



# **MODEL 397 ELECTRON BEAM SOURCE LINEAR CRUCIBLE INDEXER**

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## **INSTRUCTION MANUAL**

Software version 3.32.19130

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Current version of this manual can be found at

<https://telemark.com/electron-beam-sources/e-beam-accessories-and-upgrades/indexers/>

## WARRANTY

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The 397 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.

## USER RESPONSIBILITY

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The user is responsible for proper operation and ordinary maintenance of the equipment, following procedures described in this manual, including reference documents. Proper operation includes timely replacement of parts that are missing, broken or plainly worn. If the user has a reasonable doubt about understanding the use or installation of a component, Telemark Technical Service should be called.

It is vitally important that the user properly install the equipment as described in Chapter 3 (Installation) of this manual. The warranty will be void if the equipment is improperly installed.

Alteration of the design or any function of the equipment voids the warranty and is entirely the responsibility of the user.

## SAFETY WARNING

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General Precautions: Human contact with the voltages present within the power supply and vacuum system can be fatal. Make sure that the input power is turned off before opening the doors or removing panels. Short all HV feedthroughs connections with a grounding hook before accessing the indexer main body.

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# 1

## UNPACKING

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Your Model 397 electron beam source crucible indexer is packed into a specially designed double strength box surrounded with rigid foam padding.

Since packaging the indexer for safe shipment is otherwise difficult, please save the box in the event that the indexer may ever need to be returned for servicing.

We cannot be held liable and may not be able to fix without charge indexers which are damaged in transit as a result of improper packaging.

Contents of shipping box:

- Indexer mechanism
- Controller
- Power cord
- Indexer motor cable
- Indexer control cable

# 2

## DESCRIPTION

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The indexer positions the crucibles of a Telemark linear type source (models 568, 575 and 578). It also has a position-indicating function. The indexer features a high torque motor.

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
- It can index up to 9 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 9 binary (software selectable active or passive)
- Relay isolated outputs In-position up to 6 pockets directly and up to 9 pockets using binary, Mode signal and General In position signal

### Specifications

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Number of pockets: 2 to 9

Controller dimensions: 19-inch rack 2U, 3 1/2" high x 9 3/8" deep

Motor Assembly Dimensions: 5.83" (148mm) x 4.60" (117mm) x 2.50" (64mm)

Inputs: 8 optically isolated, active (4 to 24V DC or AC), or passive (contact closure)

Outputs: 8 relay contacts NO/NC @ max 1A, 24 DC or AC

Power Input: 90-260VAC, 50-60 Hz

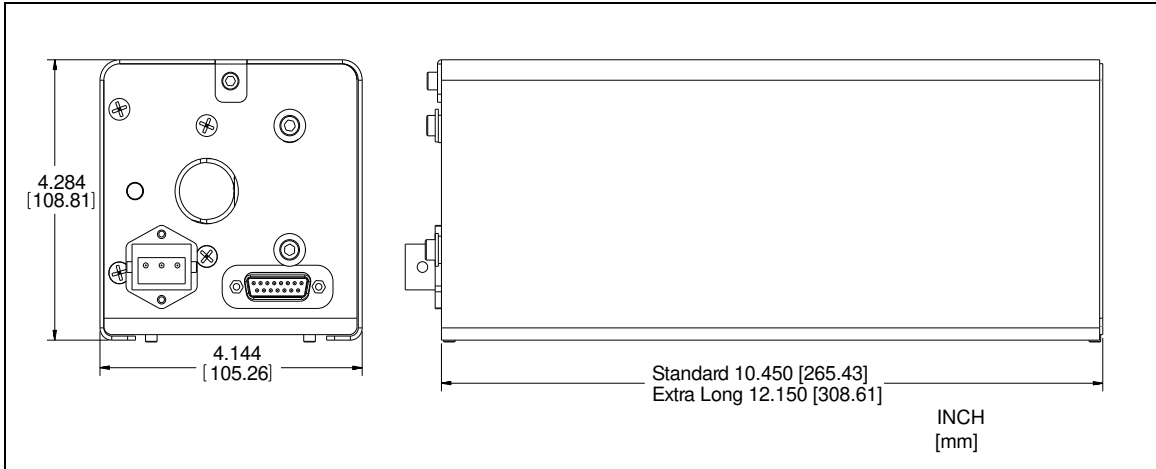


Figure 2-A Motor Assembly Reference Dimensions

# 3

## INSTALLATION

### 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 indexer controller.

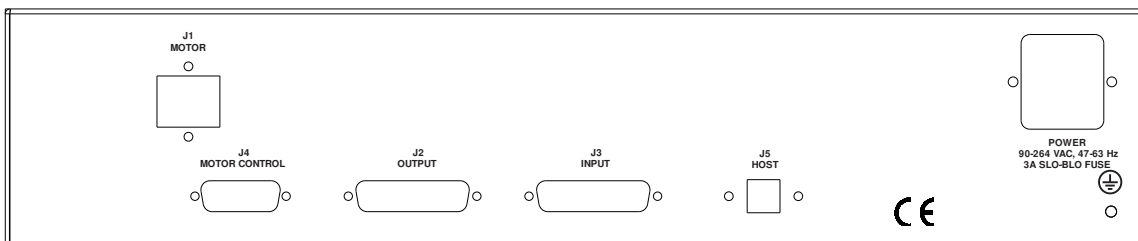


Figure 3-A Rear Chassis

### 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.

### Inputs - J3

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.

The optically isolated input 25 pin female connector on the back of 397 indexer controls the remote pocket selection, up to 6 pockets directly and up to 9 pockets using binary code.

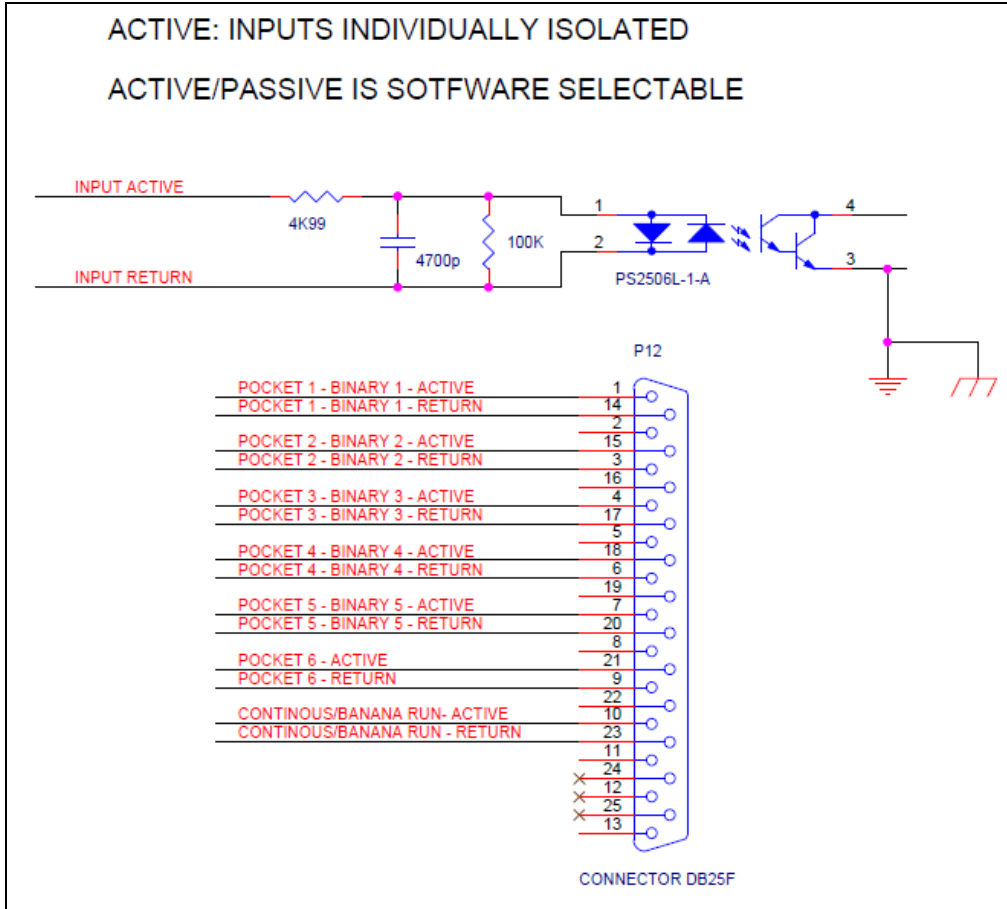


Figure 3-B Active Input Connections



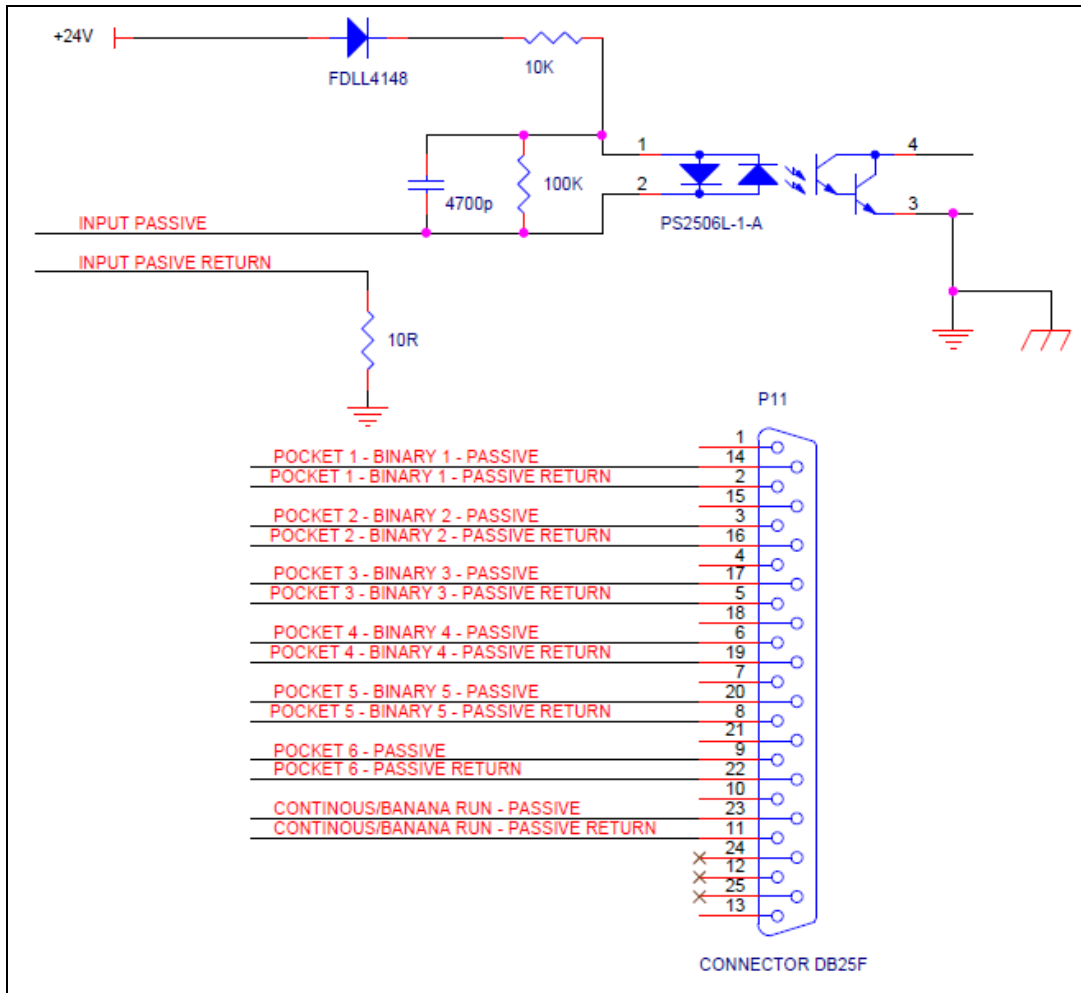


Figure 3-C Passive Input Connections

## Outputs – J2

The outputs are on a 25-pin male connector on the back of 397, isolated SPST relays, 50VDC max, 2A max.

Outputs are:

1. **Pocket signal**, up to 6 pockets directly and up to 9 pockets using binary. These signals can be used in conjunction with 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.

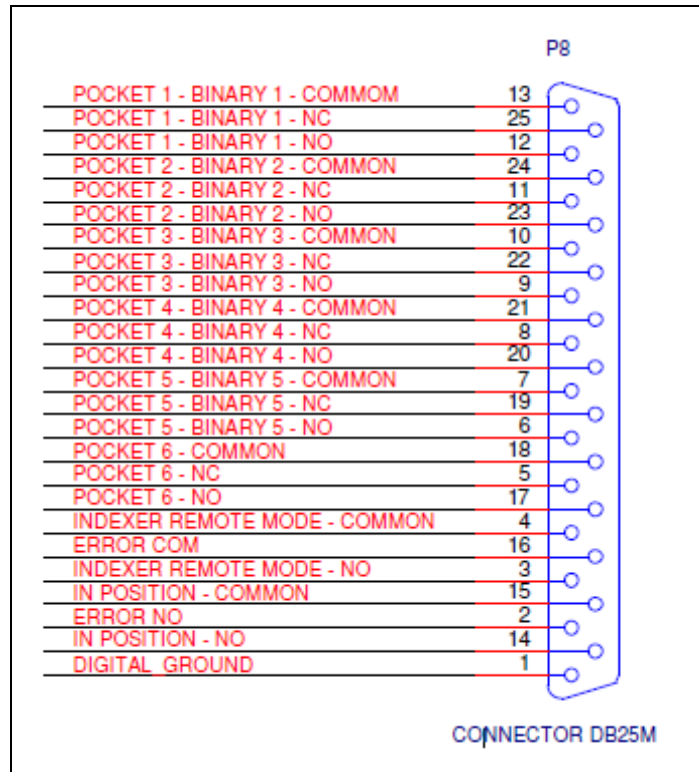


Figure 3-D Output Connections

## Host - J5

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The host port is for upgrading the indexer software.

## Motor Assembly

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

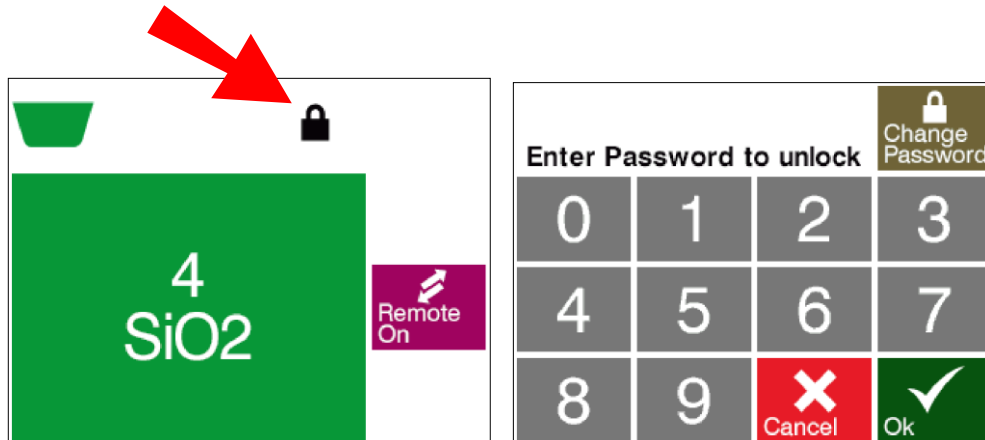
# 4

## CONFIGURATION

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### Unlocking

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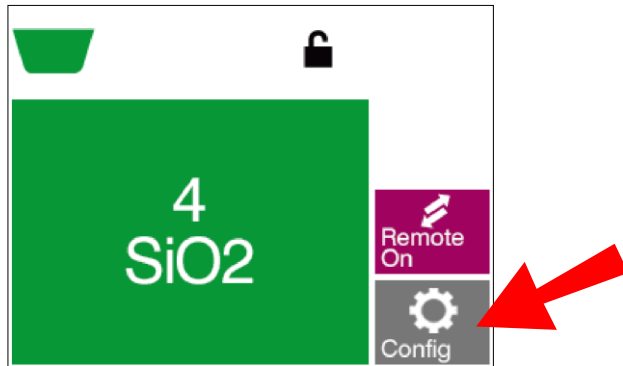


To configure the indexer first it must be unlocked. Press the lock to unlock the sweep and enter the password.

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.

## Configuration

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

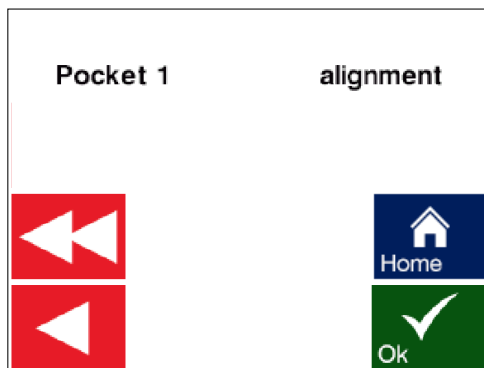
### Alignment



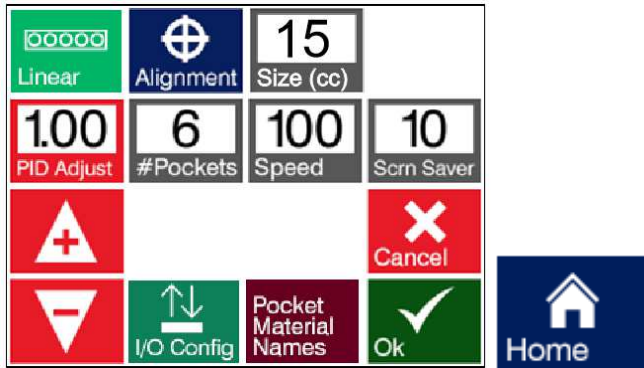
Alignment sets pocket one center. Alignment needs to be set so that any gear backlash in the gear train is accounted for. Press the buttons to move the crucible till it is aligned. It must be moved a minimum amount till the “TOO CLOSE TO HOME SWITCH” message disappears.

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 over shot it press **Home** to try again.

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



## Config



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)

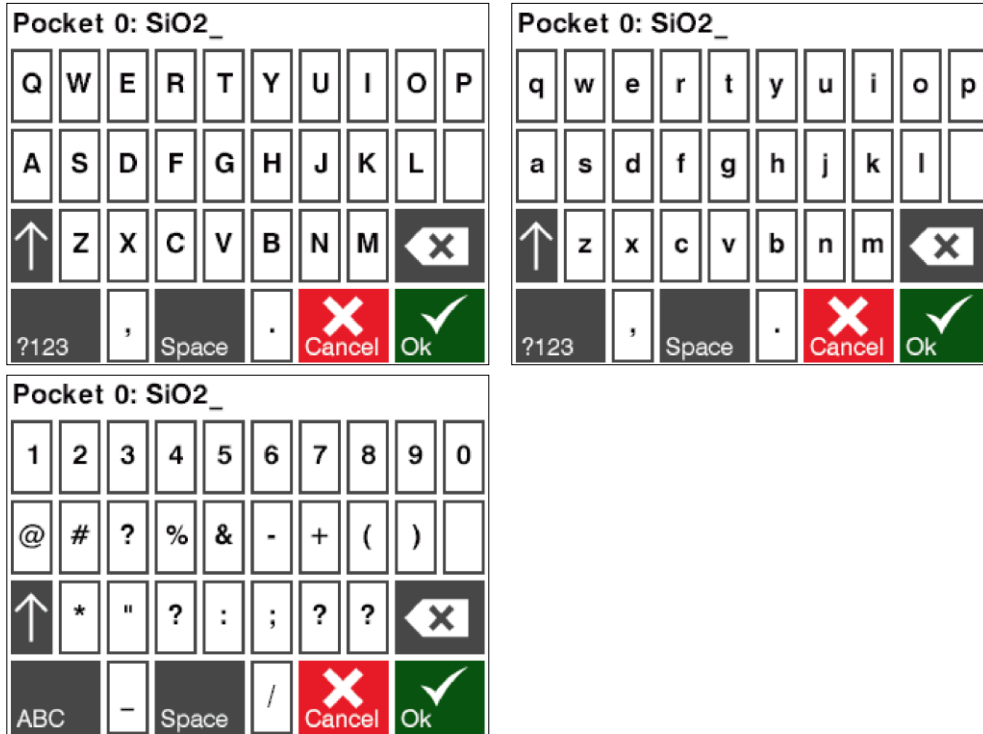
**#Pockets** – Total number of pockets in crucible (2-9, the number depends on crucible size selected.)

**Speed** – Maximum rotational speed (0-100%)

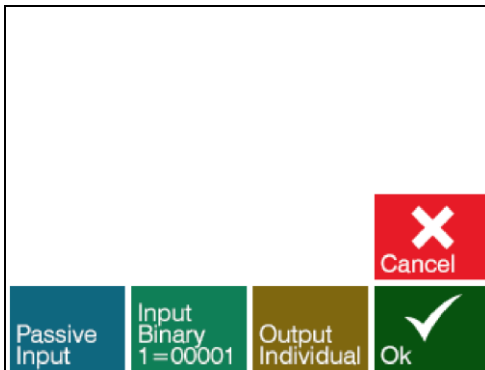
**Scrn Saver** (Screen Saver) - Time till indexer goes into screen saver mode and blanks the screen (0-300). Touch the screen to wake screen up. The indexer is always operational if the power is on.

**I/O Config** – goes to the I/O configuration sub menu.

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



## I/O Config



**Passive/Active Input** – Input can be configured two ways

1. **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.
2. **Active** inputs activated by 12 to 24 volts DC across the input pins. (Optically Isolated)

**Input Binary 1=0000/1=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 9 pockets using binary (see table below).

**Output Binary 1=00000/1=00001/ Individual** - Relay isolated outputs up to 6 pockets directly and up to 9 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
Not used	9	1	0	0	1

\* Note 00001 and 00000 both equal one.

# 5

## OPERATION

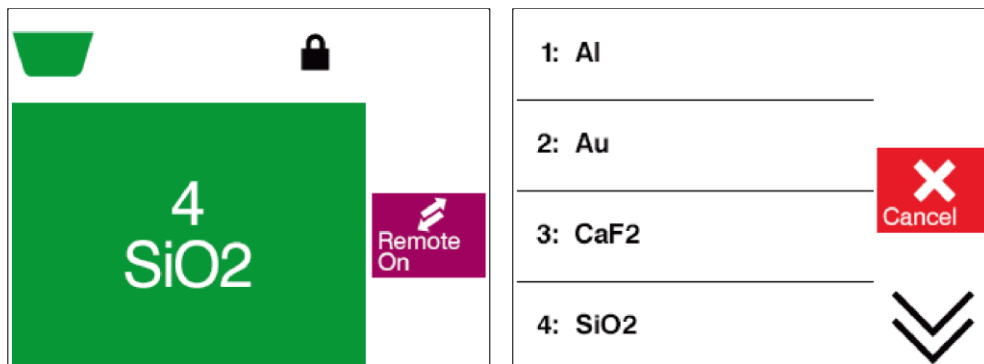
### Power Up

Once alignment has been performed as described in the Configuration chapter 4, the indexer will remember where the pockets are even after power has been turned off and on. On power up first there is a splash screen with the software revision number. Then the screen asks the user to confirm the current pocket. If the crucible has not been moved then press Ok. If the crucible has been moved due to an operation such as cleaning then press Find Pocket and the indexer will check its internal reference point and then return to the indicated pocket.

If the EB source, indexer motor or any of the drive linkage has been disconnected or for some reason the pocket does not line up then press Ok and then repeat the Alignment procedure in chapter 4.

### 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.







When the crucible is moving the graphic will spin.

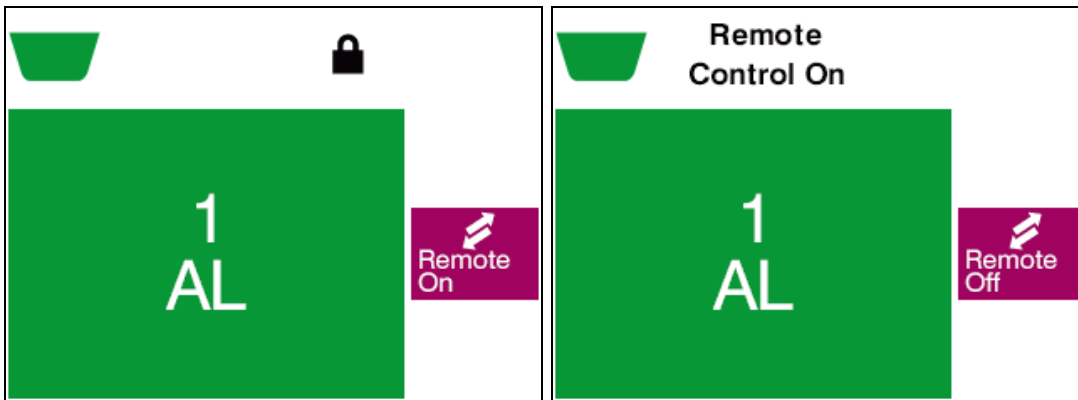


When the crucible is in position the green pocket will be displayed.

## Remote Operation

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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.



## Error Codes

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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 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 source has travelled too far toward pocket one.

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

**"OUT OF POSITION"**

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 InPocket 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 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"**

Inpocket 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.

# TELEMARK EU Declaration of Conformity

No 01/CE/15

Battle Ground, 18-11-2015

## Telemark

1801 SE Commerce Ave  
Battle Ground, WA 98604 USA

/manufacturer/

This declaration of conformity is issued under the sole responsibility of the manufacturer.

**Commercial name:** POCKET INDEXER CONTROLLER

**Generic denomination/function:** The Models 396 and 398 indexers provide either manual or PLC selection of 4 to 30 pockets, and continuous or retrograde (banana pocket) operation with speed control. The Model 397 offers 2 to 9 pocket selection for linear sources.

**Models:** 396, 397, 398

The object of the declaration described above is in conformity with relevant Union harmonisation legislation:

EMC DIRECTIVE  
2014/30/UE

*DIRECTIVE 2014/30/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 2004/108/WE*

STANDARD  
EN 61326-1:2013


*Electrical equipment for measurement, control and laboratory use. EMC requirements. General requirements.*

LVD DIRECTIVE  
2014/35/EU

*DIRECTIVE 2014/35/EU OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 26 February 2014 on the harmonisation of the laws of the Member States relating to the making available on the market of electrical equipment designed for use within certain voltage limits and repealing Directive 2006/95/WE*

STANDARD  
EN 61010-1:2010

*Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements*

This declaration is the basis for affixing the  CE conformity marking.

This declaration relates exclusively to the machinery in the state in which it was placed on the market, and excludes components which are added and/or operations carried out subsequently by the final user.

Battle Ground, 18-11-2016  
(place and date of the declaration)

  
Gerald G. Henderson  
President