MODEL 396/397/398/399/391 ELECTRON BEAM SOURCE CRUCIBLE INDEXER

INSTRUCTION MANUAL

Indexer Controller

Model 396/398/399/391 Rotary

Model 396/398 Standoff Rotary

Model 397 Linear

Manual Rev 1.1.0 January 2022

telemark.com

This manual is for software version 6.13.213 and above.
Current interface and software options might be different. Contact manufacturer for current manual release if the software interface or functions are different from this manual or download the current version of this manual at
https://telemark.com/electron-beam-sources/e-beam-accessories-and-upgrades/indexers/

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1 INTRODUCTION

Please read this manual carefully to ensure optimum operating conditions right from the start. This user manual handbook contains important information about the functionality, installation, start-up and operation of the Model 396/397/398/399/391 Crucible Indexer.

1.1 Intended Use

Model 396/398/399/391 Rotary Crucible Indexer is a rotary pocket indexer for electron beam sources with a 4 to 1 gear ratio (except the model 221/224 which is 10 to 1 gear ratio) and provides control of up to 30 pockets, and continuous or retrograde (banana pocket) operation with speed control.

Model 397 Linear Crucible Indexer positions the crucibles of a Telemark linear type source (models 568, 575 and 578) and provides control of up to 10 pockets.

The same controller is used for all models and automatically detects which motor assembly it is plugged into. It can be operated either manually from the touchscreen or remotely with digital inputs and outputs.

The device is referred to as Indexer in the remainder of this manual.

1.2 Liabilities and Warranty

Telemark is not liable for damages resulting from improper use of the device and the guarantee expires, if the user, or third party:

- ignores information contained in this manual,
- utilizes the product in a manner inconsistent with intended purpose,
- makes any modification or alteration of the product,

- unit should not be used with unauthorized accessories (compatible accessories, types and models can be found in the product documentation)

Telemark reserves the right to make changes without prior notice. Illustrations may vary depending on the version of the device.

1.3 Safety

1. Personnel Qualifications

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end user of the product.

2. Illustration of Residual Dangers

This Operating Manual illustrates safety notes concerning residual dangers as follows:

Information on preventing any kind of physical injury.

Information on preventing extensive equipment and environmental damage.

Information on correct handling or use. Disregarding safety notes can lead to malfunctions or equipment damage.

Note: Indicates particularly important, but not safety-relevant information.

1.4 General Safety Instructions

For all work you are going to do, adhere to the applicable safety regulations. Also observe all safety notes given in this document and forward the information to all other users of the product. Pay attention to the following safety notes:

DANGER

Mains voltage.

Contact with live parts is extremely hazardous when any objects are introduced, or any liquids penetrate the device.

Make sure that no objects enter the device. Keep the device dry.

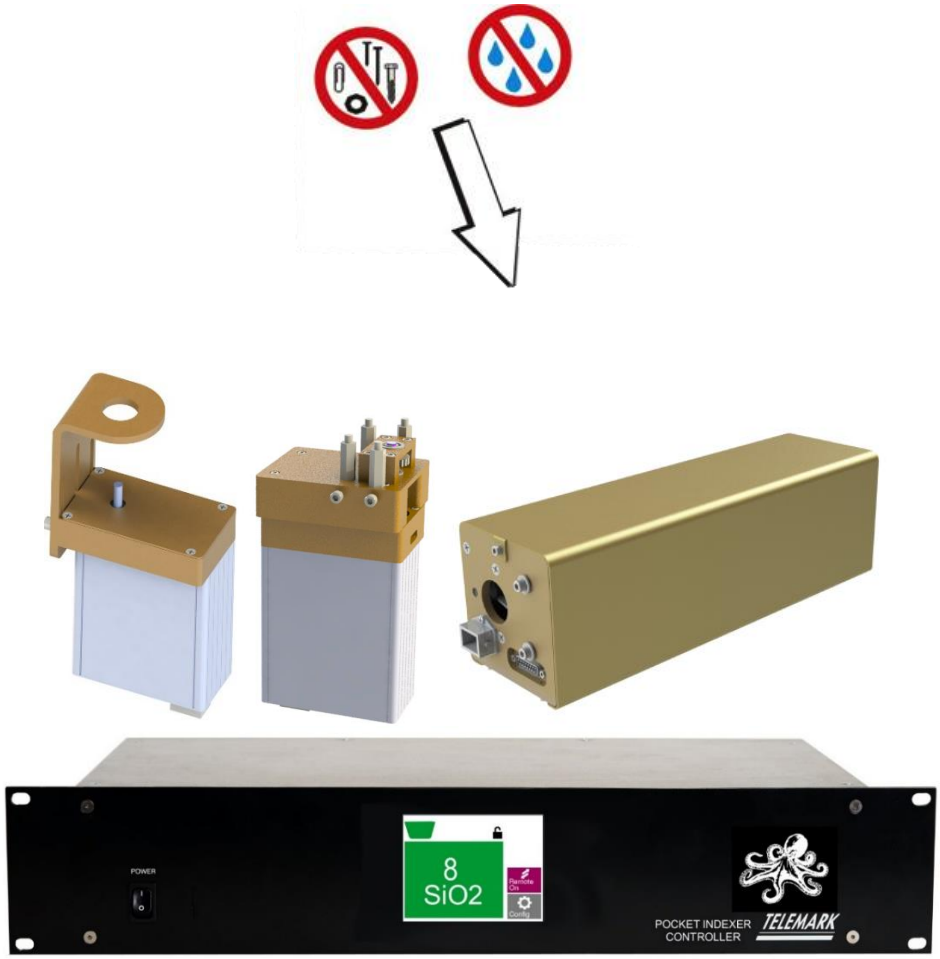


Figure 1-1, Keep Foreign Material Out of the Controller and Motor Assembly

WARNING

Improper use.

Improper use can damage the Crucible Indexer.

Use the Crucible Indexer only as intended by the manufacturer.

WARNING

Improper installation and operation data.

Improper installation and operation data may damage the Crucible Indexer.

Strictly adhere to the stipulated installation and operation data.

2 TECHNICAL DATA

2.1 General Data

3. Mechanical Data

Controller dimensions:	19-inch (483mm) rack 2U, 3 1/2” (89mm) high x 9 3/8” (238mm) deep, See Fig. 2-1
Controller Net Weight:	5.1 lb. (2.3 kg)

396/398 Motor Assembly Dimensions:	5.83” (148mm) x 4.60” (117mm) x 2.50” (64mm) See Fig. 2-2 or fig 2-3
396/398 Motor Assembly Net Weight:	2.8 lb. (1.3 kg)
399 Motor Assembly Dimensions:	7.41” (188mm) x 4.60” (117mm) x 2.50” (64mm) See Fig. 2-2 or fig 2-3
399 Motor Assembly Net Weight:	3.3 lb. (1.5 kg)
391 Motor Assembly Dimensions:	10.27” (291mm) x 4.60” (117mm) x 2.75” (70mm) See Fig. 2-2 or fig 2-3
391 Motor Assembly Net Weight:	4.1lb. (1.9 kg)

397-9901-1 Motor Assembly Dimensions:	4.28” (109mm) x 4.14” (105mm) x 10.45” (265mm) See Fig. 2-4
397-9901-1 Motor Assembly Net Weight:	5.5 lb. (2.5 kg)
397-9901-2 Motor Assembly Dimensions:	4.28” (109mm) x 4.14” (105mm) x 12.15” (265mm) See Fig. 2-4
397-9901-2 Motor Assembly Net Weight:	5.9 lb. (2.7 kg)
397-9901-3 Motor Assembly Dimensions:	4.28” (109mm) x 4.14” (105mm) x 13.6” (345mm) See Fig. 2-4
397-9901-3 Motor Assembly Net Weight:	6.3 lb. (2.9 kg)

Controller Installation: 19” Rack standard or Bench Top unit

Motor Assembly: Connected outside of a high vacuum system to electron beam source that is inside a high vacuum system.

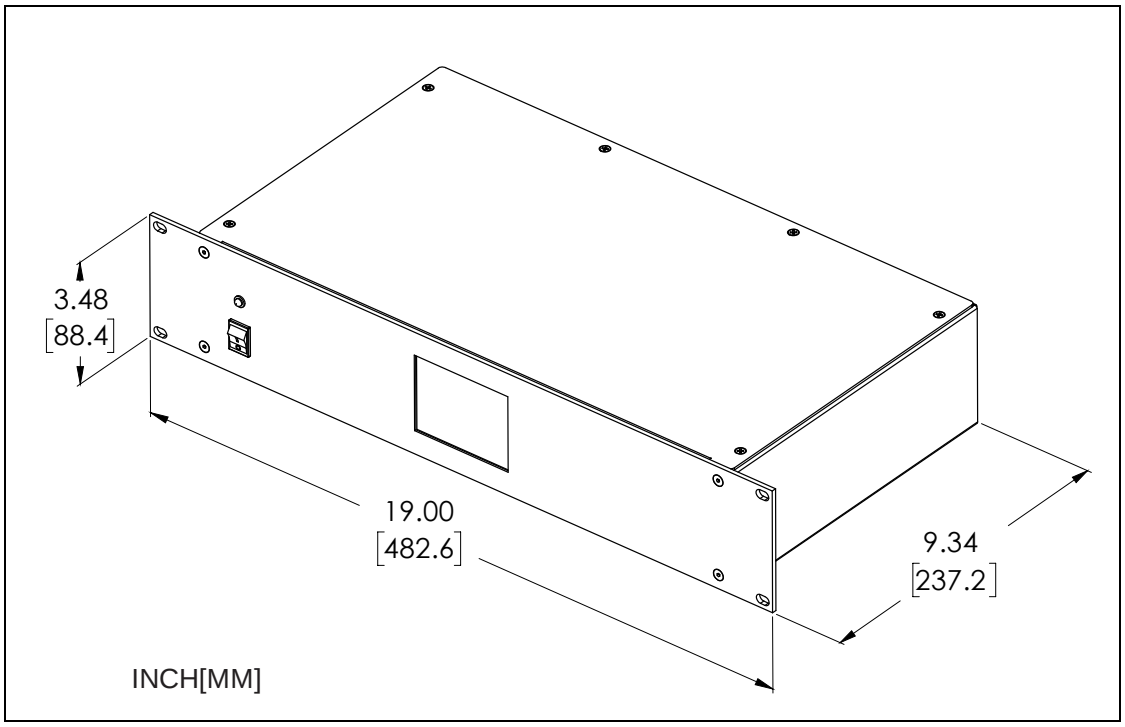


Figure 2-1, Controller Reference Dimensions

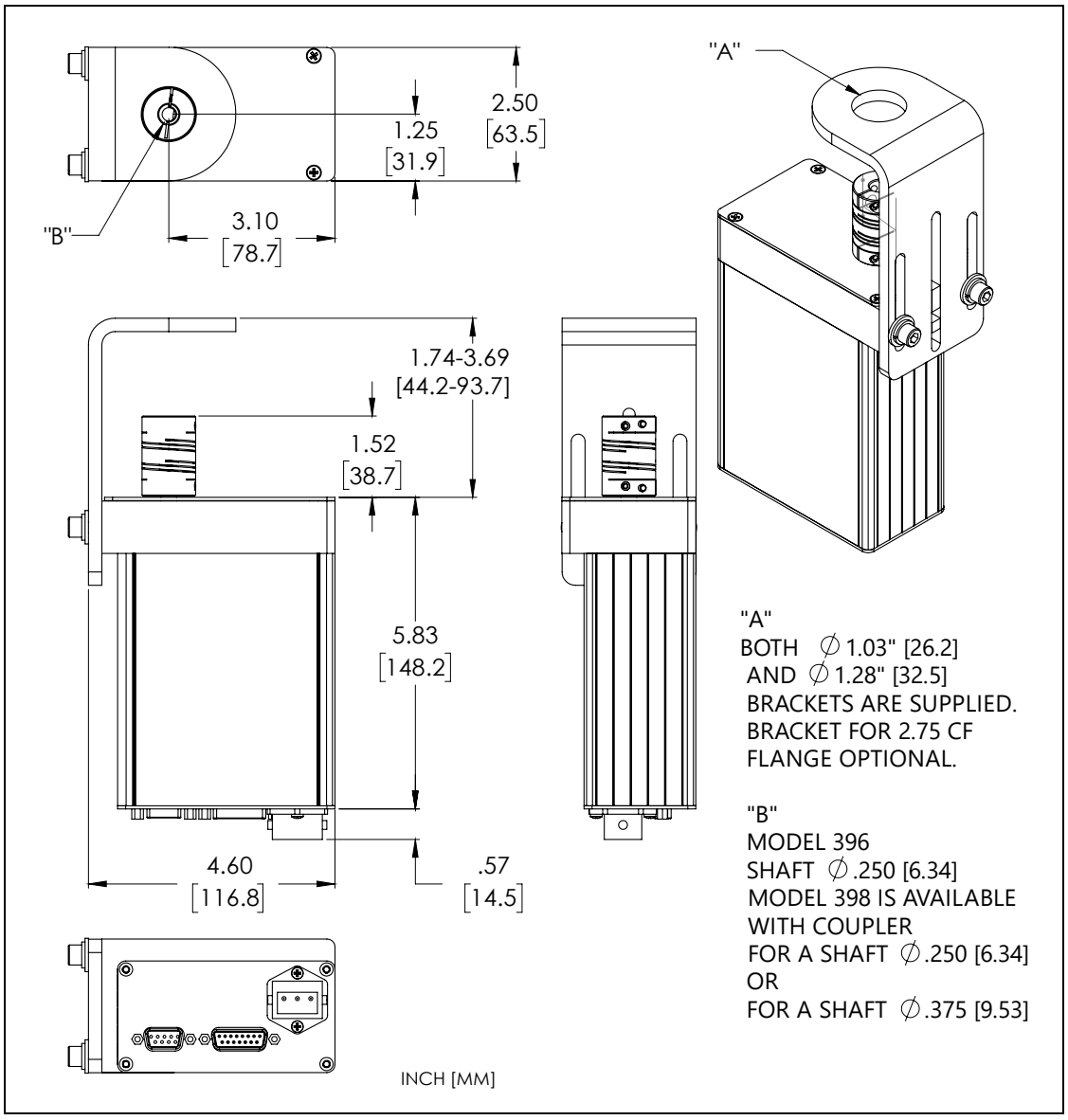


Figure 2-2, Model 396/398 Rotary Motor Assembly Reference Dimensions

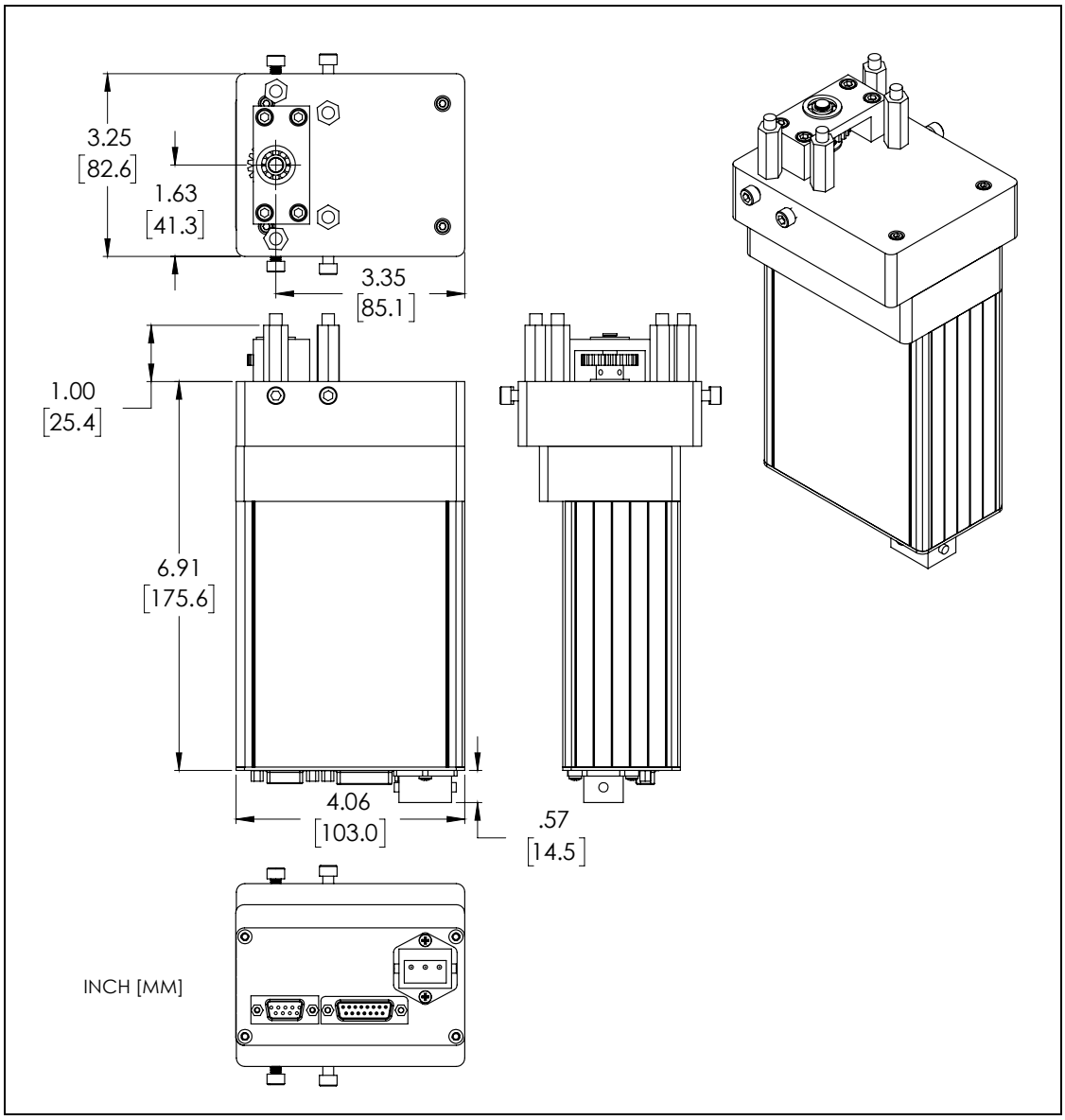


Figure 2-3, Model 396/398 Standoff Motor Assembly Reference Dimensions

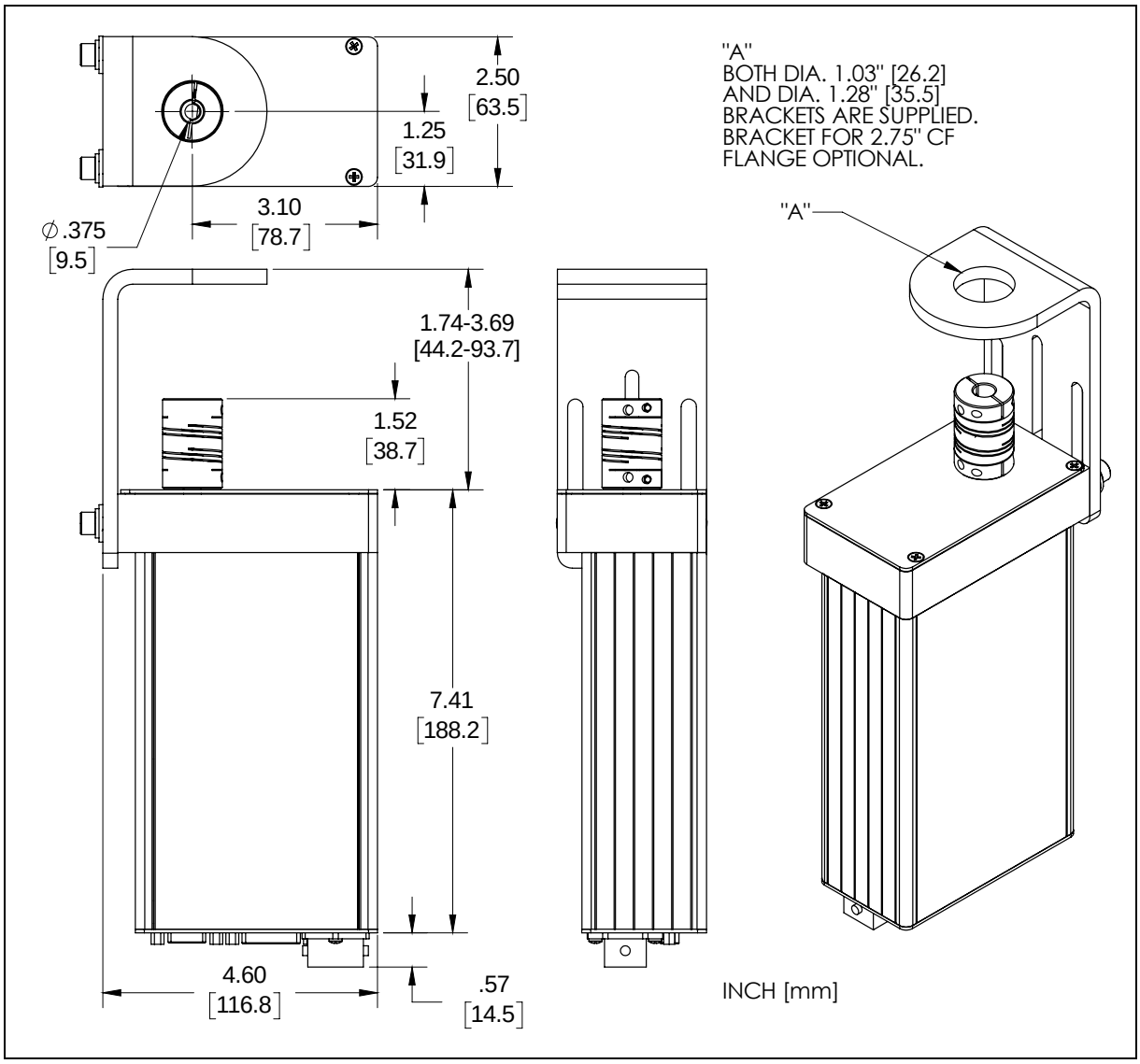


Figure 2-4, Model 399 Rotary Motor Assembly Reference Dimensions

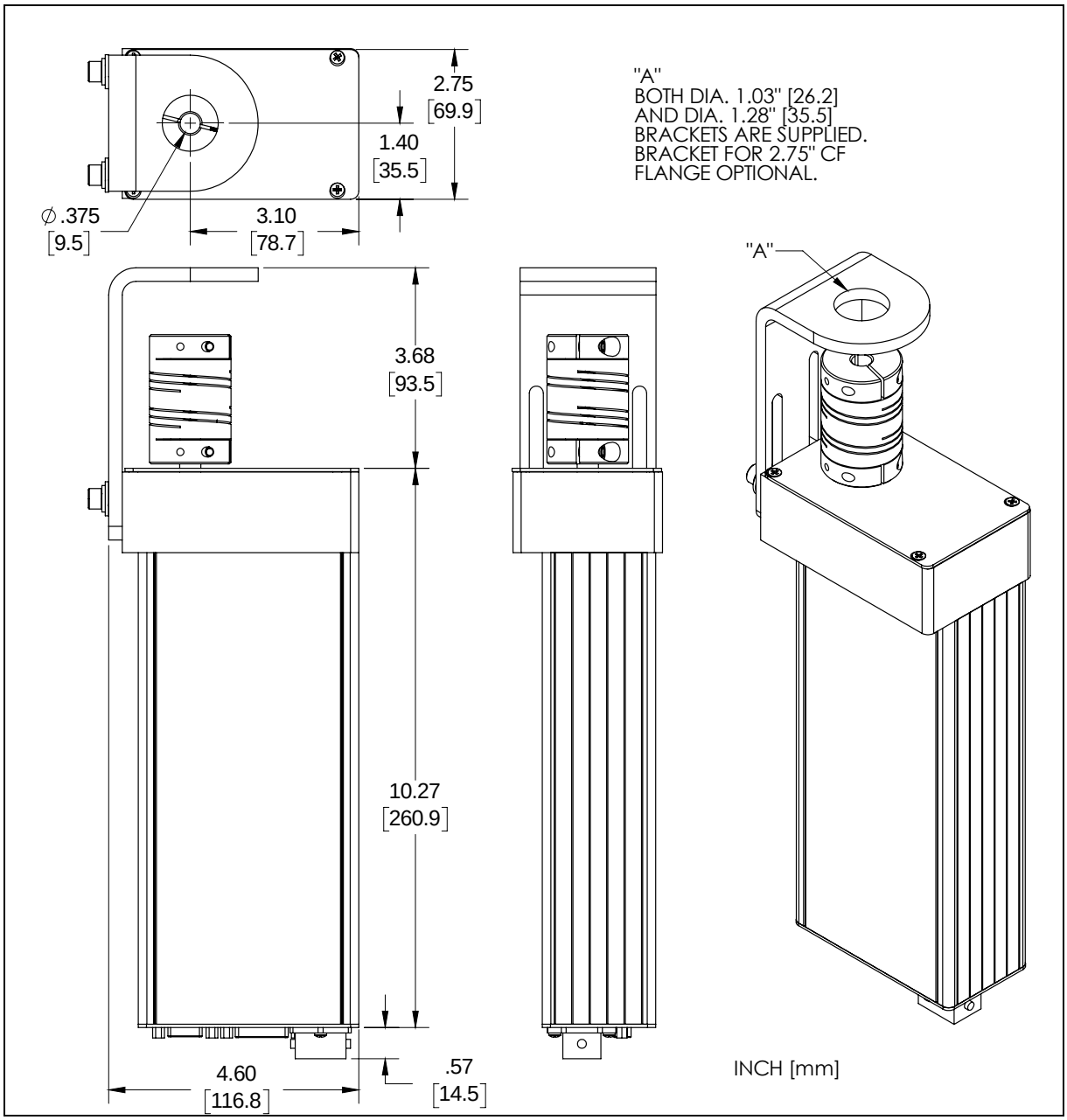


Figure 2-5, Model 391 Rotary Motor Assembly Reference Dimensions

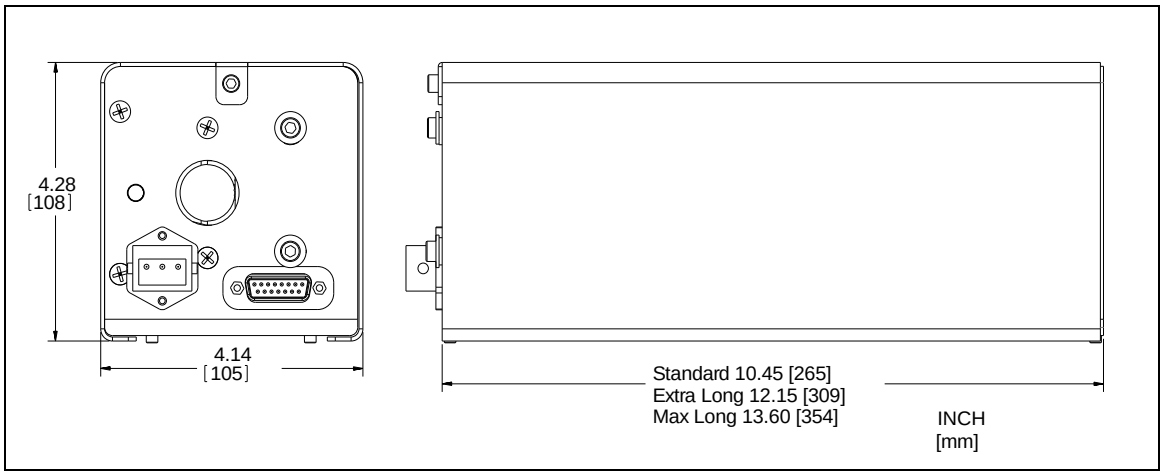


Figure 2-6, 397 Motor Assembly Reference Dimensions

4. Ambience

Temperature Storage:	-20…+60 °C
Operation Temperature:	+5…+40 °C
Relative Humidity:	Max. 80 % (up to 31 °C), decreasing to max. 50 % (above 40 °C)

Use indoor only

Altitude:	max. 2000 m n.p.m.
The degree of dust standard:	II
Humidity resistance:	IP20

5. Use and Operating Modes

There are two common operation modes:

1. Manual control, with the touchscreen on the front panel
2. Hardware remote control with I/O interface

This mode is active by pressing the Remote button on the touchscreen. In this mode the only button available on the touchscreen is to return to manual mode.

6. Standards

Conformity with the Directive relating to electrical equipment designed for use within certain voltage limits 73/23/EWG

Conformity with the Directive relating to electromagnetic compatibility 89/336/EWG

Harmonized and international/national standards and specifications:

EN 61010-1 (Safety requirements for electrical equipment for measurement, control and laboratory use)

EN 61000-6-2 (Electromagnetic compatibility generic immunity standard)

EN 61000-6-3 (Electromagnetic compatibility generic emission standard)

2.2 Mains Connection

Voltage:	90 to 264 VAC, 1 phase operation
Frequency:	47 - 63 Hz
Current consumption:	Max. 0.3 A at 120V, Max. 0.3 A at 230V
Power consumption:	Max. 20 W
Overvoltage category II	
Protection class 1	
Connection US	
appliance connector	IEC 320 C14
Fuse	Slow Blow, 3 A, 250 V, 5mm x 20mm

2.3 Pack List

7. Assembly Part numbers

Model Number	Motor Assembly Part Number	Description	
396-9901-1 or 396-9901-3 (CF)	396-0530-1	Motor Assembly, 396, Rotary	
398-9901-1 or 398-9901-3 (CF)	396-0530-2	Motor Assembly, 398, Rotary	
398-9901-1 or 398-9901-3 (CF)	399-0530-1	Motor Assembly, 399, Rotary	
391-9901-1 or 391-9901-3 (CF)	391-0530-1	Motor Assembly, 391, Rotary	
396-9902-1	396-0531-1	Motor Assembly, 396 Rotary w/Standoff	
398-9902-1	396-0531-2	Motor Assembly, 398 Rotary w/Standoff	

397-9901-1	397-1600-1	Linear Indexer Assembly, Standard	
397-9901-2	397-1600-2	Linear Indexer Assembly, Ex Long	
397-9901-3	397-1600-3	Linear Indexer Assembly, Max Long	

8. Pack List

Part No.	Quantity	Description	
	1	Motor Assembly	See above
396-0600-1	1	Indexer Controller, 396/397/398/399/391	
	(if used)	Feedthrough Bracket	
396-9300-1	1	Shipping Kit	

396-9300-1, Shipping Kit

Part No.	Quantity	Description	
122-3230-1	1	Cable, USB 2.0 A to B, 3 ft LP	
124-0925-8	1	Connector Kit, 25 Pin, D-Sub Male	

124-0925-9	1	Connector Kit, 25 Pin, D-Sub Female	
376-9010-1	1	Power Cord	
396-9040-1	1	Motor Power Cable, 396, 15ft	
396-9050-1	1	Motor Control Cable, 396, 15ft	

2.4 Specifications

Electrical	
Input Supply Voltage	90 to 264 Vac (47 …. 63 Hz), 1 phase operation *
Input Current	Max 0.3A
Mode of operation	Electron beam source pocket indexing from 4 to 30 pocket, banana and continuous
Methods of control	Local or remote through Communication Interface
Dimensions	Controller dimensions: 19-inch (483mm) rack 2U, 3 1/2” (89mm) high x 9 3/8” (238mm) deep
Weight	Controller Net Weight: 5.1 lb. (2.3 kg) Rotary Motor Assembly Net Weight: 2.8 lb. (1.3 kg) Standard Linear Motor Assembly Net Weight: 5.5 lb. (2.5 kg)

	Extra Long Linear Motor Assembly Net Weight: 5.9 lb. (2.7 kg) Max Long Linear Motor Assembly Net Weight: 6.3 lb. (2.9 kg)

I/O control	
Analog Interface	25 Dsub female connector, 8 Inputs: 75V reverse breakdown Active Mode: optically isolated, active (4 to 24V DC or AC), Passive Mode (contact closure) 25 Dsub male connector, Outputs: 8 relay contacts NO/NC @ max 1A, 24 DC or AC

2.5 Model 396/398/399/391 Rotary Indexer Features

The indexer positions the crucibles of a rotary turret-type E-beam source. It also has a position-indicating function. The indexer features a high torque motor. It is equipped with a coupling to accommodate a feedthrough drive shaft of a .250 inch (6.34 mm) or .375 (9.53 mm).

The model 396 is for model 244 EB sources, the model 398 with a larger motor is designed for all larger EB sources.

The electron beam source crucible indexer's most notable features are the following:

- Color LCD touch screen for graphical and numerical display, providing an intuitive and user-friendly operator interface
- Material names can be displayed on the screen
- Can index up to 30 pockets
- Automatic recover from pocket jams by reversing and approaching from the opposite direction when in bi-direction mode.
- No clutch needed for pocket jams due to automatic motor current sensing
- Includes Rotary, Banana and Continuous modes.
- Automatically rotates the shortest distance to the desired pocket (can be turned off to only rotate in CW or CCW rotation.)
- Mounts available for 1-inch bolt, 1.25-inch bolt, 2-3/4" CFF and standoff
- Speed control from 0.25 to 5 rpm

- Remote pocket selected by optically isolated inputs, up to 6 direct and up to 30 binary (software selectable active or passive)
- Relay isolated outputs “In position” up to 6 pockets directly and up to 30 pockets using binary, Mode signal and General In position signal

2.6 Model 397 Linear Indexer Features

● Color LCD touch screen for graphical and numerical display, providing an intuitive and user-friendly operator interface

● Material names can be displayed on the screen

● It can index up to 10 pockets

● No clutch needed for pocket jams due to automatic motor current sensing

● Remote pocket selected by optically isolated inputs, up to 6 direct and up to 10 binary (software selectable active or passive)

● Relay isolated outputs In-position up to 6 pockets directly and up to 10 pockets using binary, Mode signal and General In position signal California

Engineer

2.7 Interfaces

9. Input Interface

Connector: D-Sub 25 female connector

Refer to chapter 3.6.5 for details

No of Digital Inputs: 8 – active mode (opto-isolated, 4 to 24V DC or AC), or passive mode (contact closure)

Response time: 108 ms max

10. Output Interface

Connector: D-Sub 25 male connector

Refer to chapter 3.6.6 for details

No of Digital Outputs: 9 – Relay; 24 VDC

Response time: 108 ms max

3 INSTALLATION

3.1 Unpacking

1. Visually inspect the transport packaging for signs of external damage
2. Unpack the Crucible Indexer and put the packaging material aside

Note: Keep the packaging material for later use. The Crucible Indexer must be stored and transported in the original packaging material only.

3. Examine the Crucible Indexer for completeness
4. Visually inspect the Crucible Indexer for signs of damage

DANGER

Damaged product.

Putting a damaged product into operation can be extremely dangerous.

Never attempt to put a damaged product into operation. Secure the damaged product from unintended operation. Send a damage report to the haulage company or the insurer.

3.2 Mechanical Installation

Crucible Indexer can be used in the following ways: as a bench top device, mounted in a control panel or mounted in a 19 "rack. In each case, consider the following important safety information:

WARNING

The temperature of the environment.
Exceeding the allowable temperature of the device may damage the unit.

Make sure that the maximum permissible ambient temperature is not exceeded, and the air can circulate freely through the ventilation slots. Do not expose the device to direct sunlight.

11. Required components

The following is the minimum list of components required for setting up the indexer for safe operation.

- Electron beam source. Source rotation must be in working order.
- Vacuum system with adequate external room for indexer mounting.
- 19-inch rack with 115/230VAC, 50/60 Hz power to house the controller.
- Cable from ground on chamber to ground stud on indexer controller.

3.3 Model 396/398/399/391 Shaft Drive Motor Installation

There are many ways to install the indexer motor. The best location and drive connection for your application can only be made after analyzing all the factors. The determining factors for the location of the indexer are source type (side or bottom drive), Free space in the chamber as well as under the chamber.

The preferred way is a direct drive on each side of the feedthrough eliminating the problems associated with gear and chain drive. However, the locating holes and bolts of the feedthrough, source and indexer must be precisely predetermined so that the indexer can function properly. The feedthrough bracket makes it easy to bolt the indexer to the bottom of the chamber with the nut of a 1 inch or 1.25 inch feedthrough or a 2-3/4” CFF

Installation procedure

Install rotary feedthrough with indexer bracket

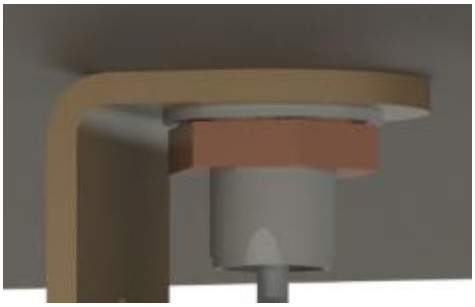


Figure 3-1, Indexer Bracket Install

Install coupler

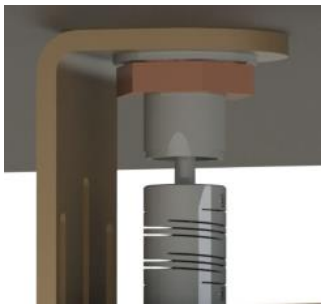


Figure 3-2, Coupler Install

Install motor assembly with the two adjustment screws and tighten the coupler.

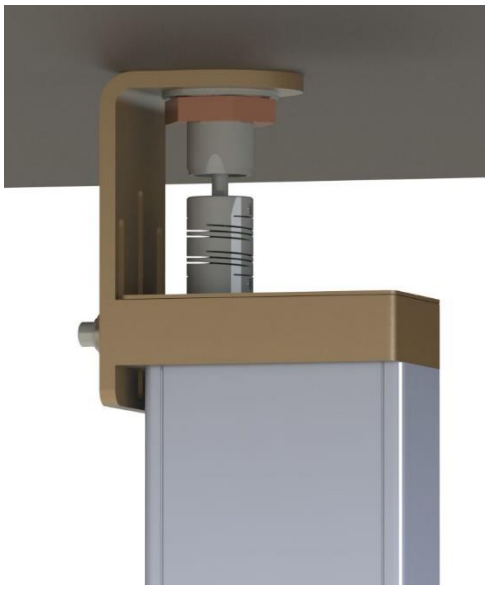


Figure 3-3, Motor Assembly Install

Attach cables to controller.

3.4 Model 396/398 Standoff Motor Installation

The standoff motor assembly is for Telemark e-beam source models 246, 249, 266, 269, 276, 279, 296, 299.

Installation procedure

Install source and feedthrough assembly

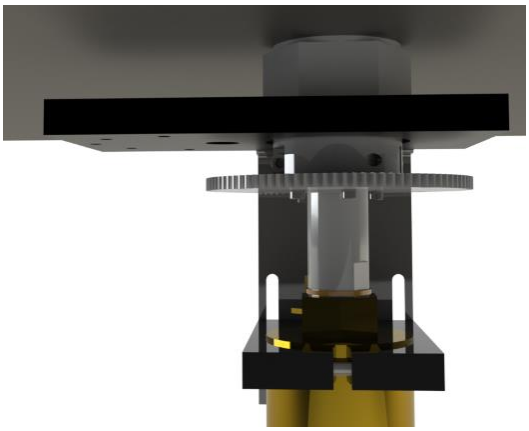


Figure 3-4, Source and Feedthrough Install

The indexer is shipped with four standoffs attached. Loosen the four screws holding the standoffs from the side and remove the standoffs from the motor assembly

Figure 3-5, Standoff

Then screw the four standoffs into the plate

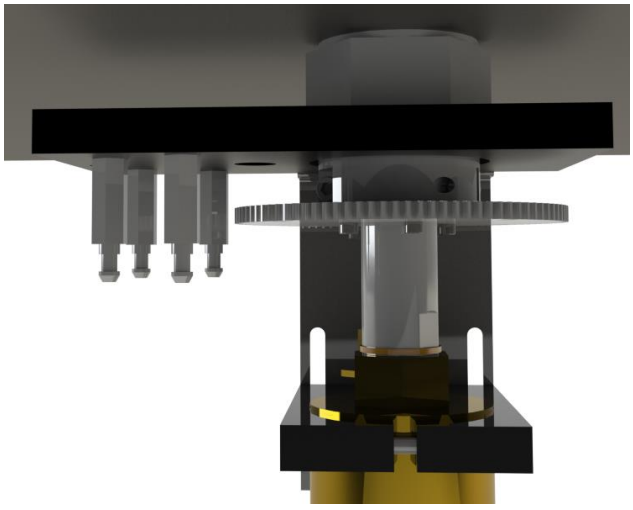


Figure 3-6, Standoff Install

Place the motor assembly and tighten down the four screws.

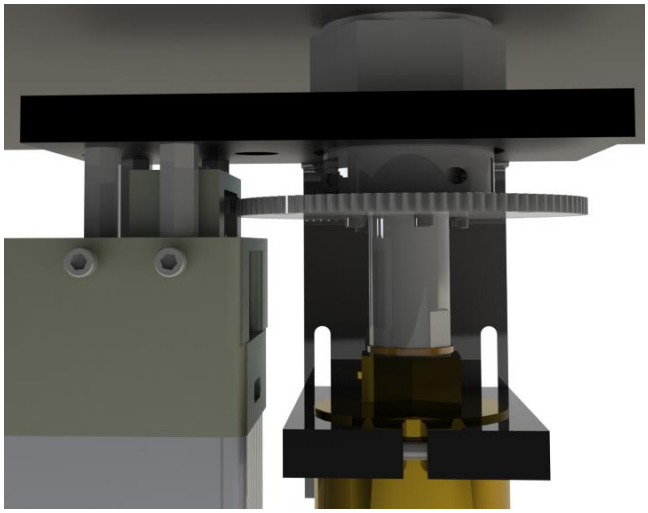


Figure 3-7, Standoff Motor Install

3.5 Model 397 Linear Motor Installation

To mount the 397 linear indexer motor assembly for Telemark model 575 and 578 sources remove the cover off the motor assembly.

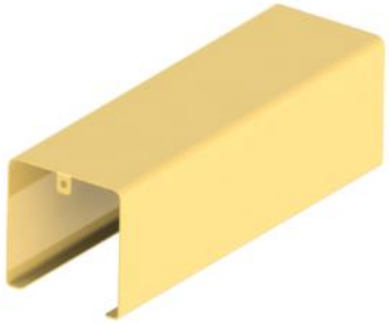


Figure 3-8, Motor Cover

Remove the clamp from the carriage.

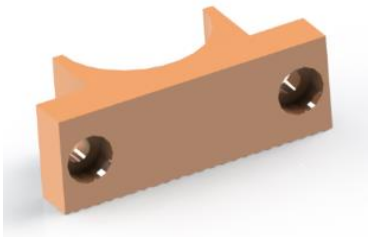


Figure 3-9, Clamp

Fit the carriage to the tube from the source

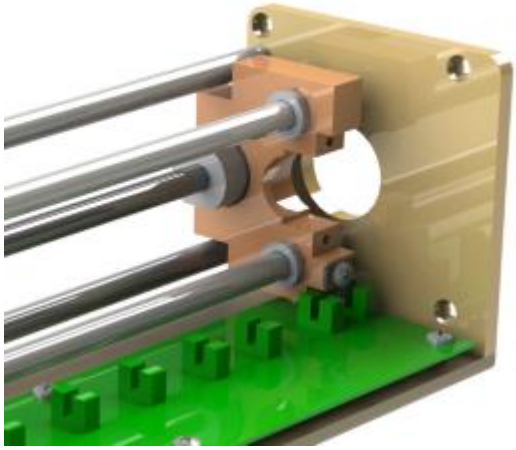


Figure 3-10, Mounting Motor Assembly

Replace the clamp and two screws holding the clamp. Then install the three screws holding the indexer plate to the Source CF flange. Replace the cover.

DANGER

Rotation pinch points.

If the motor is running there are a number of pinch points in a typical system that can cause injury.

Take appropriate measures to prevent human contact with pinch points.

12. Rack Installation

The Crucible Indexer is designed for installation into a rack according to DIN 41 494 (19", 2 HU).

WARNING

Ambient temperature.

Exceeding the maximum permitted ambient temperature may damage the device.

Make sure that the maximum permitted ambient temperature is not exceeded. Do not expose the device to direct sunlight.

DANGER

Protection class of the rack.

If the product is installed in a rack, it is likely to lower the protection class of the rack (protection from foreign bodies and water) e.g. according to the EN 60204-1 regulations for switching cabinets.

Take appropriate measures to restore the required protection class of the rack.

3.6 Controller Connecting

13. Rear Panel

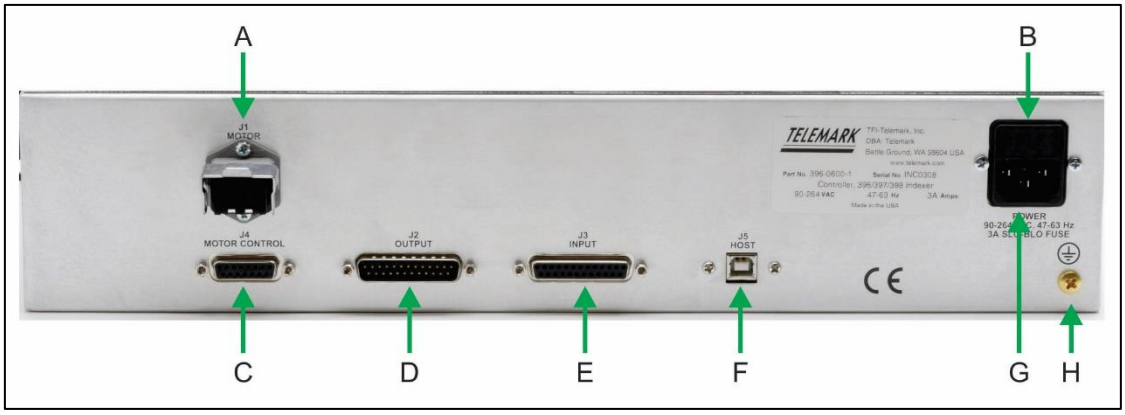


Figure 3-11, Rear panel Crucible Indexer Controller

A – Motor Power (see chapter 3.6.4 for details)

B – Main power socket IEC C13 (see chapter 3.6.2 for details)

C – Motor Control (see chapter 3.6.4 for details)

D – Output interface connector Dsub 25 female (see chapter 3.6.6 for details)

E – Input interface connector Dsub 25 female (see chapter 3.6.5 for details)

F – USB connector, Type B (see chapter 3.3.7 for details)

G – Fuses

H – Grounding Screw (see chapter 3.3.3 for details)

The configuration of the available connections and photographs of cables is described in the following sections.

14. Mains Connection

The mains connection is designed for a mains cable which contains IEC 320 connector on the device side. A mains cable is supplied with the device. If the plug is not compatible with your wall socket, you should replace it with a suitable mains cable:

Three-conductor cable with protective ground

Conductor cross-section 3x1.5 mm^2 or larger

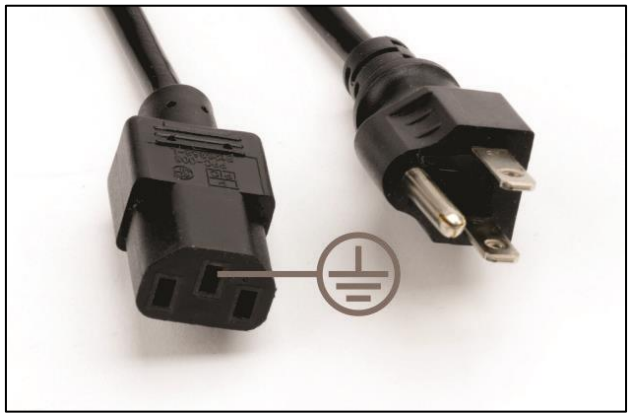


Figure 3-12, Three-conductor cable with protective ground (example)

DANGER

Mains power.

Improperly grounded devices can be extremely dangerous in the event of a fault. Use three-wire mains or extension cables with protective ground only. Plug the mains cable into wall sockets with protective ground only.

1. Connect the appliance connector of the mains cord with the mains connection of the device

2. Connect the plug of the mains cable with the wall socket

Note:

If the device is installed in a switching cabinet, the mains power can be supplied via a switchable central power distributor.

15. Grounding

Grounding screw (Fig. 3-11, the reference H) should be used to connect the Crucible Indexer with the main grounding system in which it operates. It is recommended to use a cable with a minimum section of 2.5 mm^2

If required, connect the vacuum system ground from the earthing screw using the protective conductor.

16. Motor Cables

J1 (Motor) on the chassis goes to J1 on the Motor Assembly.

J4 (Motor Control) on the chassis goes to J2 on the Motor Assembly.

17. Inputs - J3

The outputs are on a 25-pin female connector on the back of the controller. Inputs are software selectable to be active or passive from the configuration screen.

Passive TTL level inputs activated by a short across input pins.

Active inputs activated by 12 to 24 volts DC across the input pins.

Pin outs and functions description:

1. **Remote pocket selection**, up to 6 pockets directly and up to 30 pockets using binary code
2. **Continuous/Banana Run**, remote control start/stop of the continuous/banana rotation
3. **Force Remote**, when pins closed indexer will be forced into remote mode regardless of touchscreen setting.

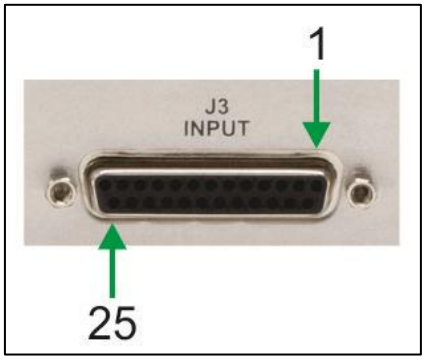


Figure 3-13, Input Dsub25 pinouts

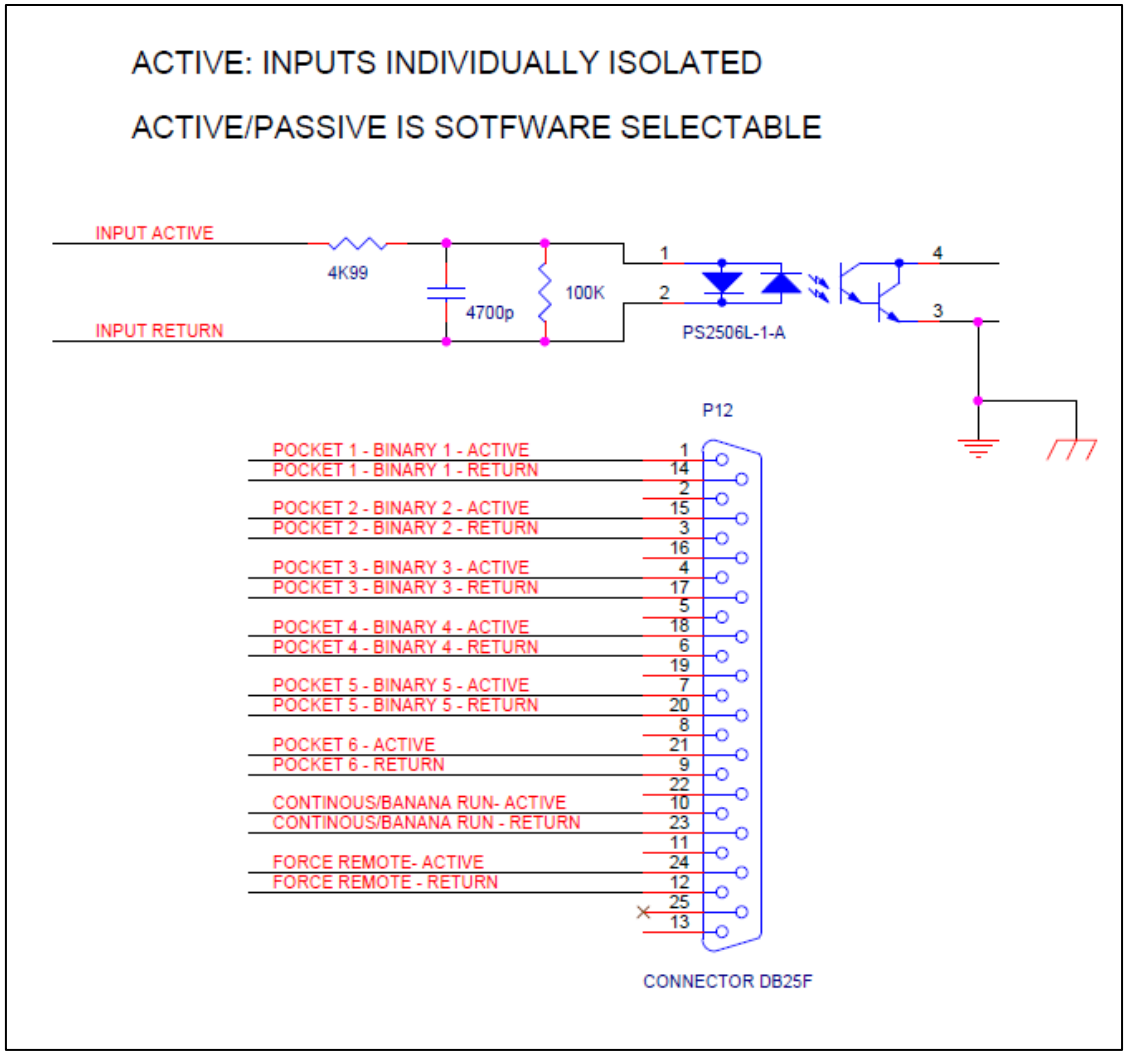


Figure 3-14, Active Input Connections

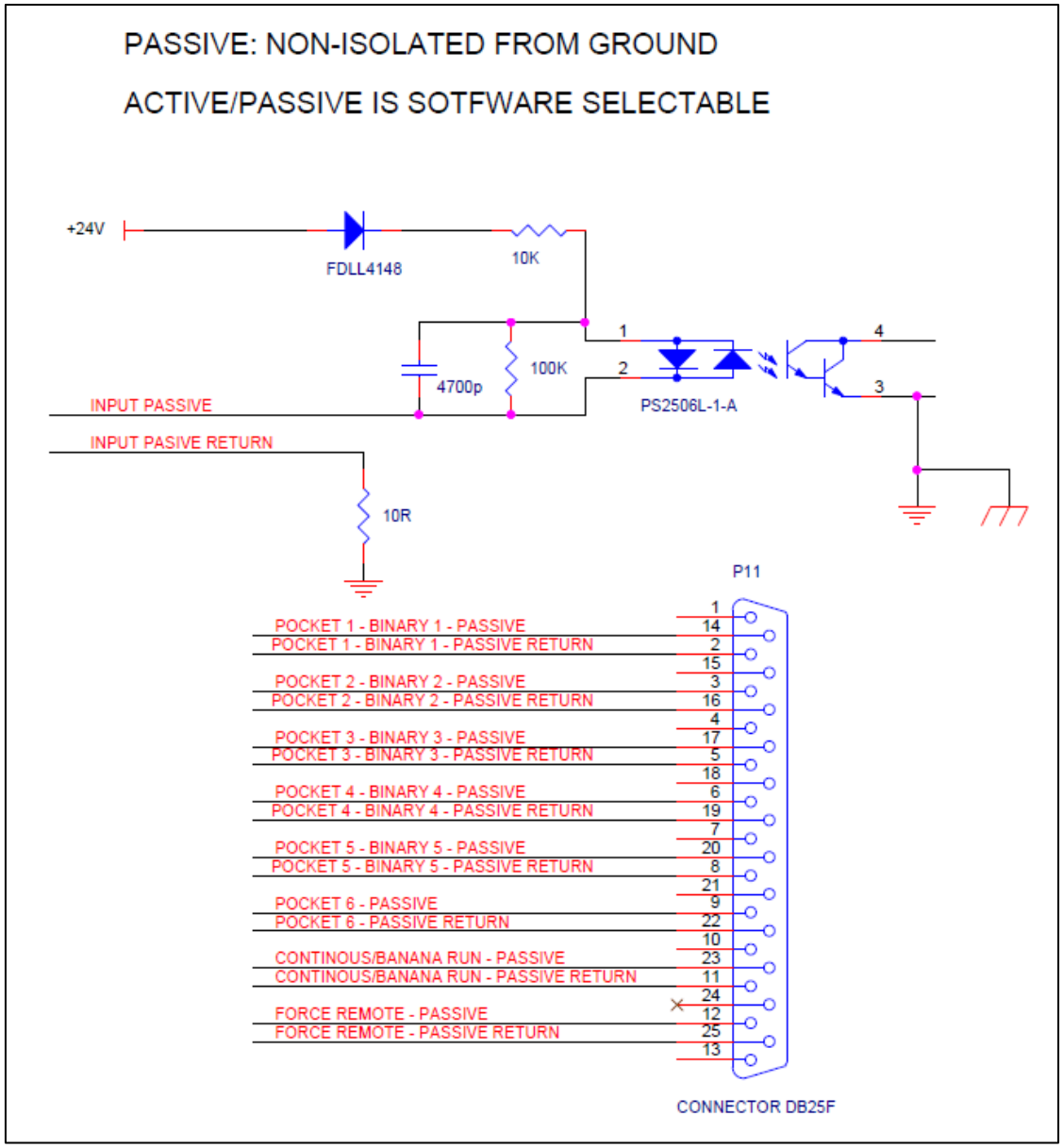


Figure 3-15, Passive Input Connections

18. Outputs – J2

The outputs are on a 25-pin male connector on the back of the controller, isolated SPST relays, 50VDC max, 2A max.

Pin outs and functions description:

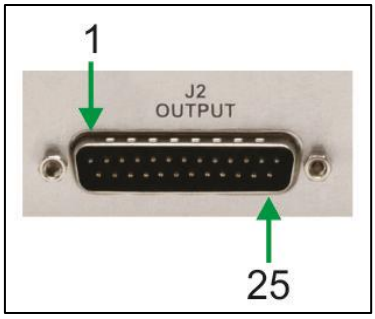


Figure 3-16, Output Dsub25 pinouts

Outputs are:

1. **Pocket signal,** up to 6 pockets directly and up to 30 pockets using binary. These signals can be used in conjunction with a XY sweeper to select a sweep pattern.
2. **Remote Mode signal**, signal when the indexer is in remote mode.
3. **In position signal**, when the motor has stopped when the pocket is in position.
4. **Error signal,** when there is an error such as a motor jam.

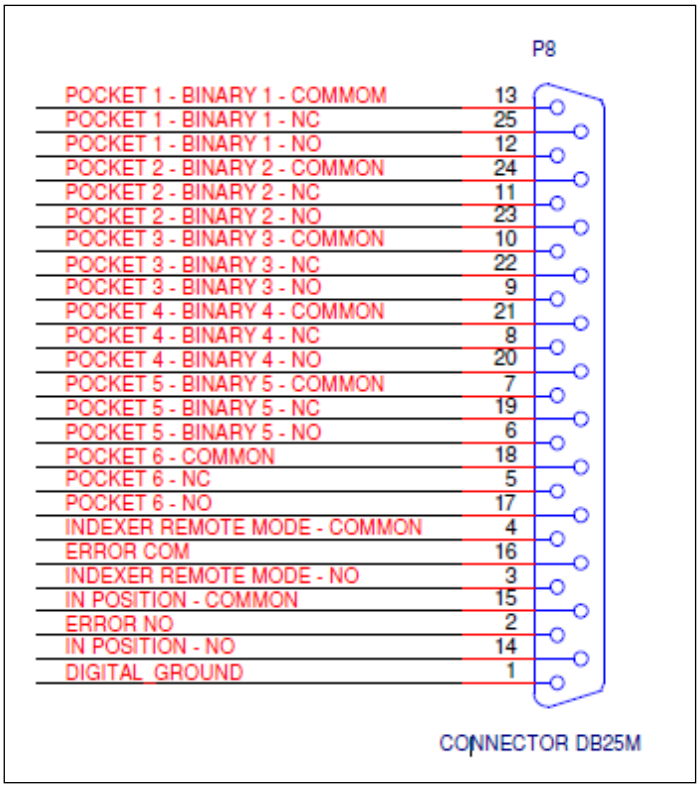


Figure 3-17, Output Connections

19. Host - J5

The host port is for upgrading the indexer software.

Figure 3-18, Host Port

CAUTION

Improper connection.

In the case of incorrect connection - in accordance with Figure 3-14, 3-15, and 3-17 there is a danger of damage to the controller

3.7 Model 396/398/399/391 Motor Connecting

Connectors J1 and J2 connect to the chassis with the supplied cables. Connector J3 is for an optional connection to an in-vacuum in-pocket switch.

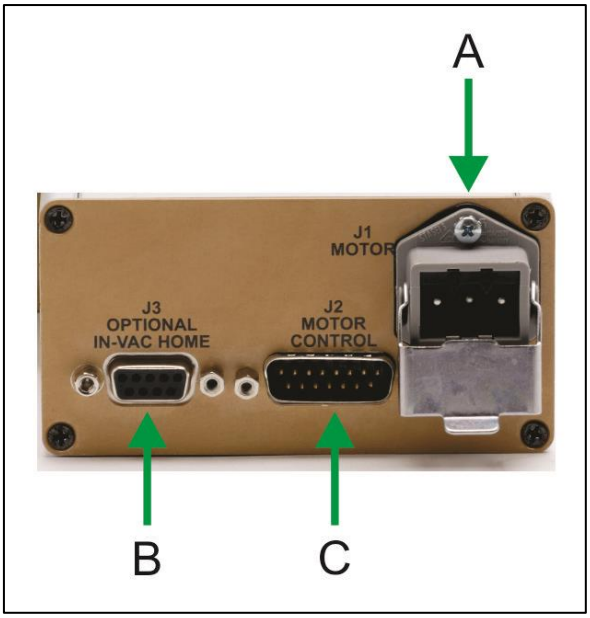


Figure 3-19, 396/398/399/391 Motor Assembly Connections

A – Motor Power

B – Optional in-Vac Home (see chapter 3.9 for details)

C – Motor Control

3.8 Optional Rotary In-vacuum In-pocket Switch

Optional in-vacuum in-pocket confirmation kits are available for Telemark models 244, 246, 271, 274, 276, 277, 294 and 295. When enabled from the touch screen, the software will check that the crucible is in-pocket and count the number of pockets it goes past. This provides confirmation to the optical encoder and home switch inside the motor assembly to makes sure that no slippage has happened between the motor assembly and the e-beam source.

20. In-pocket Hardware installation

This requires an e-beam source bearing housing (hub) that matches the number of pockets in the e-beam source crucible and two pins on a feedthrough.

The switch assembly mounts in the empty side drive hole on the side arm.

Supplied Kapton wires are wired to the “comm” and “normally closed” terminals of the switch and to an electrical feedthrough. The atmosphere side is wired to the supplied cable that comes with a 9 pin D connector, which is plugged into J3 of the motor assembly.

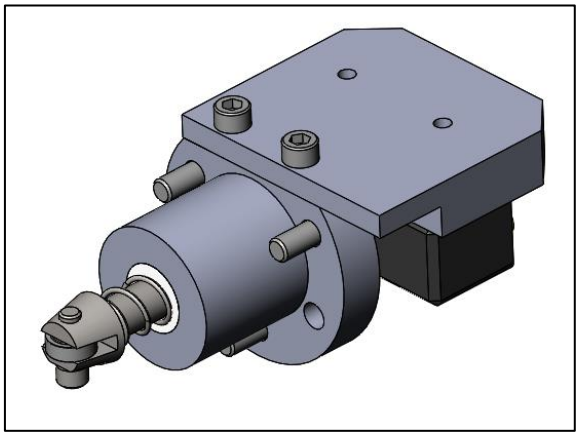


Figure 3-20, In-vacuum In-pocket Switch Assembly

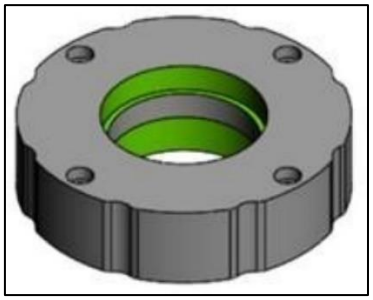


Figure 3-21, E-beam Source Bearing Housing

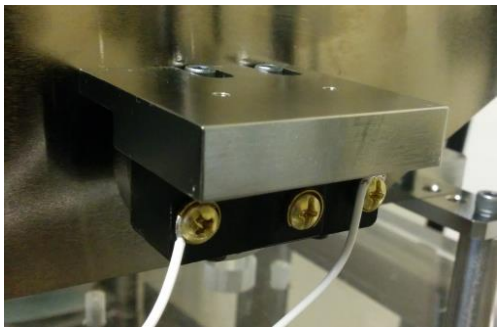


Figure 3-22, In-vacuum In-pocket Home Switch Installation

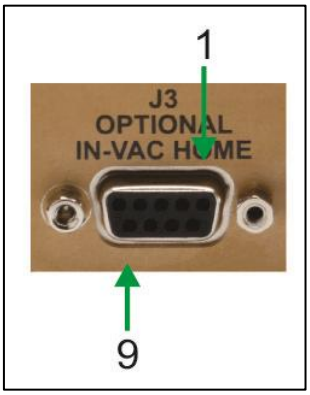


Figure 3-23, In-vacuum In-pocket Home Connector

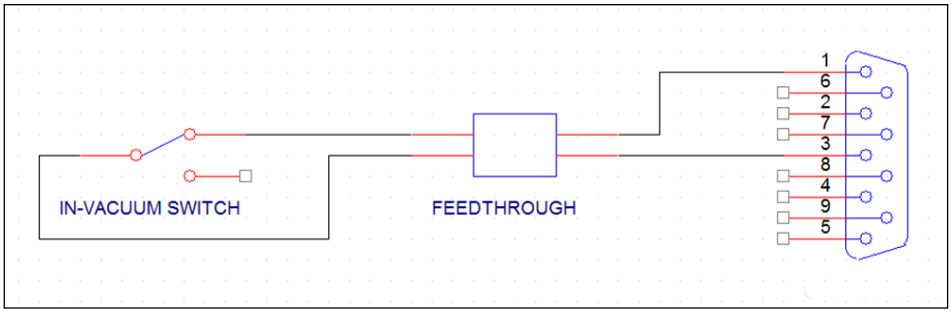


Figure 3-24, In-vacuum In-pocket Home Switch Wiring

“HP” and “HC” the end of the kit number for existing installations to receive a kit with a bearing housing (Hub), crucible O-ring, pivot shaft O-ring, quad ring, Kapton wire for in-vacuum in-pocket switch and a 9 pin cable assembly for the outside to connect to J3 on the motor assembly.

21. Standard In-Pocket Switch Part Numbers

Model	4 Pocket Option	4 Pocket Upgrade Kit	6 Pocket Option	6 Pocket Upgrade Kit
244	244-0300-4	244-0300-4-HP	244-0300-6	244-0300-6-HP
264	264-0300-4	264-0300-4-HP	264-0300-6	264-0300-6-HP
266	266-0300-4	266-0300-4-HP	266-0300-6	266-0300-6-HP
271	271-0300-4	271-0300-4-HP	271-0300-6	271-0300-6-HP
274	274-0300-4	274-0300-4-HP	274-0300-6	274-0300-6-HP
276	276-0300-4	276-0300-4-HP	276-0300-6	276-0300-6-HP
277	277-0300-4	277-0300-4-HP	277-0300-6	277-0300-6-HP
294	294-0300-4	294-0300-4-HP	294-0300-6	294-0300-6-HP
295	295-0300-4	295-0300-4-HP	295-0300-6	295-0300-6-HP

Model	8 Pocket Option	8 Pocket Upgrade Kit	Continuous Option	Continuous Upgrade Kit
264	264-0300-8	264-0300-8-HP		
266	266-0300-8	266-0300-8-HP		
271	271-0300-8	271-0300-8-HP	271-0300-7	271-0300-7-HP
274	274-0300-8	274-0300-8-HP	274-0300-7	274-0300-7-HP
276	276-0300-8	276-0300-8-HP	276-0300-7	276-0300-7-HP
277	277-0300-8	277-0300-8-HP	277-0300-7	277-0300-7-HP
294	294-0300-8	294-0300-8-HP	294-0300-7	294-0300-7-HP
295	295-0300-8	295-0300-8-HP	295-0300-7	295-0300-7-HP

22. Ceramic In-Pocket Switch Part Numbers

Model	4 Pocket Option	4 Pocket Upgrade Kit	6 Pocket Option	6 Pocket Upgrade Kit
244	244-0300-4-H	244-0300-4-HC	244-0300-6-H	244-0300-6-HC
264	264-0300-4-H	264-0300-4-HC	264-0300-6-H	264-0300-6-HC
266	266-0300-4-H	266-0300-4-HC	266-0300-6-H	266-0300-6-HC
271	271-0300-4-H	271-0300-4-HC	271-0300-6-H	271-0300-6-HC
274	274-0300-4-H	274-0300-4-HC	274-0300-6-H	274-0300-6-HC
276	276-0300-4-H	276-0300-4-HC	276-0300-6-H	276-0300-6-HC
277	277-0300-4-H	277-0300-4-HC	277-0300-6-H	277-0300-6-HC
294	294-0300-4-H	294-0300-4-HC	294-0300-6-H	294-0300-6-HC
295	295-0300-4-H	295-0300-4-HC	295-0300-6-H	295-0300-6-HC

Model	8 Pocket Option	8 Pocket Upgrade Kit	Continuous Option	Continuous Upgrade Kit
264	264-0300-8-H	264-0300-8-HC		
266	266-0300-8-H	266-0300-8-HC		
271	271-0300-8-H	271-0300-8-HC	271-0300-7-H	271-0300-7-HC
274	274-0300-8-H	274-0300-8-HC	274-0300-7-H	274-0300-7-HC
276	276-0300-8-H	276-0300-8-HC	276-0300-7-H	276-0300-7-HC
277	277-0300-8-H	277-0300-8-HC	277-0300-7-H	277-0300-7-HC
294	294-0300-8-H	294-0300-8-HC	294-0300-7-H	294-0300-7-HC
295	295-0300-8-H	295-0300-8-HC	295-0300-7-H	295-0300-7-HC

23. In-pocket Software setup

In-pocket only works with “CW Rotation” and “CCW Rotation”. Select “In Pocket Feedback” See figure 3-26

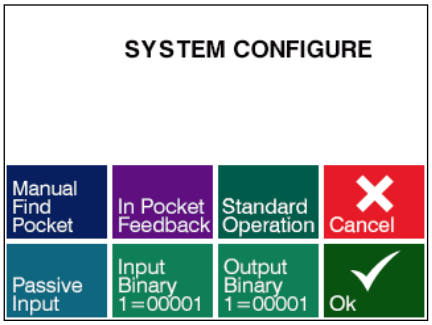


Figure 3-25, In-vacuum “In-pocket Feedback “Configured

3.9 Model 397 Motor Connecting

Connectors J1 and J2 connect to the chassis with the supplied cables.

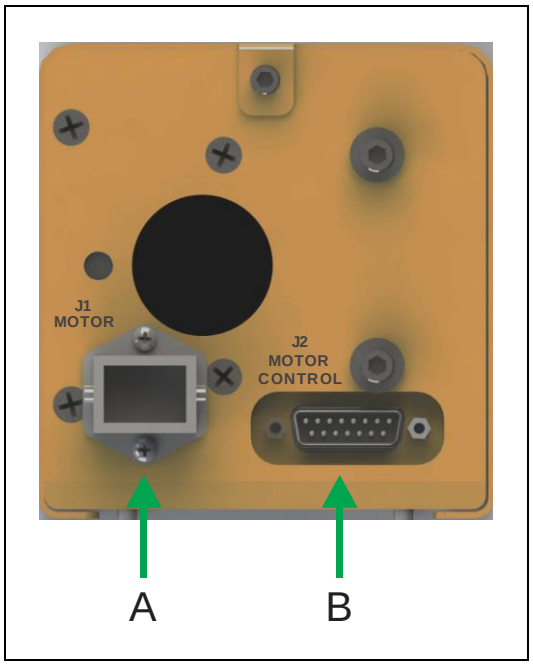


Figure 3-26, 397 Motor Assembly Connections

A – Motor Power

B – Motor Control

3.10 List of Accessories or Supplies

Recommended parts:

Rotary feedthrough or Right-angle rotary feedthrough.

4 USING THE CRUCIBLE INDEXER

4.1 Front Panel

Please refer to Fig. 4-1 for front panel details

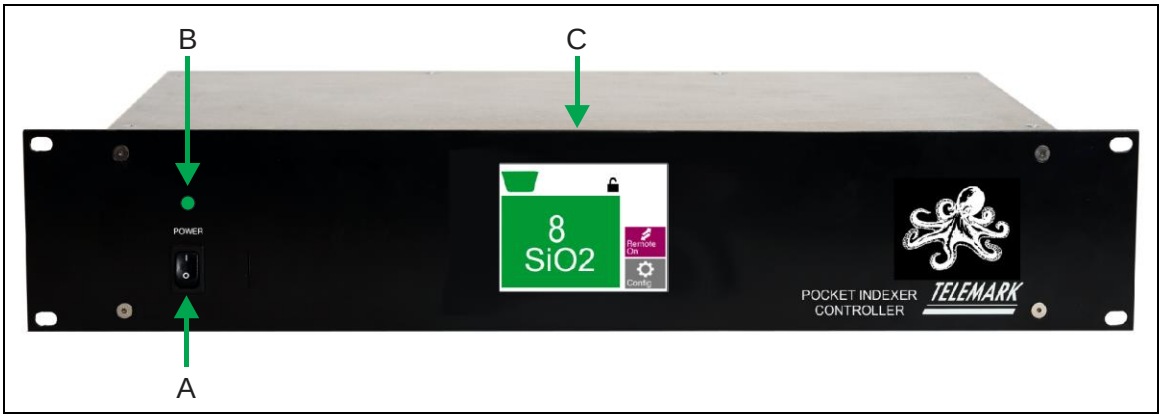


Figure 4-1 - Controller Front Panel

A – Main power switch – Rocker type (see chapter 4.1.1 for details)

B - Power On LED indicator (see chapter 4.1.2 for details)

C – LCD Touchscreen (see chapter 4.1.3 for details)

24. Main Power Switch

Switching On the power button (position 'I') activates the main power circuit of the device. Switching off the unit (position 'O' switch) completely cuts the power to the internal circuits - controller is safe to make rear panel connections.

DANGER

Risk of the electric shock!

All connection to the devices may only be carried out with the unit is turned off - the main power switch in 'O' position.

Failure to do so may cause electric shock

25. Power On LED indicator

Green LED indicates the unit power is on.

26. LCD Touchscreen

Interaction with the user takes place by means of a graphical LCD Touchscreen display. The screen can be set to turn off using the screen saver setting, The indexer is always operational if the power is on even if the screen is off. Touch the screen to wake screen up.

5 ROTARY CONFIGURATION

See chapter 6 for Model 397 linear indexer configuration.

5.1 Unlocking

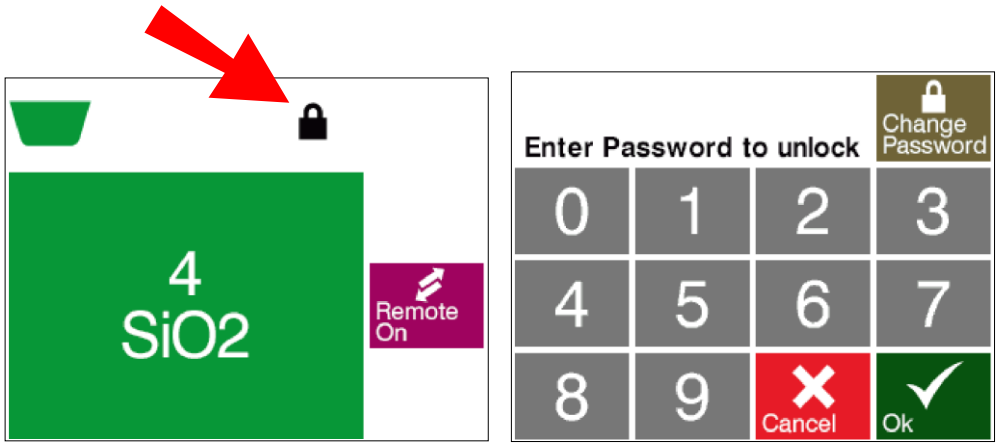


Figure 5-1, Unlocking Screen

To configure the indexer first it must be unlocked. Press the lock to unlock the indexer and enter the password.

The default password is “1234”. The password can be changed at this time by pressing the **Change Password** button. Once the indexer is unlocked it will stay unlocked until it is locked by pressing the **lock** or by turning the power off.

5.2 Rotary Configuration

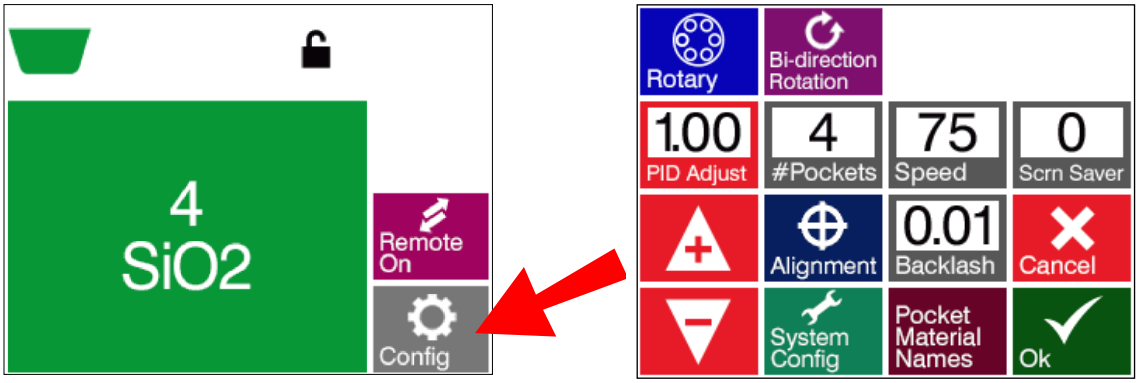


Figure 5-2, Configuration Screen

Once the indexer is unlocked then the **Config** (Configure) button can be pressed.

27. Crucible Type

Available types are Rotary, Banana and Continuous. Press button to cycle to the desired type.

28. Rotation

Bi-directional Rotation/CW Rotation/CCW Rotation – "Bi-directional Rotation" will enable the indexer to rotate the shortest distance to the selected pocket, clockwise (CW) or counterclockwise (CCW). With "CW Rotation" and "CCW Rotation" option the indexer will rotate only one direction.

29. Alignment

Alignment sets the pocket one center. For rotation setting "CW Rotation" and "CCW Rotation" there is only one step to align the pocket. For "Bi-direction" rotation setting there are three steps.

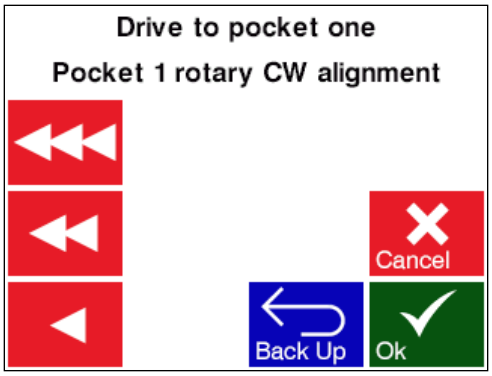


Figure 5-3, Drive to Pocket One CW

Step 1: Set the pocket one alignment. There are three speed buttons, **Slow**, **Medium** and **Fast**. They are used so that pocket one is approached with the gear train tight. Use the **Fast** and **Medium** speeds till pocket one is almost in position, then use **Slow** speed to finish the alignment. If you over shot pocket one use the **Back Up** button to try again. Press **Ok** when done. For “CW Rotation” and “CCW Rotation” you are done.

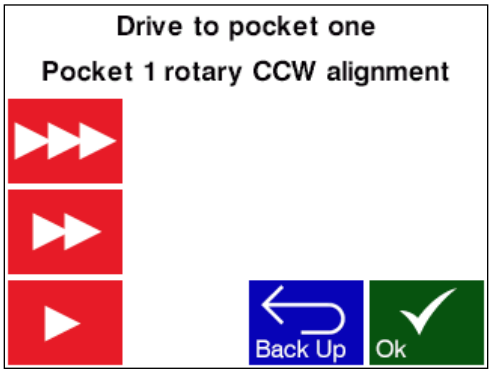


Figure 5-4, Drive to Pocket One CCW

Step 2: For “Bi-direction” rotation set counter-clockwise pocket one alignment. Press **OK** when aligned.

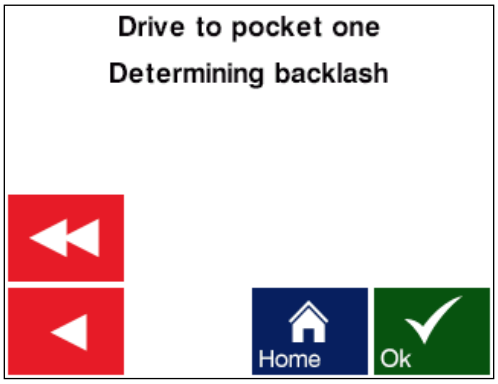


Figure 5-5, Backlash

Step 3: Then the indexer rotates from the other side to set the backlash so that any gear backlash in the gear train is accounted for. Align pocket one and then you are done.

30. Numeric Settings

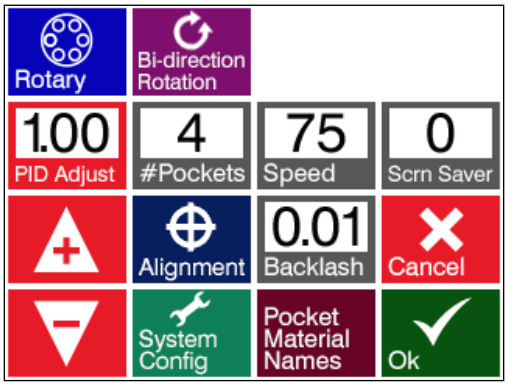


Figure 5-6, Settings

First press the setting to adjust, it will turn red, then press the “+” and “-“ to adjust the numeric value.

PID Adjust - Adjustment for motor, default 1.00 (0.01-2.00). Most sources should use the default value. Only the source model 298 will need fine tuning because of the massive weight. Values less than1will have a slower response and greater than 1 will have a faster response.

#Pockets – Total number of pockets in crucible (4-30)

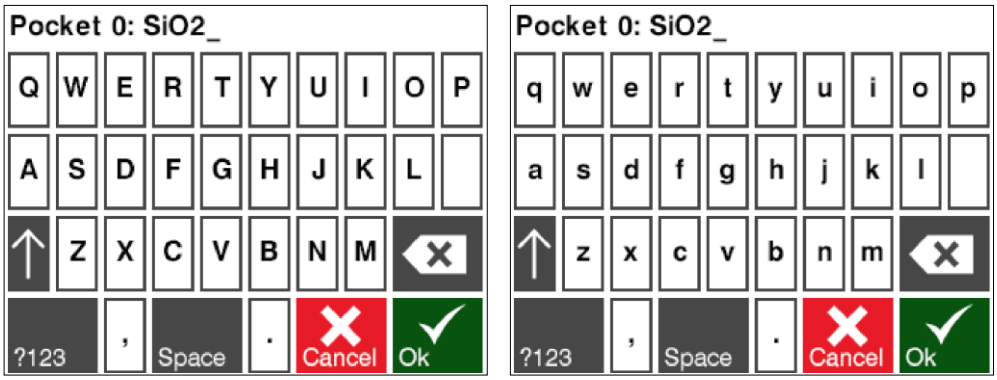
Speed – Maximum rotational speed (0-100%)

Scrn Saver (Screen Saver) - Time till indexer goes into screen saver mode and blanks the screen (0-300). If set to 0 the screen will not go into screen saver mode. Touch the screen to wake screen up. The indexer is always operational if the power is on.

Backlash – This number is only shown if “Bi-direction” rotation is selected. The number is automatically generated when Alignment is run, but it can be manual changed to fine tune it.

System Config - This button goes to the system configuration sub menu.

Pocket Material Names - Material names can be added for each pocket. If no name is entered, then “Pocket” will be displayed. Use the up arrow to shift between upper case, lower case and numbers.



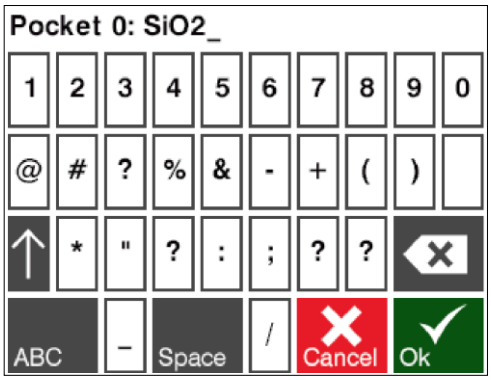


Figure 5-7, Entering Alfa Numeric Characters

5.3 System Configuration

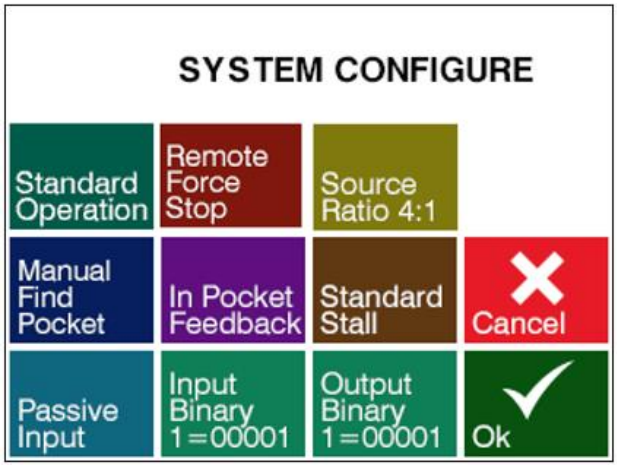


Figure 5-8, System Configuration

Standard Operation/Home Every Pocket

- **Standard Operation –** Indexer rotates to the next pocket normally
- **Home Every Pocket –** Indexer rotates past the internal home switch for each pocket change. I will always make at least a 360-degree rotation when moving from pocket to pocket.

Normal Operation/Remote Force Stop

- **Normal Operation –** Indexer rotates to the next pocket normally once the motor start moving, inputs going inactive do nothing.
- **Remote Force Stop –** During rotation Indexer motor stops if: All individual inputs go inactive and cause a STOP condition. or Binary select input 6 (P3 connector pin 9) MUST be active for normal operation. If binary select input 6 goes inactive it will cause a STOP condition.

Source Ratio 4:1/10:1

All Telemark sources have a 4:1 gear ratio except for the 221/224 Side drive which has a 10:1 gear ratio.

Manual/Automatic Find Pocket – On power up operation

- **Manual** – When the Indexer is powered on a screen will ask to confirm the current pocket is aligned. Press ok if aligned or press “Manual Find Pocket” to make the indexer move the motor to verify its internal home position.
- **Automatic** - When the Indexer is powered on it will automatically make the indexer move the motor to verify its internal home position.

In Pocket Feedback/No Pocket Feedback

- **No Pocket Feedback –** Normal operation
- **In Pocket Feedback –** Select this option when using the optional in pocket switch on 271, 274 or 294 EB sources, see chapter for installation instructions. This setting only works with “CW Rotation” and “CCW Rotation”

Stall (only active for the model 398)

- **Standard Stall –** Normal operation
- **SSC Stall –** Increased operational current maximum for self-sealing option. Speed is automatically set to 50 and speed adjustment is removed.

Passive/Active Input – Input can be configured two ways

- **Passive** TTL level inputs activated by a short across input pins.
- **Active** inputs activated by 12 to 24 volts DC across the input pins.

Input – Selecting a pocket from a PLC or other device can be done by using the optically isolated indexer inputs. See table below for binary code.

- **Binary 1=00000 -** up to 30 pockets
- **Binary 1=00001 -** up to 30 pockets
- **Individual -** up to 6 pockets directly

Output - Relay isolated outputs up to 6 pockets directly and up to 30 pockets using binary, these signals can be used to connect to a XY sweep to select a sweep pattern.

- **Binary 1=00000 -** up to 30 pockets
- **Binary 1=00001 -** up to 30 pockets
- **Individual -** up to 6 pockets directly

“Binary 1=00000” **Pocket Number**	“Binary 1=00001” **Pocket Number**	**Binary Bit 4**	**Binary Bit 3**	**Binary Bit 2**	**Binary Bit 1**	**Binary Bit 0**
1	1*	0	0	0	0	0
2	1*	0	0	0	0	1
3	2	0	0	0	1	0
4	3	0	0	0	1	1
5	4	0	0	1	0	0
6	5	0	0	1	0	1

7	6	0	0	1	1	0
8	7	0	0	1	1	1
9	8	0	1	0	0	0
10	9	0	1	0	0	1
11	10	0	1	0	1	0
12	11	0	1	0	1	1
13	12	0	1	1	0	0
14	13	0	1	1	0	1
15	14	0	1	1	1	0
16	15	0	1	1	1	1
17	16	1	0	0	0	0
18	17	1	0	0	0	1
19	18	1	0	0	1	0
20	19	1	0	0	1	1
21	20	1	0	1	0	0
22	21	1	0	1	0	1
23	22	1	0	1	1	0
24	23	1	0	1	1	1
25	24	1	1	0	0	0
26	25	1	1	0	0	1
27	26	1	1	0	1	0
28	27	1	1	0	1	1
29	28	1	1	1	0	0
30	29	1	1	1	0	1
Not used	30	1	1	1	1	0
Not used	Not used	1	1	1	1	1

* Note: For “Binary 1=00001” 00001 and 00000 both equal pocket one.

31. Banana

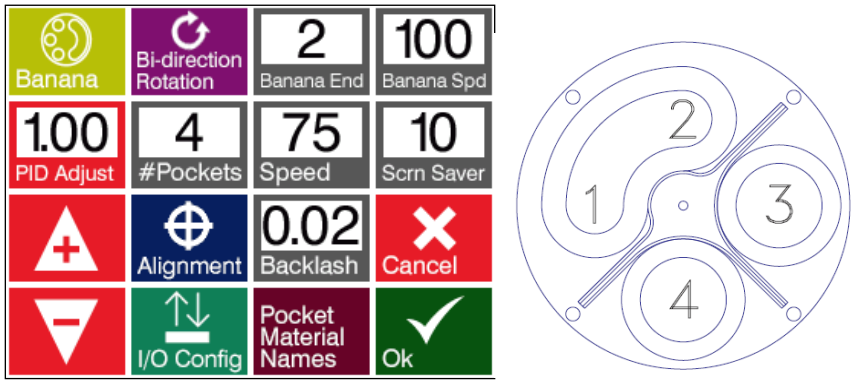


Figure 5-9, Banana Configuration

To use Banana mode set rotation to “Bi-direction” rotation. In banana mode pocket “one” is always the start of the banana.

Banana end is the end pocket of the banana relative to the nominal crucible number.

Banana Spd (Banana Speed) is the speed at which the crucible moves when in the banana pocket.

32. Continuous

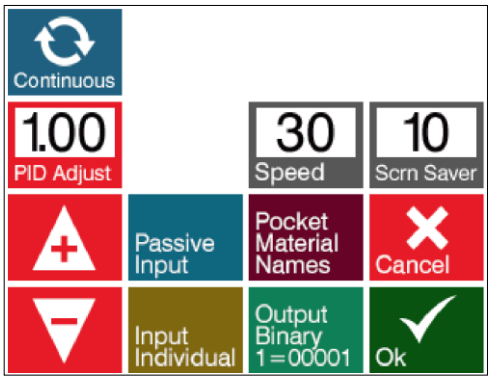


Figure 5-10, Continuous Setup

The continuous rotary speed setting is adjustable on the main screen.

6 LINEAR CONFIGERATION

See chapter 5 for model 396/398/399/391 rotary indexer configuration.

6.1 Unlocking

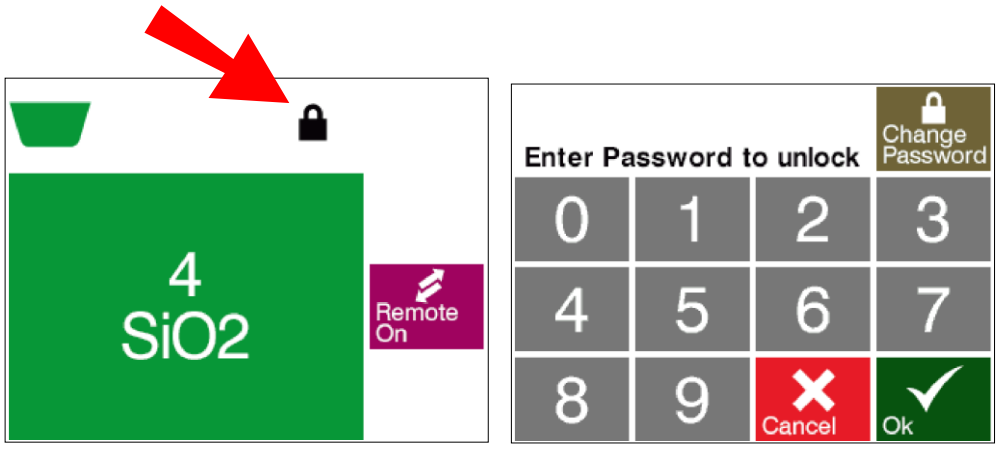


Figure 6-1, Unlocking Screen

To configure the indexer first it must be unlocked. Press the lock to unlock the sweep and enter the password.

The default password is “1234”. The password can be changed at this time by pressing the **Change Password** button. Once the sweep is unlocked it will stay unlocked until it is locked by pressing the **lock** or by turning the power off.

6.2 Linear Configuration

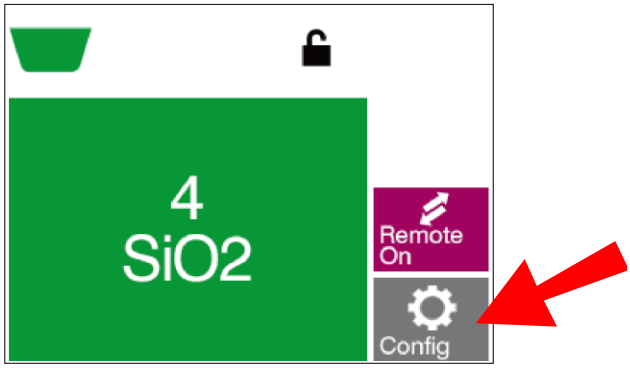


Figure 6-2, Configuration Screen

Once the indexer is unlocked then the **Config** (Configure) button can be pressed.

33. Alignment

Alignment sets pocket one center. Alignment needs to be set so that any gear backlash in the gear train is accounted for. Press the buttons to move the crucible till it is aligned. It must be moved a minimum amount till the “TOO CLOSE TO HOME SWITCH” message disappears.

There are two speed buttons, **Slow** and **Fast**. They are used so that pocket one is approached with the gear train tight. Use the **Fast** speed till pocket one is almost in position, and then use **Slow** speed to finish the alignment. If you overshot it press **Home** to try again.

After you press the **Ok** button the indexer will move full travel, then return to pocket one.

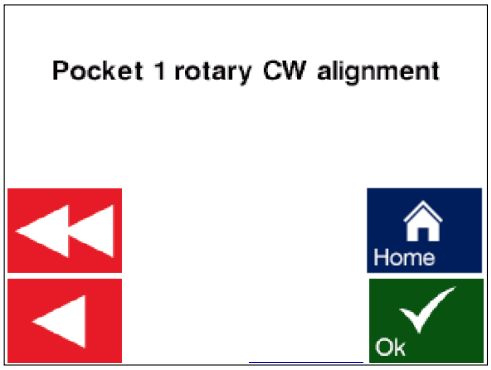


Figure 6-3, Alignment

34. Configure Screen

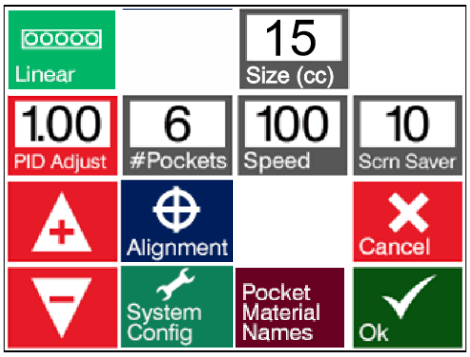


Figure 6-4, Configuration

First press the setting to adjust, it will turn red, then press the “+” and “-“ to adjust the numeric value.

Size – First adjust the pocket size.

PID Adjust – Adjustment for motor, default 1.00 (0.01-2.00)

#Pockets – Total number of pockets in crucible (2-10, the number depends on crucible size selected.)

Speed – Maximum rotational speed (0-100%)

Scrn Saver (Screen Saver) - Time till indexer goes into screen saver mode and blanks the screen (0-300). Touch the screen to wake screen up. The indexer is always operational if the power is on.

System Config – goes to the System configuration sub menu.

Pocket Material Names – Material names can be added for each pocket. If no name is entered, then “Pocket” will be displayed.

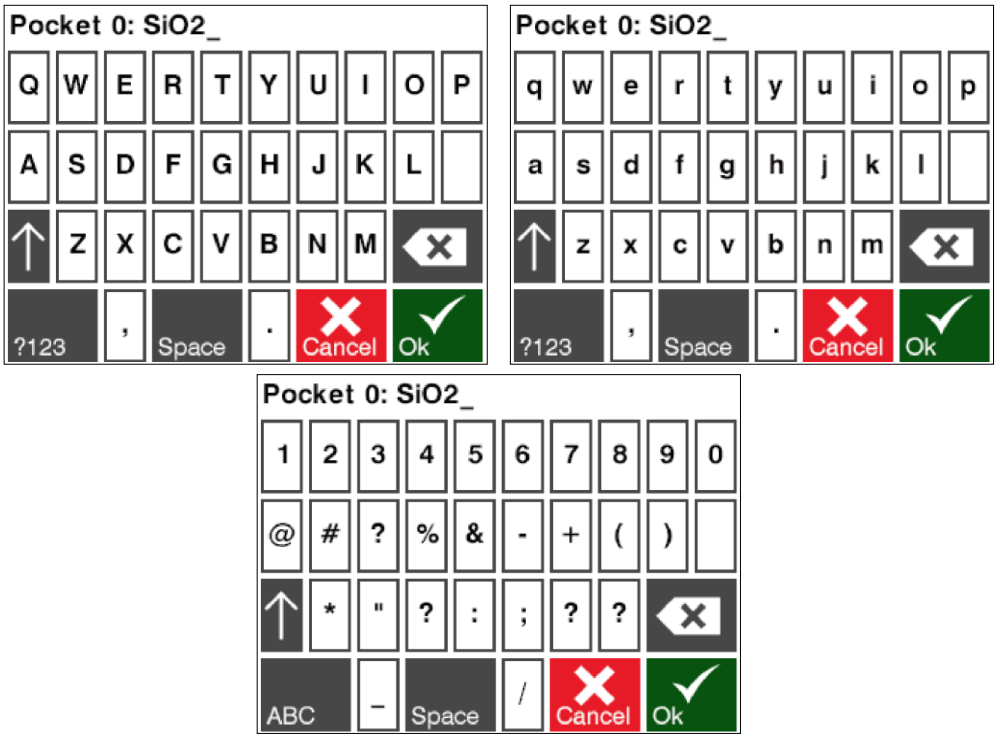


Figure 6-5, Entering Alfa Numeric Characters

35. System Configure Screen

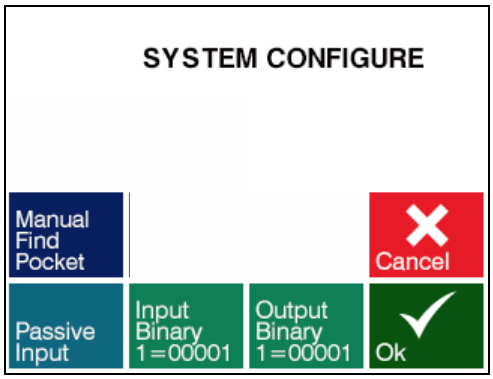


Figure 6-6, System Configure

Manual/Automatic Find Pocket – On power up operation

- **Manual** – When the Indexer is powered on a screen will ask to confirm the current pocket is aligned. Press ok if aligned or press “Manual Find Pocket” to make the indexer move the motor to verify its internal home position.
- **Automatic** - When the Indexer is powered on it will automatically make the indexer move the motor to verify its internal home position.

Passive/Active Input – Input can be configured two ways

- **Passive** TTL level inputs are activated by a short across the input pins. All passive inputs use earth as a common and there for are not isolated. For full isolation drive inputs with relays.
- **Active** inputs activated by 12 to 24 volts DC across the input pins. (Optically Isolated)

Input Binary 1=00000/1=00001/ Individual – Input to select a pocket from a PLC or other device can be selected by optically isolated inputs, up to 6 direct or up to 10 pockets using binary (see table below).

Output Binary 1=00000/1=00001/ Individual - Relay isolated outputs up to 6 pockets directly and up to 10 pockets using binary, these signals can be used to connect to a XY sweep to select a sweep pattern.

"Binary 1=00000" **Pocket Number**	"Binary 1=00001" **Pocket Number**	**Binary Bit 3**	**Binary Bit 2**	**Binary Bit 1**	**Binary Bit 0**
1	1*	0	0	0	0
2	1*	0	0	0	1
3	2	0	0	1	0
4	3	0	0	1	1
5	4	0	1	0	0
6	5	0	1	0	1
7	6	0	1	1	0
8	7	0	1	1	1
9	8	1	0	0	0
10	9	1	0	0	1
Not used	10	1	0	1	0

* Note 00001 and 00000 both equal one.

7 OPERATION

7.1 Power Up

Once alignment has be performed as described in the Configuration chapter 5 or 6, the indexer will remember where the pockets are even after power has been turned off and on. On power up the indexer rotate the crucible to find its internal reference home and then return to the last pocket it was at.

If for some reason the pocket does not line up repeat the Alignment procedure in chapter 5 or 6.

7.2 Operation

Crucible pockets are selected by pressing the large green button. A list of pockets will display. Press the desired pocket. The up or down arrow will bring up the rest of the list of pockets.

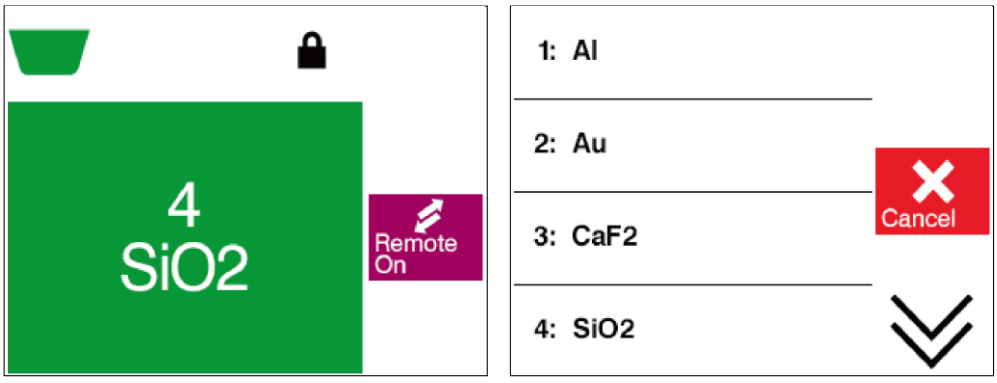


Figure 7-1, Pocket Selection

7.3 Banana and Continuous Rotation Control

Rotary indexers can control Banana and Continuous crucibles.

The Banana pocket can stop and start rotation. Press the **Start Rotate** button

When the crucible is not moving there is line across the rotate graphic.

When the crucible is rotating the graphic will spin.

Speed can be controlled by pressing the Banana Speed or Speed button.

7.4 Banana

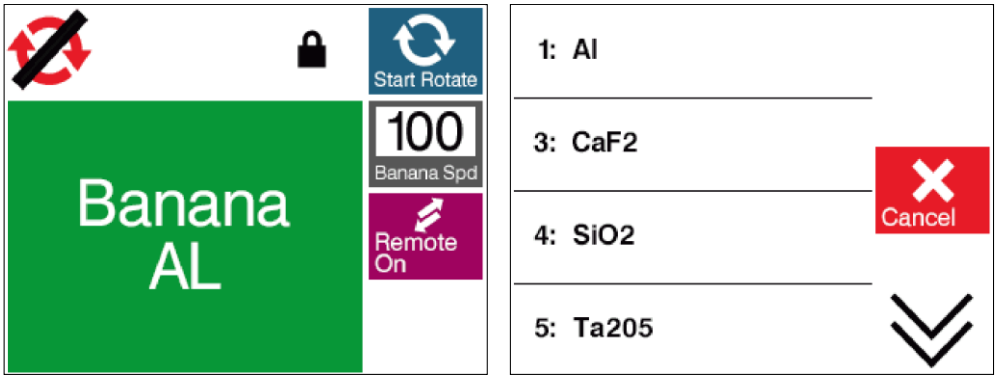


Figure 7-2, Banana Operation

The banana is always pocket 1. In the case above the banana end pocket is 2 so the next pocket after the banana is pocket 3.

7.5 Continuous

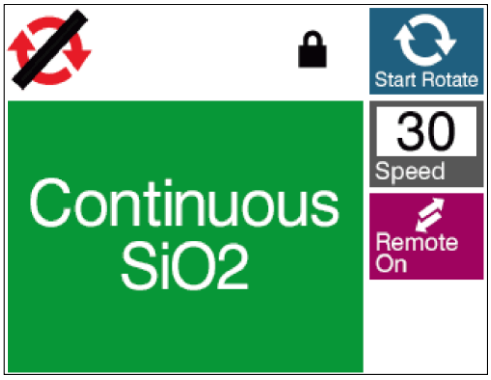


Figure 7-3, Continuous Operation

In this mode the crucible rotates continuously (varied by the speed control). This is commonly used with a trough type crucible.

7.6 Remote Operation

All types of crucibles can be operated remotely. Press the **Remote On** button to activate remote operation. “Remote Control On” will be displayed when in remote mode. Remote is force and cannot be changed by the user if Input pins closed.

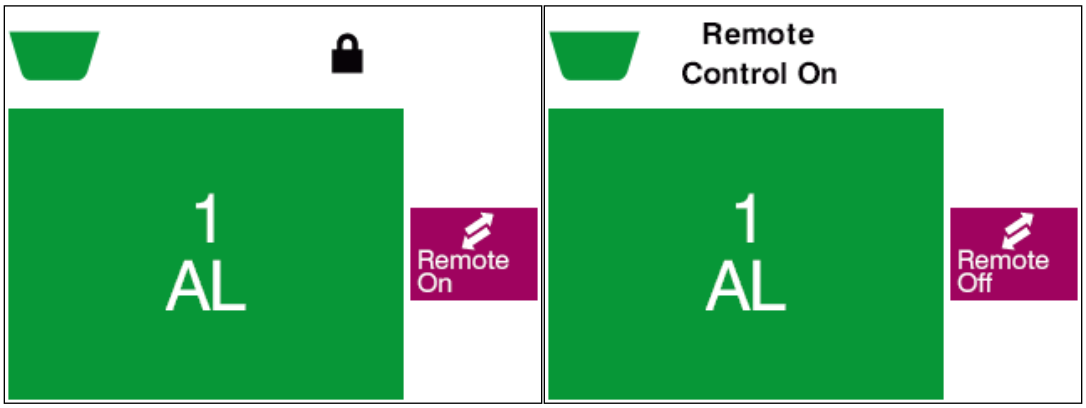


Figure 7-4, Remote Operation

8 MAINTENANCE AND SERVICE

8.1 Maintenance

The Indexer does not require any special maintenance work except checking that the shaft couplers are tight.

8.2 Cleaning

For cleaning the outside of the device, a slightly moistened cloth will usually do. Do not use any aggressive or abrasive cleaning agents.

Mains voltage.

Components inside of the indexer controller are components to mains voltage.

Protect the device from liquids.

Do not open the device.

9 STORAGE AND DISPOSAL

9.1 Packaging

Please keep the original packaging. The packaging is required for storing the Indexer and for shipping it to a Telemark service center.

9.2 Storage

The Indexer may only be stored in a dry room. The following requirements must be met:

Ambient temperature: -20….+60 °C

Humidity: as low as possible. Preferably in an air-tight plastic bag with a desiccant.

9.3 Disposal

The product must be disposed of in accordance with the relevant local regulations for the environmentally safe disposal of systems and electronic components.

9.4 WEEE

The use of the Waste Electrical and Electronic Equipment (WEEE) symbol (see Figure 8-1) indicates that this product may not be treated as household waste. By ensuring this product is disposed of correctly you will protect the environment. Recycling information of this product can be obtained at the place of sale, your household waste disposal service provider, or local authority.

Figure 9-1, WEEE Symbol

10 ERROR CODES

These are HARD alarms that force a stop condition and require hardware fix and controller reboot to clear. The rotary models 386/398 use the same controller as the linear model 397. All error codes are listed below.

"EEPROM failure - no acknowledge"

EEPROM access did not receive acknowledge from EEPROM chip.

Most likely a faulty EEPROM chip.

"EEPROM failure - write verify"

EEPROM data did not verify after writing.

Most likely a faulty EEPROM chip.

"PWM shutdown - motor shorted"

Motor current exceeds 4 amps.

Most likely due to shorted cable or motor.

Can also occur during a hard stall. This requires manual turning of the motor to unstick the brushes.

"Motor stall timeout"

Motor current exceeds stall threshold for stall timeout period.

Occurs when crucible jams and will not turn.

Can also occur during a hard stall. This requires manual turning of the motor to unstick the brushes.

"Motor assembly cable disconnected"

D15 cable is unplugged/loose or pins have become dislodged.

"Motor not connected"

Motor current is less than 4 mill-amps for undercurrent timeout period.

Most likely cause is disconnected/loose motor cable.

"Motor polarity swapped"

LINEAR source moves 1/32" in the wrong direction.

ROTARY source moves 10 degrees in the wrong direction.

Most likely caused by motor wires or motor cable wires swapped.

"Motor speed is zero"

Motor not turning for timeout period when moving to pocket.

Most likely caused when lightly jammed (stalled) when speed setting is too low.

"Indexer model unknown"

Configuration four bit code at motor assembly is unknown.

Most likely caused by loose D15 cable or dislodged pins.

"MICRO switch EndStop encountered" (linear model 397)

LINEAR source has travelled too far toward end pocket.

Most likely caused by loose end stop switch assembly.

Could also be caused by dislodged quadrature encoder signal D15 cable pins.

Could also be caused by faulty motor quadrature encoder.

"HOME switch EndStop encountered" (linear model 397)

LINEAR source has travelled too far toward pocket one.

Most likely caused by loose opto-switch vane assembly on travel carriage.

"OUT OF POSITION" (linear model 397)

LINEAR source has greater than 1/8" travel error after passing an opto-switch.

Most likely caused by too much backlash in worm drive.

Could be caused by loose opto-switch vane assembly on travel carriage.

ROTARY source InPocket feedback not valid.

Most likely caused by loose drive train.

Could be caused by disconnected in-pocket feedback switch.

"ROTATION TIMEOUT"

ROTARY continuous source In-Pocket feedback not valid.

Most likely caused by loose drive train.

Could be caused by disconnected in-pocket feedback switch.

" HOME SWITCH NOT FOUND **"**

ROTARY source has traveled 1.5 revolutions without encountering the home switch.

Most likely caused by loose home switch assembly.

Could be caused by loose drive train.

"REMOVE motor box opto jumpers" (linear model 397)

LINEAR source has one or more opto-switch jumpers installed on motor box PCB.

ALL jumpers need to be removed when updating to software version 3.31.19101 or later.

The following alarms are not considered HARD but they do force the entering of a valid value of the variable in question. Use unlock to access the CONFIG screen.

"Invalid system parameters CRC"

System parameter checksum is not valid.

Most likely caused by updating to a different software version that has a different number of parameters.

NotaBene: Parameters are not saved to EEPROM until "OK" button is pressed on Config screen.

"Invalid crucible type"

Crucible type: ROTARY, LINEAR, CONTINUOUS or BANANA

"Invalid PID factor"

PID factor: 0.01 to 2.00

"Invalid find pocket type"

Find pocket type: Manual or Auto.

"Invalid input select type"

Input select type: Active or Passive.

"Invalid input coding type"

Input coding type: 1=00000, 1=00001 or INDIVIDUAL.

"Invalid output coding type"

Output coding type: 1=00000, 1=00001 or INDIVIDUAL.

"Invalid rotation type"

Rotation type: Bidirectional, CWonly or CCWonly.

"Invalid mode"

Mode: LOCAL or REMOTE.

"Invalid number of pockets"

Number of pockets: 1 to #POCKETS.

"Invalid current pocket"

Currently selected pocket is invalid.

"Invalid speed"

Motor speed: 5% to 100%.

"Invalid banana speed"

Banana motor speed: 5% to 25%.

"Invalid banana end pocket"

Banana end pocket: 2 to #POCKETS.

"Invalid linear size index"

Linear size data structure index: 0 to 4.

"Invalid motor direction"

Motor direction: CW or CCW.

"Invalid screen saver minutes"

Screen save minutes: 0 to 300.

"Invalid CW home offset"

CW home offset is out of range.

"Invalid CCW home offset"

CCW home offset is out of range.

"Invalid backlash degrees"

Backlash degrees: 0 to 9.99.

"Invalid position switch count"

Position switch count: -1 to 10.

"Invalid inpocket feedback type"

In-pocket feedback type: No pocket feedback or Pocket feedback.

"Invalid model398 stall type"

Model 398 stall type: StandardStall or SSCstall.

"Invalid Home Every Pocket type"

Home every pocket type: No HomeEveryPocket or HomeEveryPocket.

11 WARRANTY CONDITIONS

11.1 Limited Warranty

The 396/397/398/399/391 Electron Beam Source Crucible Indexer is guaranteed against faulty materials, function and workmanship for a period of 12 months after delivery from Telemark. Components which are purchased by Telemark from other manufacturers will be guaranteed for any lesser time that such manufacturer warrants its products to Telemark. This warranty is valid only for normal use where regular maintenance is performed as instructed. This warranty shall not apply if repair has been performed or an alteration made by anyone other than an authorized Telemark representative or if a malfunction occurs through abuse, misuse, negligence or accident. No charge will be made for repairs made under warranty at Telemark's facilities. Freight costs both ways will be at customer's expense. Telemark reserves the right for final warranty adjustment.