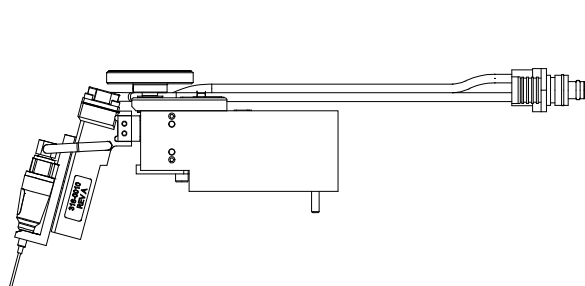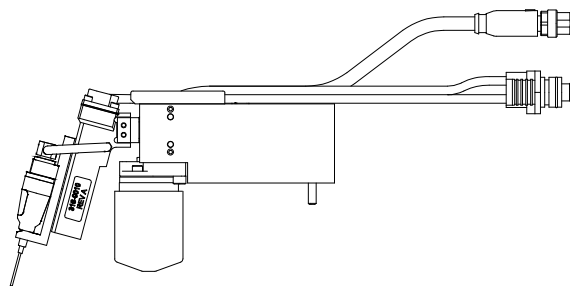# XANDEX INC.

MICRO-Z SMALL DOT PNEUMATIC INKER
INSTALLATION AND OPERATION MANUAL
Models 340-7110 and 340-7120

820-0332   Revision E
January, 2025

340-7110 Manual Micro-Z Inker   340-7120 Motorized Micro-Z Inker

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IMPORTANT OPERATION NOTICE!

The Model 350-0027 Micro-Z Small Dot Pneumatic Controller has two (2) air inputs. Each is designed to operate at **80 ± 5 PSI**.

FAILURE TO SET BOTH AIR REGULATORS PROVIDING AIR TO THE CONTROLLER AT 80 PSI WILL RESULT IN INCONSISTENT SYSTEM OPERATION!

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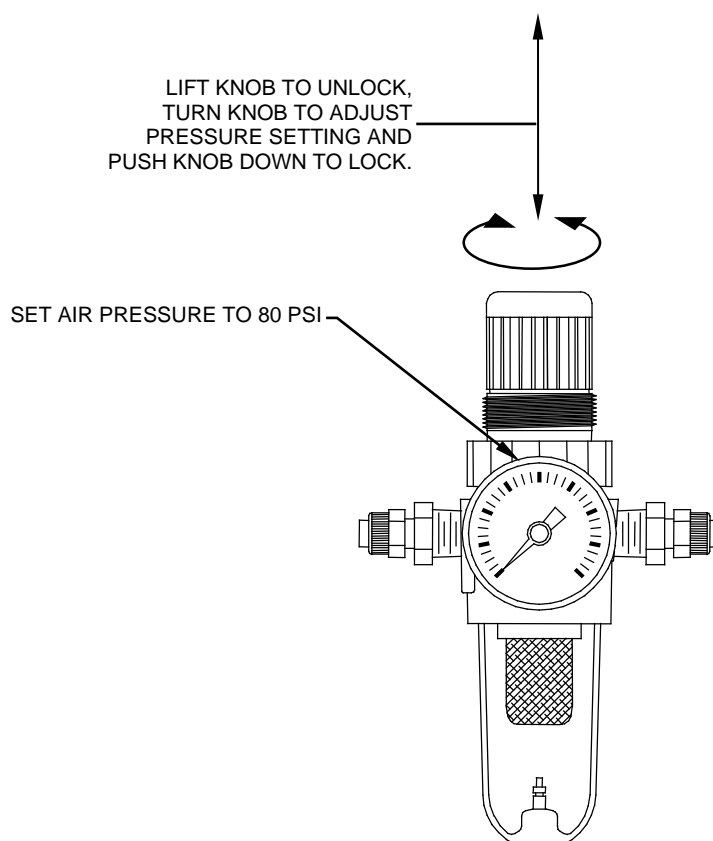Website:www.hugle.co.kr

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IMPORTANT OPERATION INFORMATION!

The Model 350-0027 Micro-Z Small Dot Pneumatic Controller requires two independent filtered air inputs, one for the Inker Shuttle mechanism and one for the DM-2 Pneumatic Ink Cartridge. Each input is designed to operate at **80 ± 5 PSI**.

FAILURE TO SET THE REGULATORS PROVIDING AIR TO THE CONTROLLER AT 80 PSI WILL RESULT IN INCONSISTENT SYSTEM OPERATION!

LIFT KNOB TO UNLOCK, TURN KNOB TO ADJUST PRESSURE SETTING AND PUSH KNOB DOWN TO LOCK.

SET AIR PRESSURE TO 80 PSI

For more information contact Xandex Customer Service at (707) 763-7799 or Toll Free in the U.S at (800) 767-9543, FAX (707) 763-2631, or visit us at www.xandexsemi.com

SAFETY INFORMATION

Safety and Hazard identification symbols used in this document are intended to be compliant with ANSI/NEMA Z 535.6 2006. The table below lists the symbols used in this document along with a description of each type of safety hazard. Failure to observe identified safety risks may result in serious injury or death.

Safety and Hazard Identification Symbols

SYMBOL	DESCRIPTION
⚠ **DANGER**	**DANGER = Indicates a hazardous situation which, if not avoided, will result in death or serious injury**
⚠ **WARNING**	**WARNING = Indicates a hazardous situation which, if not avoided, could result in death or serious injury.**
⚠ **CAUTION**	**CAUTION = Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.**
NOTICE	**NOTICE = Indicates a practice that is not related to personal injury but may cause damage to equipment or property.**

⚠ **WARNING**	*Use this product only in the manner described in this manual. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.*
⚠ **WARNING**	*Install the pneumatic controller in a location that is easily accessible to the operator. The ON/OFF switch is the pneumatic controller's main disconnecting device and must be easily accessible at all times.*
⚠ **WARNING**	*For your safety, the AC power cord set provided with your product has a grounded plug. Always use the power cord with a properly grounded wall outlet, to avoid the risk of electrical shock.*
⚠ **WARNING**	*Do not operate this product with a damaged AC power cord set. If the AC power cord set is damaged in any manner, replace it immediately. Damaged cords may result in user exposure to hazards.*

WARNING	*The power cord set received with the product meets the requirements for use in the country where you purchased the equipment. Use only the power cord provided with the unit or an authorized replacement power cord from Xandex Inc. or an approved Xandex distributor. Use of an inadequately rated power cord may result in shock or injury.*
WARNING	*Do not operate this product with a damaged DC power supply. If the DC power supply is damaged in any manner, replace it immediately. A damaged DC power supply may result in user exposure to hazards.*
WARNING	*The DC power supply received with the product meets the requirements for use in the country where you purchased the equipment. Use only the DC power supply provided with the unit or an authorized replacement power supply from Xandex Inc. or an approved Xandex distributor. Use of an inadequately rated power supply may result in shock or injury.*

CONTROLLER / INKER REDESIGN

Re-design Overview

The Xandex DieMark® 350-0027 Micro-Z Small Dot Pneumatic Controller and the X7110 Manual and X7120 Motorized Micro-Z Inker Assemblies represent a new design that incorporates several changes that make it unique to the inker assembly model(s) designed for use with the Micro-Z Pneumatic Controller. (This controller cannot be used with other DieMark inker assemblies)

The design changes focus on features specific to repeatable, reliable small (5 mil and smaller) ink dot production, including:

1. Separate regulated Controller air inputs for the Cartridge Valve and the Shuttle Valve to isolate dot production from even minor changes in air pressure that may occur when the Cartridge and Shuttle valves share a single air input.

2. Modified controller firmware to optimize the cartridge valve on time for smaller dot settings.

3. A new Precision pneumatic shuttle design that reduces friction between moving parts and eliminates potential vibration related parts movement for more accurate, repeatable dot placement.

4. An orifice has been added to the shuttle's air signal input tubing that acts to dampen the shuttle end of stroke and dramatically reduce the shock vibration present in previous pneumatic shuttle designs.

5. Manual and Motorized Micro-Z Models: Changes to the Inker Assembly also include a rigid "uni-body" design that eliminates multiple points of movement compared to previous pneumatic inker models.

6. Manual Micro-Z Model" manual Z height adjustment system is much more accurate than previous manual DieMark inker models. Accuracy in Z adjustment is critical in obtaining uniform small ink dots.

7. Motorized Micro-Z Model: A motorized version of the Manual Micro-Z Inker Assembly is available to provide extremely accurate Z adjustment with push button controls. The Motorized Micro-Z inker provides Z adjustment of 0.00005 inches per actuation in Micro-Z mode.

Please contact Xandex Customer Service with any questions regarding this design change or any other feature of your Xandex DieMark Inking System.
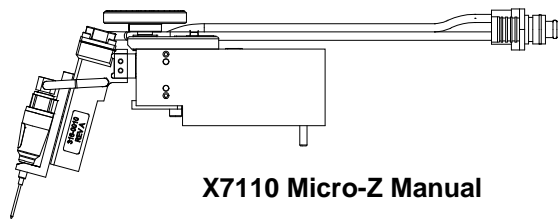
TABLE OF CONTENTS

Chapter 1 Introduction

X7110 Micro-Z Manual

X7120 Micro-Z Motorized

The X7110 Manual and X7120 Motorized Micro-Z pneumatic inkers are designed for use in cabled in-line and off-line inking. The innovative Micro-Z design combines operator friendly Micro-Z movement capability in both Manual or Motorized models which provides fast, precise Z adjustment, with a dual air regulation system to produce small ink dots of 5 mil or less with consistent geometry and extreme repeatability.

The Micro-Z series inker also incorporates the convenience of a new A4 model DieMark™ disposable ink cartridge for the ultimate small dot inking solution.

Ink dots are deposited via pneumatic actuation of the inker shuttle mechanism and a simultaneous pulse of air into the cartridge reservoir. There is no filament and no direct contact with the wafer surface. A prober signal to the controller initiates the inking sequence, actuating the shuttle mechanism downward and sending an air pulse to the cartridge.

As the shuttle extends to the downward position, the air pulse to the cartridge forces ink out of the cartridge barrel and forms a drop at the end of the needle tip. When the shuttle is at its lowest position, the drop makes contact with the wafer surface and forms a dot.

After several milliseconds the shuttle returns to the normal position. After completion of each dot, slightly lower pressure is developed in the cartridge by the closure of the valve, causing the ink to back up into the cartridge reservoir, preventing dripping.

The dot size is determined by cartridge air pulse duration. Adjust the controller setting to change the dot size - without changing the cartridge. Pneumatic cartridges are factory tuned, ensuring consistent dots and contain 40% more ink than standard DieMark™ filament ink cartridges.

Thank you for selecting Xandex as your inking choice. Please spend a few minutes familiarizing yourself with the unit. Most questions you may have will be answered in this manual. If you would like further assistance, please contact your local Xandex distributor or call us at (707) 763-7799 or Toll Free in the U.S: (800) 767-9543. FAX (707) 763-2631. For more information about Xandex and our complete line of quality inking and interfacing products, visit us on the Internet at www.xandexsemi.com or email: us at insidesales@xandex.com.

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Chapter 2 System Overview

Manual Micro-Z Component Connection

1. Regulator Assembly (Qty. 2)
   Part No. 220-0076

2. Air Hose Regulator-to-
   Controller (Qty. 2)
   Part No. 210-2001

3. Micro-Z Pneumatic Controller
   Part No. 350-0027**

4. Micro-Z Manual Pneumatic
   Inker Assembly Part No. 320-
   7110
   A. Pneumatic Shuttle Part
      No. 316-0010
   B. Inker Mounting Plate Part
      No. 120-0019 (340-7110-
      02 for KLA only)

5. Cable/Connector Assembly*
   Type C + none #210-0113
   Order Set 340-7110-05

   Type P8-C for TEL #210-0120
   Order Set 340-7110-04

   Type J-C for TSK / Accretech
   #210-0114
   Order Set 340-7110-03

   Type C-C for KLA #210-0110
   Order Set 340-7110-02

   Type A-C for EG #210-0109
   Order Set 340-7110-01

6. Cartridge Opening Tool Part
   No. 200-0001

7. 24VDC Power Supply Part No.
   220-0078

8. **A. AC Power Cord (USA)
       Part No. 158-0051 OR
   **B. AC Power Cord (Europe)
       Part No. 158-0407 OR
   **C. AC Power Cord (UK)
       Part No. 158-0408
   **D. AC Power Cord
       (PSE-Japan)
       Part No. 158-0727

*One cable type supplied and is specified
based on part number tabulation.

**One AC power cord is shipped with each
set and must be specified at ordering.

Objects not to scale.
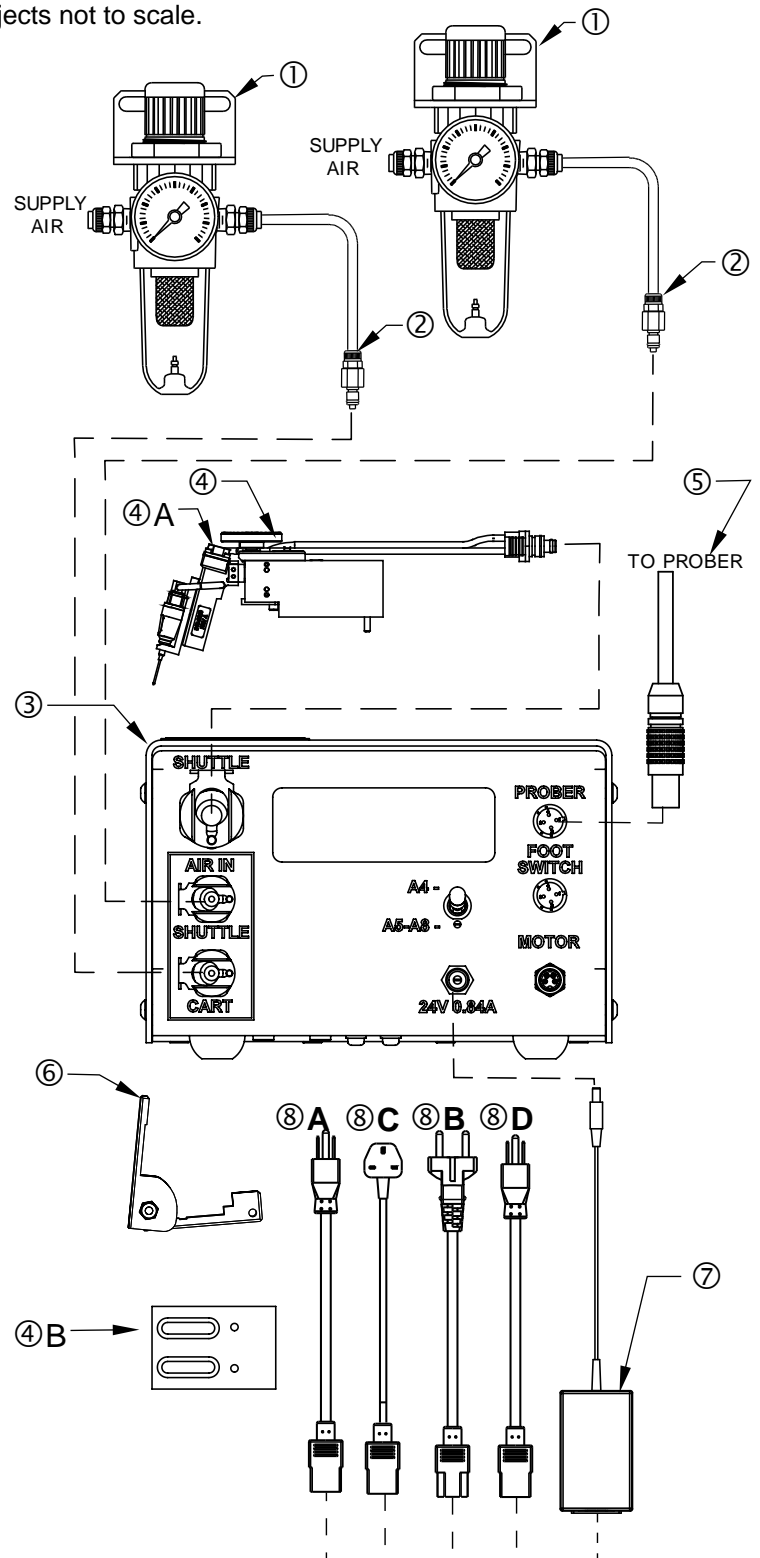
Motorized Micro-Z Component Connection

1. Regulator Assembly (Qty. 2)
    Part No. 220-0076

2. Air Hose Regulator-to-
    Controller (Qty. 2)
    Part No. 210-2001

3. Micro-Z Pneumatic Controller
    Part No. 350-0027**

4. Micro-Z Motorized Pneumatic
    Inker Assembly Part No. 320-
    7120
    A. Pneumatic Shuttle Part
        No. 316-0012
    B. Inker Mounting Plate
        Part No. 120-0019
        (340-7120-02 for KLA
        only)

5. Cable/Connector Assembly*
    Type C + none #210-0113
    Order Set 340-7120-05

    Type P8-C for TEL #210-0120
    Order Set 340-7120-04

    Type J-C for TSK / Accretech
    #210-0114
    Order Set 340-7120-03

    Type C-C for KLA #210-0110
    Order Set 340-7120-02

    Type A-C for EG #210-0109
    Order Set 340-7120-01

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          Part No. 158-0727

*One cable type supplied and is specified
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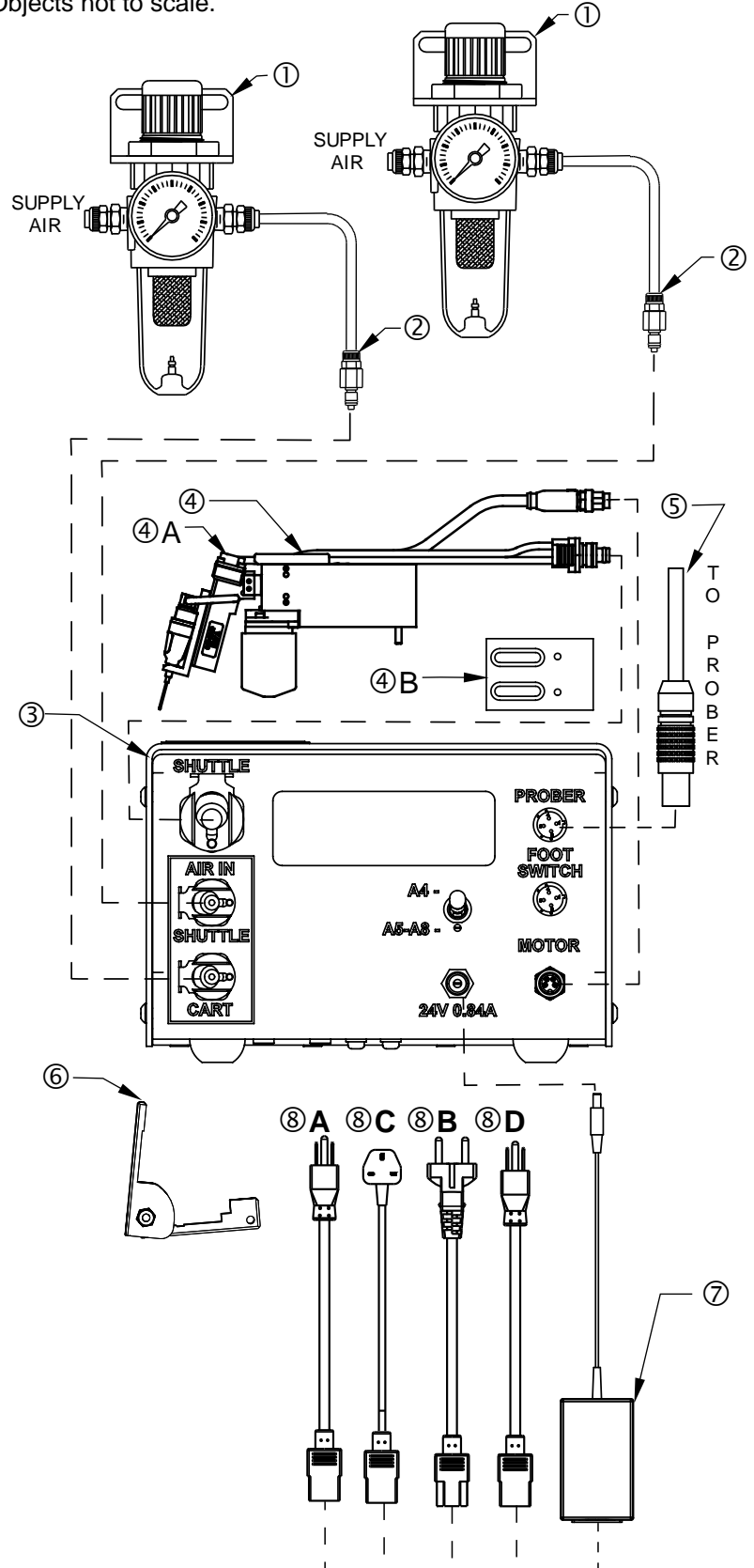
Chapter 3   Installation

X7110 and X 7120 Micro-Z Inker Installation

The X7120 Motorized and X7110 Manual Micro-Z pneumatic inkers are for use with wafer probing and wafer inspection equipment from multiple OEMs. Both Manual and Motorized models are installed using two 4-40 x 1.25" Shoulder Head Cap Screws (SHCS)

1. If you are currently using another inker, remove it from the prober/ equipment.

NOTICE	Move the chuck/wafer from underneath the inker when installing inker to prevent damage.

2. Install the inker base onto the prober using the two (2) supplied 4-40 x 1.25" SHCS. Torque to 8.0 inch-pounds (in-lbs).

X7110 Manual Micro-Z Inker Assembly

CARTRIDGE FITTING (RED HOSE)

PNEUMATIC SHUTTLE ASSEMBLY

2X 4-40 x 1.25" INSTALLATION SCREWS

MOTOR CABLE CONNECTOR TO CONTROLLER: CONNECT TO "MOTOR" TERMINAL

CONTROLLER-TO-SHUTTLE AIR HOSE: CONNECT TO LARGE "SHUTTLE" PORT

X7120 MOTORIZED INKER BASE ASSEMBLY

MICRO-Z ADJUSTMENT MOTOR
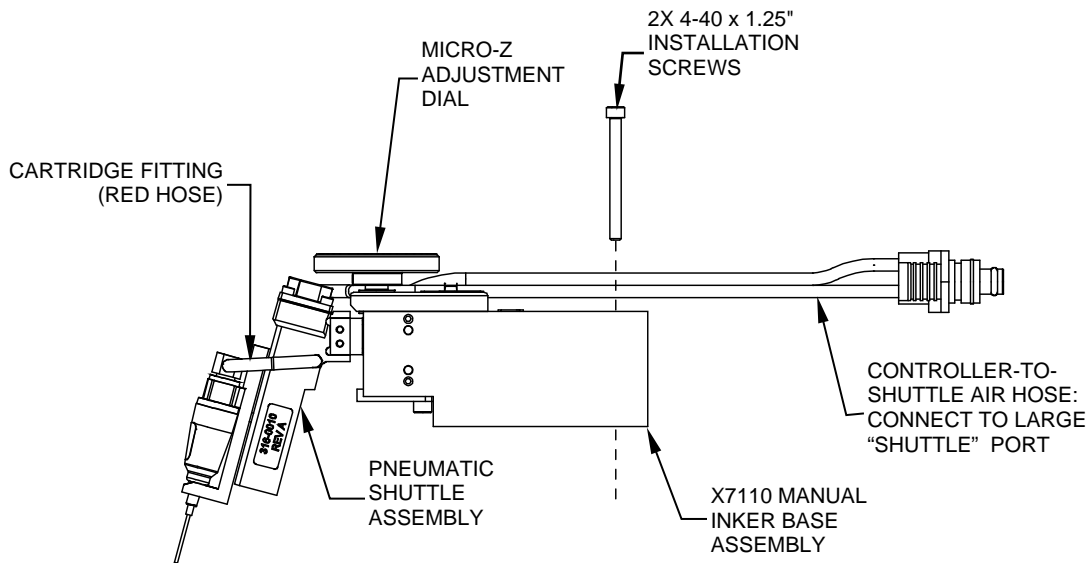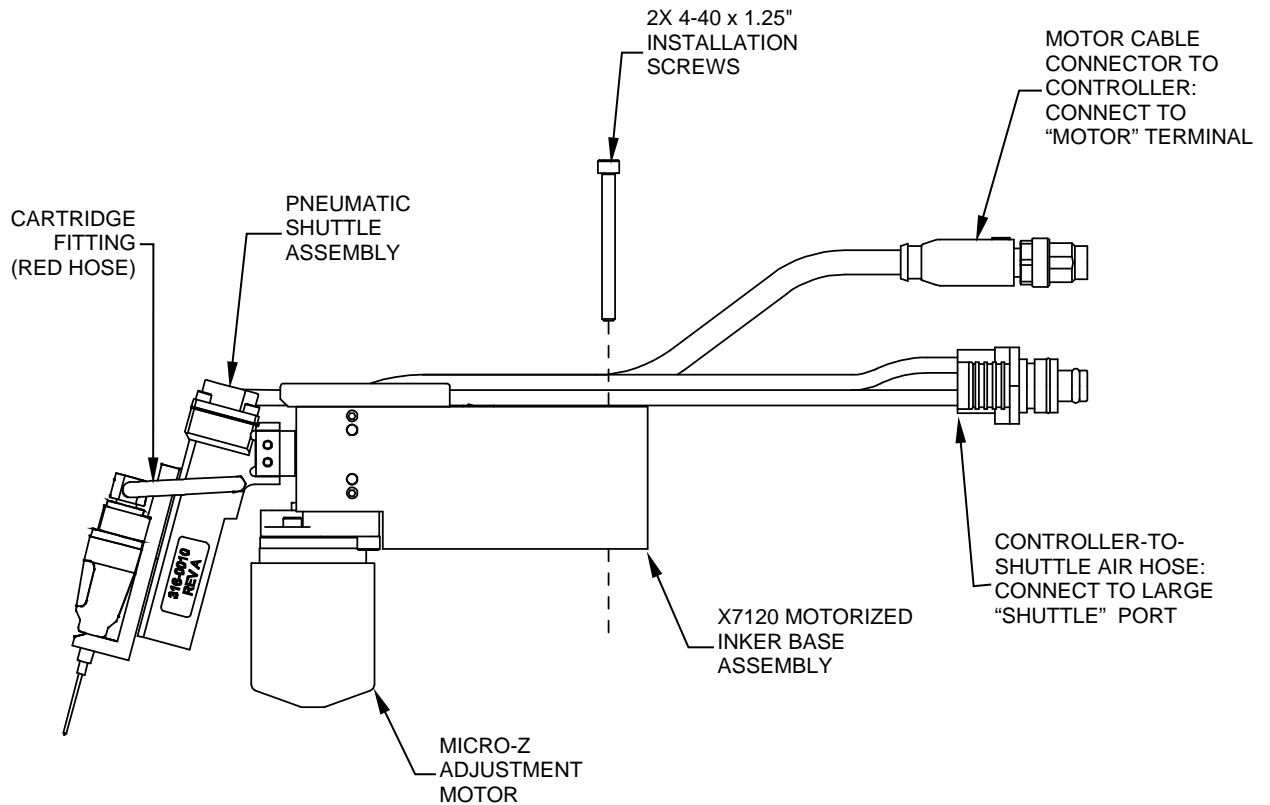
X7120 Motorized Micro-Z Inker Assembly

3. Proceed to the **"Controller Installation"** portion of this Installation Section (3) and install the pneumatic controller per instructions for your application.

4. Proceed to Chapter 4. System Operation for ink cartridge installation, inker setup, alignment, and controller operation instructions.

NOTICE	Do not install an ink cartridge on the inker until after the inker is installed on the prober or damage to the ink cartridge may occur.

Controller Installation

Regulator Assembly and Installation

The Micro-Z Small Dot Controller requires two regulated air inputs. The supplied air hoses connecting the regulators to the controller are 6 ft (182 cm) in length. Install the two regulators close enough to the controller location that ensures free air flow. Make sure the air hoses are not overextended, twisted, bent or kinked.   Install each regulator as follows;

1. Remove the bracket from the regulator/filter assembly by removing the plastic retaining nut. Mount the regulator/filter bracket in a convenient location (mounting screws are not supplied). Re-mount the regulator to the bracket with the supplied nut after the bracket is installed.

LIFT KNOB TO UNLOCK, TURN KNOB TO ADJUST PRESSURE SETTING AND PUSH KNOB DOWN TO LOCK.

MOUNTING BRACKET

AIR FLOW ARROW

LOCATED ON ONE SIDE ONLY (BEHIND GAUGE)

PLASTIC NUT RETAINS BRACKET

INSTALL REGULATOR - TO-CONTROLLER AIR HOSE HERE (P/N 210-2001)

REGULATOR/FILTER ASSEMBLY P/N 220-0076
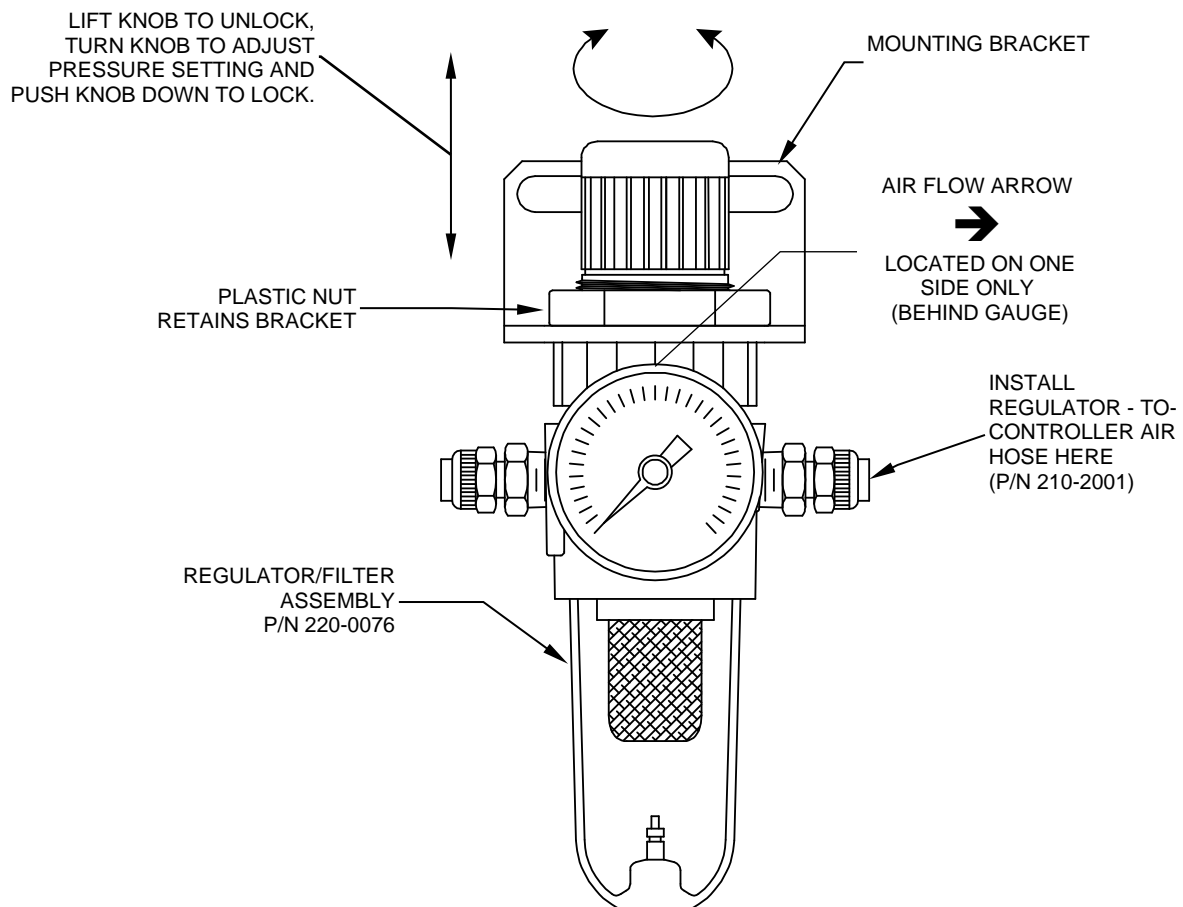
NOTICE	The Model 350-0027 Small Dot Controller is designed to operate at 80 ± 5 PSI. FAILURE TO SET THE REGULATORS PROVIDING AIR INPUT TO THE CONTROLLER AT 80 PSI WILL RESULT IN INCONSISTENT SYSTEM PERFORMANCE!

2. Lift the regulator adjustment knob and turn counterclockwise until it stops to shut off the regulator air output. Do this on both regulators.

3. Install 1/4 O.D. x 0.170 I.D. polyethylene tubing (not supplied) to the main air source and then connect to the input fitting on the regulators. (The left side when facing the gauge.)

4. Connect the *regulator-to-pneumatic controller air hoses* (P/N 210-2001 supplied) to the *output fittings* on the regulators. (The right-side fittings when facing the gauge.)

5. Plug one of the *regulator-to-controller air hoses* into the AIR IN port labeled "SHUTTLE" on the rear of controller.

6. Plug the 2^(nd) *regulator-to-controller air hose* into the AIR IN port labeled "CART" on the rear of controller.

Note: *The air hose connectors are spring locked. If the air hose connectors do not insert easily, make sure the spring lock is in the open position by pushing the metal snap-lock down until it clicks.*

7. Turn on the main air and adjust the regulator until it reads 80 ± 5 PSI on both regulator dials. To make regulator adjustments, pull up on the knob on the top of the regulator to unlock, then rotate the knob clockwise to increase or counterclockwise to decrease. Push down on the knob after adjustment to lock it into position.

8. Check all connections for air leaks. If required, turn off the main air and make necessary adjustments / repairs.

9. Install the *cable/connector cable* to the inker port on the prober and the "PROBER*"* connector on the rear of the controller unit.

NOTICE	Toggle switches are a locking lever type to prevent accidental actuation. Pull the toggle switch out slightly to move to the desired position.

10. Move the toggle switch on front of the controller to "RUN" (mid) position.

11. Connect the fitting on the controller-to-shuttle air hose into the pneumatic connection on the rear of the pneumatic controller labeled "SHUTTLE". (The large port in the top left hand corner on the controller back panel: NOT the port with the same name in the "Air In" section below the large port.)

12. **Motorized Micro-Z inker only:** Route the cable and connector from the inker to the mating jack on the rear of the controller labeled "MOTOR" and connect.

If you are connecting a Manual Micro-Z inker, go to step 13 and connect the power supply.

13. Install the *AC power cord* into the back of the power supply. Connect the power supply cord to the 24V-.84A socket on the back of the controller. Plug the AC power cord into a 100-240 VAC supply outlet. Turn the ON/OFF switch on the front of the controller to ON. At this point, the "INK ON" LED and the "STATUS" LED will flash faintly once, and the "POWER" LED will stay on.

14. This completes Inker and Controller installation. Proceed to **Section 4 "System Operation"** for ink cartridge installation, inker setup, alignment, and controller operation instructions.

Note: *The standard controller-to-shuttle air hose for Manual Micro Z supplied by Xandex is 36in (91.44 cm) long. The standard controller-to-shuttle air hose supplied for Motorized Micro Z is 60in (152.40cm) long. The length of this air hose is a critical design specification.*

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Chapter 4 System Operation

Controller Operation

ON-OFF Switch:

⚠ WARNING	Install the pneumatic controller in a location that is easily accessible to the operator. The ON/OFF switch is the pneumatic controller's main power disconnect device and must always be easily accessible.

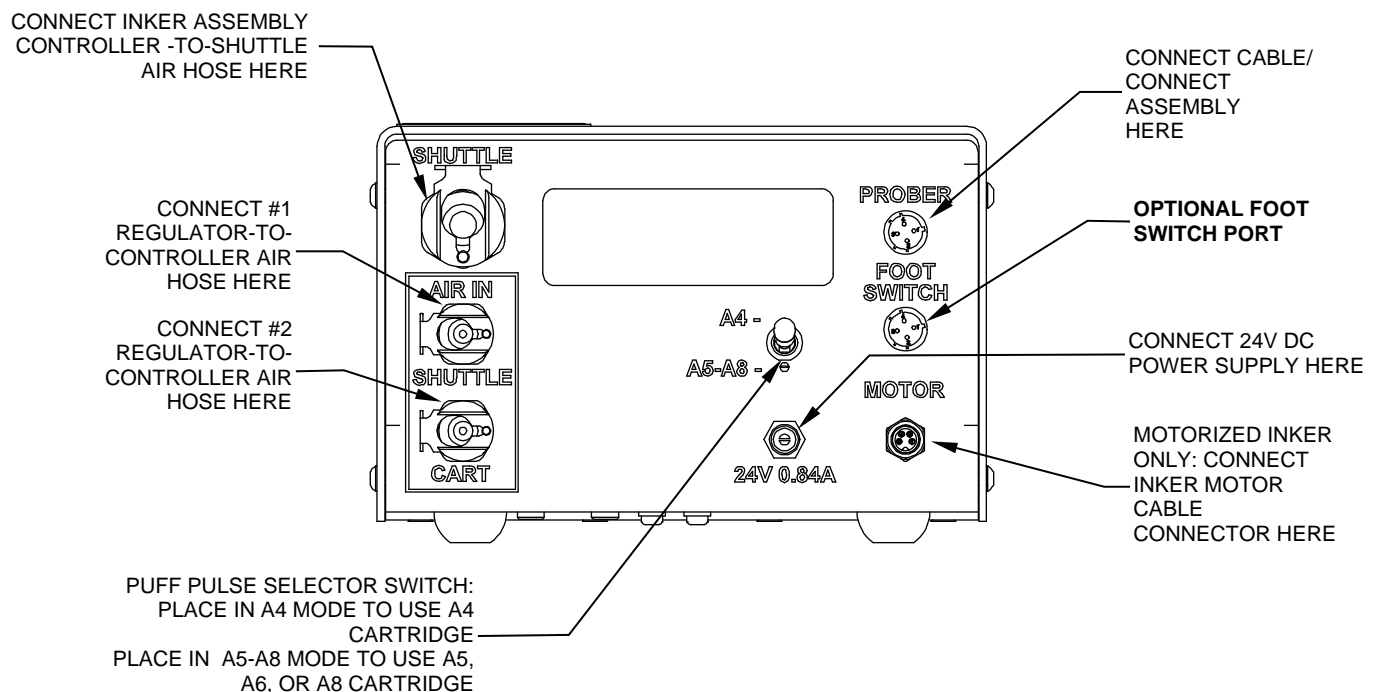| NOTICE	Toggle switches are a locking lever type to prevent accidental actuation. Pull the toggle switch out slightly to move to the desired position.
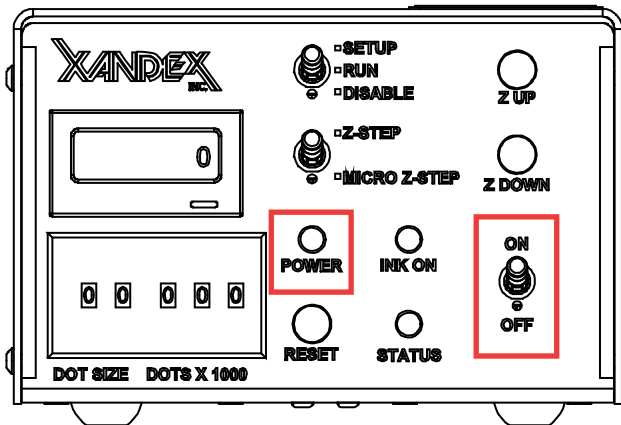
The ON/OFF switch turns power to the controller ON and OFF. The POWER LED will light when power is turned ON.

Programable Thumbwheel Counter
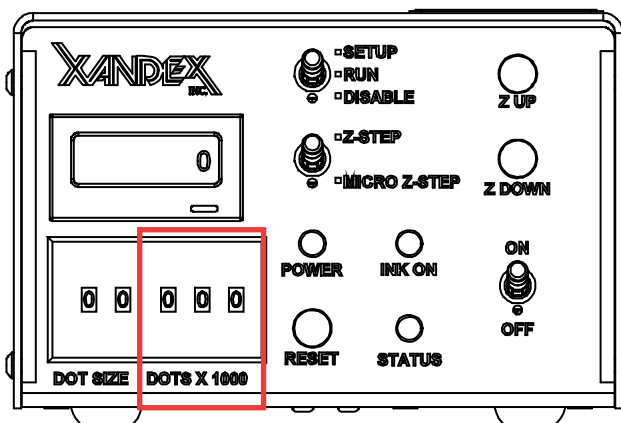
Individual thumbwheel settings are available to monitor the number of Dots placed by an ink cartridge (Dots X 1000). These three thumbwheels can be set to any number of dots between 1,000 and 999,000. A red "STATUS" LED will be illuminated, and an audible alarm will sound when the programmed limit is exceeded.

For example, if you select 30,000 dots (turning the "DOTS X 1000" thumbwheel to 30) the "STATUS" LED will light when 30,000 dots have been deposited. Upon installation of a new ink cartridge, it is recommended that the thumbwheels be reset to alert the operator when a cartridge is nearing replacement. The "DOTS X 1000" setting is programmed by using the RESET button. See RESET button for programming the "DOTS X1000" setpoint.

Reset Button

A "RESET" button is located to the right of the thumbwheels for resetting the counters in the microprocessor. When the "RESET" button is depressed once, the "INK ON" LED will flash for 5 seconds. If it is pressed a second time within 5 seconds, it will "read" the setting on the Dots X 1000 thumbwheel counter and load those values into the microprocessor. If the "RESET" button is not pressed a second time and the 10-second flash time is exceeded, the "INK ON" LED will stop flashing and the current set points and internal counts will not be changed.

The "RESET" button is also used to enter the diagnostic mode when power is applied to the controller with the "RESET" button depressed.

Audible Alarm: An audible alarm is activated, along with the "STATUS" LED, whenever the "DOTS X 1000" thumbwheel setting has been reached. The alarm is silenced and reset by pausing the prober, resetting the "DOTS X 1000" thumbwheels if desired and depressing the "RESET" button twice within five seconds.

Digital Dot Counter
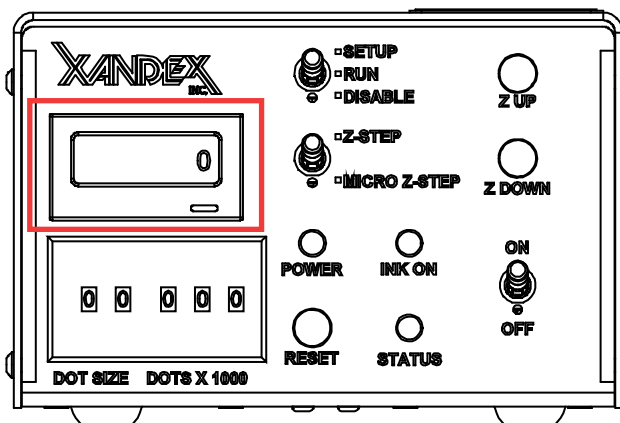
A separate LCD dot counter is located on the front panel above the thumbwheels. This counter has an internal Lithium battery with a nominal life of 7 years, and an integral reset button. Pressing the small reset button below the LCD window will reset the counter display only. It will have no effect on the counter circuits within the microprocessor. Upon installation of a new ink cartridge, it is recommended that the counter be reset to accurately record the numbers of dots produced by that cartridge.

Dot Size Thumbwheels:
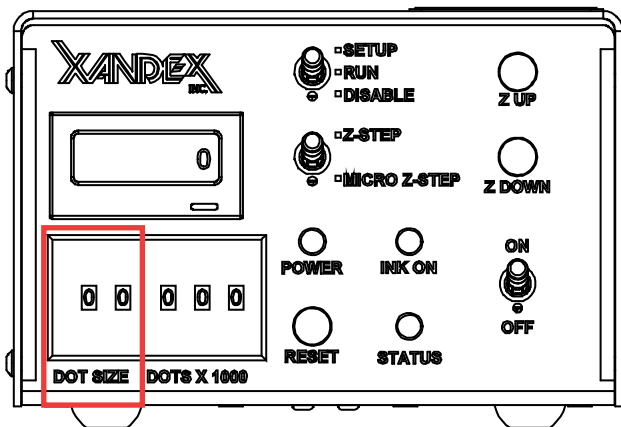
The adjustable Dot Size Thumbwheels on the front panel are used to vary the size of the dot produced without affecting set-up or requiring additional operator steps. The microprocessor reads the thumbwheel settings and outputs a signal to enable the cartridge air valve for a predetermined amount of time. Higher settings enable the cartridge air valve for a longer time, producing a larger dot.

Compared to other DieMark Pneumatic Controllers, the dot size range in the Small Dot Controller is small, due to the limited volume of ink that can flow through the A4 cartridge's 0.002 inch Teflon tube.

Mode Selection Switches

There are two mode selection mode switches located on the front panel for selecting different inker operating modes. The following is a description of the functions of each switch position.

Top Mode Switch Positions
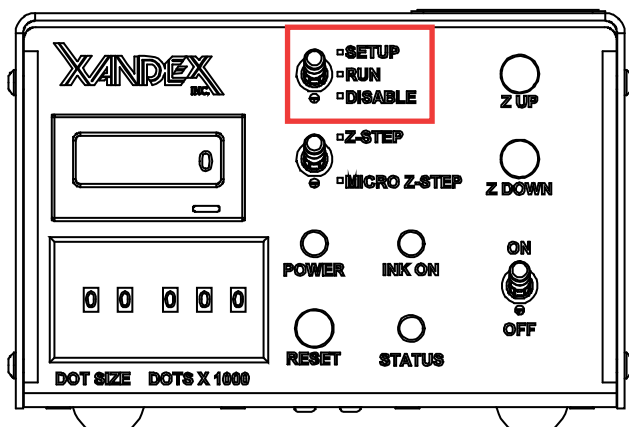
- SETUP = Cartridge air valve disabled for A4 Z height setup
- RUN = Normal Operation
- DISABLE = Shuttle air valve disabled (troubleshooting aid)

When the toggle switch is placed in the SETUP position, the Cartridge air valve (V1) is disabled. When SETUP is active, and the RESET button is pressed, the Shuttle Valve fires and the shuttle extends and returns without any air pulse to the Cartridge Valve. This mode is used in inker setup to achieve an optimal Z height setting.

In the RUN position, the system operates normally. The switch is placed in the RUN position for inking.

When the toggle switch is placed in the DISABLE position, the shuttle air valve (V2) is disabled and the shuttle does not extend during inking. This mode is used in controller diagnostics, to place dots in hand-inking applications with the optional foot switch or when utilizing the prober Z function without actuating the shuttle.

Ink On and Status LEDs
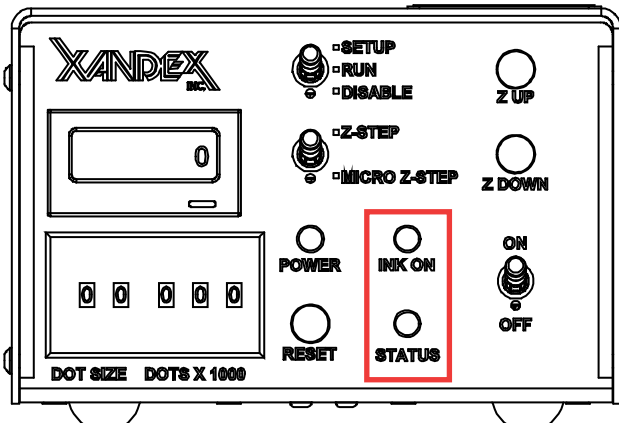
INK ON LED
During normal inking, the INK ON LED flashes when an ink dot is placed.

STATUS LED
The STATUS LED flashes or is solid on to indicate different states of the controller. See RESET for more information.

Bottom Mode Switch Positions
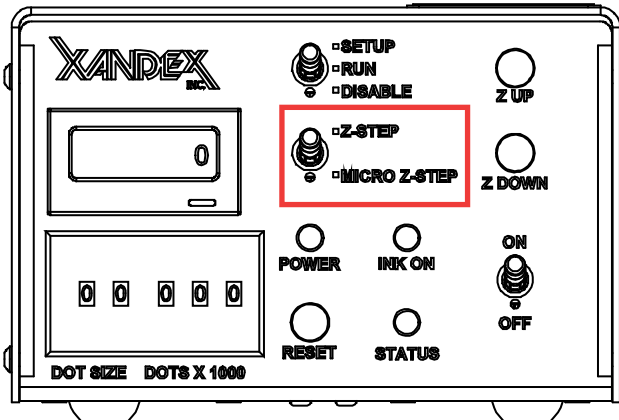
- Z STEP
- MICRO Z STEP

The bottom mode switches are used with the X7120 Motorized Micro-Z inker assembly. They are not used in the X7110 Manual Micro-Z inker assembly.

Z-STEP will move the inker's Z stage up or down in small steps when the Z UP and Z DOWN buttons are pressed. MICRO Z-STEP will change the Z STEP to 1/10 of normal step distance.

Z UP and Z DOWN Buttons:
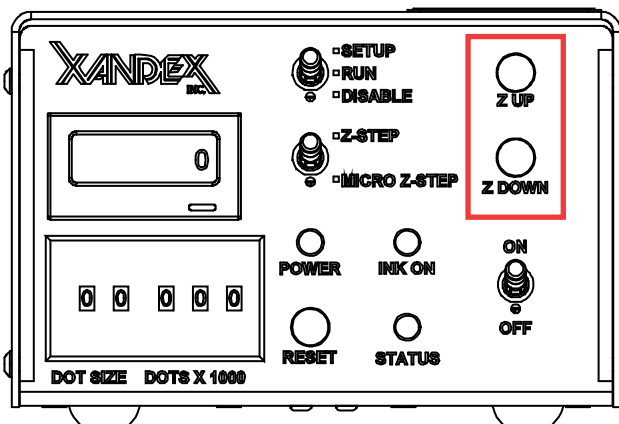
Z UP and Z DOWN buttons are used with the X7120 Motorized Micro-Z inker assembly only. In Z-STEP mode, the inker's shuttle is raised (Z-UP) or lowered (Z-DOWN) by 0.0005 inches per actuation (0.5 mil).

In MICRO Z-STEP mode, up or down shuttle movements are reduced to 0.00005 inches per actuation.

The buttons should be pressed no faster than one time per second as the unit cannot react to faster use. Minor adjustment of Z height may be necessary after changing an ink cartridge, due to slight manufacturing variations between cartridges.

The Z UP and Z DOWN buttons can also be used to move the inker up or down by depressing and holding down either button. This function is useful to quickly raise inker Z height when changing cartridges, but great care should be taken not to "run" the inker down into the wafer surface in this mode.

External Switch Input
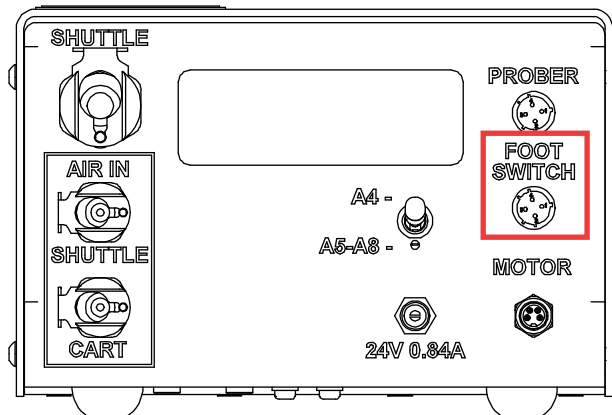
There is a second input on the rear of the unit for use with a foot switch. Upon activation, the foot switch sends a > 50mSec switch closure signal (across pins 1&3) to the controller, enabling an inking sequence. There is a 50-millisecond delay between the end of the sequence and the recognition of the next switch closure. No other adjustments or settings need to be made.

Rear Panel Puff Pulse Selector
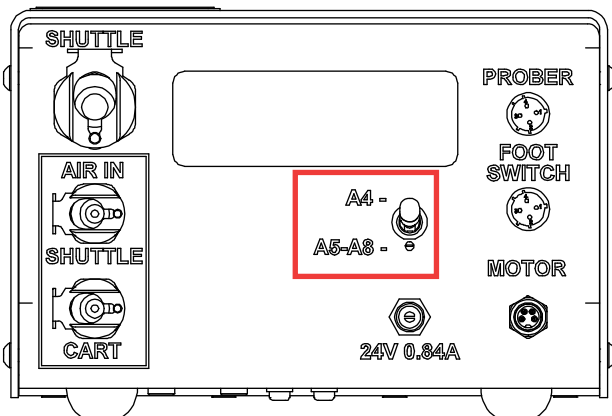
In normal operation, after a pause in inking activity, a "puff pulse" of air is introduced into the cartridge air line to keep ink from being drawn back out of the cartridge's Teflon tubing by a vacuum effect, due to valve closure.

This pulse is calculated differently when using the A4 cartridge, than when using existing A5-A8 cartridges. Place the switch in A4 mode when using the A4 cartridge to place small dots. When using A5-A8 cartridge types, place the switch in A5-A8 mode to duplicate the puff pulse operation of the older 350-0018 Motorized-Z pneumatic controller.

Ink Cartridge
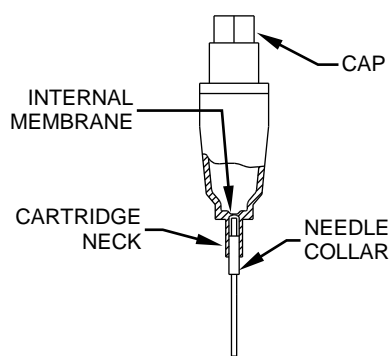
The ink cartridge used with the Micro-Z Inkers is a DM-2 pneumatic ink cartridge. DM-2 cartridges have a polypropylene reservoir (sealed at the bottom by a thin membrane) and a small Teflon® tube encased in a stainless steel needle. When the cartridge is opened, the needle punctures the membrane to provide ink flow through the Teflon® tube.

Each cartridge holds 1.0 grams minimum of ink and can produce a wide range of dot sizes. Dot size is controlled by changing the duration of the air pulse into the cartridge reservoir, which determines how much ink is forced through the Teflon® tube to create the ink drop at the needle tip. For more information see **Section 5 "Ink".**

Cartridge Type Label Color Code

DM-2 PNEUMATIC CARTRIDGE LABELS	
LABEL	**DESCRIPTION**
DieMark™ TYPE A4	**A4 IS GREEN**
DieMark™ TYPE A5	**A5 IS RED**
DieMark™ TYPE A6	**A6 IS BLUE**
DieMark™ TYPE A8	**A8 IS YELLOW**

Ink Cartridge Labeling

DieMark ink cartridges are individually labeled with two distinct labels. One label shows the cartridge type and ID number. The other label indicates the ink batch number, ink type and expiration date of the cartridge.

Do not remove the labels from the cartridges as this can cause cartridge type and ink types to be confused at cartridge installation, resulting in improper performance. Removal of cartridge labels will also void the cartridge warranty.

DieMark™ Cartridge Type Label

This label contains the cartridge type, (either **A4, A5**, **A6** or **A8**).
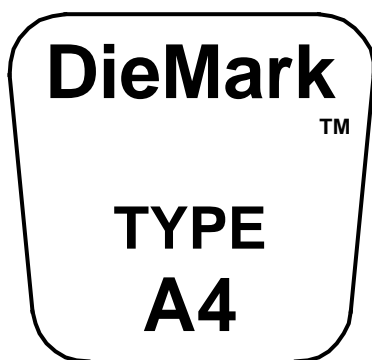
DieMark™ Cartridge Expiration Date Label

This label indicates the ink type and batch number of the ink contained in the cartridge and the cartridge expiration date. Expiration dates shown are for *unopened* cartridges.

- ♦ 6990, 6993, 6997, 7824, 7824T, 8103 and 8104 (except 8103 White) = Four (4) months
- ♦ 8103 White = Two (2) months

After the cartridge is opened, consistent ink flow can only be expected for up to five (5) days for 6990, 6993, 6997 and three (3) days for 7824, 7824T, 8103 and 8104.
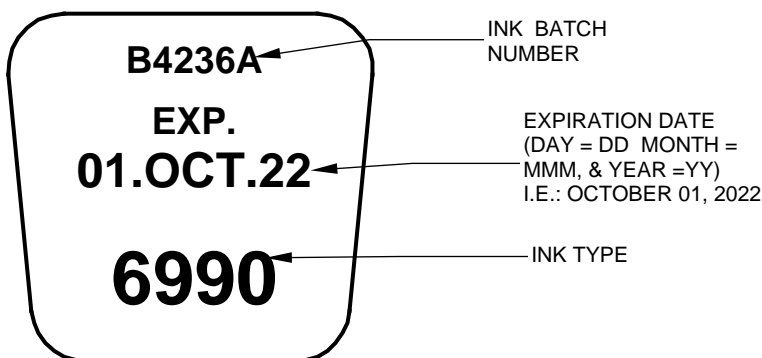
Cartridge Preparation
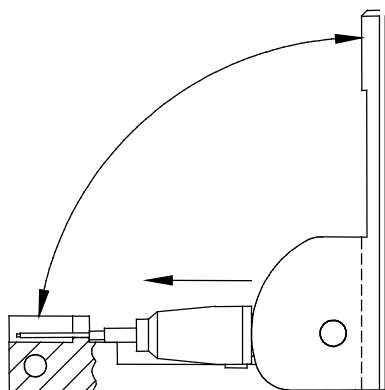
1. Place the cartridge into the cartridge preparation tool (Xandex Part No. 200-0001) as shown, exercising care to avoid damaging the Teflon® tip. The cartridge cap should be seated in the tool hinge with the needle resting in the slot.

2. Firmly squeeze the tool fully closed with a smooth, quick motion. This will push the cartridge body forward, causing the needle to puncture the internal membrane.

NEEDLE PUNCTURES MEMBRANE

NEEDLE COLLAR FLUSH WITH NECK
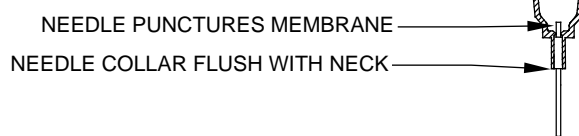
3. Open tool and remove cartridge. The needle should be straight and the needle collar flush with the cartridge neck.

NOTICE	*Do not shake the cartridge at any time, as air bubbles may be introduced into the reservoir and restrict the flow of ink. If mixing of the ink in the reservoir is desired, roll the cartridge between thumb and forefinger (or between palms) for 1-2 minutes prior to installation.*

Cartridge Installation

1. Use the slotted section of the cartridge preparation tool and a *counter-clockwise* motion to remove cap.

2. Thread the cartridge onto the brass air fitting of the RED AIR HOSE, turning the cartridge *clockwise* until snug.
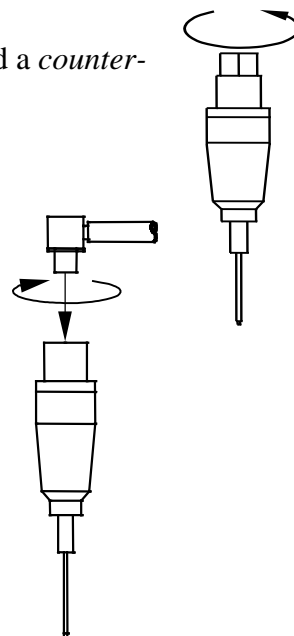
3. Press top of cartridge into shuttle spring clip.
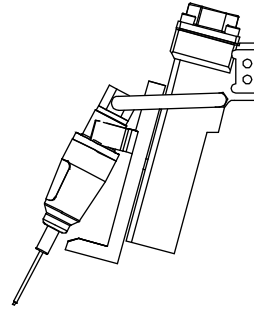
4. Press cartridge body into shuttle forks until the neck fully snaps into place.
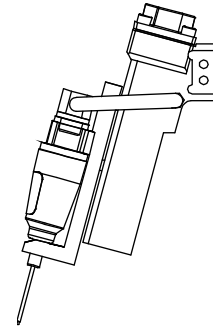
Cartridge is now ready for priming. (See "**Cartridge Priming**" later in this Section (4) for instructions)

Caution: Ink Cartridge needle can pierce skin when moved manually or when shuttle valve is actuated:
 1. *Keep hands and fingers clear of the cartridge needle tip after cartridge change out and priming.*
 2. *Never place hands or fingers under the cartridge needle*
 3. *Keep hands and fingers clear of needle tip during cartridge change out and priming. Always follow recommended cartridge priming procedure. Place the controller toggle switch in RUN position and press the controller RESET button, which fires ONLY the cartridge valve to send ink to the needle tip. Priming using any other mode that actuates the shuttle valve during the priming process exposes the user to possible hand or finger puncture when the shuttle actuates.*

⚠ **CAUTION**

Cartridge Priming

> ⚠️ **CAUTION** | *Always wear protective eyeglasses when handling an active pneumatic inking system!*

1. Prepare a cartridge per the "Cartridge Preparation" section of this manual.

2. Install a cartridge to the inker per the "Cartridge Installation" section of this manual.

3. Move the controller switch to RUN.

5. Push the RESET button on the controller and hold down for at least 3 seconds until ink appears at the needle tip.

6. When there is a large drop of ink at the end of the cartridge needle tip, move the top toggle switch to SETUP to prevent the cartridge valve from firing again.

7. Proceed to Inker Setup

Note: *When the RESET button is initially pushed the INK ON LED will begin to flash. At the end of 3 seconds the INK ON LED will light continuously and the air valve will begin to pulse, priming the cartridge.*

Manual Micro-Z Inker Assembly Setup
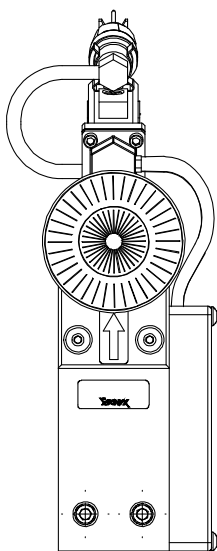
The adjustment dial on the Micro-Z inker assembly is labeled in 10 degree increments. 9 increments = 90 degrees, 18 = 180 degrees etc.

Each 10 degree increment moves the shuttle 0.0002 inches (two ten thousandths of an inch). Five 10 degree increments = 0.001 = one thousandth of an inch, or 1 mil (25.4 microns).

Total Z adjustment range is 0.360 inches (0.180 inches up or down from Z neutral position).

Keep in mind that when you adjust the dial $^1/_8$ turn (4.5 increments) you have moved 0.0009 or almost one mil.

1. Once priming is completed, verify that the inker is at a safe Z height adjustment and position the chuck/wafer under the inker and set the prober chuck "Z Up".

NOTICE	*If the inker height is adjusted with the prober stage "Z Down" the cartridge will be positioned too low and the cartridge needle may contact the wafer when you begin inking. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!*

2. Verify that there is a large drop of ink on the tip of the cartridge needle from priming.

3. Verify the top mode switch is set to SETUP.

4. Press the RESET button once. The shuttle will actuate and move down to place an ink dot.

5. If the large ink drop is not transferred to the wafer surface on 1st attempt, adjust the Z dial clockwise $^1/_8$ to ¼ turn and press the RESET button to attempt to place the ink drop.

6. Repeat step 5 as required until the ink drop is transferred to the wafer surface.

7. Once the ink drop is released to the wafer surface, run a test dot sequence to verify consistent transfer.

Fine Adjustments

8. If ink dots are consistent in size and shape, the inker is setup and ready to ink wafers.

9. Test dots that are inconsistent in size and shape (larger dots mixed with smaller dots) indicate a slight downward (clockwise) Z adjustment is required. Turn the dial 1-2 increments until consistent size and geometry is achieved.

10. If dots are "smeared" (larger dots with elongated geometry) Teflon tube contact with the wafer surface is occurring.

11. Turn the dial counterclockwise ¼ turn (9 increments) and then down again to get accurate placement. (*Note: The Z mechanism can become "down loaded" and must be backed off a thousandth or two to get accurate small increment downward movement again.*)

12. Run a test dot sequence and make small 1 increment clockwise (Z Down) adjustments until dots are consistent with good geometry.

TEFLON®
TUBE

CARTRIDGE NEEDLE

WAFER
SURFACE

NO ! Tube too close to wafer

NO! Tube too far away from wafer

YES! Ink drop is deposited on wafer surface

NOTICE	*Do not let the Teflon® cartridge tube contact the wafer surface. This may crush the tip preventing ink flow and damaging the cartridge or the wafer!*

Note: *Due to the unavoidable incidence of slight manufacturing variations from cartridge to cartridge, additional Z height adjustment of the inker may be necessary after changing ink cartridges.*

13. If the unit fails to operate as specified, please contact Xandex Customer Service for assistance at (707) 763-7799 or toll free in the United States at (800) 767-9543 or email insidesales@xandex.com .

Motorized Micro-Z Inker Assembly Setup

MOTORIZED MICRO-Z INKER ASSEMBLY

SHUTTLE

316-0010
REV A
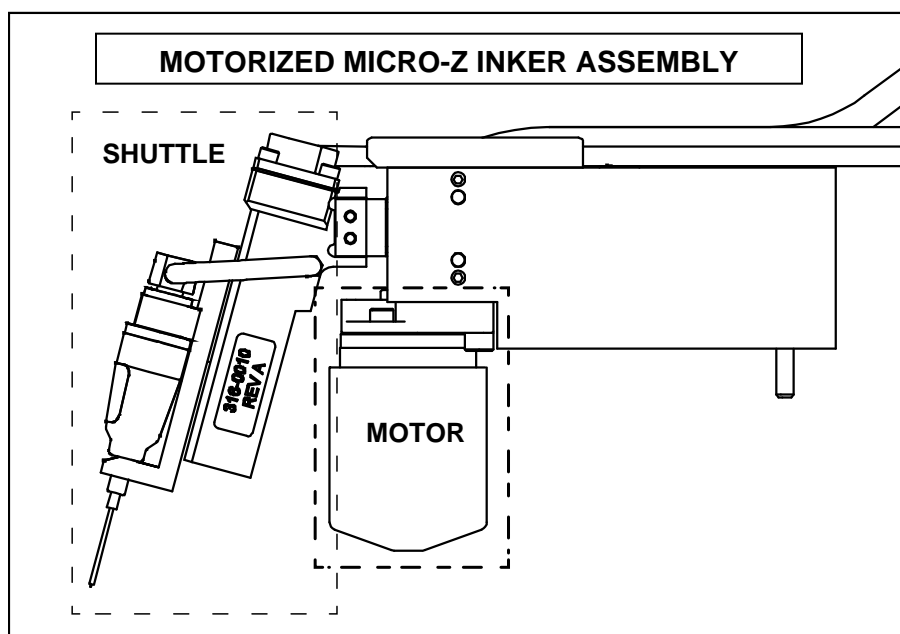
MOTOR

The Motorized Micro-Z Inker Assembly shown in the diagram above, is adjusted by using the Bottom Mode Switch Positions and the Z UP and Z DOWN Buttons: described on page 4-4.

When the Bottom Mode Switch is in the Z-STEP position, the shuttle assembly will move 0.0005 inches (5 ten thousandths of an inch or 0.5 mil) each time the Z-UP or Z-DOWN buttons are pressed once.

When the bottom mode switch is moved to MICRO-Z mode, each press of the Z-UP or Z-DOWN buttons moves the shuttle 0.00005 inches (5 one hundred thousandths of an inch = 0.05 mil = 1.27 micron).

Total Z adjustment range is 0.360 inches (0.180 inches up or down from Z neutral position).

Keep in mind that in Z-STEP mode, when you press either the Z-UP or Z-DOWN button twice, you have moved 0.001 inches or one (1) mil (25.4 microns).

1. Once priming is completed, verify that the inker is at a safe Z height adjustment and position the chuck/wafer under the inker and set the prober chuck "Z Up".
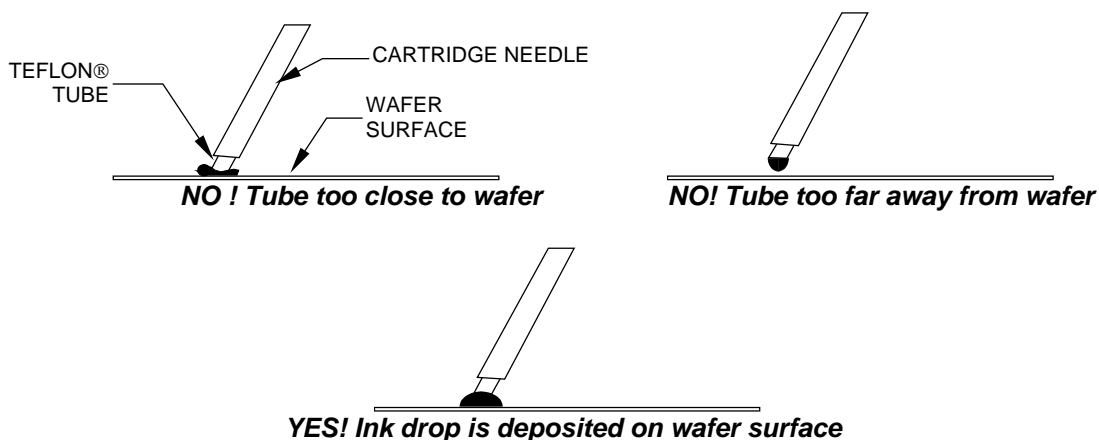
NOTICE	*If the inker height is adjusted with the prober stage "Z Down" the cartridge will be positioned too low and the cartridge needle may contact the wafer when you begin inking. This will stop the ink flow and possibly ruin the cartridge or damage the wafer!*

2. Verify that there is a large drop of ink on the tip of the cartridge needle from priming.

3. Verify the TOP MODE SWITCH is set to SETUP.

4. Press the RESET button once. The shuttle will actuate and move down to place an ink dot. Factory shuttle stroke setting is 0.050-0.060 inches (50-60 mil or 1270-1524 microns)

5. If the large ink drop is not transferred to the wafer surface on 1st attempt, adjust the shuttle Z-DOWN 2-3 button presses (1-1.5 mils) and press the RESET button to attempt to place the ink drop.

6. Repeat step 5 as required until the ink drop is transferred to the wafer surface.

7. Once the ink drop is released to the wafer surface, run a test dot sequence to verify consistent transfer.

Fine Adjustments

8. If ink dots are consistent in size and shape, the inker is setup and ready to ink wafers.

9. Test dots that are inconsistent in size and shape (larger dots mixed with smaller dots) indicate a slight downward Z adjustment is required. Place the bottom mode switch in MICRO-Z mode and adjust the shuttle Z-DOWN in 1-2 button press increments until consistent dots are achieved.

10. If dots are "smeared" (larger dots with elongated geometry) Teflon tube contact with the wafer surface is occurring.

11. In Z-STEP mode, press Z-UP 4 times (2 mil) and then change to MICRO-Z and adjust down for accurate placement. (*Note: The Z mechanism can become "down loaded" and must be backed off a thousandth or two to get accurate small increment downward movement again.*)

12. Run a test dot sequence and make MICRO-Z mode Z Down adjustments until dots are consistent with good geometry.
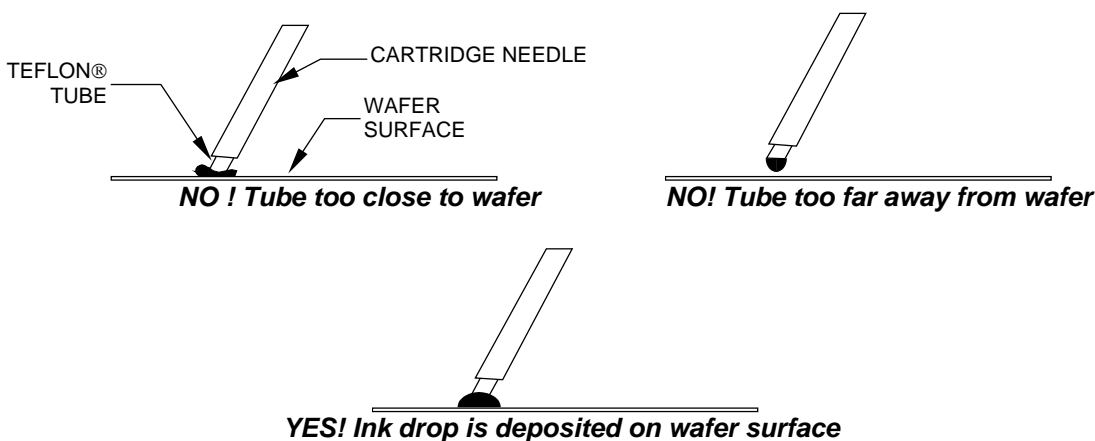
TEFLON® TUBE — CARTRIDGE NEEDLE — WAFER SURFACE

NO ! Tube too close to wafer   ***NO! Tube too far away from wafer***

YES! Ink drop is deposited on wafer surface

NOTICE	*Do not let the Teflon® cartridge tube contact the wafer surface. This may crush the tip preventing ink flow and damaging the cartridge or the wafer!*

Note: Due to the unavoidable incidence of slight manufacturing variations from cartridge to cartridge, additional Z height adjustment of the inker may be necessary after changing ink cartridges.

13. If the unit fails to operate as specified, please contact Xandex Customer Service for assistance at (707) 763-7799 or toll free in the United States at (800) 767-9543 or email insidesales@xandex.com .

Changing the Cartridge

1. Place thumb and forefinger on each side of the cartridge and gently pull up and out to remove cartridge from the shuttle dove tail and cartridge clip.

2. Unthread the cartridge from the air fitting and discard in the proper manner.

3. Inspect the air fitting and air hose for ink contamination and clean or replace as necessary.

4. Install a new cartridge per installation instructions.

Cartridge Priming Tips

Tips to avoid common problems with DieMark Pneumatic Ink Cartridges.

DO NOT attempt to refill Xandex DieMark Ink Cartridges. Cartridges are disposable and designed for single use only. Using a refilled cartridge will have an adverse effect on functionality and performance. Please note, Xandex does not warranty refilled cartridges.

Handling Tips:

Handle cartridges with care to avoid damaging the exposed Teflon tube at the tip of the needle

When removing the cartridges from the clamshell package, lift the cartridge straight up to avoid bending the needle or damaging the Teflon tube.

Allow the cartridge to reach optimal temperature of 18-25C (65-78F) before priming the cartridge. Never attempt to prime and use cartridges that are not at optimal temperature.

Priming Tips:

Wipe off any excess ink on the outside of the needle using a lint free cloth or swab before use.

DO NOT use the cartridges beyond the recommended open time for the ink type in the cartridge. Recommended open time is three (3) days for 7824, 7824T, 8103 and 8104 and five (5) days for 6990, 6993, and 6997.

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Chapter 5 Ink

General Information

Semiconductor manufacturers use the vision system of automatic pick and place equipment during the assembly process to detect damaged and/or rejected die. This is done by shining a combination of different lights on the wafer surface to create a "white" background. Ink dots and defects such as chipped corners are easily recognizable against this background.

DieMark black and red inks are opaque and easily recognizable under most lighting conditions. Glycol Free 8103 ink is thick in viscosity and delivers opaque dots ranging from 6 to 40 mils. 8104 is not as viscous as 8103 and provides thinner dots with excellent geometry and adhesion in larger dot range up to 86 mils.

8103 ink is certified to contain less than 10 ppm of Sodium (Na) and Chloride (Cl). 8104 ink is certified to contain less than 20 ppm of Sodium (Na) and Chloride (Cl). Both 8103 and 8104 premium inks are free of glycol ethers, which are identified reproductive hazards and carcinogens. 7824 and 7824T inks are certified to contain less than 10 ppm of Na and Cl. 6990, 6993, and 6997 inks are certified to contain less than 10 ppm of Na and Cl. Analysis reports are available upon request from Xandex Customer Service.

Glycol Free 8103 and 8104 inks have a 4 month shelf life, except for 8103 White ink, which has a 2 month shelf life. Glycol Free inks air dry rapidly at ambient conditions and will give consistent flow for 3 days after cartridge opening. 6990, 6993 and 6997 inks have a 4 month shelf life, require heat curing to be permanent, and will give consistent flow for 5 days after cartridge opening. 7824 and 7824T inks have a 4 month shelf life and will give consistent flow for 3 days after cartridge opening. 7824 and 7824T can be air or "heat set" cured.

Glycol Free 8103 and 8104 inks are thermally stable at temperatures up to 150° C and can be used in hot chuck or oven drying applications without cracking or loss of adhesion. Use of either 6990, 6993 and 6997 or 7824 and 7824T inks in hot chuck applications is not recommended as the elevated ambient temperature in the probing area can reduce cartridge life and cause inconsistent ink flow. However, use of a hot chuck to heat set dots during offline inking has reportedly been successful when employed by some customers. All the inks offered by Xandex are non-magnetic.

Safety Data Sheets (SDS) are available for all inks offered by Xandex. To obtain SDS or information about choosing the appropriate ink for your application please contact your local distributor or Xandex Customer Service. [1] Test results are dependent on test method

Ink Curing

The procedure for curing will depend on the type of ink used and other factors such as dot size and spacing (see "General Notes on Ink Curing", below). Xandex guidelines are developed under laboratory conditions using single wafers and are intended as a baseline to develop a curing process that meets your specific needs.

6990, 6993, and 6997 should be cured/baked within 2 hours of inking due to the evaporation of solvents in the ink over time. If a wafer (or boat of wafers) is left uncured for an extended period of time, the dots may crack and/or flake after the baking process.

6990, 6993, and 6997 inks, when air-dried, will not smear when touched. They are not permanent, however, and will not withstand most post-probe handling or processes. Conversely, 7824 and 7824T inks air cure within 2.5 hours (≤20 mil, up to 10 hours for >20 mil dots). 7824 and 7824T may also be heat cured at up to 150°C for 10 minutes.

8103 and 8104 Glycol Free inks hard cure under ambient conditions in the least time of any of the inks offered by Xandex. Ink dots of ≤25 mil typically air dry to a hard cure in 45 minutes. Dot sizes >25 mil may require significantly longer to cure. An ambient cure time of up to 6 hours may be needed for larger dot sizes. 8103 and 8104 may also be heat cured at up to 150°C for 10 minutes if a faster cure is desired.

General Notes on Ink Curing

Several factors have greater influence on the time required to get a full cure in the shortest amount of time, either when heat curing or curing at room temperature:

> **Dot Size**: Larger dot sizes will require longer cure times.

> **Dot Spacing**: Large numbers of closely spaced ink dots will require a longer cure time than small numbers of widely spaced dots.

> **Air Flow:** Continuous air flow across the wafer surface will reduce the amount of time required for ink curing. This is especially important when air curing at ambient temperatures.

> **Wafer/Die Surface**: Both the surface chemistry and degree of patterning on the die affect how the ink spreads on the wafer. If the ink does not spread as much, the dots will be thicker. And if the dots are thicker, they will require a longer cure time.

> **Temperature**: Higher temperatures will lead to faster ink cure times.

> **Wafer Boat / Cassette**: Wafers stacked in a boat / cassette will require increased cure time compared to single wafers.

Ink Curing Guidelines

The following table provides guidelines for curing each type of ink sold by Xandex:

The following table provides guidelines for curing each type of ink sold by Xandex:

INK CURING GUIDELINES			
CURE TYPE	**TEMPERATURE**	**CURE TIME**	**RESULT**
6990, 6993, and 6997			
Soft Cure	70-100°C	5-30 minutes	Ink is semi-permanent and will not withstand wash of alcohol, acetone, or photoresist removers
Hard Cure	150-185°C	30-60 minutes	Ink is permanent and resistant to wash process
7824, 7824T			
Hard Cure	Air dry, ambient conditions*	1-3 hours for ≤20 mil 3-4 hours for 20-25 mil 4-10 hours for 25-40 mil	Ink is permanent and may only be removed with great difficulty
Hard Cure	150 Watt heat lamp at 5-6 inches **OR** oven at 110-150°C	5-10 minutes	Ink is permanent and may only be removed with great difficulty
8103 and 8104 Glycol Free			
Hard Cure	Air dry, ambient conditions*	5-15 minutes for ≤ 15 mil 15 minutes – 3 hours for 15-25 mil 3-6 hours for 25-40 mil	Ink is permanent and may only be removed with great difficulty
Hard Cure	150 Watt heat lamp at 5-6 inches **OR** oven at 110-150°C	5-10 minutes	Ink is permanent and may only be removed with great difficulty

Ink cure testing performed on single, (not stacked in a wafer boat/cassette) polished silicon wafers with dot spacing of 50 mil (1270 μm) with moderate air flow at 70-72°F (21.1-22.2°C).

Ink Removal Information

A rinse with isopropyl alcohol or acetone generally removes ink completely if the wafer is washed shortly after inking (within 5 minutes). An ultrasonic bath is recommended to ensure complete removal of ink residue. Ink dots, which have been air dried or hard cured, require the application of an ink remover.

DieMark Remover 8000

Xandex has developed DieMark Remover 8000 specifically for the semi-conductor industry. DieMark Remover 8000 thoroughly removes all inks supplied by Xandex, including oven baked ink dots. DieMark Remover 8000 has very low levels of organic and inorganic contaminants and is an efficient and thorough ink remover when used in simple bench top cleaning methods. Due to its high flash point, DieMark Remover 8000 is also safe and effective when used in ultrasonic, temperature/pressure cycling under vacuum and deep bath heating and agitation ink removal processes.

DieMark Remover 8000 is carcinogen free (NTP, OSHA) and all ingredients used are TSCA listed. For an MSDS or more information on using DieMark Remover 8000 in your specific ink removal process, contact Xandex Customer Service.

Ink Removal Procedure

The following is the recommended bench top procedure for removing ink from wafers using DieMark Remover 8000. *

⚠ CAUTION	*All procedures should be performed under a laboratory hood, following proper safety precautions (protective goggles, gloves and clothing).*

1. Apply sparingly with an eyedropper to a localized area of the wafer.

2. Allow 2-3 minutes for the DieMark Remover 8000 to begin solvating. Time required will vary depending on the degree that the ink was cured.

3. For highly cured ink dots, use longer soak times, then wipe gently with a clean lint-free cloth to facilitate removal. If necessary, repeat steps 1 and 2.

4. For large areas or removal of ink from entire wafer, soak a clean lint-free cloth with DieMark Remover 8000, then lay the wet cloth over the entire surface and allow time to soak/solvate ink, then remove wet cloth. Repeat as necessary.

5. After dots are removed, clean wafer via standard procedures, such as vapor degreasing, and/or rinse with a clean solvent (Isopropyl Alcohol) followed by a bake cycle at 65° C to dry.

* The following ink removers may be substituted for DieMark Remover 8000, however, Xandex does not guarantee that satisfactory results will be obtained. None of the following solvents or ink removers are available from Xandex.

- ♦ Aptek 6515 Ink Remover
- ♦ Markem® 540
- ♦ P-300 Resist Remover
- ♦ 712-D Resist Remover
- ♦ Uresolve Resist Remover
- ♦ Methyl Ethyl Ketone (MEK)
- ♦ N-Methyl-2-Pyrrolidone (M-Pyrrol)

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Chapter 6 Maintenance & Troubleshooting

Ink Troubleshooting

This Troubleshooting section for the Micro-Z Pneumatic Inker is divided into three parts. The first part covers Ink and the DM-2 ink cartridge. The second part covers the Inker Assembly, and the third part covers the Pneumatic Controller. More troubleshooting information is available in the "Support" section at www.xandexsemi.com

Problem	Solution
Some ink dots tend to crack after baking using Xandex recommended cure cycles.	This occurrence is related to the ink surface tension, the wafer surface conditions and too long a delay time between inking and curing. To remedy this situation, the curing cycle has to be modified (reduce time and temperature). See **Section 5 "Ink Curing."**
Runny, blobbing ink or skipping dots.	1. Check ink shelf life. 6990, 6993, 6997 inks should be used within 4 months or 5 days of cartridge opening. 8103 and 8104 air dry glycol free inks should be used within 4 months or 3 days of cartridge opening except for 8103 White ink, which should be used within 2 months or 3 days of cartridge opening. 7824 and 7824T air-dry ink within 4 months or 3 days after cartridge opening. 2. Check for exposure to extreme temperatures. Cartridges should be stored at 25°C. **DO NOT refrigerate the cartridges.** Occasionally, ink is subjected to much higher temperatures (40-50° C) for an extended time during transport. This could break down the ink such that its viscosity and surface tension are altered permanently. 3. Z height adjustment is incorrect. After cartridge replacement, minor Z height adjustment may be required. See **Section 4 "Inker Assembly Setup and Alignment."** 4. Chuck top or wafer surface not planar. Verify planarity of both.
After changing the controller dot size settings, the dots are too small or the ink blobs at the tip of the needle.	1. The cartridge tip may be damaged. Examine cartridge and replace if necessary. 2. Whenever dot size is changed there may be minor Z height adjustments required. The inker should be set so that just the bottom of the ink drop touches the wafer.

Problem	Solution
Small, inconsistent or no ink dots.	1. Soft Teflon® tip of the cartridge tube is clogged or damaged. Change ink cartridge. 2. The dot size setting may be too low. Increase dot size setting. 3. Air pressure too low. Verify that or the controller's air regulators are set to 80 ± 5 PSI. 4. Z height adjustment is incorrect. After cartridge replacement, occasional Z height adjustment may be required due to the unavoidable incidence of slight manufacturing variations from cartridge to cartridge. It is recommended that at setup, several rows of dots be placed and inspected for consistency. See **Section 4 "Inker Assembly Setup and Alignment."** 5. Shuttle mechanism may be binding.

Inker Troubleshooting

Problem	Solution
Cartridge tip does not reach wafer surface.	1. Check Z height The cartridge tip should be 1-2 mil from the wafer surface. Adjust Z height per **"Inker Assembly Setup and Alignment"** in **Section 4 "System Operation"** of this manual.
Unit functions normally, no dots, no shuttle movement.	1. Verify that the Controller-to-Shuttle air hose connector is plugged into the controller. 2. Verify that the Controller-to-shuttle air hose is not kinked, clogged or pinched closed. 3. Check Main Air pressure setting (verify 80 ± 5 PSI air input).
Unit functions normally, shuttle moves, no dots.	1. Check air hose to top of cartridge to be sure it is connected and not clogged, kinked or pinched. 2. Verify cartridge preparation, insuring Needle Collar is flush with the Cartridge Neck and the internal membrane is broken. See **Section 4 "Ink Cartridge."** 3. Check the Teflon® tip of cartridge tube to confirm that it is not clogged or damaged. 4. Verify rubber washer on cartridge air hose connector is installed.

Schedule and Preventive Maintenance Kits

Periodic preventive maintenance of the shuttle mechanism is recommended to insure continued, trouble-free operation of your Xandex pneumatic inking system.   The recommended maintenance schedule is as follows;

- Off-line use = 6 month intervals
- In-Line / Post Probe use = Once per year

Shuttle preventive maintenance kits are available, which include all parts necessary for one normal shuttle maintenance procedure. These kits may be ordered direct from Xandex or through your local Xandex distributor.

With the introduction of the Precision Shuttle in spring of 2022, shuttle maintenance has been dramatically simplified. The new Precision Pneumatic Shuttle is available in two different hose lengths to service the Manual and Motorized Micro-Z inker bases. Shuttle maintenance can be performed without disassembly or removal from the Inker Base. The 316-0010 Precision Shuttle is standard for the Manual Micro-Z and is equipped with a 36 inch long controller-to-shuttle air hose assembly. The 316-0012 Precision Shuttle is standard for the Motorized Micro-Z and is equipped with a 60 inch long controller-to-shuttle air hose assembly. For a longer controller-to-shuttle air hose assembly, specify the optional 316-0012 Precision Shuttle.

The Standard Maintenance Kit for your X711X Manual Micro-Z inker bases with Precision Shuttle is part number 370-0006 with 36 inch air hose. For Motorized Micro Z inker base with Precision Shuttle, order maintenance kit part number 370-0008 with 60 inch air hose.

Controller Troubleshooting

Problem	Solution
The Unit is plugged in but the "Power" LED is off.	1. Make sure that the AC outlet has power. Requirement is 100-240 VDC @ 47-63Hz. 2. Verify that the power supply is connected to the 24V input on the back of the controller and that the ON/OFF switch on the controller is in the ON position.
Unit powers up okay but will not respond to prober signal.	3. Verify input cable is plugged into the prober input on the Controller. 2. Verify input cable is plugged into inker jack on prober. 3. Check continuity of cable. Replace /repair if defective.
Unit powers up okay, responds to prober input but the shuttle does not move.	1. Check that shuttle toggle switches on the front of the controller are in the RUN position. 2. Check that the air hose "quick disconnects" on the back of the controller are correctly oriented and connected. 3. Place top mode switch to DISABLE. Press the RESET button. The shuttle should cycle. If it does not, and all air hose connections are correct, the problem may be that the shuttle mechanism is binding

Problem	Solution
"STATUS" & "INK ON" LED's Flashing	1. Verify that there is air input to the controller. 2. Unacceptable mode switch combination. Review **"Controller Operation" in Section 4.**

Dot size does not change with adjustment of Dot Size Thumbwheels	1. Verify that the air hoses from the controller to the inker are connected properly:
	   ♦ RED AIR HOSE connects to the ink cartridge.
	   ♦ BLUE AIR HOSE connects to the shuttle connection on the shuttle mechanism.
	
	2. Replace ink cartridge.

Controller Maintenance

Pneumatic Controller Preventive Maintenance Schedule and Kits

The preventive maintenance kit for the 350-0027 Micro-Z Pneumatic Controller is based on the serial number of the controller. Contact Customer Service for additional information.

Chapter 7 System Specifications

Input Power Requirement:	100-240 VAC @ 50-60Hz
Output Power Requirement:	24V ▬ (VDC) / 0.8A or greater
Approvals:	UL / FCC / PSE / CCC / CE / WEEE / ROHS
Protection:	Overvoltage/Short Circuit
Output Pin Assignments:	Center: +V Rtn ─◖─ +V Outside: Return
Output Plug Size:	Outside Diameter: 5.5mm Inside Diameter: 2.5mm Barrel Length: 9.5mm

The DC power supply received with your DieMark inking system meets these requirements. Use only the DC power supply provided with the unit or an authorized replacement power supply from Xandex Inc. or an approved Xandex distributor. For the exact specification of your power supply, see the "24VDC Power Supply" drawing included in your product manual drawing package.

Pneumatic Controller Specifications

Size:	6.4" x 7.6" x 4.3" (16.3 x 19.3 x 11cm)
Weight:	3.25 lbs (1.47 kg)
Input Power Requirement:	24V▬ (VDC) 0.84A
Foot Switch Input:	Contact Closure >50 msec
Air Consumption per Regulator:	80 PSI ±5 PSI Instrument Air per ISA 7.3 specification <0.5 cfm @ 10 dots/second
Cycle Rate:	Exceeds 300 cycles/minute
Counters:	Eight Digit with External Reset (Independent of Microprocessor)
External Regulator/Filter:	5.0 micron Air Filtration
Prober Input:	12 - 60 volts @ minimum 30 ms pulse width. The input circuit presents approximately 1 KΩ - 700 Ω input resistance. Typical current as a function of input voltage is listed in the following table:

15 V	25 mA
20 V	45 mA
40 V	65 mA
60 V	85 mA (Maximum input)

Environmental Range:	- Indoor use - Altitude up to 2,000 m - Temperature range 5° C to 40° C - Maximum relative humidity 80 % for temperatures up to 31°C decreasing linearly to 50 % relative humidity at 40 °C

Certifications:	
C E **MARK** PENDING	Standards to which conformity is declared: EN61010-1 / EN61326-1 Marked for LVD and EMC
RoHS	RoHS Compliant with EU Directive 2011/65/EU
FC	This device complies with FCC Rules Part 15. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference that may be received or that may cause undesired operation.
	Xandex Inc. has labeled its branded electronic products with the WEEE Symbol to alert our customers that products bearing this label should not be disposed of in a landfill or with municipal or household waste in the EU.
UK CA	Conforms to UK Directives: 2016 No.1101 Electrical Equipment (Safety) 2016 No.1091 Electromagnetic Compatibility 2012 No.3032 RoHS Standards to which conformity is declared: BS EN IEC 61010-1:2010 BS EN 61326-1:2013

Inker Specifications	
Ink Cartridge Model	DM-2
Ink Cartridge Type	A4, A5, A6, A8
Available Inks	DieMark 699X series, 7824, 8103 and 8104 inks
Dot Sizes	Dot sizes (± 10%) for speeds of 5 dots/second to 1 dot/2 minutes.
Dot Size Range	3 mil to 50 mil with currently available inks
Shuttle Stroke Length	0.040"- 0.060" factory set
Z Adjustment Resolution	X7110 Manual: 0.0002" per 10° adjustment, X7120 Motorized: Z-Step Mode = 0.0005", Micro Z-Step Mode 0.00005"
Z Adjustment Range	±0.18" adjustment from neutral

Ink Cartridge Specifications

Models:	DM-2, Type A4, A5, A6, A8
Teflon Tube I.D.:	**A4** - 0.002" / **A5** - 0.005" / **A6** - 0.006" / **A8** - 0.008"
Reservoir Capacity:	1.0 grams minimum
Available Inks:	DieMark 6990, 6993, 6997, 7824, 8103 and 8104 inks
Dot Sizes:	Dot sizes (± 10%) for speeds of 5 dots/second to 1 dot/2 minutes.

Cartridge Availability

The following table illustrates ink and cartridge configurations. Configurations designated with a 0 are available as a Customer Specific Product (CSP) but have not been tested by Xandex and are subject to limited warranty conditions. The information in this table is accurate as of the time of publication but is subject to change without notice.

	Pneumatic Cartridge Types							Filament Cartridge Types											
	DM-2				DM-2.3			DM-1							DM-1.25			DM-S	
Ink Type	A4	A5	A6	A8	A5	A6	A8	3 mil	5 mil	8 mil	10 mil	15 mil	25 mil	30 mil	10 mil	15 mil	25 mil	10 mil	15 mil
6990 Black	+	+	+	+	+	+	+	T	T,F	+	+	+	+	+	+	+	+	+	+
6993 Black	+	+	+	+	+	+	+	T	+	+	+	+	+	+	+	+	+	+	+
6997 Black	+	+	+	+	+	+	+	T	T,F	+	+	+	+	+	+	+	+	+	+
Empty (no ink)		+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+
7824 Black	+	+	+	+	+	+	+	T	T,F	+	+	+	+	+	0	+	+	0	0
7824T Black	+	+	+	+	+	+	+	T	T	+	+	+	+	+	0	0	+	0	0
8103 Black	+	+	+	+	+	+	+	T	T	+	+	+	+	+	0	0	0	0	0
8103 Red	0	+	+	+	+	+	0	T	T	+	+	+	+	+	0	0	0	0	0
8103 White	0	+	+	+	+	+	+	0	T	+	+	+	+	+	0	0	0	0	+
8104 Black	0	+	+	+	+	+	+	0	X	X	X	X	X	X	X	X	X	X	X

+ = Available standard cartridge and ink configuration.
0 = Not yet qualified by Xandex. Available as a special order, subject to limited warranty conditions.
T = with Tungsten filament
F = with Mono-Filament
X = Not available in filament cartridge configurations.

Dot Size Guidelines in Mils (0.001 inch)	Micro-Z X711X Manual & X712X Micro-Z Motorized Series DM-2		X1000 & X901 Series DM-2		X5000 Series DM-2.3	
8103 INK						
A4	Min.	3.5 mil	Min.	0	Min.	0
	Mid.	6.75 mil	Mid.	0	Mid.	0
	Max.	10 mil	Max.	0	Max.	0
A5	Min.	10 mil	Min.	12 mil	Min.	13 mil
	Mid.	19 mil	Mid.	21 mil	Mid.	23 mil
	Max.	22 mil	Max.	24 mil	Max.	27 mil
A6	Min.	11 mil	Min.	15 mil	Min.	17 mil
	Mid.	23 mil	Mid.	25 mil	Mid.	27 mil
	Max.	28 mil	Max.	29 mil	Max.	30 mil
A8	Min.	17 mil	Min.	22 mil	Min.	23 mil
	Mid.	32 mil	Mid.	37 mil	Mid.	39 mil
	Max.	38 mil	Max.	42 mil	Max.	43 mil
6990 / 6993 / 6997 INK						
A4	Min.	4 mil	Min.	0	Min.	0
	Mid.	7 mil	Mid.	0	Mid.	0
	Max.	10 mil	Max.	0	Max.	0
A5	Min.	9 mil	Min.	16 mil	Min.	17 mil
	Mid.	12 mil	Mid.	28 mil	Mid.	29 mil
	Max.	16 mil	Max.	32 mil	Max.	33 mil
A6	Min.	8 mil	Min.	20 mil	Min.	18 mil
	Mid.	16 mil	Mid.	32 mil	Mid.	32 mil
	Max.	19 mil	Max.	36 mil	Max.	36 mil
A8	Min.	12 mil	Min.	29 mil	Min.	27 mil
	Mid.	24 mil	Mid.	52 mil	Mid.	50 mil
	Max.	29 mil	Max.	60 mil	Max.	57 mil
7824 INK						
A4	Min.	6 mil	Min.	0	Min.	0
	Mid.	8.5 mil	Mid.	0	Mid.	0
	Max.	11 mil	Max.	0	Max.	0
A5	Min.	10 mil	Min.	19 mil	Min.	18 mil
	Mid.	18 mil	Mid.	33 mil	Mid.	33 mil
	Max.	21 mil	Max.	38 mil	Max.	38 mil
A6	Min.	13 mil	Min.	25 mil	Min.	20 mil
	Mid.	24 mil	Mid.	44 mil	Mid.	36 mil
	Max.	29 mil	Max.	50 mil	Max.	41 mil
A8	Min.	20 mil	Min.	37 mil	Min.	29 mil
	Mid.	34 mil	Mid.	59 mil	Mid.	50 mil
	Max.	40 mil	Max.	69 mil	Max.	56 mil
8104 INK						
A5	Min.	14 mil	Min.	26 mil	Min.	24 mil
	Mid.	25 mil	Mid.	49 mil	Mid.	44 mil
	Max.	30 mil	Max.	54 mil	Max.	50 mil
A6	Min.	20 mil	Min.	33 mil	Min.	27 mil
	Mid.	34 mil	Mid.	56 mil	Mid.	50 mil
	Max.	39 mil	Max.	65 mil	Max.	56 mil
A8	Min.	38 mil	Min.	51 mil	Min.	54 mil
	Mid.	59 mil	Mid.	80 mil	Mid.	85 mil
	Max.	67 mil	Max.	90 mil	Max.	93 mil

0= A4 cartridges are qualified by Xandex for use on Micro-Z inking systems. A4 cartridges can be purchased for use on other DieMark pneumatic inker models, however, performance is not guaranteed, and subject to limited warranty conditions.

Dot production figures are averages and as such, are not guaranteed. All ink dot characterization testing performed at ambient temperature of 70° degrees F, relative humidity of 50% using polished, unetched silicon wafers (no passivation).

Dot Size Guidelines in Microns (µm)	Micro-Z X711X Manual & X712X Micro-Z Motorized Series DM-2		X1000 & X901 Series DM-2		X5000 Series DM-2.3	
8103 INK						
A4	Min.	89 µm	Min.	0	Min.	0
	Mid.	172 µm	Mid.	0	Mid.	0
	Max.	254 µm	Max.	0	Max.	0
A5	Min.	254 µm	Min.	304.8 µm	Min.	330.2 µm
	Mid.	482.6 µm	Mid.	533.4 µm	Mid.	584.2 µm
	Max.	558.8 µm	Max.	609.6 µm	Max.	685.8 µm
A6	Min.	279.4 µm	Min.	381 µm	Min.	431.8 µm
	Mid.	584.2 µm	Mid.	635 µm	Mid.	685.8 µm
	Max.	711.2 µm	Max.	736.6 µm	Max.	762 µm
A8	Min.	431.8 µm	Min.	558.8 µm	Min.	584.2 µm
	Mid.	812.8 µm	Mid.	939.8 µm	Mid.	990.6 µm
	Max.	965.2 µm	Max.	1066.8 µm	Max.	1092.2 µm
6990 / 6993 / 6997 INK						
A4	Min.	102 µm	Min.	0	Min.	0
	Mid.	178 µm	Mid.	0	Mid.	0
	Max.	254 µm	Max.	0	Max.	0
A5	Min.	228.6 µm	Min.	406.4 µm	Min.	431.8 µm
	Mid.	304.8 µm	Mid.	711.2 µm	Mid.	736.6 µm
	Max.	406.4 µm	Max.	812.8 µm	Max.	838.2 µm
A6	Min.	203.2 µm	Min.	508 µm	Min.	457.2 µm
	Mid.	406.4 µm	Mid.	812.8 µm	Mid.	812.8 µm
	Max.	482.6 µm	Max.	914.4 µm	Max.	914.4 µm
A8	Min.	304.8 µm	Min.	736.6 µm	Min.	685.8 µm
	Mid.	609.6 µm	Mid.	1320.8 µm	Mid.	1270 µm
	Max.	736.6 µm	Max.	1524 µm	Max.	1447.8 µm
7824 INK						
A4	Min.	152 µm	Min.	0	Min.	0
	Mid.	216 µm	Mid.	0	Mid.	0
	Max.	279 µm	Max.	0	Max.	0
A5	Min.	254 µm	Min.	482.6 µm	Min.	457.2 µm
	Mid.	457.2 µm	Mid.	838.2 µm	Mid.	838.2 µm
	Max.	533.4 µm	Max.	965.2 µm	Max.	965.2 µm
A6	Min.	330.2 µm	Min.	635 µm	Min.	508 µm
	Mid.	609.6 µm	Mid.	1117.6 µm	Mid.	914. µm
	Max.	736.6 µm	Max.	1270 µm	Max.	1041. µm
A8	Min.	508 µm	Min.	939.8 µm	Min.	736.6 µm
	Mid.	863.6 µm	Mid.	1498.6 µm	Mid.	1270 µm
	Max.	1016 µm	Max.	1752.6 µm	Max.	1422.4 µm
8104 INK						
A5	Min.	355.6 µm	Min.	660.4 µm	Min.	609.6 µm
	Mid.	635 µm	Mid.	1244.6 µm	Mid.	1117.6µm
	Max.	762 µm	Max.	1371.6 µm	Max.	1270 µm
A6	Min.	508 µm	Min.	838.2 µm	Min.	685.8 µm
	Mid.	863.6 µm	Mid.	1422.4 µm	Mid.	1270 µm
	Max.	990.6 µm	Max.	1651 µm	Max.	1422.4 µm
A8	Min.	965.2µm	Min.	1295.4 µm	Min.	1371.6 µm
	Mid.	1498.6 µm	Mid.	2032 µm	Mid.	2159 µm
	Max.	1701.8 µm	Max.	2286 µm	Max.	2362.2 µm

0= A4 cartridges are qualified by Xandex for use on Micro-Z inking systems. A4 cartridges can be purchased for use on other DieMark pneumatic inker models, however, performance is not guaranteed, and subject to limited warranty conditions.

Dot production figures are averages and as such, are not guaranteed. All ink dot characterization testing performed at ambient temperature of 70° degrees F, relative humidity of 50% using polished, unetched silicon wafers (no passivation).

Inker Warranty

Seller warrants as follows:

All material supplied will conform to the description stated. All products will be free of defects in materials and workmanship under normal use for the following periods:

Stated shelf life of DM-2 Ink Cartridges:
- 6990, 6993, 6997 = Four (4) months. Five (5) days after cartridge opening
- 8103 and 8104 (except for 8103 White) = Four (4) months. Three (3) days after cartridge opening.
- 8103 White = Two (2) months. Three (3) days after cartridge opening.
- 7824 and 7824T = Four (4) months. Three (3) days after cartridge opening.

Pneumatic Controller = One (1) year only when clean, dry, filtered air is used, and when product is installed and operated per manufacturer's recommendations and instructions.

Ninety (90) days from the date of delivery to the customer for all other products.

Xandex makes no other warranty, express or implied, including without limitation any warranty of merchantability or of fitness for a particular purpose. Customer, OEM or Distributor's exclusive warranty shall be, at Xandex's option, to have defective product repaired or replaced, or to receive a refund of purchase price.

Xandex may, upon request, furnish to buyer such technical advice, as it may be able to supply with reference to the use by buyer of any materials delivered. Xandex assumes no liability for the advice given or results obtained. Buyer expressly agrees that it will implement any advice thus given at its own risk and agrees to indemnify and hold Xandex harmless against any liabilities, costs or expense resulting therefrom.

Xandex makes no warranty for performance, service or support of any products unless they are purchased directly from Xandex or through an authorized Xandex Distributor.

Exclusions: This warranty shall not apply to defects or damage resulting from;
- Improper or inadequate maintenance by customer, including failure to perform preventive maintenance per manufacturer's specified schedule
- Misuse or unauthorized modification
- Operation outside the environmental specifications for the product
- Improper site preparation and maintenance

Some states and provinces do not allow limitations on how long an implied warranty lasts, so the limitation or exclusion contained in this warranty may not apply to you. However, any implied warranty of merchantability or fitness is limited to the duration period of this written warranty.

If you have any questions or need further assistance please contact your authorized Xandex distributor or contact our Customer Service Group.

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System Drawings

The Inker Assembly Dimensional Drawings are available via link from www.xandexsemi.com The remaining drawings in the list below are available on request, in Adobe PDF format, from Xandex Customer Service.

Description	Drawing Number
X7110 Manual Micro-Z Pneumatic Inker Dimensions	900-7110
X7210 Motorized Micro-Z Pneumatic Inker Dimensions	900-7120
Micro-Z Pneumatic Controller Overall Dimensions	900-0227
Precision Shuttle Direct Mount Dimensional Drawing	900-0219