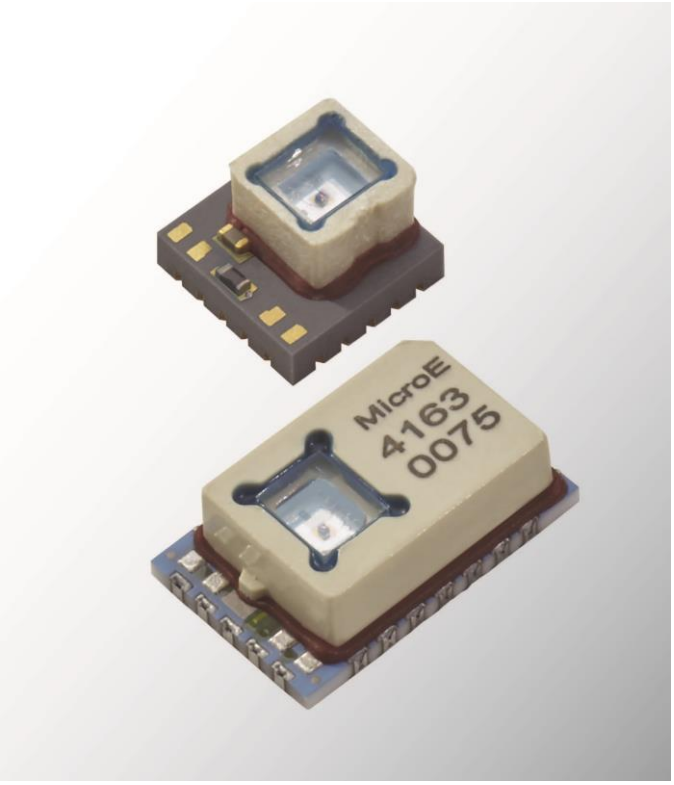
ChipEncoder™ Series

Installation Manual and Reference Guide



IM-ChipEncoder-Series-Rev. 2

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1.0 Introduction

1.1 Overview

The ChipEncoder is an encoder system on a chip:

- Small enough to mount directly on a printed circuit board
- Designed for high-volume applications
- Compatible with low-cost automated assembly processes

The instructions in this manual apply to the following ChipEncoders models:

- Models CE300-4, CE300-40
- Model CE40-GC

1.2 Precautions

1. Follow standard ESD precautions. Turn **power to off** before connecting the sensor.
2. **Do not touch** electrical pins without static protection such as a grounded wrist strap.

1.3 Laser Safety Information

This product is sold solely for use as a component (or replacement) in an electronic product; therefore, it is not required to, and does not comply with U.S. FDA **21 CFR 1040.10** and **1040.11** which pertain to complete laser products. The manufacturer of the complete system-level electronic product is responsible for complying with **21 CFR 1040.10** and **1040.11**.

MicroE Systems encoders contain an infrared laser diode or diodes. Emitted invisible laser radiation levels have been measured to be within the **CDRH Class 1** range, which is not considered hazardous; however, to minimize exposure to the diverging beam, install the **encoder sensor in its operational configuration in close proximity to the encoder scale before applying power**.

- Invisible laser radiation: wavelength of 850 nm.
- Maximum power of 2.4 mW CW.

- **Caution**: The use of optical instruments with this product will increase eye hazard. **Do not** view powered encoder directly with optical instruments (microscopes, eye loupes, or magnifiers).
- All maintenance procedures such as cleaning must be performed with the MicroE encoder turned **off**.
- **Do not** insert any reflective surface into the beam path when the encoder is powered.
- **Do not** attempt to service the MicroE encoder.

1.4 Standards Compliance

ChipEncoders are RoHS and REACH compliant.

1.5 Related Documentation

- ChipEncoders Series Data Sheet
- ChipEncoders Series Interface Drawings

1.6 Manual Revisions

Version	Date	Notes
Rev. 2	04/21/2022	Changed stencil thickness. New values for Sin+. REACH compliance.

1.7 Trademarks

ChipEncoder is a registered trademark of MicroE Systems®.

1.8 Special Conventions Used

The following symbols *may* be used in this document.

Symbol	Description
	Warning or caution: potential damage to parts.
	Instructions show correct method.
	Instructions show example of incorrect method.
See Section 2.2	Single click with the mouse on these highlighted references to jump to specified places in instructions.

2.0 Before Installation

Review the items in this section prior to installing the ChipEncoder.

2.1 Power Recommendations

The ChipEncoder requires a 5.0 V_{DC} power supply:

- The ChipEncoders require a minimum of 4.5 V_{DC} continuously.
- When designing circuits and extension cables to use ChipEncoders, be sure to account for voltage loss over distance and tolerances from the nominal supply voltage so that at least 4.5 V_{DC} is available to the ChipEncoder under all operating conditions. The supply voltage can be confirmed by measuring between the applicable 5 V and ground pads.
- The input voltage should not exceed 5.5 V_{DC}.

2.2 Installation Considerations

The ChipEncoder is a precision electronic instrument. It has been designed to function in a wide range of applications and environments. To take full advantage of the encoder design, allow easy access to the sensor for service and/or replacement.

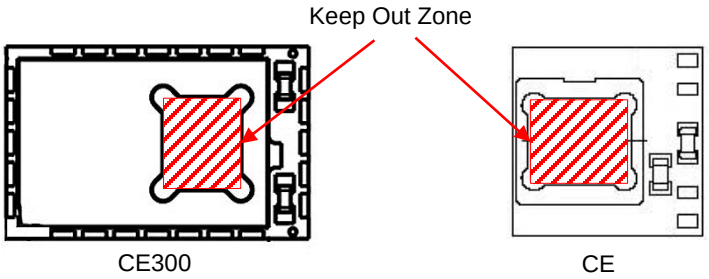
For optimal performance and reliability:

- DO follow standard ESD precautions while handling the sensor.
- DO allow proper clearance for sensor head alignment.
- DO follow setup and alignment instructions for the encoder system.
- DO, where possible, install the scales in an inverted or vertical position to minimize accumulation of dust.
- DO NOT store sensors in an uncontrolled environment.
- DO NOT electrically overstress the sensor (power supply ripple/noise).
- DO NOT intentionally “hot swap” the sensor if the device is energized.

2.3 Handling Considerations

Note: Follow Electrostatic Discharge (ESD) precautions at all times. Prior to reflow soldering, pay particular attention to preventing ESD damage as the damage threshold is 500 V.

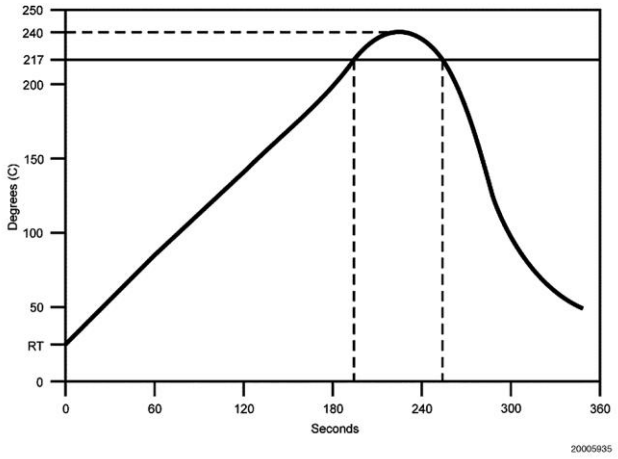
When handling the ChipEncoder, do not allow the pickup device to touch anywhere in the “Keep Out Zone.” Refer to the following illustrations. Scratches or 'digs' in the Keep Out Zone can affect ChipEncoder performance.



2.4 Solder Paste Recommendation and Reflow Profile

The ChipEncoder can be soldered to a PCB using industry standard techniques. The diagram below illustrates the recommended reflow temperature profile.

Reflow Solder Temperature Profile



Lead-Free Solder Reflow

Use a temperature-controlled convection or IR reflow oven and SAC305 solder paste with no-clean flux in either air or an inert atmosphere (N_2). The temperature should be measured on the carrier board close to the ChipEncoder parts and should not exceed 260°C.

The ChipEncoder has soldered devices under the cover. The rate of heating and cooling must be controlled so that it does not exceed 5°C per second to avoid thermal stressing of the devices.

The ChipEncoder inputs and outputs are pre-tinned palladium silver pads with the typical spacing between adjacent input/output pads of 0.2 mm (0.008 inches). The pads are pre-tinned with SAC305 solder alloy. Solder material with good slump characteristics should be chosen to ensure that solder does not bridge or short during pre-heating in the reflow process.

Hand Soldering

Hand soldering can cause damage. Hand soldering guidelines:

- CE300: **Do not** hand solder. Castellations are for electrical testing only.
- CE: Hand solder only if necessary.

2.5 Application Notes

The printed circuit board (PCB) land pattern and assembly processes necessary to successfully integrate the ChipEncoder are detailed as follows:

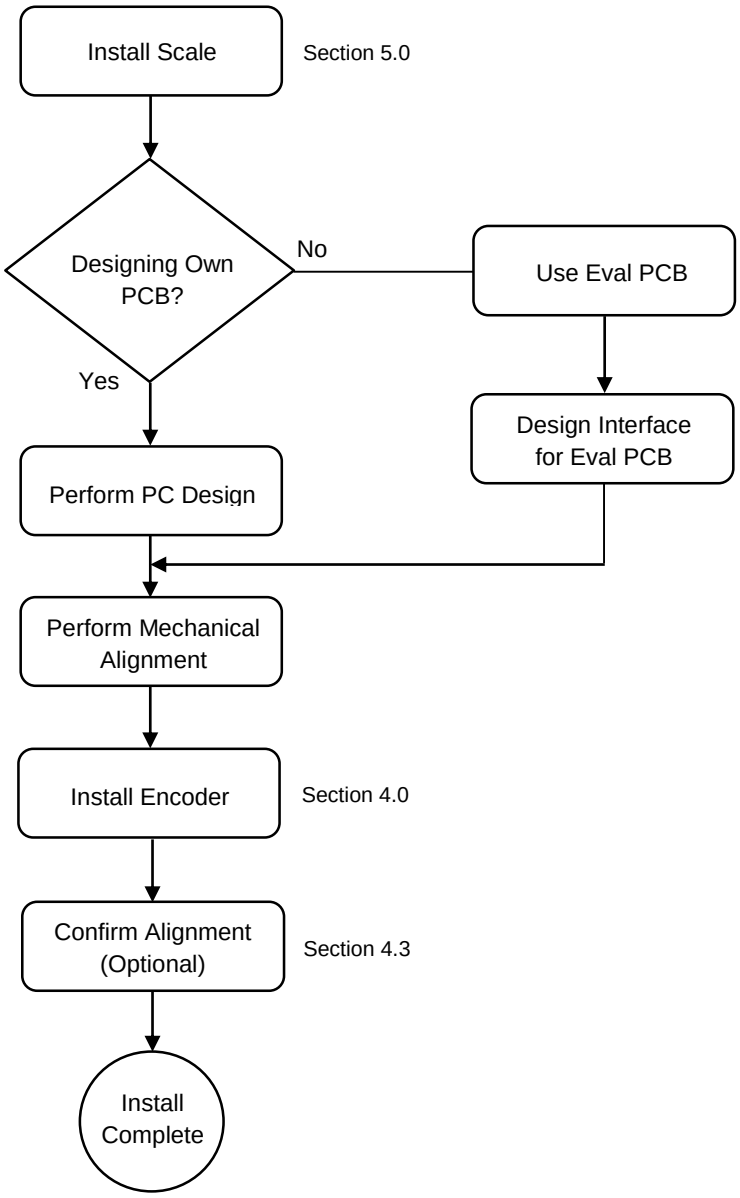
- Use the publication *IPC-7351 Generic Requirements for Surface Mount Design and Land Pattern Standard* (developed 2005 by IPC) as a guide for proper land pattern design for the solder pads on the printed circuit board.
- Due to the tight spacing between solder pads, it is recommended that solder mask be used between the solder pads to prevent solder bridging and shorting to adjacent pads.
- A 0.003 - 0.005 inch thick stainless steel stencil is recommended for solder paste application to the printed circuit board lands.
- Machine placement and reflow soldering of the ChipEncoder is recommended.
- Acetone is the recommended cleaner for the ChipEncoder.

PCB Requirements

The ChipEncoder electrical interface, land pattern, schematic of additional required passive components and mechanical dimensions are found in the interface drawings, which are located on the following webpage: http://www.microesystems.com/resource/product-documentation.

2.6 Installation Flowchart

The following flowchart lists the main steps in ChipEncoder installation.

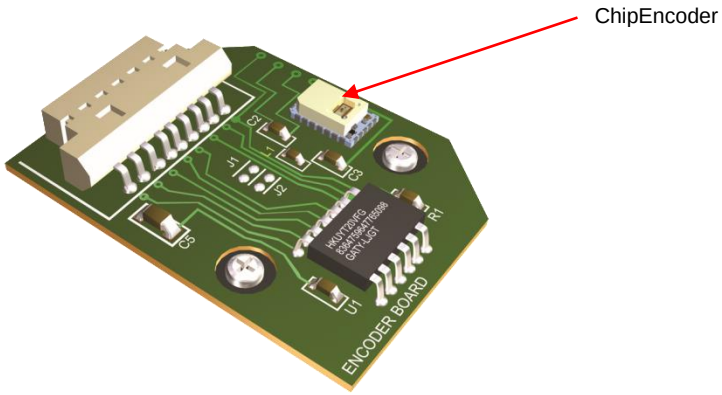


3.0 System Overview

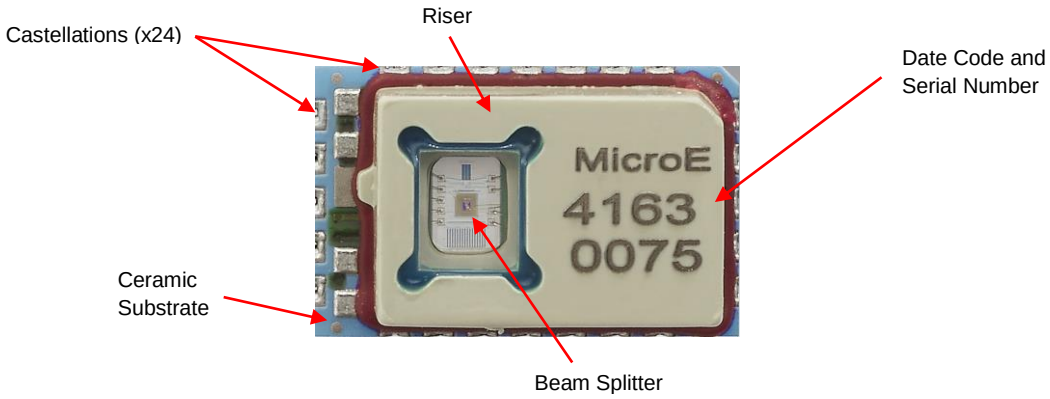
This section identifies parts for the installation. Use the information in this section to design the mounting scheme for the encoder.

3.1 ChipEncoder Models

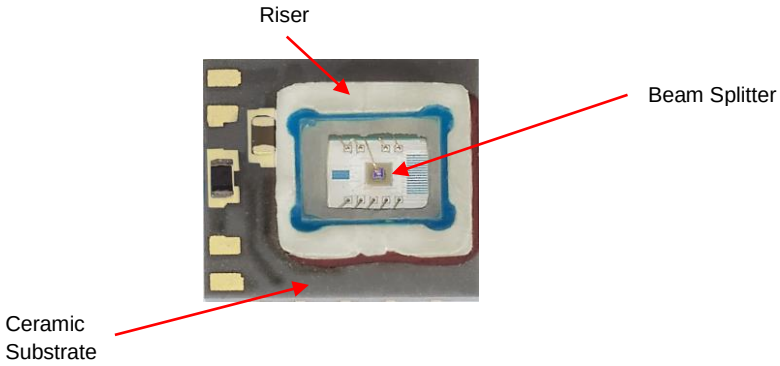
Example of ChipEncoder Installed on a PCB



CE300-4, CE300-40 (7 mm x 11 mm) Top View



CE-40GC (6 mm x 6 mm) Top View

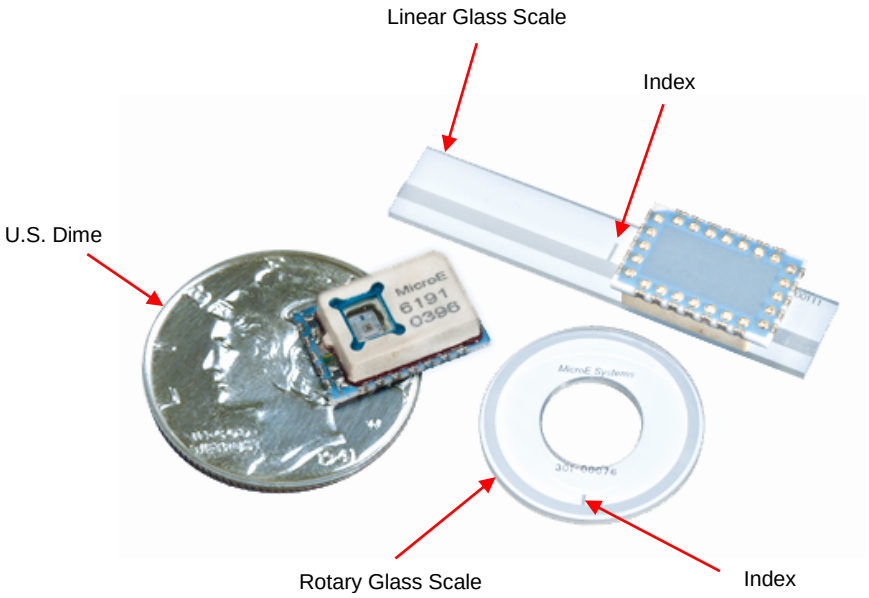


3.2 Linear and Rotary Glass Scales

The scales available for the ChipEncoder:

- Linear Glass Scales
- Rotary Glass Scales

Examples of scales (shown with ChipEncoder CE300)



3.3 Evaluation PCB

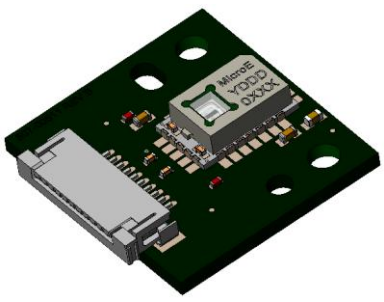
There are two alternatives for initially creating/designing a PCB to test with the ChipEncoder:

- Design your own PCB and install the ChipEncoder to it
- Purchase the Eval PCB and install the ChipEncoder to it (see ***Section 7.5 Evaluation Board*** for more details). Once testing is successful, then a production PCB can be designed.

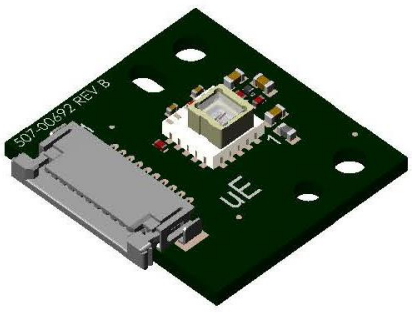
The ChipEncoder must be mechanically aligned to the scale. Alignment can be confirmed using an Oscilloscope (see install procedure). See ***Section 8.0 Order Guide*** for details on ordering the Eval PCB.

ChipEncoder Evaluation Board

Evaluation PCB (CE300-4-PCB or CE300-40-PCB)



Evaluation PCB (CE-40GC-PCB)

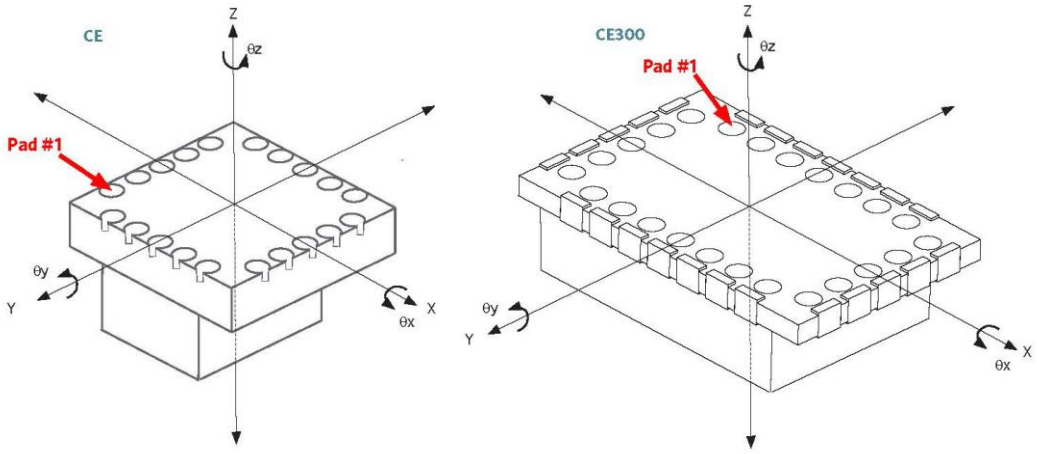


4.0 ChipEncoder Installation

4.1 Mounting Orientation and Tolerances

Refer to the following specifications when installing and aligning the ChipEncoder. See ***Section 7.2 Output Signals Descriptions*** in the Appendix for pad identification.

Orientation



Tolerances

Mounting with Linear Scales	
Axis	**Alignment Tolerance**
X	Direction of Motion
Y	± 0.008" (0.20 mm)
Z	± 0.010" (0.25 mm)
θX	± 1.5°
θY	± 1.5°
θZ	± 2.0°

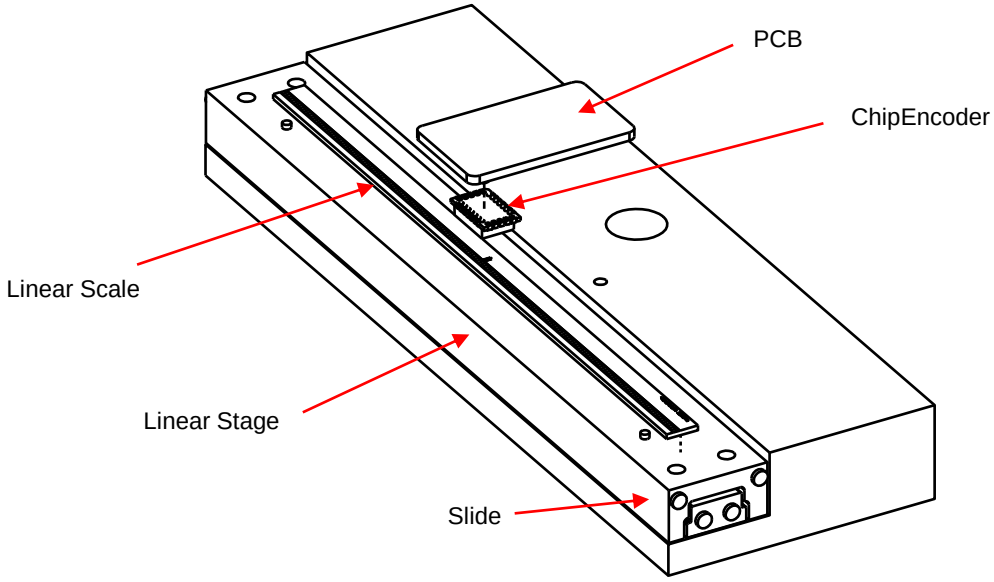
Mounting with Rotary Scales	
Axis	**Alignment Tolerance**
X	± 0.004" (0.10 mm)
Y	± 0.004" (0.10 mm)
Z	± 0.010" (0.25 mm)
θX	± 1.5°
θY	± 1.5°
θZ	± 2.0°

Note: Tolerance for each axis is specified independently, assuming nominal alignment in other axes.

4.2 Mounting the ChipEncoder

Refer to the ChipEncoder interface drawings for more details for installation.

4.2.1 Linear Scale Installation



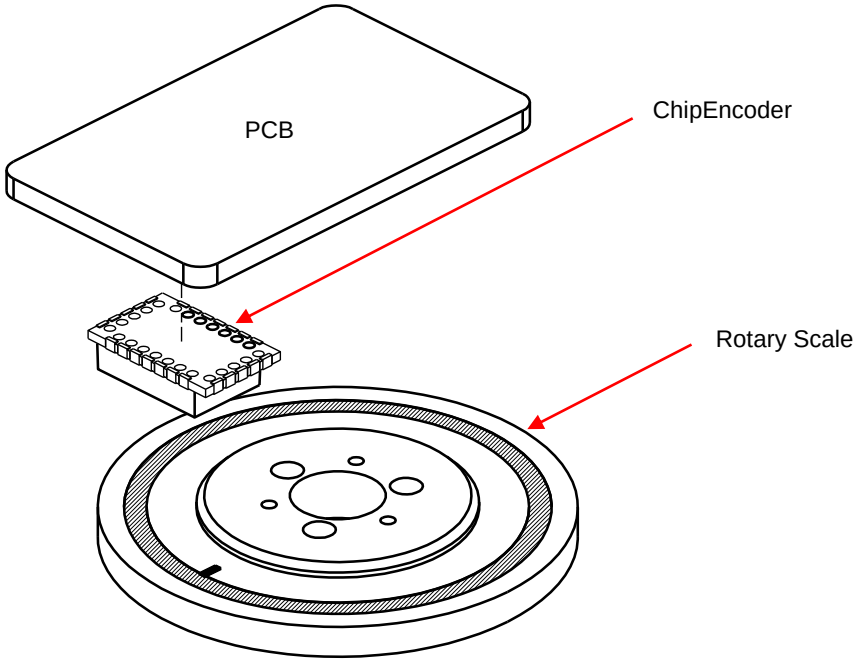
Note: The linear glass scale must be installed before installing the ChipEncoder.

Note: The encoder may be powered during this procedure.

Perform the following steps to install the ChipEncoder.

Step	Action
1.	Install the ChipEncoder on a printed circuit board (PCB) to the electrical and mechanical specifications listed in the ChipEncoder interface drawings, which are available on the MicroE website: http://www.microesystems.com/resource/product-documentation. Refer to ***Section 4.1 Mounting Orientation and Tolerances*** when installing the encoder to the PCB.
2.	Attach the scale to the linear stage. Refer to the datum on the interface drawings for either end or center index orientation.
3. 	Attach the scale to the slide using adhesive. Follow the steps in ***Section 5.0 Linear Glass Scale Installation*** for alternative methods. Be sure that the grating surface of the scale faces the sensor. **Caution**: Damage can result from the ChipEncoder contacting the grating.
4.	Apply power to encoder if not already powered on.
5.	ChipEncoder outputs can be viewed using a digital oscilloscope. See ***Section 7.2 Output Signals Descriptions*** for the A, B, and Index Window signals. The ChipEncoder should not require additional alignment as long as the PCB and mechanical components have been fabricated and assembled according to the mechanical dimensions and tolerance specified in the applicable interface drawings. Go to ***Section 4.3 Encoder Alignment*** for additional details for alignment.

4.2.2 Rotary Scale Installation



The rotary scale must be installed before installing the ChipEncoder.

Note: The encoder may be powered during this procedure.

Perform the following steps to install the ChipEncoder.

Step	Action
1.	Install the ChipEncoder on a printed circuit board (PCB) to the electrical and mechanical specifications listed in the ChipEncoder interface drawings, which are available on the MicroE website: http://www.microesystems.com/resource/product-documentation.
2.	Attach the hub/scale assembly to the rotary device. The reflective surface of the scale must face the sensor. Refer to the datum on the interface drawings for either end or center index orientation.
3. 	Attach the scale to the slide using adhesive. Be sure that the grating surface of the scale faces the sensor. **Caution**: Damage can result from the ChipEncoder contacting the grating.
4.	Apply power to encoder if not already powered on.
5.	ChipEncoder outputs can be viewed using a digital oscilloscope. See ***Section 7.2 Output Signals Descriptions*** for the A, B, and Index Window signals. The ChipEncoder should not require additional alignment as long as the PCB and mechanical components have been fabricated and assembled according to the mechanical dimensions and tolerance specified in the applicable interface drawings. Go to ***Section 4.3 Encoder Alignment*** for additional details for alignment.
6.	For alignment verification, see ***Technical Note TN-103: Alignment of Rotary Scales.***

4.3 Encoder Alignment

Optimal alignment of the CE300 (7 mm x 11 mm package) or CE (6 mm x 6 mm package) ChipEncoder is achieved through adherence to MicroE System's published interface drawings and can be verified and fine-tuned using the Sin+ and IW+ signals:

- Sin+ is available on pad 14 (7x11 mm) and on pad 3 (6x6 mm). Sin+ is a sinusoidal function riding on a 1.7 V (approximate) offset.
- IW+ is on pad 24 (7x11 mm) and pad 16 (6x6 mm). IW+ is an active-high TTL pulse which occurs each time the index mark on the scale is passed.

Both signals must be present and within the following specification limits in order to ensure proper encoder function:

- Sin+ Range = 1.1 - 2.1 V pk-pk
- IW+ = 40 um wide ±25%

5.0 Linear Glass Scale Installation

Use the steps in this section to mount and install linear scales.

5.1 Before Installation

Review the information in this section prior to installing scales.

5.1.1 Items Required for Linear Glass Scale Installation

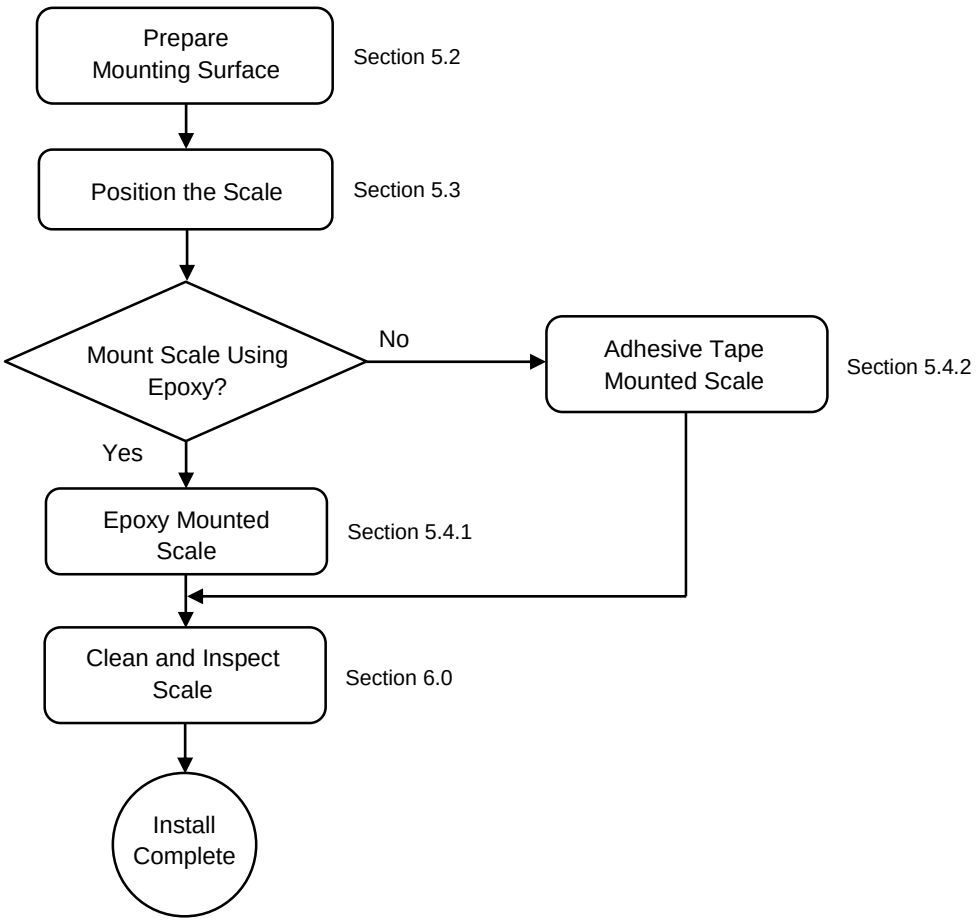
You will need the following items available for glass scales installation.

Item
Finger Cots or talc-free gloves
Acetone or isopropyl alcohol
Lint-free cotton cloths or wipes
Epoxy, non-conductive[1]
Stick and disposable surface for stirring epoxy[1]
Silicone adhesive[1]
Double-sided tape[1]

Note[1]: Not needed for every installation.

5.1.2 Flowchart for Linear Glass Scale Installation

The following flowchart lists the main steps in glass scale installation.



5.2 Prepare Mounting Surface

Perform the following steps prior to mounting the glass scales.

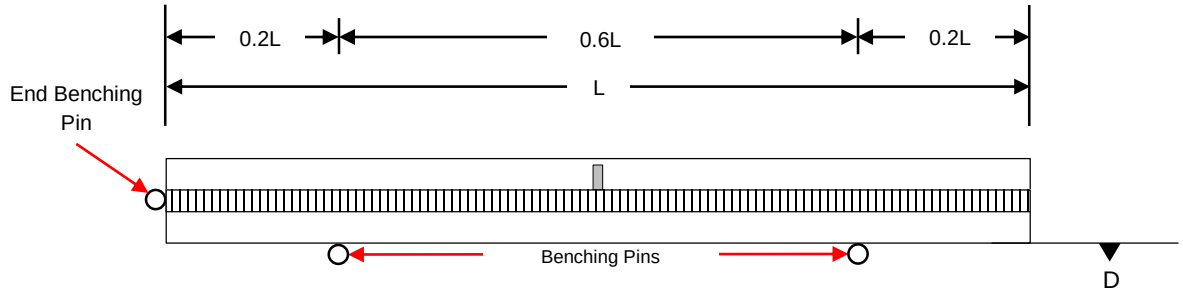
Step	Action
1.	Inspect the mounting surface for any machining irregularities. MicroE Systems recommends a surface finish of better than 3.2 micrometers Ra.
2.	MicroE Systems recommends a mounting surface flatness of 0.0001 inch/inch.
3.	Thoroughly clean the scale mounting surface and reference edge using a cotton swab or lint-free cloth dampened with isopropyl alcohol or acetone. Remove all dust and particles.

5.3 Position the Scale

Note: Use talc-free gloves or finger cots to handle the scales.

'Benching' the scale means aligning the scale by using benching pins. Refer to the applicable interface drawing for datum edges.

Refer to the following drawing for this procedure:



Step	Action
1.	Two benching pins are recommended on the long side of the scale and one at the end as shown below. This is marked as Datum D on the interface drawing.
2.	Position the benching pins in from both ends. 20% of the overall scale length is the recommended distance from the edge of the scale.
3.	Be sure the benching pins do not exceed the height of the scale (Z direction) to prevent mechanical interference with the encoder.

5.4 Mounting the Scale

There are two different methods for attaching linear scales to a surface:

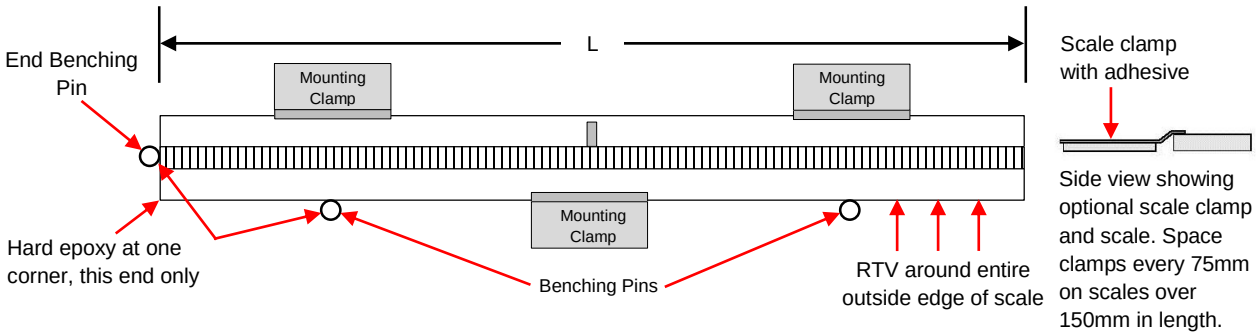
- Permanently attach scale using epoxy and RTV silicone (recommended)
- Permanently attach scale using double-sided tape

5.4.1 Epoxy Mounted Scale

Linear scale is permanently attached to the mounting surface using epoxy and silicone adhesive on the back of the scale. This method is recommended for best encoder accuracy as it ensures the best flatness.

Note: Use talc-free gloves or finger cots to handle the scales.

Refer to the following drawing for this procedure:



Step	Action
1.	Make sure that the mounting surface is dry and clean.
2.	Align the scale by placing the edges against the benching pins.
3.	Optionally, scale clamps[1] may be used to secure the scale while the adhesive cures. Avoid damaging the top surface when using clamps.
4. 	Apply a hard epoxy, such as Tra-Bond 2116, at the end of the scale at the end benching pin. Apply 100% Silicone RTV adhesive around the edges of the scale. This method allows thermal expansion from the benched end of the scale. **Note**: If an end benching pin is not used, then applying epoxy at the index mark is suggested. **Caution**: Do not allow epoxy to seep under the scale; this will affect scale flatness and therefore encoder accuracy.
5.	After the adhesive cures, remove the scale mounting clamps, or, if permanently installing the clamps, make sure that the clamps do not interfere with the encoder or encoder mounting.

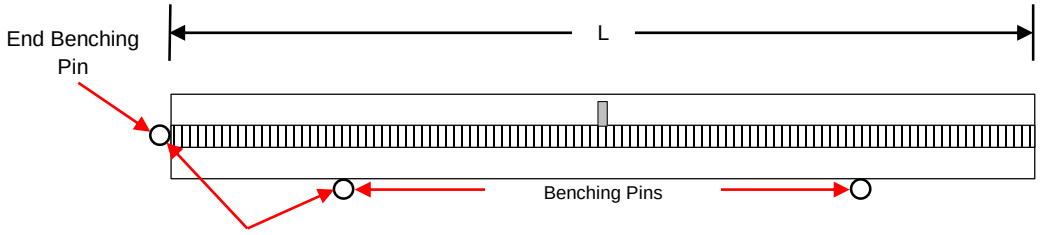
Note[1]: See ***Section 8.0 Order Guide*** for details on ordering clamps.

5.4.2 Adhesive Tape Mounted Scale

Linear scale is permanently attached to the mounting surface using double-sided adhesive tape on the back of the scale.

Note: Use talc-free gloves or finger cots to handle the scales.

Refer to the following drawing for this procedure:



Step	Action
1.	Make sure that the mounting surface is dry and clean.
2.	Peel the cover paper off and place the scale above the final location.
3.	Align the scale by placing the edges against the benching pins.
4.	Gently place the scale on the mounting surface.
5.	When scale is in final position, firmly press down on the top of the scale to secure it.

6.0 Cleaning Scales

Step	Action
1.	General Particle Removal: Blow off any contamination with nitrogen, clean air, or a similar gas.
2.	Contamination Removal: Use a lint-free cleanroom wipe or cotton swab dampened with isopropyl alcohol or acetone to wipe the surface clean. Handle the scale by the edges. **Do not** scrub the scale.

7.0 Appendix

7.1 Specifications

System

Scales

ChipEncoders are compatible with ChipEncoder Linear and Rotary Glass scales.

Scale Pitch	40 µm

System Resolution	CE300-4	CE300-40	CE-40GC
Linear Resolution:	10 µm	1 µm	1 µm
Rotary Resolution:	See ***Sec. 7.3 Linear and Glass Scales***		
Interpolation Depth:	X4	X40	X40

Accuracy

Linear Glass:	±5 µm/m
Rotary Glass:	±2 arc-seconds[1]

Sensor Size and Weight

Dimensions (mm)	Width	Length	Height
CE300:	7.0	11.0	3.1
CE:	6.1	6.1	3.9

Weight

CE300:	0.37 g
CE:	0.25 g

Note[1:] Excludes eccentricity

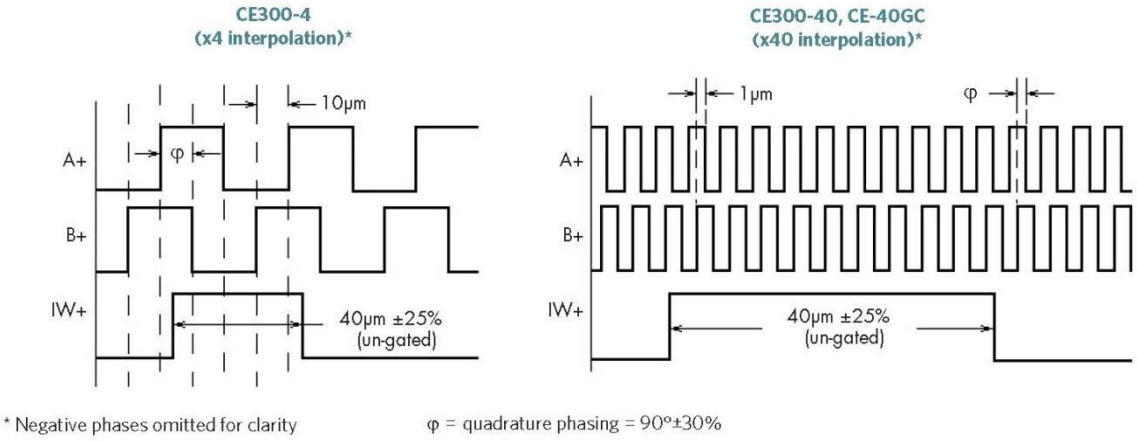
Operating and Electrical Specifications

Power Supply:	5 V_{DC} ±0.5 V_{DC}
Current Draw:	30 mA, unterminated outputs
Temperature	
Operating:	0°C to 70°C
Storage:	-20°C to 85°C (CE300) -20°C to 100°C (CE)
Max Lead-Free Reflow Temperature	260°C for<5 seconds
Humidity	
Operating:	10% to 90% RH, non-condensing
Vibration	30 G @ 20 Hz; EN60068-2-6
Shock	300 G (0.40, half sine) CE300 100 G (11 ms, half sine) CE
Reliability (MTTF)	100,000 Hours

Outputs

Signals: CMOS/TTL
Format: Digital – differential quadrature
Output impedance per channel = 60 ohms

Output Signals

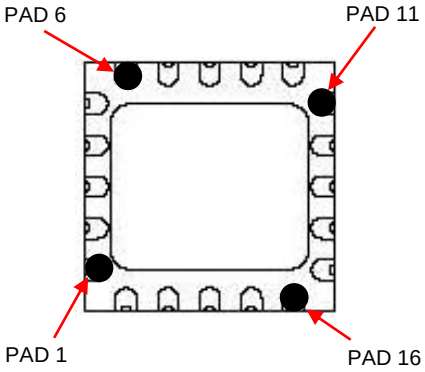


* Negative phases omitted for clarity

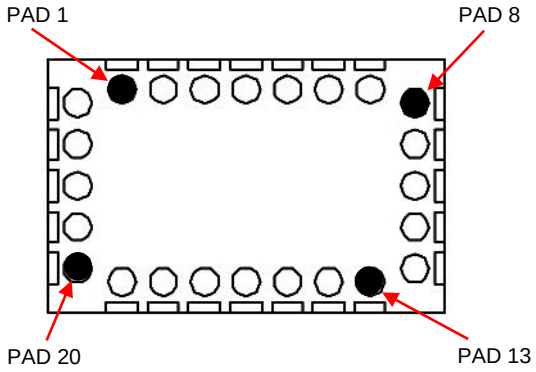
φ = quadrature phasing = 90°±30%

7.2 Output Signals Descriptions

CE (6mm x 6mm ChipEncoder)



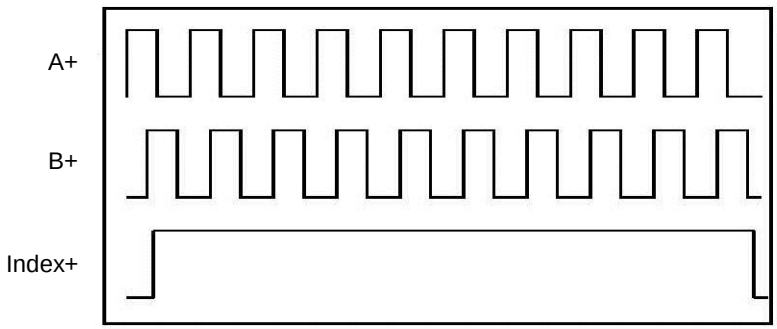
CE300 (7mm x 11mm ChipEncoder)



CE Output Signals			
Pad	**Function**	**Pad**	**Function**
1	+5VD	11	No Connect
2	No Connect	12	CP+
3	SIN+	13	No Connect
4	AN	14	No Connect
5	+5VA	15	Index Window-
6	DC1	16	Index Window+
7	No Connect	17	A-
8	DC2	18	A+
9	GND	19	B-
10	CA	20	B+

CE300 Output Signals			
Pad	**Function**	**Pad**	**Function**
1	Index Window-	13	AN
2	GND	14	SIN+
3	No Connect	15	No Connect
4	No Connect	16	No Connect
5	CP+	17	No Connect
6	+5VA	18	GND
7	No Connect	19	+5VD
8	GND	20	B+
9	DC2	21	B-
10	No Connect	22	A+
11	DC1	23	A-
12	No Connect	24	Index Window+

A+, B+, and Index Window+ Outputs from 40X Encoder

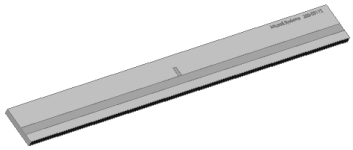


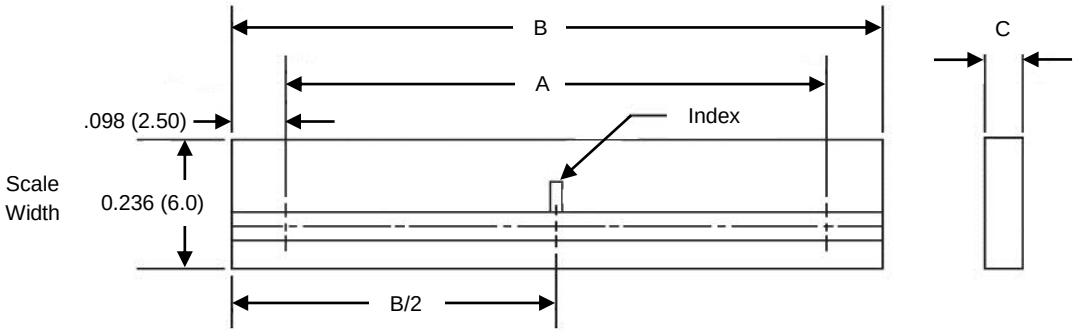
Description of signals:

Signal	Description
A+/A-	Digital quadrature outputs. Signals are RS-422 compatible square waves. Pulses are 90° out of phase with B+/B- outputs.
B+/B-	Digital quadrature outputs. Signals are RS-422 compatible square waves. Pulses are 90° out of phase with B+/B- outputs.
Index Window+/ Index Window-	The Index Window defines one particular fringe on the grating surface. The Index Window signal is a TTL compatible pulse, and is approximately 40 um wide. Note that this signal is not synchronized to the A or B signals.

7.3 Linear and Glass Scales

Linear Scales





Linear Scale Identification and Sizes			
Scale Model	**A Usable Measured Length**	**B Scale Length**	**C Scale Thickness**
L18CE	Scale Length (mm) - 5mm = 13mm	0.709 (18.0)	0.036 (0.91)
L30CE	Scale Length (mm) - 5mm = 25mm	1.181 (30.0)	0.036 (0.91)
L55CE	Scale Length (mm) - 5mm = 50mm	2.165 (55.0)	0.036 (0.91)
L80CE	Scale Length (mm) - 5mm = 75mm	3.150 (80.0)	0.036 (0.91)
L130CE	Scale Length (mm) - 5mm = 125mm	5.118 (130.0)	0.036 (0.91)
L155CE	Scale Length (mm) - 5mm = 150mm	6.102 (155.0)	0.098 (2.50)
L325CE	Scale Length (mm) - 5mm = 320mm	12.795 (325.0)	0.098 (2.50)

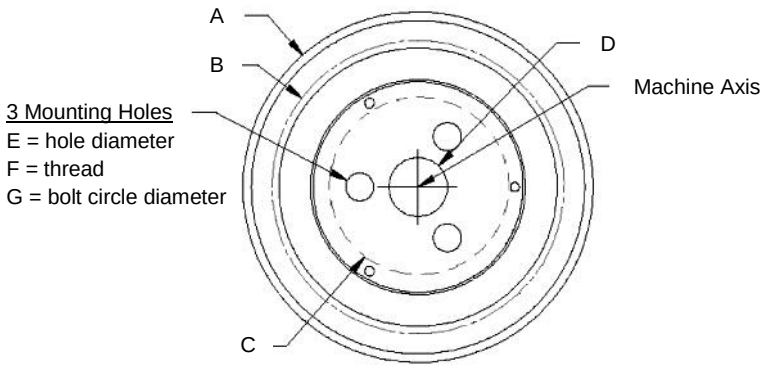
inches (mm)

Features

- 40 µm diffraction pattern
  - 10 µm resolution with CE300-4
  - 1 µm resolution with CE300-40 and CE-40GC
- Maximum speed = 14.4 m/s
- Center index mark
- Scales are chrome patterns printed on soda lime glass (CTE = 9.4 ppm/°C)
- Usable measuring length is 5 mm less than total length
- Temporary clamp kits to facilitate epoxy mounting
- Optional pressure sensitive adhesive tape for permanent mounting
- Custom scale lengths, materials, and index locations are available

Rotary Scales

Scale	Fundamental CPR	Max Speed RPM	Resolution CE300-40, CE-40GC			Resolution CE300-4		
			CPR	µrad	arc-sec	CPR	µrad	arc-sec
R1206CE	825	26,200	33,000	190.0	39.3	3,300	1,900	393.0
R1506CE	1,024	21,100	40,960	153.0	31.6	4,096	1,530	316.0
R1910CE	1,250	17,280	50,000	126.0	25.9	5,000	1,260	259.0
R3213CE	2,048	10,550	81,920	76.7	15.8	8,192	767	158.0
R5725CE	4,096	5,270	163,840	38.3	7.9	16,384	383	79.1
R10851CE	8,192	2,640	327,680	19.2	4.0	32,768	192	39.6



Rotary Scale Identification and Sizes									
Scale Only	A (Glass OD)	B (Optical Dia.)	C (Glass ID)	Glass Thickness	Scale with Optional Hub	D (Hub ID)	E (Dia.)	F (Thread)	G (BCD)
R1206CE	0.472 (12.00)	0.414 (10.50)	0.250 (6.35)	0.036 (0.91)	R1206CE-HF	0.125 (3.18)	N/A	N/A	N/A
R1506CE	0.571 (14.50)	0.513 (13.04)	0.250 (6.35)	0.036 (0.91)	R1506CE-HF	0.125 (3.18)	N/A	N/A	N/A
R1910CE	0.750 (19.05)	0.627 (15.92)	0.375 (9.53)	0.092 (2.34)	R1910CE-HG	0.125 (3.18)	0.047 (1.19)	0-80	0.250 (6.35)
R3213CE	1.250 (31.75)	1.027 (26.08)	0.500 (12.70)	0.092 (2.34)	R3213CE-HH	0.250 (6.35)	0.070 (1.78)	2-56	0.370 (9.40)
R5725CE	2.250 (57.15)	2.053 (52.15)	1.000 (25.40)	0.092 (2.34)	R5725CE-HC	0.500 (12.70)	0.136 (3.45)	8-32	0.750 (19.05)
R10851CE	4.250 (107.95)	4.106 (104.30)	2.000 (50.80)	0.092 (2.34)	R10851CE-HD	1.000 (25.40)	0.136 (3.45)	8-32	1.375 (34.80)

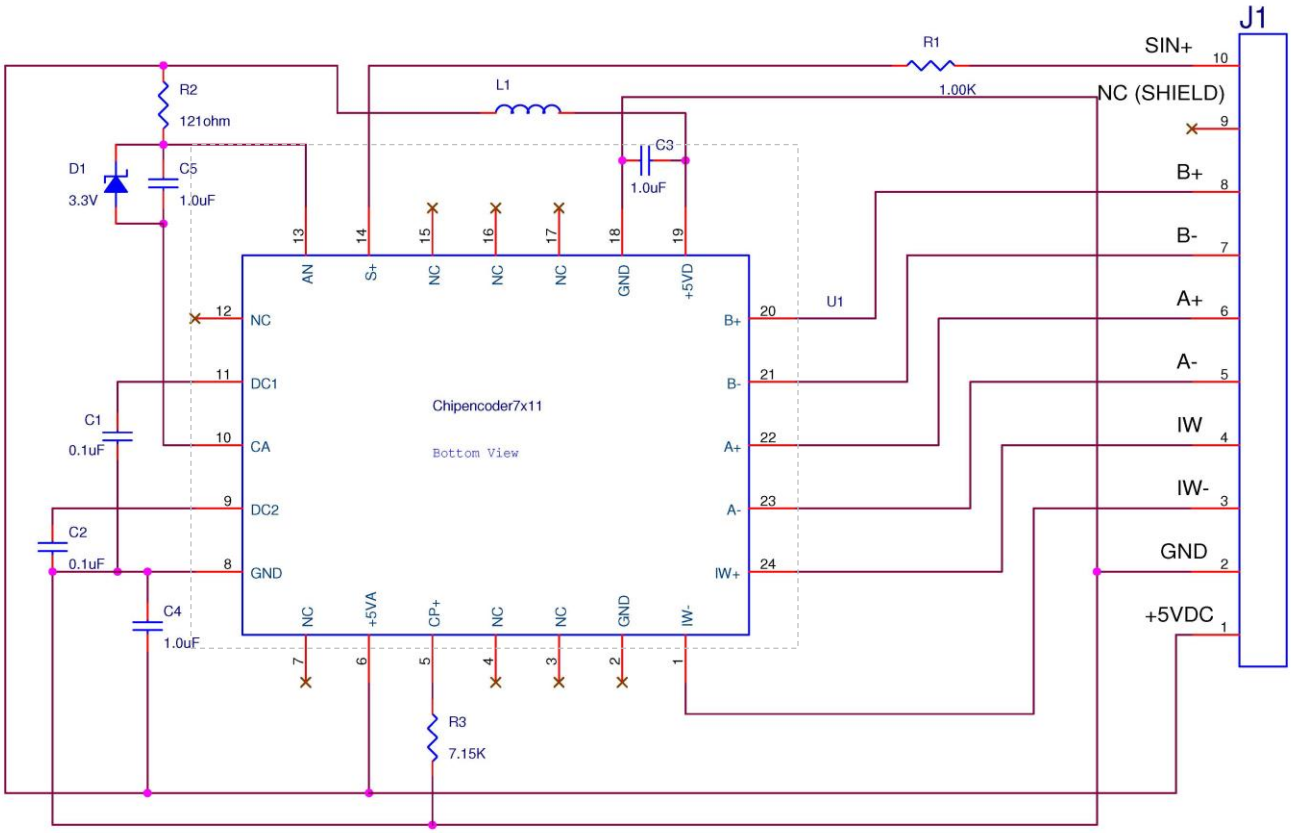
inches (mm)

Features

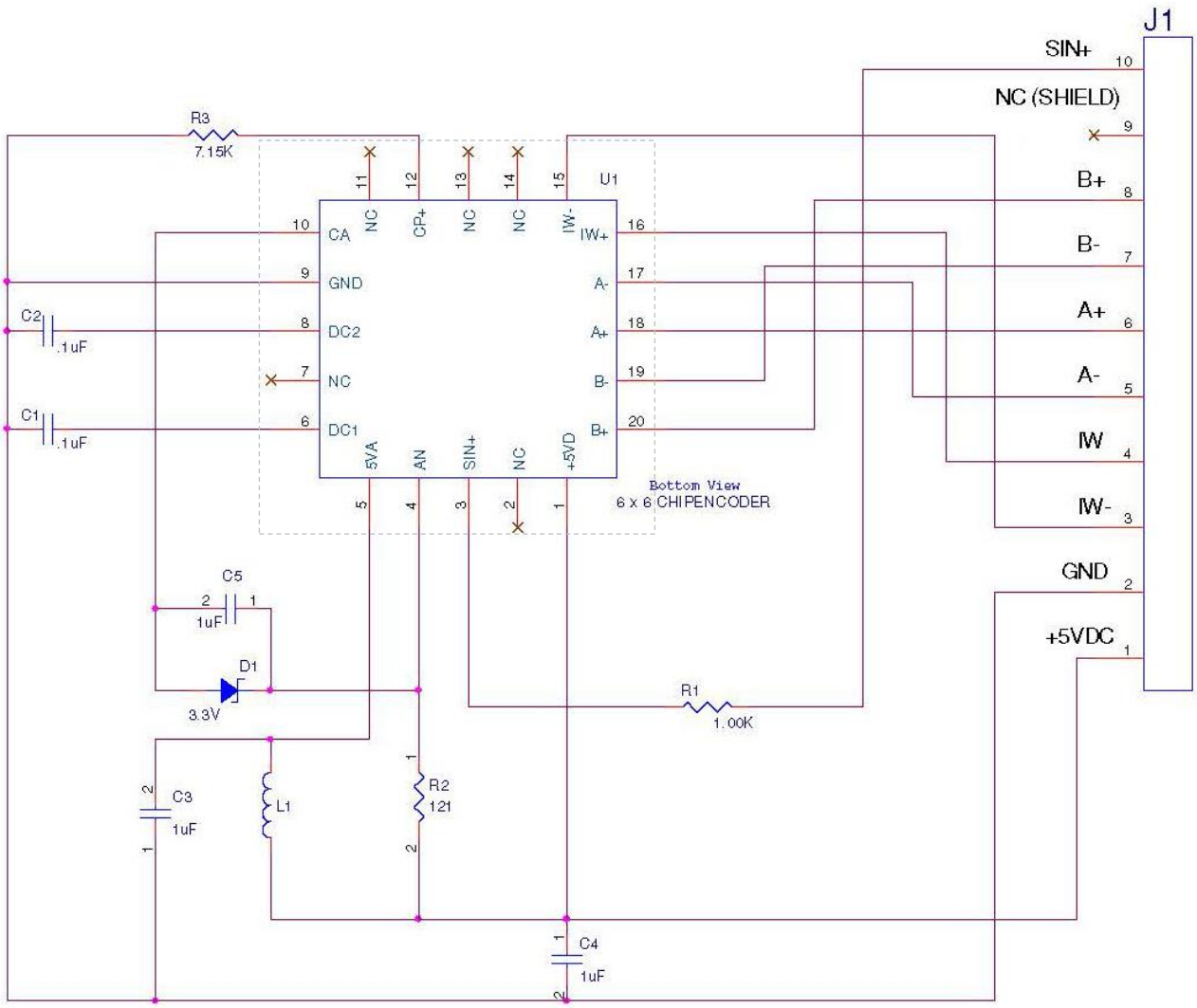
- Scales are chrome patterns printed on soda lime glass (CTE = 9.4 ppm/°C)
- Optional hubs are 303/304 stainless steel (CTE = 17 ppm/°C)
- For factory mounted scales, optical patterns are centered to within 0.002" of the hub ID
- Custom OD, ID, CPR, and materials are available

7.4 Electrical Schematics

Recommended customer circuit with the CE300 ChipEncoder:

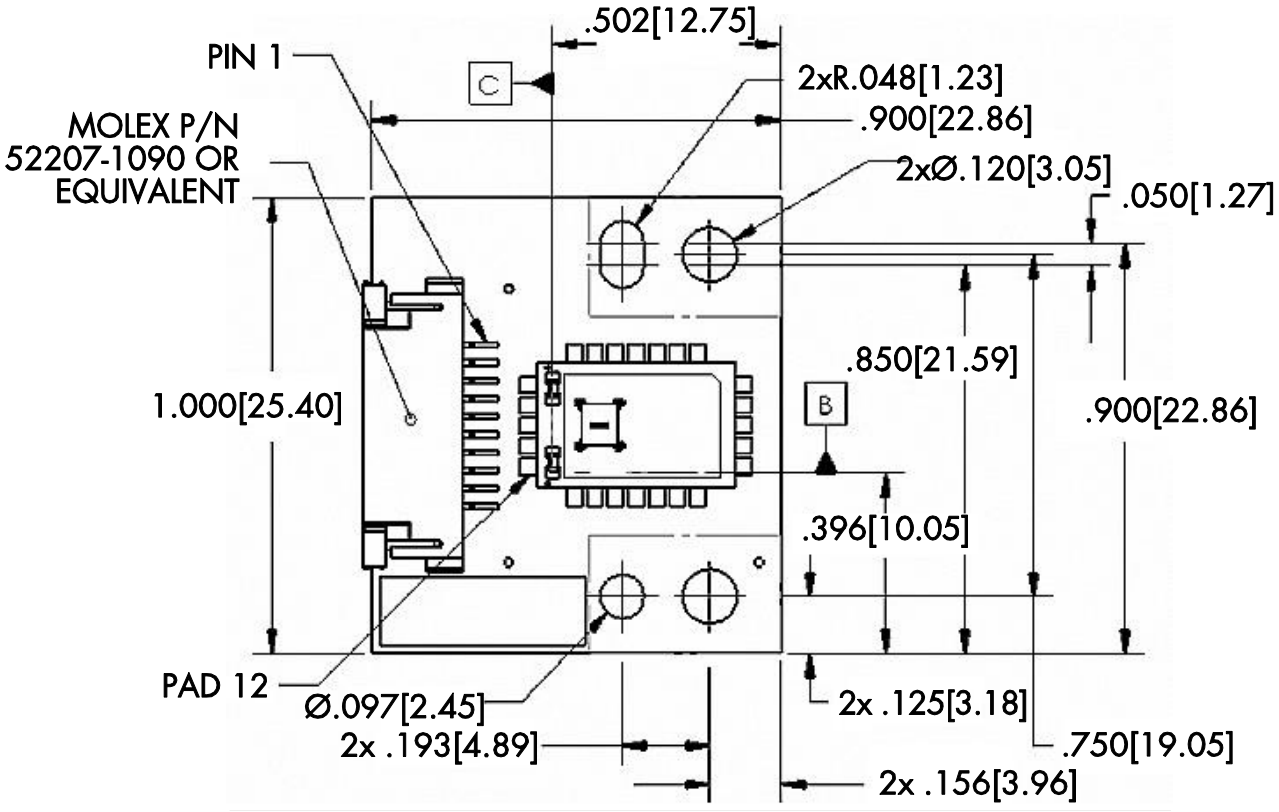


Recommended customer circuit with the CE ChipEncoder:

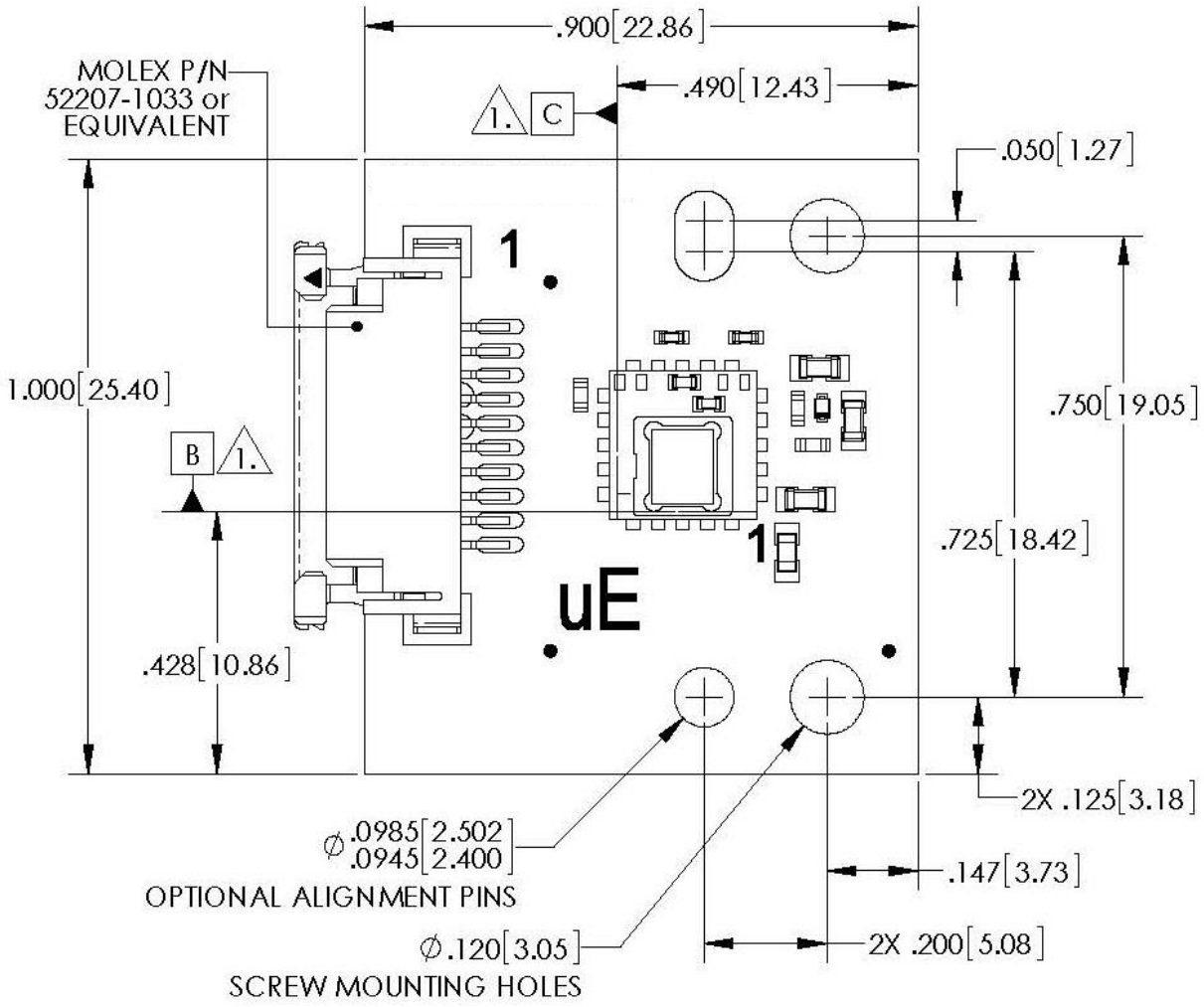


7.5 Evaluation Board

Evaluation PCB: CE300-4-PCB or CE300-40-PCB (7x11 ChipEncoder)



Evaluation PCB: CE-40GC-PCB (6x6 ChipEncoder)



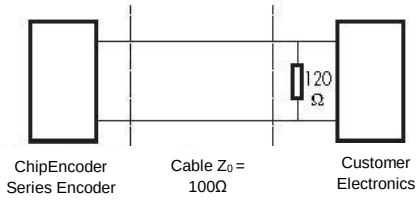
Connector Pinouts

PCB connector pinouts for CE300-4, CE300-40, and CE-40GC:

10 Pin ZIF Connector	
1	+5VDC
2	Gnd
3	IW-
4	IW+
5	A-
6	A+
7	B-
8	B+
9	NC
10	Sin+

7.6 Recommended Signal Termination

Digital/Analog Outputs



Note: Maximum cable length is 5 m. Contact MicroE Applications Engineering if longer lengths are required.

Note: It is not recommended that the Sin+ signal be transmitted on your cable. This may introduce noise into the ChipEncoder.

7.7 Customer Interface

Cable Requirements

Customer cables that interface to the ChipEncoder Series must have the following characteristics:

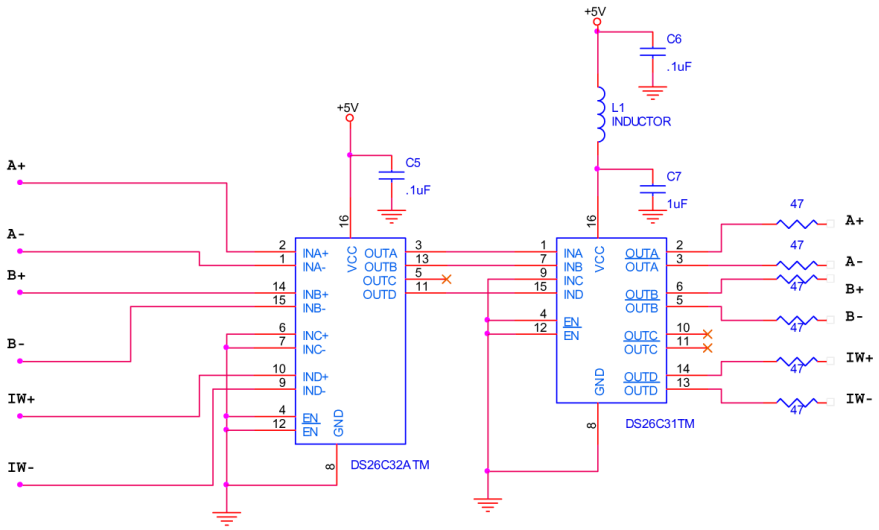
- Twisted pairs with 120 ohm characteristic impedance
- Shielding connected to the sensor's outer shield

7.8 RS-422 Compatibility

ChipEncoder Series Encoders are RS-422 compatible. Encoder signals are “sending end terminated” and customer receiving terminations are not required.

For more details, see the following Tech Note: **Proper Termination of Digital Incremental Encoder Signals.**

Optional RS-422 compliant circuitry for long cable runs in harsh electronic environments is illustrated below:



7.9 Troubleshooting

Problem	Solution
ChipEncoder will not power on	1. Confirm that +5DC is present at the following pads: ▪ Pads 6 and 19 (CE300-4, CE300-40) ▪ Pads 1 and 5 (CE-40GC) See ***Section 2.1 Power Recommendations*** for voltage range. 2. Confirm that ground is present at the following pads: ▪ Pads 2, 8, and 18 (CE300-4, CE300-40) ▪ Pad 9 (CE-40GC)
Alignment is off	Use the Sin+ and IW+ signals to confirm alignment (see ***Section 4.3 Encoder Alignment.)***
Scale problems	• Verify that the encoder is mounted in the correct orientation with reference to the scale and scale mounting reference edge. Refer to the Interface Drawing. • Verify that the sensor has been aligned to the scale and that the mounting screws are tight. Check the dimensions for the mechanical mounting holes (and clamps if any) to make sure that the sensor is correctly located over the scale in the Y and Z dimensions. Refer to the Interface Drawing. • Check that the scale is firmly mounted and can't jiggle or move in any direction other than the axis of motion. • Make sure that the scale is clean over its entire length or circumference.
Evaluation PCB does not power on	1. Make sure that the Eval PCB connector is fully seated and connected. 2. Confirm that +5DC is present at Pin 1 of the 10 pin ZIF connector. See ***Section 2.1 Power Recommendations*** for voltage range. 3. Confirm that ground is present at Pin 2 of the 10 pin ZIF connector.
ChipEncoder cannot locate index or gives erratic results	• Verify that the sensor is mounted in the correct orientation with reference to the scale and scale mounting reference edge. Refer to the interface drawings. • Verify that the sensor has been aligned correctly to the scale. • Check that the scale is firmly mounted and can't jiggle or move in any direction. • Make sure that the scale is clean over its entire length or circumference. • Confirm proper reflow connection to PCB.

8.0 Order Guide

Sensor

CE300-40-PCB (example)

Eval PCB
PCB=mounted to evaluation PCB[1]
Blank=unmounted chips

Interpolation
4=x4 (Model CE300 only)
40=x40 (Model CE300 only)
40GC=x40 (Model CE only)

Model
CE300
CE

Scales

R5725-HC (example)

Scale Mounting
For Linear Scales:
T=Tape
C1=3 clamps[2]
C2=10 clamps[3]

For Rotary Scales:
NH=No hub
HF=Standard hub (only valid for R1206CE and R1506CE)
HG= Standard hub (only valid for R1910CE)
HH= Standard hub (only valid for R3213CE)
HC= Standard hub (only valid for R5725CE)
HD= Standard hub (only valid for R10851CE)

Scale Model
Linear Scales:
L18CE=18 mm linear
L30CE=30 mm linear
L55CE=55 mm linear
L80CE=80 mm linear
L130CE=130 mm linear
L155CE=155 mm linear
L325CE=325 mm linear

Rotary Scales:
R1206CE=12 mm OD rotary
R1506CE=14.5 mm OD rotary
R1910CE=19.05 mm OD rotary
R3213CE=31.75 mm OD rotary
R5725CE=57.15 mm OD rotary
R10851CE=107.95 mm OD rotary

Notes:

1. Quantities of 1 – 9 only
2. 3 clamps for scales up to 130 mm
3. 10 Clamps for scales 155 mm or longer

9.0 Contacting Celera Motion

Celera Motion is a world leader in optical encoder technology with offices in major industrial centers around the globe. We deliver enabling technology that brings advanced applications to life in the motion control, medical, semiconductor, electronics, and industrial markets.

To learn more about MicroE encoders, visit www.celeramotion.com.

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