

Housed versus Unhoused Inductive Encoders

Discussion on the Packaging Options for Celera Motion IncOders

REV222607

INTRODUCTION

Celera Motion offers two types of absolute inductive encoders ([IncOders](#)) in terms of housing design – housed and unhoused IncOder. These can also be referred to packaged and unpackaged IncOders. The operation of both options is the same as they consist of the same sensors, electronics, and software. For this reason, they share the following benefits:

- Highly repeatable
- Robust
- Insensitive to contamination
- Insensitive to eccentricity
- No calibration required

The main differentiations which are discussed in this paper are related to the mechanical interface:

- Packaging
- Mounting
- Installation specifications

This paper also provides a recommendation on the suitable applications for each type of IncOder.

MECHANICAL INTERFACE

The main mechanical differences between the housed IncOder and the unhoused IncOder (IncOder CORE) can be seen in the packaging and the mounting options. Both types come as a pair of a rotor (containing the moving sensor board) and a stator (containing the stationary sensor board and the electrical board).

The Housed IncOder has the sensor boards enclosed in an aluminum mechanical housing. All sizes of the Housed IncOder have all associated electronics housed within the stator. The only exception is the 37mm Mini IncOder where electronics are distributed across the stator and a separate remote electronics board found in the cable assembly.

Potting compound is used to secure the stationary sensor board and the electrical board to the housing in the stator as well as the moving sensor board in the rotor. Other benefits of the potting compound are:

- Mechanical integrity
- Part of the internal structure of the IncOder
- Protection from Shock & Vibration
- Heat dissipation
- Protection from the environment

There are several options for the mounting of the stator and the rotor to the host assembly. These include screw mount, set screw, and servo clamp whereby the required mechanical features are integrated in the metal housing.



Fig.1: Housed IncOder (58mm Mini IncOder)

The Unhoused version (IncOder CORE; Fig2) offers a lightweight, simplified manufacturing and integration solution. It consists of a stacked PCB design which is not enclosed by a housing. The space between the boards is not filled with potting compound. The absence of the housing makes IncOder CORE easily customizable – the shape and the size can be changed to meet mounting requirements. For customization inquiries on IncOder CORE, please contact Celera Motion.



Fig.2: Unhoused IncOder (IncOder CORE – 44mm OD)

The rotor and the stator can be mounted to the host assembly using the M2 screw mounting holes on the PCB. It is important that attention is paid to the location of nearby metal during the installation and the operation of IncOder CORE.

INSTALLATION GUIDANCE

The main roles of the housing in an encoder are to provide protection from EMI and interference due to nearby metal. The housing serves as a Faraday Cage, which blocks external electric fields.

The housing will protect from interference of nearby metal. Hence, there are not any requirements on the installation location of the IncOder since the performance will not be affected. This provides an ease of installation.

The IncOder CORE does not have a metal housing which makes IncOder CORE a lightweight solution for various applications. Due to the absence of the housing in IncOder CORE, achieving the specified accuracy is possible when the installation conditions are met. It is recommended to mount the IncOder using non-metal spacers to ensure the Metal Exclusion Zone is established. Other than the central host shaft; rotor mounting screws; and dowels, electrically conductive or magnetically permeable objects should not be located within 3mm of the rotor faces during operation (for 44mm OD IncOder CORE). Please consult the [Product Guide](#) for specific requirements on the installation.

Fig3. illustrates the installation recommendations for Housed Encoder (Fig3.a.) and Unhoused Encoder (Fig3.b., c., and d.) for a variety of mounting substrates.

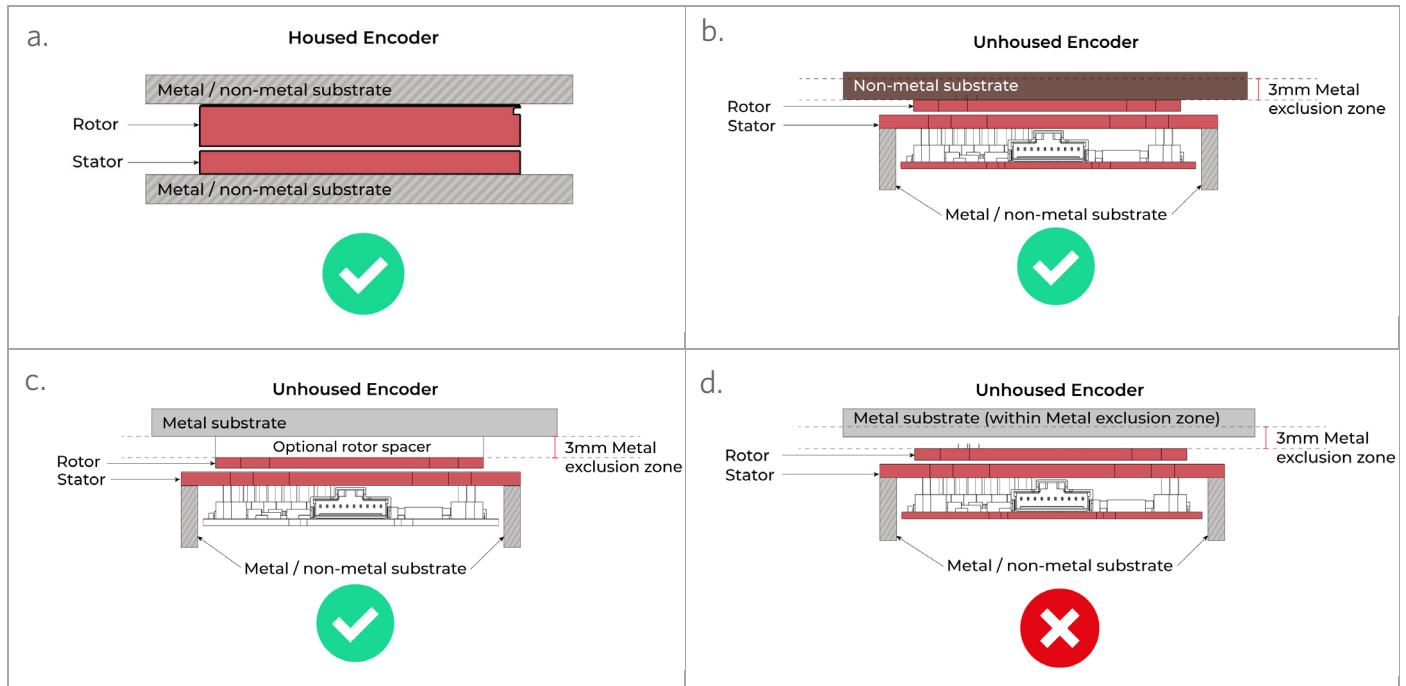


Fig 3. Installation Guidance of: a. Housed IncOder; b. Unhoused IncOder CORE rotor to non-metal substrate; c and d. Unhoused IncOder CORE rotor to metal substrate

SPECIFICATION COMPARISON

	Housed IncOder	Unhoused IncOder CORE
Ease of Installation	●●●●●	●●●●○
Weight	●●●○	●●●●●
Mounting Options	●●●●●	●●●●○
Environmental Performance	●●●●●	●●●○
Resolution	●●●●●	●●●●○
Accuracy	●●●●●	●●●●○
Price Performance	●●●●○	●●●●●
Space Envelope	●●●●○	●●●●●
Customization	●●●○	●●●●●

APPLICATIONS

The Housed IncOder and the Unhoused [IncOder CORE](#) are well suited for a wide range of applications in each of its targeted markets. Due to the enclosed design, the Housed IncOders are perfect for harsh conditions environment. Whereas optical or capacitive sensors can be unreliable in harsh conditions (notably with condensation or dust) - IncOders are generally unaffected by foreign matter and IP67 rated versions are available.

The Unhoused IncOders are designed for applications where lightweight, and compactness of the components is crucial. These include Surgical Robotics, Medical Robotics, Rotary Actuators, Pan-Tilt Positioners, Unmanned Aerial Vehicles, etc. IncOder CORE is available with a selection of sizes and mounting arrangements, however in the unlikely event these don't suit your particular application there is the flexibility to easily develop a custom solution.