

Smart Arm Installation and Setup Guide

PS1E, PS2E and PS150E

Objective: The guideline is intended to detail the installation and setup instructions for the Smart Motion Smart Arms systems, including the PS1E, PS2E and PS150E models.



Unpacking: Unpack all items and verify contents. Items should include:

- Smart arm controller
- Smart arm with encoders and encoder cables
- Pillar for mounting the arm
- Interface cables for communication to driver controller or external PLC
- Tool Holder
- Purchased options which can include:
 - Smart bins
 - Smart bit tray: 8 position or 4 position
 - Barcode reader.



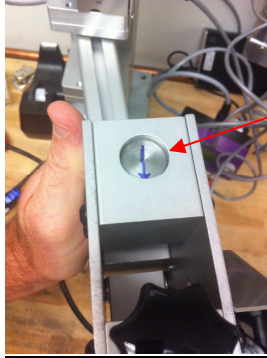

Note: PS2E arm is fully assembled at time of shipment. Larger PS1E and PS150E arms and shipped as two pieces, the outer arm is removed from the main bearing post for ease of shipment.

Electrical Detail: The smart control box is specifically designed to work with either a two encoder or three encoder smart arm. In both cases, the arm is an X,Y position arm only. The third encoder monitors the change in arm position in Z but translates the change in length of the arm.

The smart controller requires a power source from the driver controller, PLC or external power supply. The power requirement is 24VDC, 0.5A max. Power is supplied into the controller via the H10 connection port.

The connection ports of H7, H8 and H9 are used for IO interface of options such as smart bits, smart bins or PLC interface. Each port has 8 inputs and 4 outputs that can be wired as sinking or sourcing.

Installation:

<p>1.0 Mount Pillar to solid workbench or base using clamps or mounting bolts.</p>	
<p>2.) Mount arm base to pillar. Depending on length of arm, mounting plate for the arm can have either 2 or 4 bolts for locking</p>	
<p>3.) Mount outer arm onto main bearing post. Typically required only for PS1E or PS150E, depending on shipping requirements may also be required for PS2E. Make sure arrow on shaft points in direction of outer arm, this aids the homing process. When arm is shipped in two pieces, H3 encoder cable will need to be re-routed through cable clamps on side of main arm extension.</p>	 <div data-bbox="1170 1094 1459 1224" style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>Arrow pointing in direction of outer arm</p> </div>
<p>4.) Connect encoder cables to smart control box. Encoder cables should be labeled H1, H2 and H3. Connect to corresponding ports on controller</p>	

5.) Connect main power interface cable to Smart controller. For normal operation this is one cable from driver controller to smart controller. Cable will be labeled H10. If using PLC mode you will have a second cable connected to the H7 port for recipe selection. Please reference appropriate H10 cable drawing for connecting to driver controller.



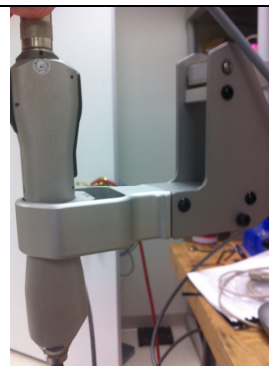
6.) Connect Accessory items. H7, H8 and H9 are used for connecting smart bit and smart bin systems. Not all connections are required but you must start with H7. If using both smart bits and smart bins, the smart bits take precedence and must be connected to H7. Smart bins will be connected to H8 and H9 if required. If only using smart bins then start with H7.



7.) Connect barcode reader into H6 if used. Note power for barcode reader must be connected into side of gray cable.



8.) Install driver and tool holder, each model arm has different tool holders which require a different mounting interface. Photo to the left details tool holder mounting for PS1E style arm.





Setup: Typically each arm is pre-configured prior to shipment. Below are the details for configuring the smart arm. Configuring the smart arm requires the user to login into the Maintenance menu using PIN 7439, this will add additional items available in the Maintenance mode. Please see login details below:

Note: The jog dial on the front of the controller is the main user interface to the menu items. Rotating the button changes the current selection while pushing the jog dial button selects the current displayed item.

Maintenance Mode Login:

- 1.) Scroll to "MAINT", push jog dial
- 2.) "LOGIN" will flash and push jog dial a second time
- 3.) Controller will flash "P 0***", scroll jog dial button until "7" appears in first digit, push jog dial to select second digit.
- 4.) Scroll jog dial button until "4" appears in second digit, push jog dial button to select third digit
- 5.) Scroll jog dial button until "3" appears in third digit, push jog dial button to select fourth digit
- 6.) Scroll jog dial button until "9" appears in fourth digit, push jog dial to complete process
- 7.) "OK" will appear on the display when process is successful.

- **Output Type (Driver configuration)**

- In Maintenance menu, scroll to "OUTTYP" and push button
- Current output type will be displayed options are:
 - "MICRTC" for Microtorque tool from Atlas Copco
 - "KLV d0" for Kolver and ASG
 - "ATLAS" for Atlas Copco, Stanley and IR tools
 - "ECRA" for Ecra tools
- Rotate jog dial to select appropriate tool and push button
- Display will flash "Busy" then you will be ready

- **Mode (How the arm functions during operation)**

- Three available options:
 - Torque Mode: For a given set of fasteners in torque mode, the fasteners can be completed in any given order. Tool will be disabled when not is a predefined location, when arm is over a defined location, tool becomes enabled.
 - Sequence Mode: For a given set of fasteners in sequence mode, the fasteners must be completed in the order in which they were defined during the recipe teaching. Tool will only be enabled when at the proper fastener for the given sequence
 - PLC Mode: This mode of operation is where an external PLC controls the sequence of moving forward and backward in a recipe. The PLC also has the ability to select the proper recipe in the smart controller via IO. This mode is firmware configurable only and is not field enabled.
- To turn on Sequence mode, In Maintenance menu scroll to "CH MOD" and push button.
- Display will flash current mode, Sequence will be either ON or Off indicating it is in Torque Mode. To change scroll selection and push jog dial.

- **Smart Bit configuration**

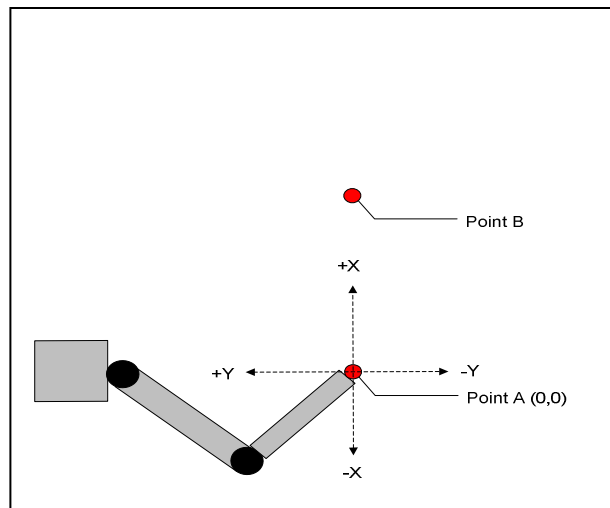
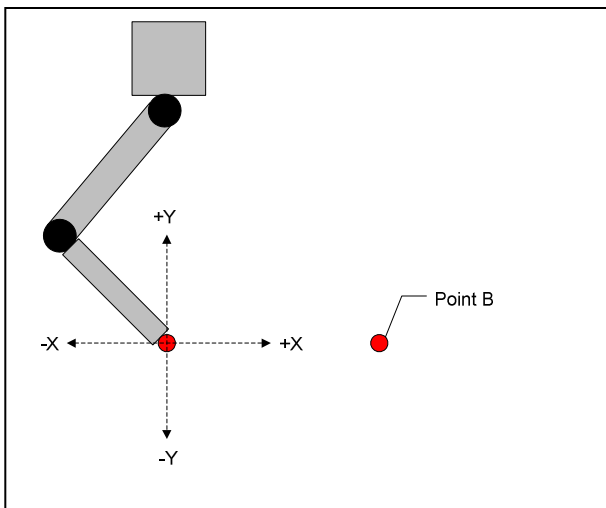
- In Maintenance menu scroll to “BITCNT” and push button
- Current available quantity will flash, scroll to required number and push button
- Two types of bit trays available, 8 Bit or 4 bit. The type of tray must also be configured
- In Maintenance menu scroll to “BITTYP” and push button
- Current type will be displayed, scroll to desired type and push button.

- **Smart Bin configuration**

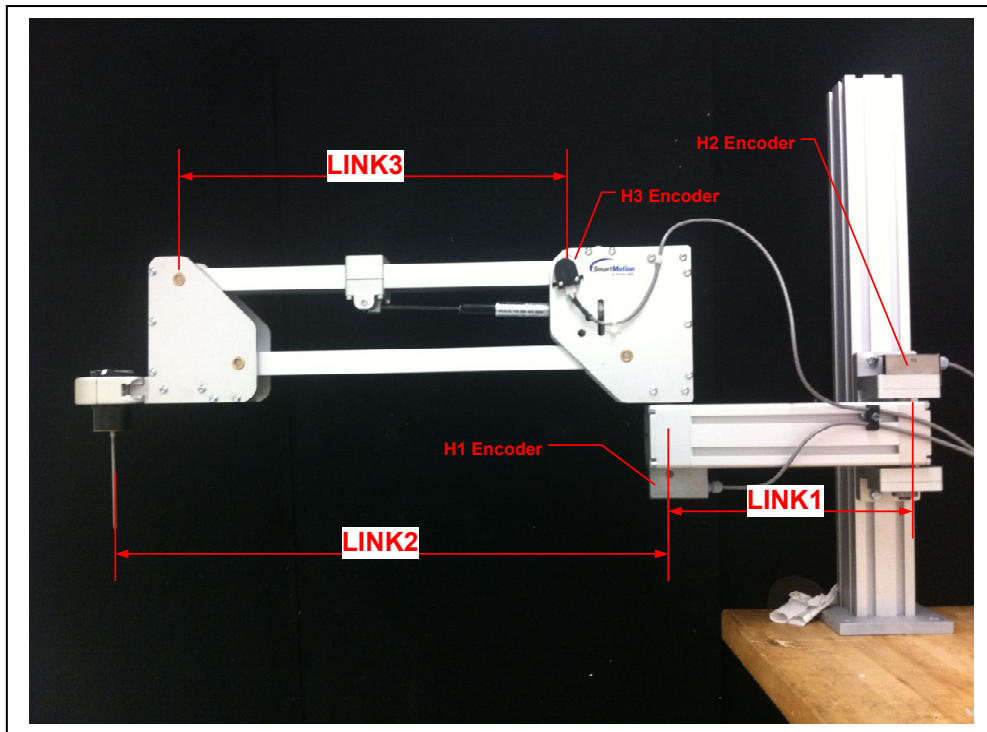
- In Maintenance menu scroll to “BINCNT” and push button
- Current available quantity will flash, scroll to required number and push button

- **System Calibration (SETORG)**

- This process defines the origin and coordinate system for each smart arm.
- Prior to running this process, two calibration points must be defined, Point A and Point B.
- It is recommended that point A be inline with the Arm pillar if possible. The distance away from the main pillar is not as critical but a good place to start would be about ½ the total reach of the arm.
- The second hole, Point B should be located to the right and inline with point A. The default distance between the points is 450mm, we recommend a value between 250-450mm. Below shows two typical layouts for calibration points.



- In order to accurately complete the SETORG process four parameters must be accurately measured and entered into the Smart controller:
 - LINK1: Distance in mm between H1 and H2 encoders
 - LINK2: Distance in mm between H1 encoder and centerline of tool.
 - LINK3: Distance in mm between H3 encoder and front pivot point for outer arm
 - CALLEN: Distance in mm between Point A and B.



- To enter link lengths, in Maintenance menu scroll to LINK1 press jog dial.
- Display will show current length, cycle through digits using jog dial to enter LINK1 dimension.
- Repeat process for LINK2, LINK3 and CALLEN.

NOTE: As part of the SETORG process LINK2 actually gets calculated, the value you enter into the LINK2 needs only to be close. Other values must be measured as accurately as possible.

- To run the SETORG process, in Maintenance menu scroll to "SETORG" and press jog dial
- Display will show "ORIG-Z", move arm up so that it is completely horizontal and press button
- Display will show "ORIG-L", move tool bit to point A so arm is in left orientation, i.e. arm bent to the left, press button. This will become the origin, point 0,0.
- Display will show "ORIG-R", rotate arm to right orientation, i.e. arm bent to the right and maintain the tool bit in point A, press button.
- Display will show "ORIG-b" – Keeping the arm in the right orientation as the last point, move the tool bit to point B, and press button. This point is calibration point B and will become coordinate ddd,0 where ddd is distance from the calibration point A as detailed in the CALLEN value. The Smart box software will estimate the position measurement error and display it as "E x.x" where x.x is estimated error in millimetres. For example "E 1.6" means that the error is approximately 1.6 millimetres. Under normal operating conditions an error of less than 4mm shall be acceptable. If the download option is being used, this error should be 2.0mm or less. The dimension of Link 2 will be calculated and stored in the Smart controller.

- **Barcode Reader Setup**

- The barcode reader (Symbol LS2208 1D linear scanner) is used to select the recipe that is required, this replaces manually selecting via the jog dial button. Each reader is preconfigured prior to shipment below is the details of the preconfiguration process.

Communication to the Smart Arm controller is via the RS232 port found on H6 of the controller. The following are the required com port settings of the controller.

Baud Rate: 19200
Parity: None
Stop Bits: 1
Data Bits: 8
Flow Control: None

These settings with the exception of the baud rate are the default settings for the LS2208. To change the baud rate to the required value of 19200, scan the barcode below:



Baud Rate 19,200

In order for the Smart Box controller to recognize the barcode string, the reader must be programmed to provide a carriage return / line feed as part of the data string. In order to configure the LS2208 scanner for this features scan the following barcodes in sequence: **(Note: These is configured by KolverUSA if reader is purchased with smart arm system.)**



Scan Options



<DATA> <SUFFIX>



Enter

- **Barcode Reader Setup, storing barcodes**
 - From Maintenance menu scroll to “TCH bC”, press button.
 - Select the required recipe number to store the barcode, press button
 - Scan the required barcode, reader should beep and display should respond with “saved”
 - Continue until all barcodes are assigned. When complete, scroll until you see “Exit” and press button.

- **Barcode Reader Setup, deleting barcodes**
 - From Maintenance menu scroll to “dEL bC”, press button.
 - Select the required recipe number to delete the barcode, press button.
 - Once the correct recipe is selected, press the button and you will see the recipe number with an “N”, scroll to change to “Y”, press button. This will only delete the barcode association, not the recipe itself.
 - To delete all barcode recipe associations, scroll and select “All” rather than a specific recipe number.