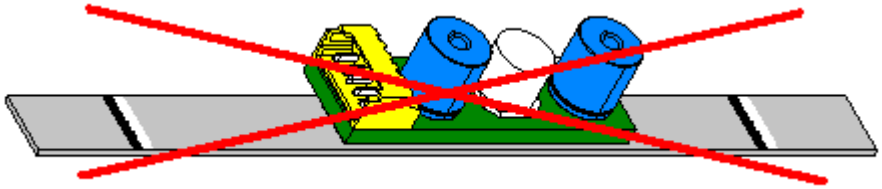

Fig.10: Incorrect orientation between printed circuit board and optical ruler

Mounting of optical ruler WMEL-LP80-PET

The PET optical ruler is self-adhesive and ready to use. It can be glued to any type of support, in particular to metals having a low coefficient of thermal expansion.

The ruler has 2 protective plastic films:

- film protecting the adhesive on the underside (to be removed prior to gluing)
- film protecting the upper optical face (to be removed at the end of the assembly)

First step: cleaning the support
Use acetone or isopropyl alcohol and a lint-free cloth to achieve a surface as clean as possible.

Second step: preparation of the support
For the positioning of the ruler, it is recommended to have a shoulder or to use a template.

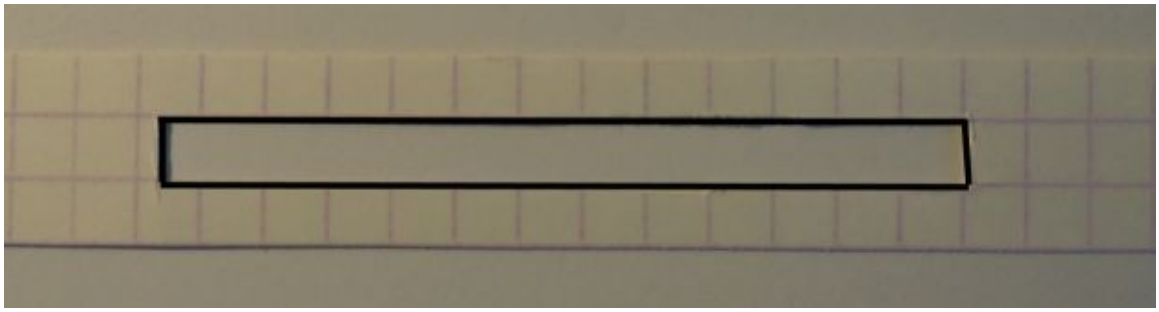

Fig.11: Example of template

Third step: adhering the ruler

***CAUTION**: The ruler adhesive is very strong and can only be placed once. This step is delicate and must be executed with care.

1st case: shorter ruler

- Completely remove the underside plastic film.
- Hold the ruler at each end by the edges without touching the backing.
- Position the ruler without touching the support.
- Place the ruler and apply light pressure

2nd case: longer ruler

- Peel off the adhesive slightly on one end and fold it back.
- Then position the ruler while ensuring the the now exposed portion of adhesive stays in the air and does not touch the support.
- Place the exposed end down and apply light pressure.
- Continue by gradually removing the plastic film and laying down the ruler while making sure to maintain alignment.

Once the ruler is fully attached to its support, remove the plastic film that protects the optical upper face.

Mounting of optical ruler WMEL-LP80-GLASS

The glass optical ruler requires a strip of adhesive to be affixed to the underside of the ruler (for example 3M's 467MP tape adhesive). Once the tape is placed on the ruler, the protective film can be removed and the ruler can be positioned.

**CAUTION: Glass rulers are very fragile, please handle with great care.*

Warranty

The product is guaranteed for one year. See warranty terms and conditions.