Mechanical and Fluidics Databook and Design Guide

Rev #: 4.02

Date: 15 July 2021

Revision History

Doc. Version	SW Release	Date	Details

4.02	R4.2.3	15-Jul-21	• Updated 3.4.3 Wiper and Wiper Cartridge – added that the wiper cartridge may need a replacement after 6,300 wipes
			• Updated 3.5.3 Position Sensors – added a note about the HOME/RAISE switch
			• Updated 10.1 Mount the IDS Blades – added the minimum 343 mm relative height requirement
			• Updated 10.3 Use Absorbent Pads or Vent Reservoir – added two methods from the *DuraFlex Installation and Commissioning Guide*
			• Updated 11.2 Connect WIMM Tubing – corrected an error in the reference
			• Updated the following figures:
			  • Figure 21 – Lift Mechanism Limit Switches – Untriggered Positions
			  • Figure 78 – IDS Relative Height
			  • Figure 80 – Feed Line Tubes Inclined
			  • Figure 82 – Absorbent Pads
			  • Figure 83 – Vent Reservoirs Connected to Each Tube
			  • Figure 84 – Example Vent Reservoir
			• Updated the following tables:
			  • Table 1 – OEM System Design Responsibilities
			  • Table 4 – Relative Height Requirements

4.01	R4.2.3	25-May-21	• Updated graphics to reflect the new IDS blade non-integrated filter • Corrected Ink Foam Sensor term to Ink Level Sensor
4.00	R4.2.3	30-Apr-21	• Added 1.5 Glossary • Added 1.6 Additional Documentation or Access • Minor editorial updates
3.00	R4.2.3	25-Mar-21	• Added N-wide information into the document • Updated 2 DuraFlex-based Printing System Overview to include module orientation, OEM system design responsibilities, and mechanical limitations • Updated 3.1 Print Module Envelope, 3.3 Printhead Cradle, and 3.5 Printhead Cradle Lift Mechanism to include new illustrations • Updated 4 Ink Delivery System (IDS) to include the IDS blade with non-integrated filter, IDS blades in a frame, etc. • Added 5 Bulk Ink Supply

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1 Introduction

This document is part of the OEM technical documentation suite for Memjet DuraFlex® module-based printing systems. Other Databook and Design Guides provide technical detail about specific modules for targeted engineering audiences.

1.1 Aim and Audience

The aim of this document is to provide Original Equipment Manufacturers (OEMs) with the mechanical and fluidic details of the DuraFlex printing system for design, integration, and maintenance purposes.

This document is targeted at OEM mechanical engineers who are designing an overall DuraFlex-based printing system and integrating it into the OEM printing system.

1.2 Prerequisites and Scope

This document assumes general knowledge about inkjet printing and printing systems, and the familiarity with Memjet inkjet printing technology.

This document introduces the DuraFlex components, integration with OEM Media Handling System (MHS), and design recommendations to ensure the reliability and high quality of print jobs.

This document does not cover the design, installation, operation, troubleshooting, theory of operation, or servicing of a system based on a particular Memjet product.

1.3 Typographic Conventions

Throughout this document, the following typographic conventions are used:

`Code Character`	`Courier` font is used to identify HTTP GET and POST commands with associated arguments, as well as references to source code, job states, registry settings, directory/file names, XCI commands, and XML settings.
Bold	Text that appears on-screen in the user interface is shown in **bold font**. This includes UI buttons, engine states, warning codes, and fault codes.
Yellow Highlighting	Yellow highlighting indicates sections that are new or updates in this version of the document, compared to the previous version.

1.4 Related Documentation

Other documents, besides this guide, provide further details for specific readers:

- *System Overview* – For OEM managers and non-technical personnel charged with evaluating the DuraFlex components for use within their products. This document describes the DuraFlex concept and Memjet-supplied DuraFlex components and gives an overview of the operational considerations. It introduces the components an OEM is required to design and manufacture to ensure the DuraFlex Modules function as designed in a DuraFlex-based print engine.
- *Mechanical and Fluidic Databook and Design Guide* – For mechanical design engineers and developers, providing details of the Memjet hardware modules and components (including printhead and maintenance system) and specifications of the ink delivery system fluidics.
- *Electrical Databook and Design Guide* – For electrical design engineers and developers, providing details of the Memjet power requirements, electronic assemblies, and connections.

- *Software Databook and Design Guide* – For software and firmware engineers who need to understand the software interfaces, commands, scripts, and reference software applications.
- *Demo GUI User Guide* – For OEM personnel using the DuraFlex Demo GUI reference application.
- *Installation and Commissioning Guide* – For OEM personnel who are installing and commissioning a new printing system.
- *Operations Guide* – For OEM engineers and operators to perform operational tasks.
- *Troubleshooting Guide* – For OEM engineers and technicians to identify symptoms and resolve issues.
- *Service and Repair Guide* – For OEM engineers and technicians to perform DuraFlex inspection and maintenance tasks and component and consumable replacement.
- *Job Submission Library Guide* – For OEM software engineers to incorporate the Job Submission Library (JSL) into their chosen Raster Image Processor (RIP).
- *Technical Bulletins* – For various audiences to announce product or process update or to provide specifics on single-subject technical topics.
- *CAD and Schematics* – For various audiences to provide detailed dimensions related to specific areas.

Note:	All technical documentation is available on your Memjet Partner Site.

1.5 Glossary

For terms, acronyms, and abbreviations used in this guide and some product-specific terms, see the *DuraFlex Glossary*.

Note:	This document is hyperlinked to the glossary. For offline reading, download the DuraFlex Glossary file from your Memjet Partner Site.

1.6 Additional Documentation or Access

For additional product-related technical documents, go to your Memjet Partner Site.

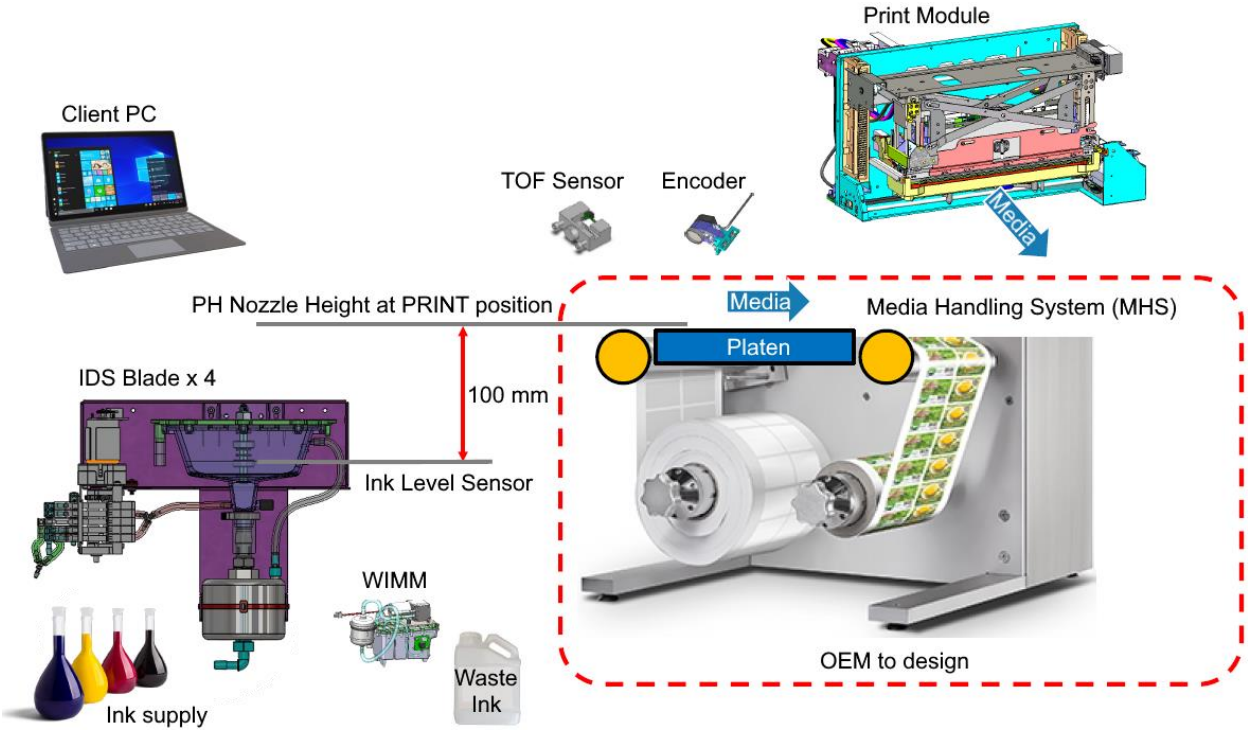
If you need Partner Site access, enter a case in Service Desk (*https://OEMsupport.memjet.com*), send an email to Memjet Customer Support (*customer.support@memjet.com*), or contact your Technical Account Manager.

2 DuraFlex-based Printing System Overview

A DuraFlex-based printing system includes a Print Module, Electrical Module, Maintenance Module, 4-color (CMYK) Ink Delivery System (IDS), Waste Ink Management Module (WIMM), and bulk ink supply to be integrated with the OEM structure.

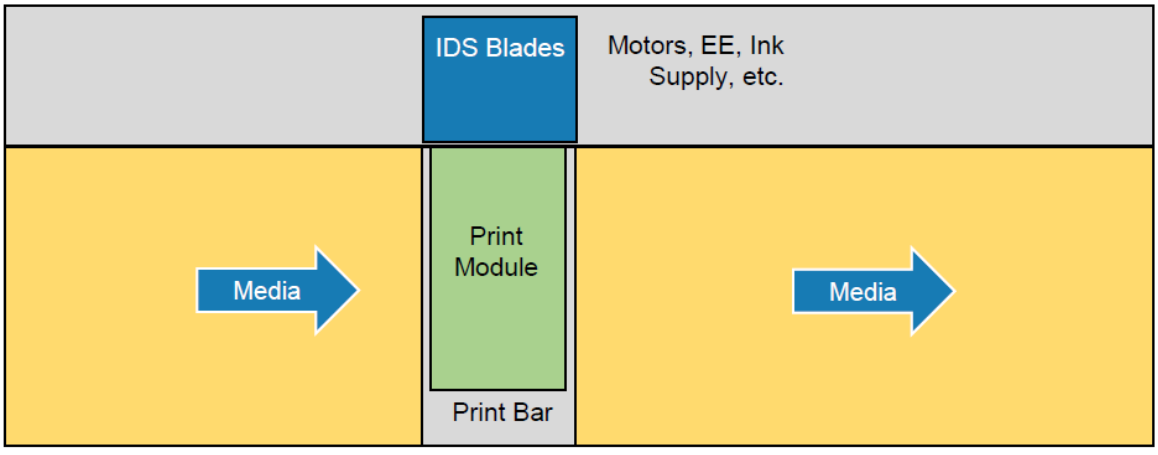
OEMs can stitch A3 printheads together (maximum of four) to meet wider printing requirements. The figure below shows the conceptual design of a 1-wide system.

Figure 1 – DuraFlex Concept (1-Wide)



The figure below shows a simplified view of the design:

Figure 2 – DuraFlex Concept (1-Wide) Simplified View



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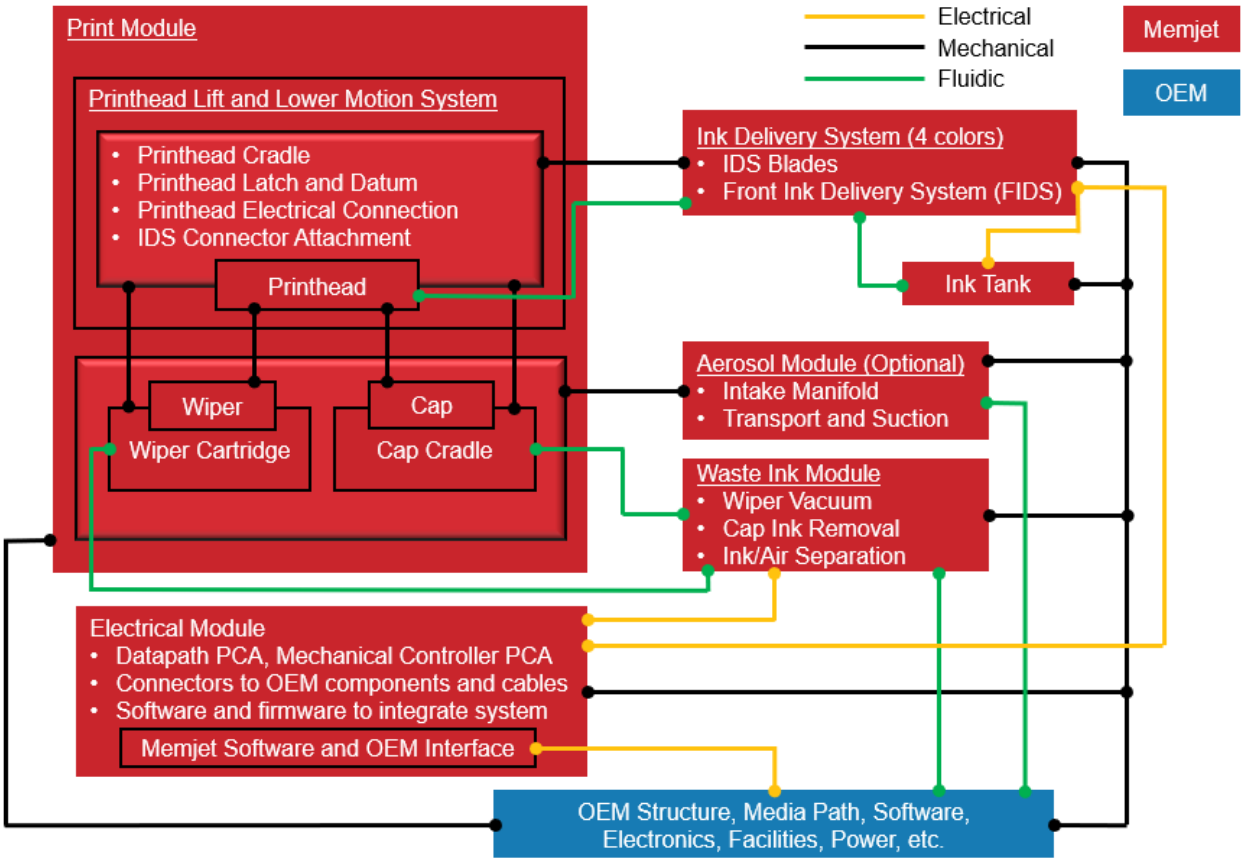
2.1 Components

The following figure shows the Memjet-supplied DuraFlex components with electrical, mechanical, and fluidic interfaces. The area of OEM responsibility is shown in the blue box.

Note:	Some parts are available as Field Replaceable Units (FRUs). Contact your Memjet Technical Account Manager to request the FRU list.

Figure 3 – DuraFlex Components

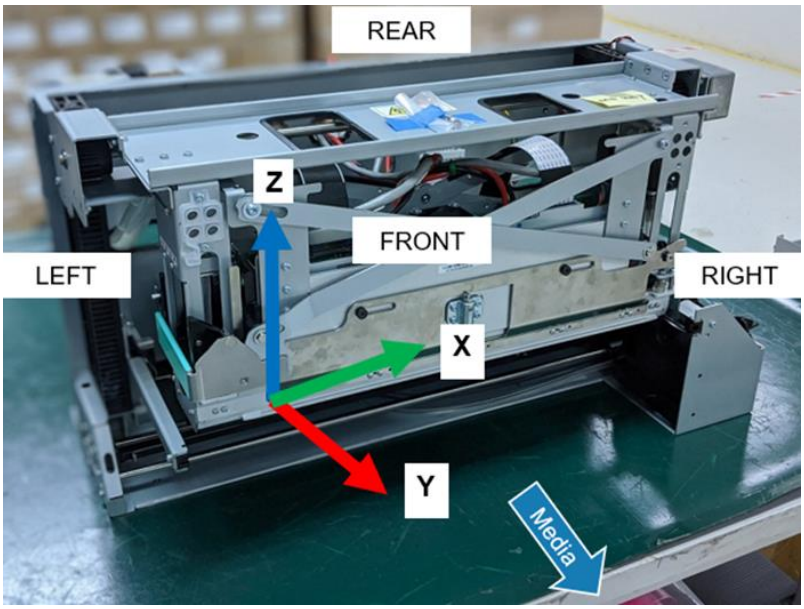


2.2 Module Orientation

The Print Module and Printhead share the same XYZ coordinates and orientation (left, right, front, and rear):

- X-axis is across the media, parallel to the printhead, considered “page width”
- Y-axis is the media travel direction, considered “page length”
- Z-axis is perpendicular to the plane of the media and is the direction of PPS

Figure 4 – Print Module Directions



The figures below show the orientation of IDS blade and WIMM.

Figure 5 – IDS Blade Directions

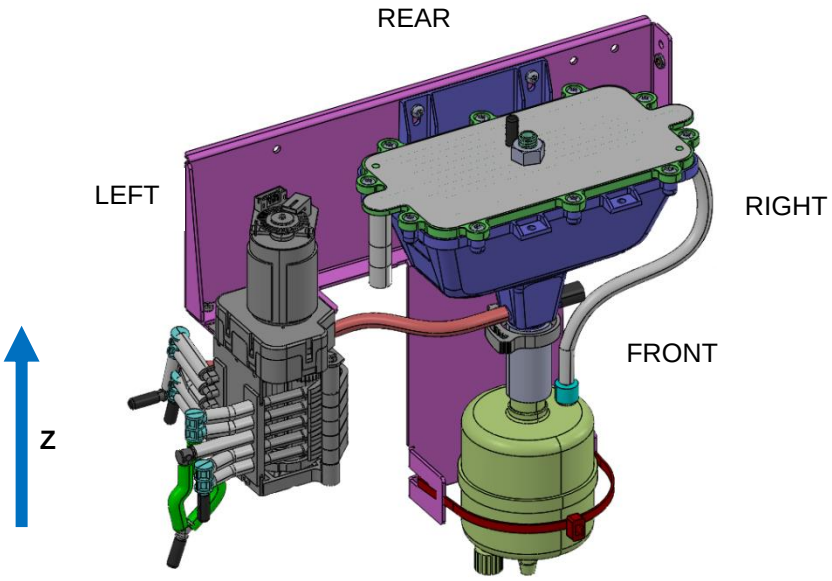
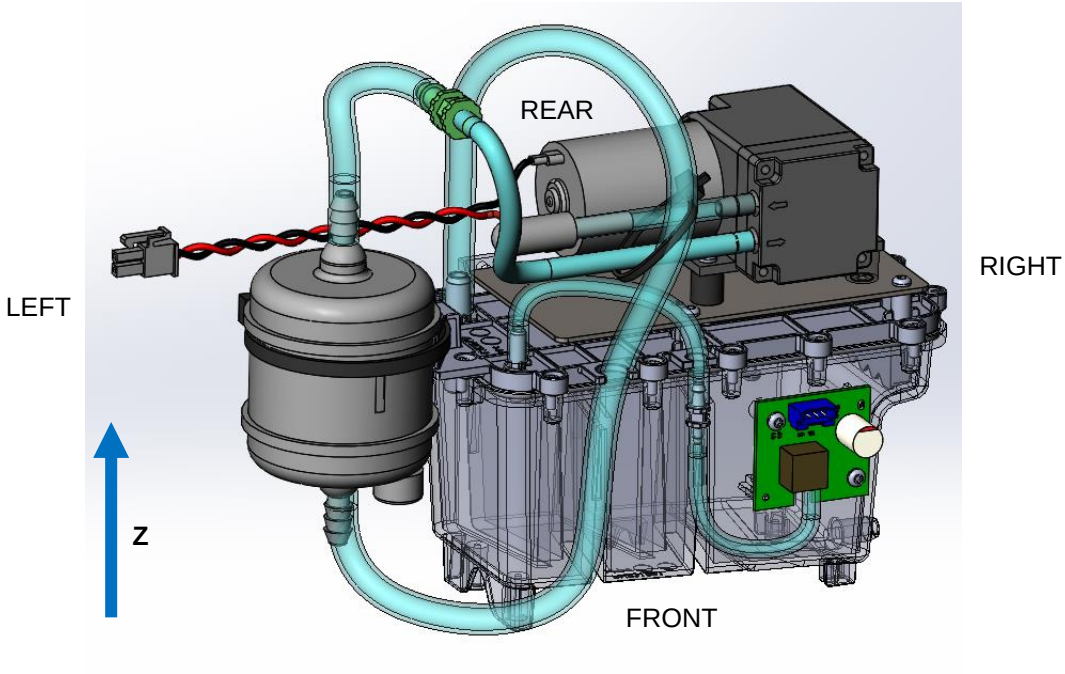


Figure 6 – WIMM Directions



2.3 OEM System Design Responsibilities

Memjet provides CAD files to help OEMs designing a DuraFlex-based printing system. CAD is available for the following:

- Print Module
- IDS Blade
- BIDS PassThrough PCA
- WIMM
- Bulk Ink Supply
- Aerosol Extraction System (AES)

The table below lists the items that OEMs must prepare to complete a printing system with DuraFlex modules. For design inquiries or assistance, contact your Memjet Technical Account Manager.

Table 1 – OEM System Design Responsibilities

Description	Required Actions by OEM	Support from Memjet
Interface for Print Module	Design and fabricate: • Print Bar/Interface Plate • Locating Pins • Datum Plates (if required) • Datum Plate Shims (if required)	CAD files will be provided
Ink Tubing 1/4” ID and 1/8” ID	Purchase, prevent contamination, and install.	See the *DuraFlex Installation and Commissioning Guide*
Network Cables (Ethernet)	Define length and source	See the *DuraFlex Electrical Databook and Design Guide*
QAI Cables (RJ12)	Define length and source	See the *DuraFlex Electrical Databook and Design Guide*
Absorbent Pads or IDS Vent Reservoir	Design and fabricate	See Section *10.3 Use Absorbent Pads or Vent Reservoir*
IDS Blade Mount	Design and fabricate	CAD files for modules will be provided
WIMM Mount	Design and fabricate	CAD files for modules will be provided
BIDS PassThrough PCA Mount	Design and fabricate	CAD files for modules will be provided
Bulk Ink Supply Mount/Rack	Design and fabricate	See Section *12 Bulk Ink Supply Mounting*
Power Cables • Print Module to PSU • PSU to wall (power source)	Define length and fabricate	See the *DuraFlex Electrical Databook and Design Guide*
Waste Tube Assembly	Purchase tubing and fittings, assemble	See Section *11.3 Connect Waste Tubing to IDS Blades*
Waste Ink Container	Purchase and mount	N/A
AES	Mount (if required)	Specifications will be provided
Power Supply Unit (PSU)	Purchase and mount	Supply sample spec upon request
Encoder	Source and install (if required - application-dependent)	Supply sample spec upon request
TOF Sensor	and install (if required - application-dependent)	Supply sample spec upon request

2.4 Mechanical Limitations in Defining Mounting Positions

2.4.1 Tubing and Cable Lengths

The diagram below shows an overview of the cables and tubes in the printing system.

Figure 7 – Cables and Tubes

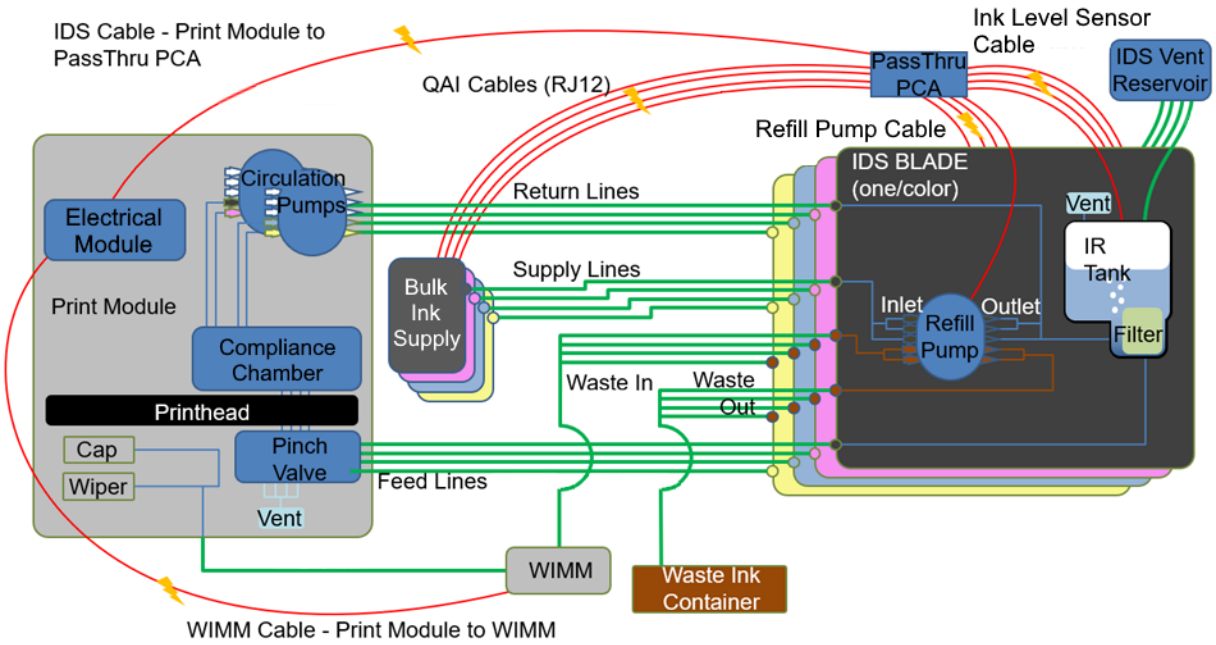


Table 2 shows the range of cables.

Table 2 – Cable Length Specifications

Cable Name	Length
IDS Cable from Print Module to BIDS PassThrough PCA	< 1.9 m
QAI Cables (RJ12) from Bulk Ink Supplies to BIDS PassThrough PCA	N/A
Refill Pump Cable from Refill Pump to BIDS PassThrough PCA	~650 mm
Ink Level Sensor Cable from IR Tank to BIDS PassThrough PCA	• For 1-wide: 1 m cable supplied. • For N-wide: OEM should supply the cable.
WIMM Cable from Print Module to WIMM	• For 1-wide: 1 m cable supplied. • For N-wide: OEM should supply the cable. 2 m cable should be sufficient for a 2-wide system.

Table 3 shows the range of tube lengths. See *Figure 25* for illustration.

Table 3 – Tube Length Specifications

Tube Name	Length
Return Lines (from Circulation Pumps to BIDS)	• For 1-wide: ≤ 1.6 m • For N-wide: ≤ 2.5 m
Feed Lines (from BIDS to Pinch Valve)	• For 1-wide: ≤ 1.3 m • For N-wide: ≤ 2 m
Supply Lines (from Bulk Ink Supplies to BIDS)	< 2 m
Vent Lines (from BIDS to Vent Reservoir)	0.5 – 1.5 m
Waste Line (from Maintenance Module to WIMM)	< 2.6 m
Waste In Line (from WIMM to BIDS)	< 2 m
Waste Out Line (from BIDS to Waste Ink Container)	OEM to define

2.4.2 Relative Height

The OEM needs to meet the relative height requirements in *Table 4*.

Table 4 – Relative Height Requirements

Type	Value or Range	Reference
Bottom of Print Module to top of nozzle surface	32.3 mm	*8.2 Set Printhead-to-Paper Spacing (PPS)*
PPS (top of media to nozzle surface)	0.7 mm (+0.00 mm, -0.2 mm)	*8.2 Set Printhead-to-Paper Spacing (PPS)*
IDS Blades to Print Module	• For IDS with non-integrated filter: 158 mm	*10.1 Mount the IDS Blades*
Absorbent Pads or IDS Vent Reservoir	Below IDS blades	*10.3 Use Absorbent Pads or Vent Reservoir*
WIMM to IDS Blade	• For IDS with non-integrated filter: Up to ~73 mm above IDS • Up to ~61 mm below the IDS blade Z datum tab	*11.1 Mount the WIMM*
Bulk Ink Supplies	Up to 1 m below IDS	*12 Bulk Ink Supply Mounting*

3 Print Module

The DuraFlex Print Module (A3 model) manages the printhead, services the printhead, and controls the print data. This module also houses two Printhead Power PCAs that transfer print data and supply power to the printhead. This section provides an overview of the Print Module components and its functions.

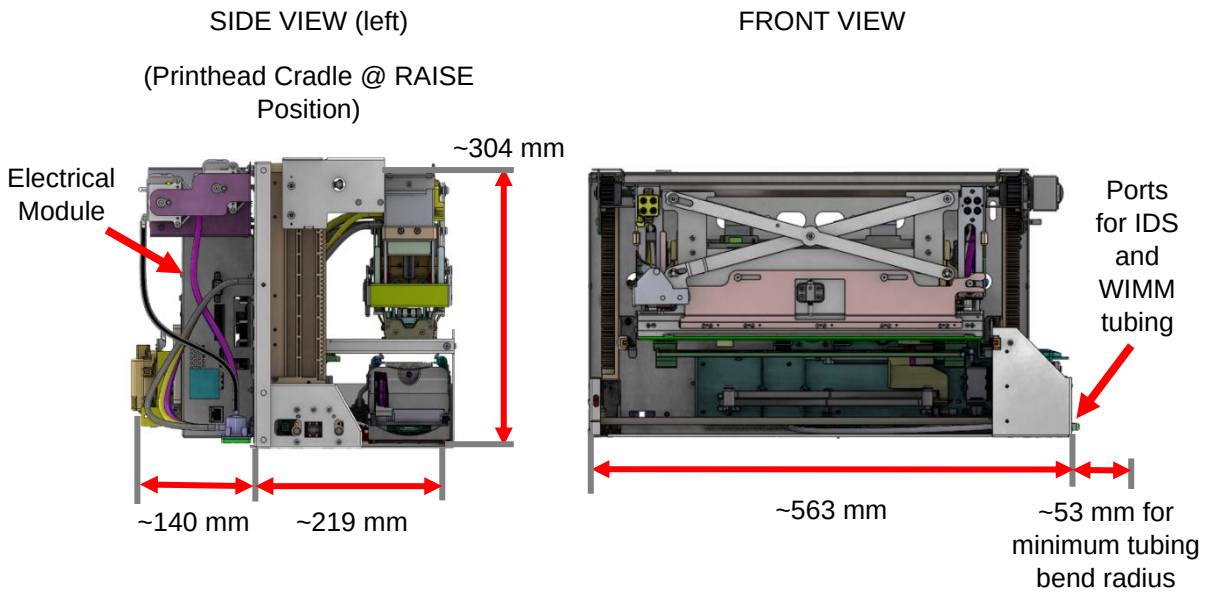
3.1 Print Module Envelope

The DuraFlex Print Module supports the following print width:

- A3: ~359 mm x 563 mm x 304 mm

Up to four A3 Print Modules can be stitched together to support wider print widths.

Figure 8 – A3 Print Module Envelope

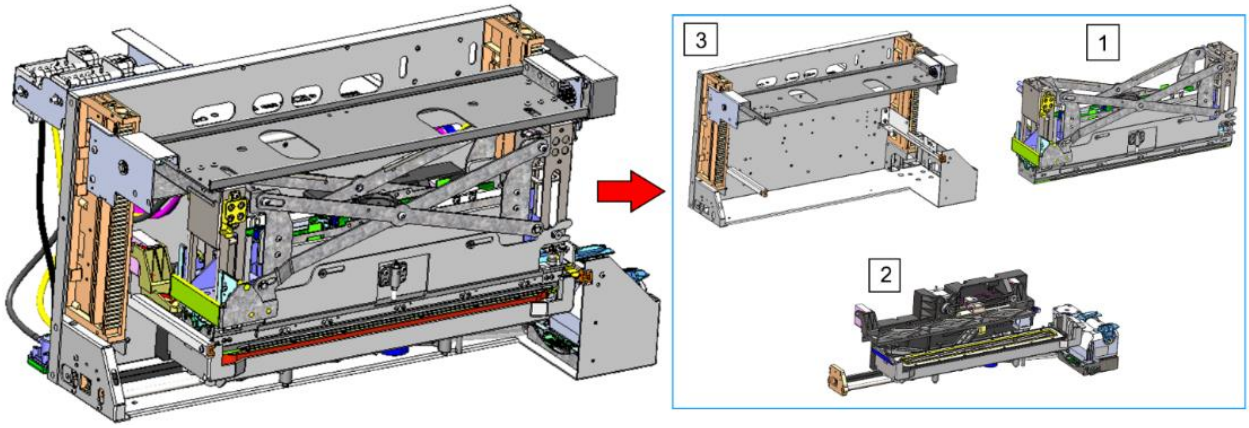


3.2 Print Module Components

The Print Module consists of three main components (*Figure 9*):

1. Printhead Cradle (see Section *3.3 Printhead Cradle*)
2. Maintenance Module (see Section *3.4 Maintenance Module*)
3. Lift Mechanism (see Section *3.5 Printhead Cradle Lift Mechanism*)

Figure 9 – Print Module Components (A3 Model)

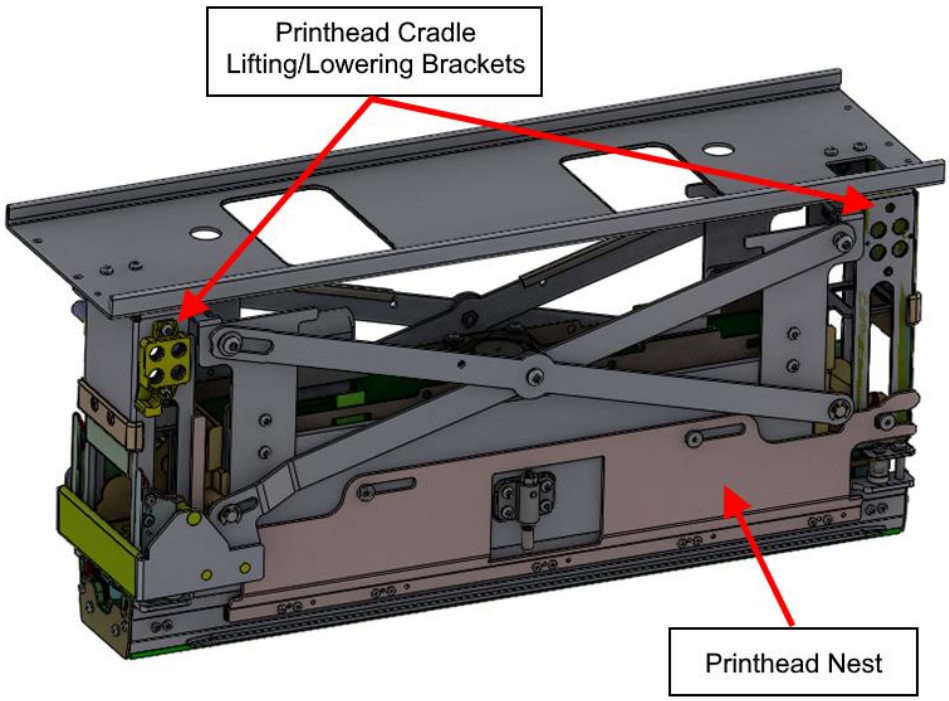


3.3 Printhead Cradle

The Printhead Cradle consists of two components (*Figure 10*).

1. Cradle: The printhead cradle lift mechanism drives the cradle up and down.
2. Printhead Nest: It gimbals relative to the cradle, holds the DuraFlex printhead, and houses two Printhead Power PCAs and fluidic couplings.

Figure 10 – Printhead Cradle and Nest



3.3.1 Cradle

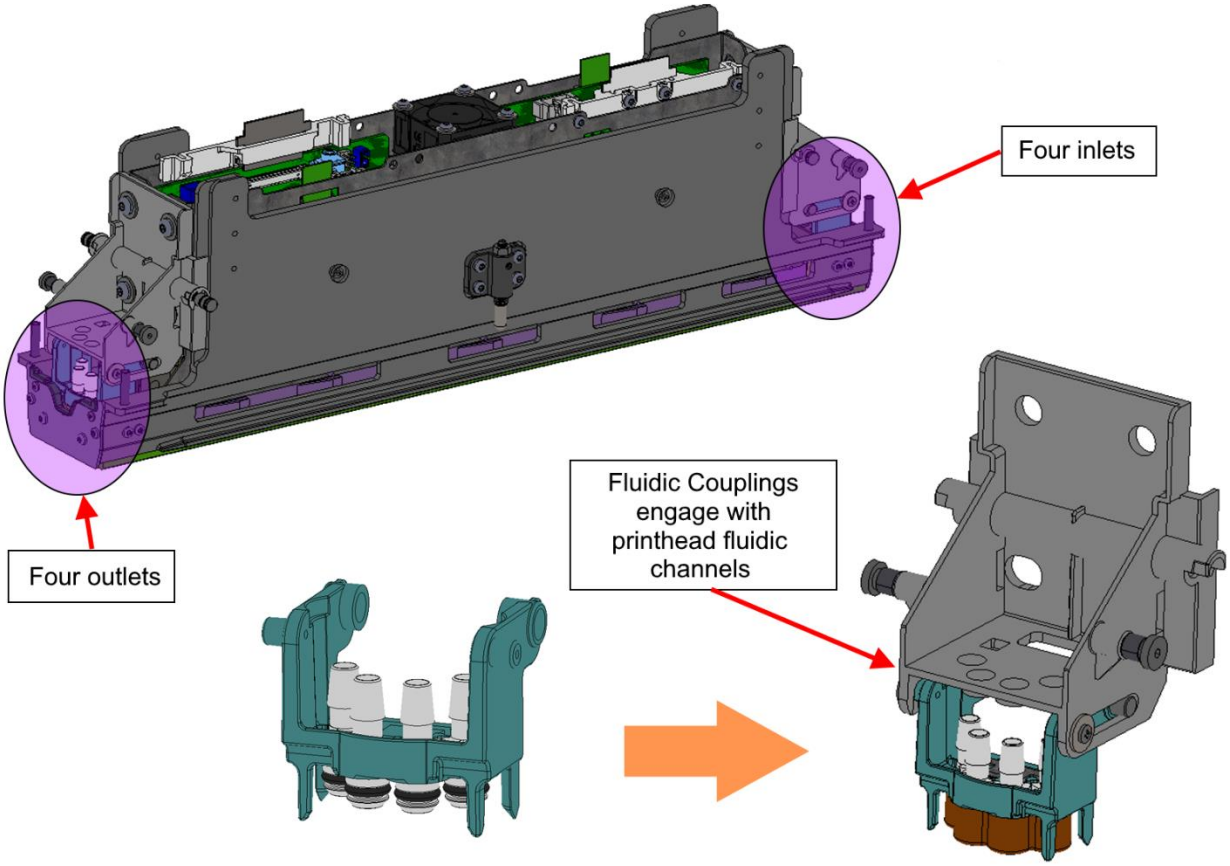
The Printhead Cradle:

- Holds the DuraFlex printhead
- Aligns the printhead to the OEM print engine with a repeatability of ±1 Dot Pitch (DP) in the X- and Y-axes and ±0.1 mm in the Z-axis
- Sets the Pen-to-Paper-Spacing (PPS) to be within a range of 0.7 mm (+0.00 mm, -0.2 mm)
- Aligns the Printhead Power PCA to ensure all connector pins are within the contact pads on the printhead
- Provides support to the Printhead Power PCA to ensure sufficient compression of the connector springs

3.3.2 Printhead Nest

The printhead nest houses the printhead, two Printhead Power PCAs, and eight fluidic couplings (four inlets on the right and four outlets on the left). *Figure 11* shows the location of the fluidic couplings on the printhead nest assembly.

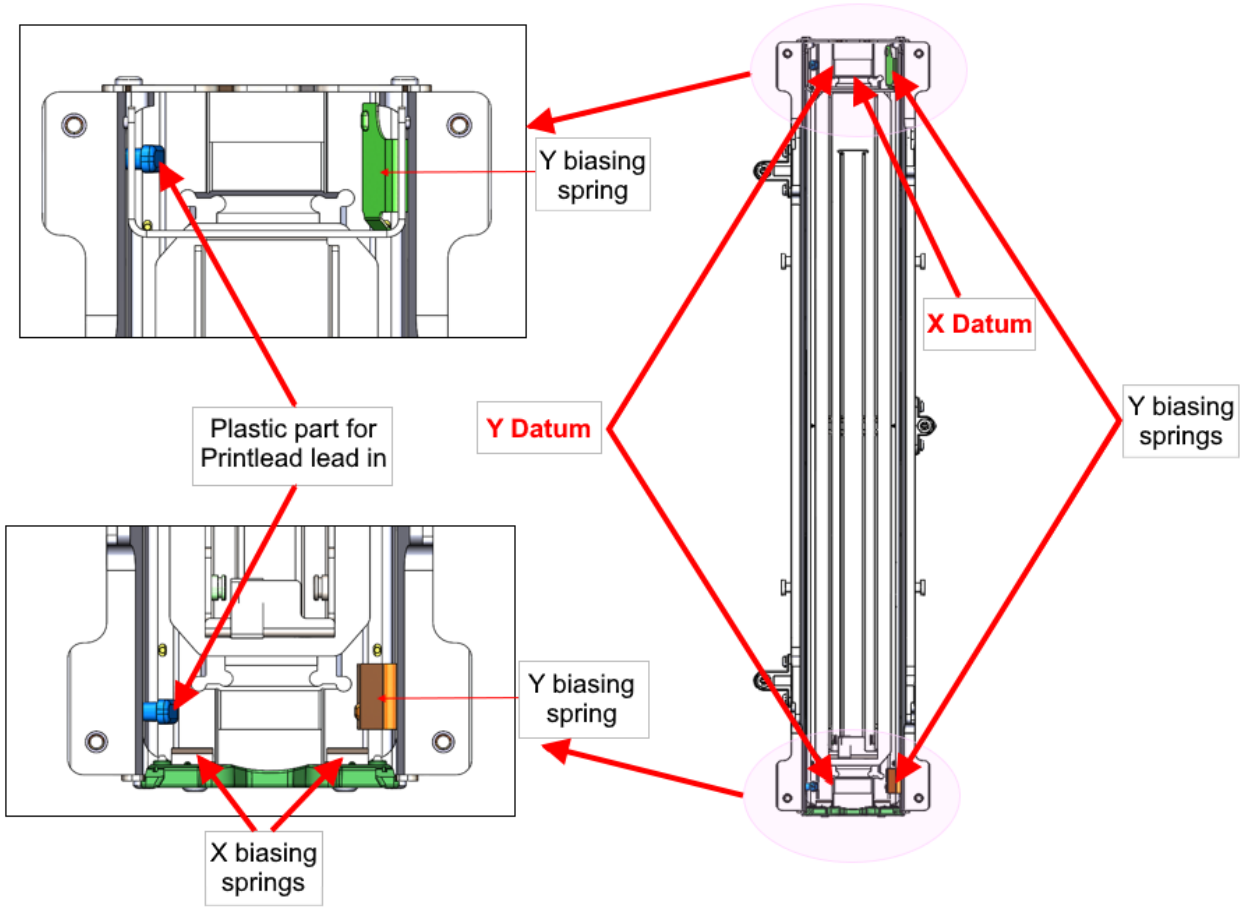
Figure 11 – Fluidic Couplings on Printhead Nest



3.3.3 Printhead to Printhead Nest Interface

Figure 12 shows the orientation of the X and Y datums on the printhead and printhead nest. The X and Y biasing springs ensure that the printhead is firmly held in position.

Figure 12 – Printhead to Printhead Nest Interface



3.3.4 Alignment of Printhead to Printhead Power PCA

The printhead nest aligns the printhead to the Printhead Power PCA to ensure all connector pins are within the contact pads on the printhead.

- Each printhead contact pad is aligned to its corresponding printhead connector spring in the X-axis to ensure that every connector spring lies within the width of the printhead contact pad.
- The distance between the printhead and Printhead Power PCA in the Y-axis determines the amount of connector spring compression.

3.4 Maintenance Module

The Maintenance Module prepares the printhead for printing and protects the printhead when it is not in use. It consists of the Cap and the Wiper:

- Cap – seals the printhead nozzles to prevent dehydration and protects the nozzles from contamination when the system is not printing.
- Wiper – removes waste ink particles from the printhead surface using microfiber material and vacuum nozzles. This helps to ensure that the printhead is clean and there are minimal non-ejecting nozzles before printing.

3.4.1 Maintenance Module Components

The Maintenance Module consists of five components as described in *Table 5*.

Figure 13 – Maintenance Module Components

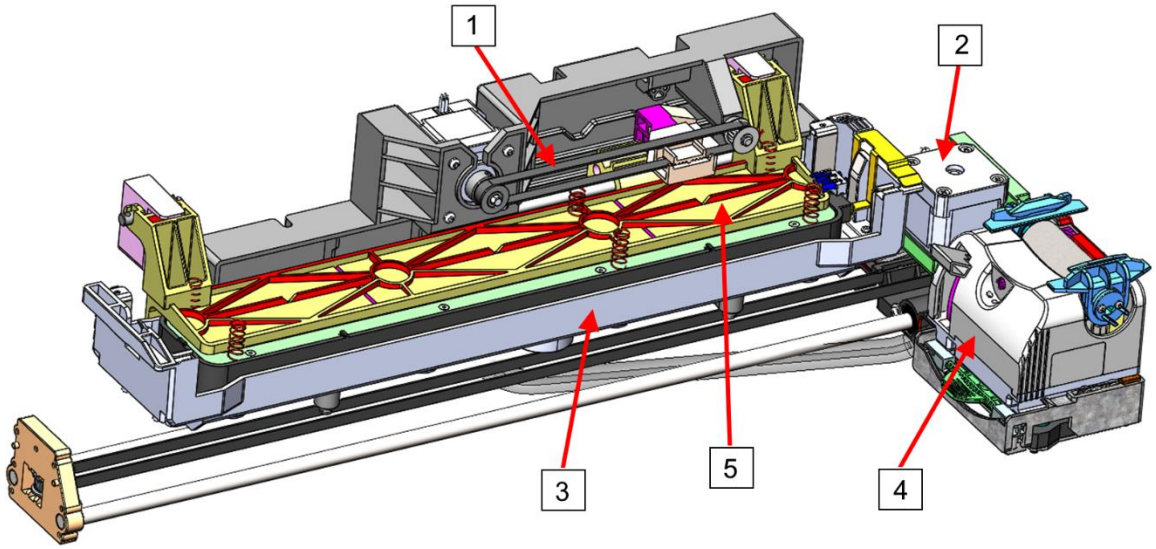


Table 5 – Maintenance Module Components

Number	Component Name	Description
1	Cap Drive	The motor that moves the cap to CAP and HOME position.
2	Wiper Drive	The wiper drive translates the wiper module along the X-Axis.
3	Cap Cradle	• Protects the printhead from dehydration and contamination • Seals the printhead when there are no printing or maintenance operations in progress

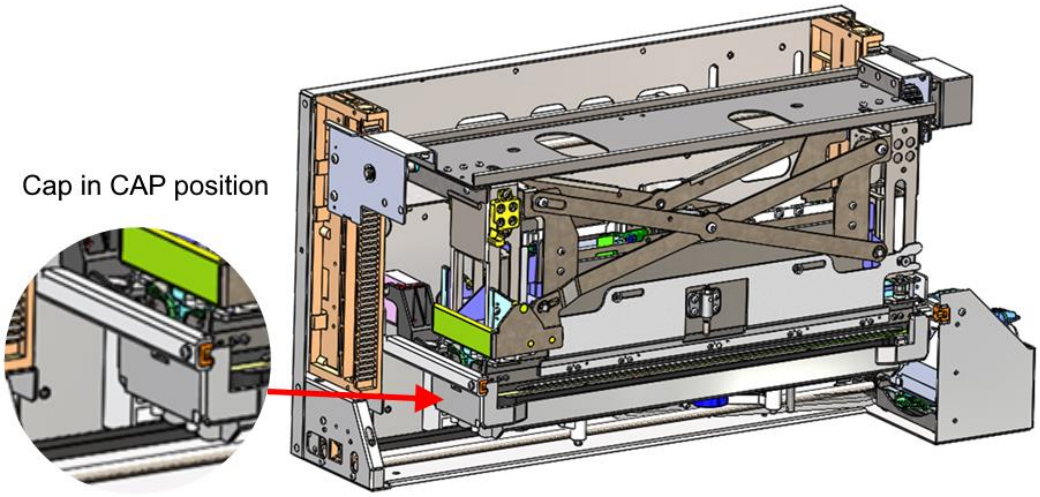
4	Wiper Cartridge	• Removes particles, dried ink, etc. from the nozzle surface
		• During a wipe, the suction performs two functions:
		  • Assists with priming the ink nozzles by drawing out any air bubbles trapped inside the nozzles
		  • Removes ink, dust, or moisture contamination from the printhead surface that may interfere with print quality

5	Cap Cover	Protects the cap seal from dust and keeps the cap moist during long print runs.

3.4.2 Cap

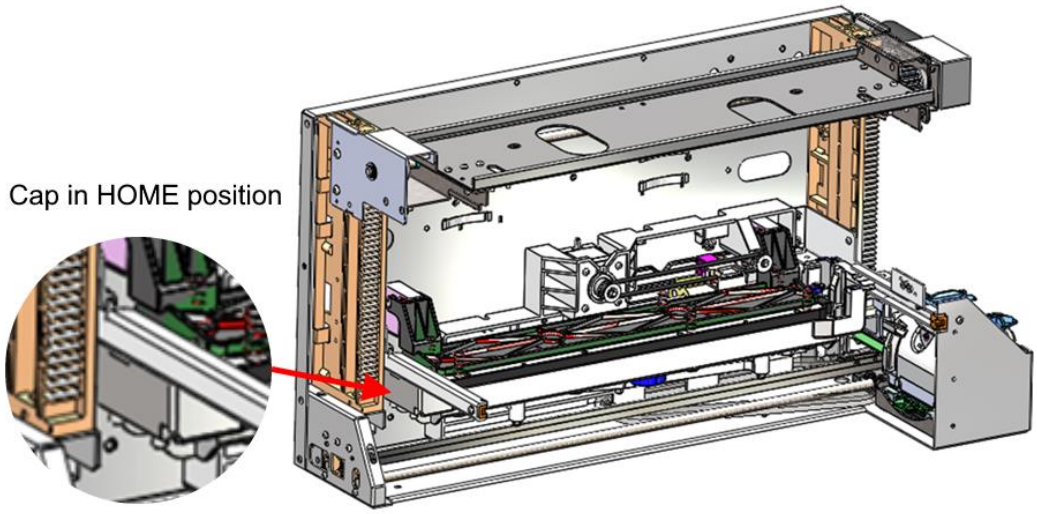
The cap seals the printhead when no printing or maintenance operations are in progress. This keeps the printing surface of the printhead hydrated to prevent the print nozzles from drying out and isolates the printhead from the environment to minimize contamination. This location is the CAP position, as shown below.

Figure 14 – CAP Position



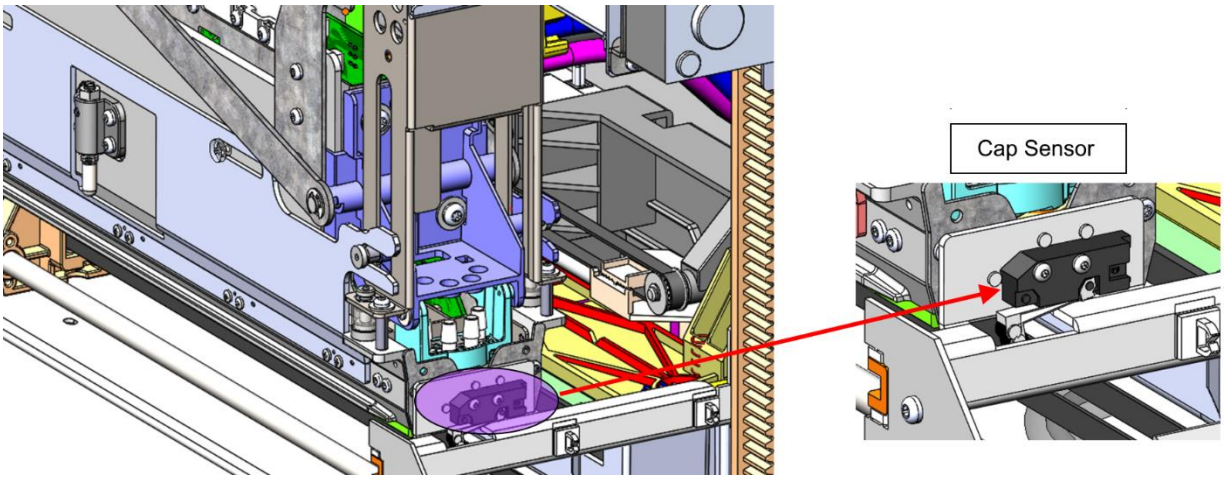
When the printhead is in use, the cap is stowed (in HOME position) to allow the printhead access to the media path. The cap is also sent to the HOME position (*Figure 15*) during printhead replacement.

Figure 15 – HOME Position (Printhead Cradle Not Shown)



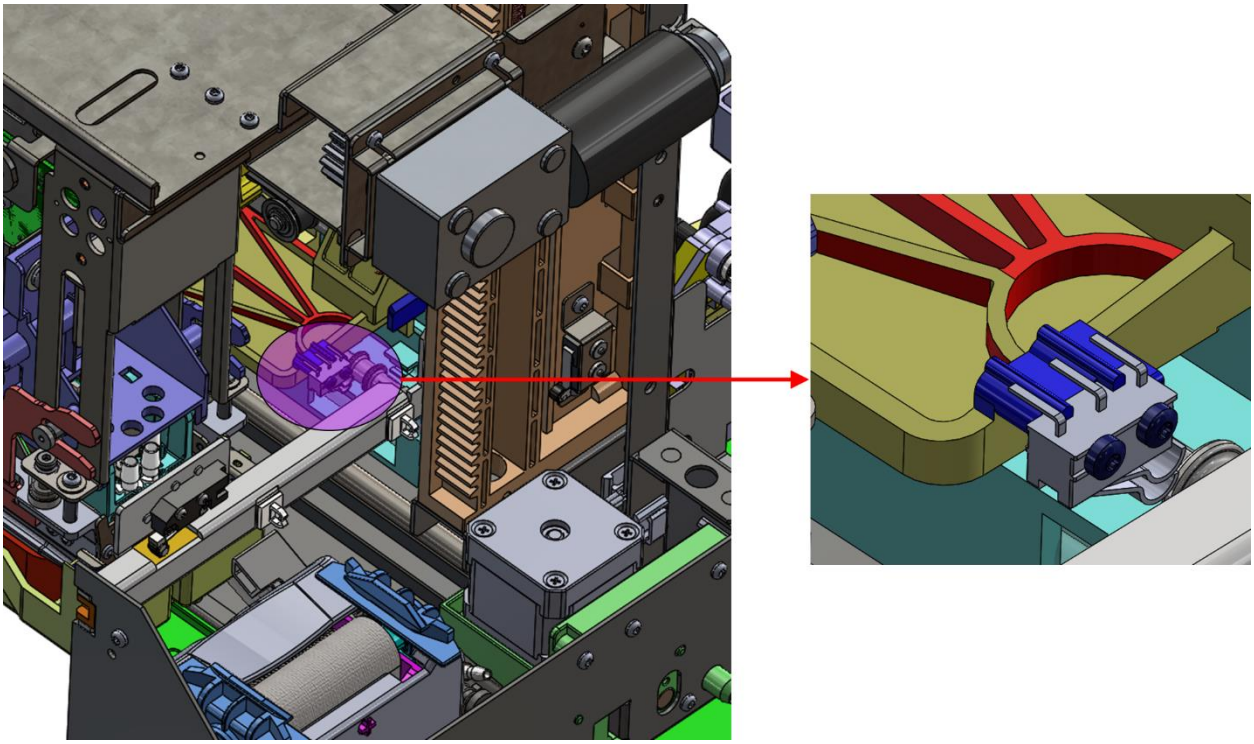
Sensors ensure that the cap is in the correct position. The Print Engine Supervisor reads the cap sensor position and then instructs the firmware, on the Mechanical Controller PCA, to lower the printhead cradle and cap the printhead.

Figure 16 – Cap Sensor Location



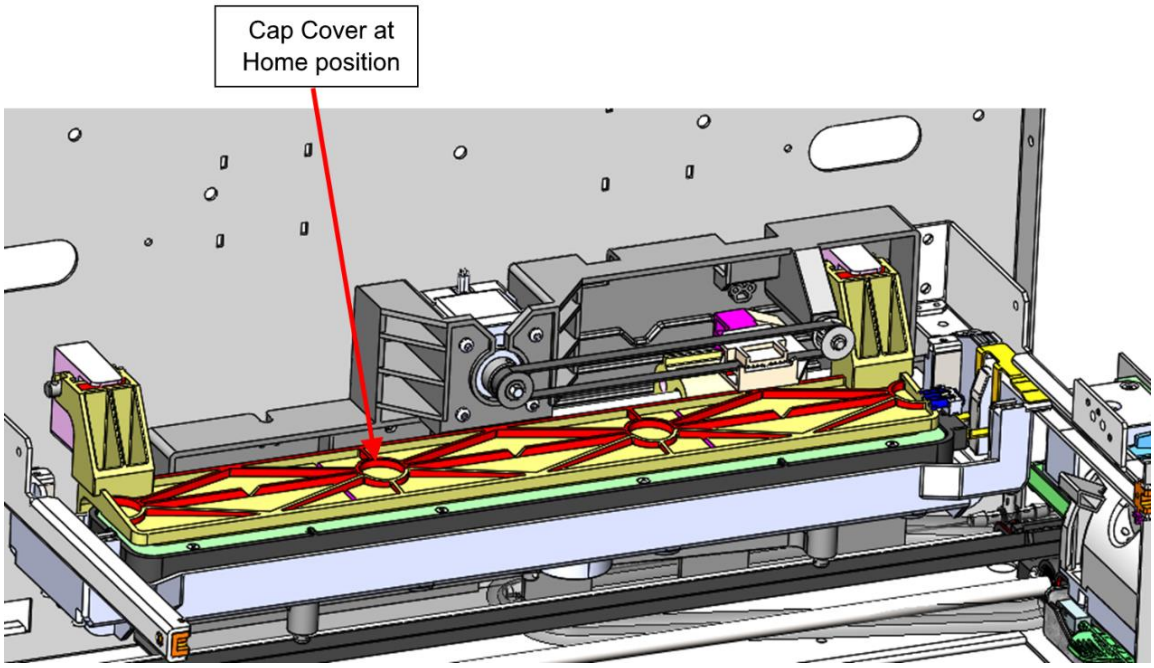
An additional home sensor ensures that the cap reaches the HOME position and prevents it from over-travelling on the rail.

Figure 17 – Cap Home Sensor Location



The Cap Cover protects the cap seal from dust and keeps the cap moist during long print runs.

Figure 18 – Cap Cover



3.4.3 Wiper and Wiper Cartridge

The wiper uses microfiber material to clean the printing surface of the printhead by removing particles, dried ink, and other contaminants from the printhead nozzles and surrounding surfaces. The microfiber is housed within a user-replaceable cartridge that winds the microfiber past a pair of vacuum nozzles. The nozzles provide suction through the wiper material to remove any ink or ink residue from the Printhead surface. The Wiper Cartridge assembly is installed on a belt-driven traverse to allow it to service the entire printhead and then be stowed away to allow the printhead clear access to the media.

After approximately 6,300 wipes, the wiper cartridge may need a replacement. The microfiber becomes too contaminated for further use and the microfiber roll advances by an indexing mechanism to expose clean material for the next wipe. The used microfiber material is wound onto a tensioned take-up spool within the wiper cartridge. The DuraFlex printing system provides a signal when the wiper is empty, and OEM printer control software is responsible to inform the operator. Used wiper cartridges cannot be serviced or refilled by an OEM or end user and are easily swapped out when exhausted.

3.4.4 Cap Cover

The Cap Cover keeps dust off the cap seal and keeps the cap moist during long print runs (*Figure 18*).

3.5 Printhead Cradle Lift Mechanism

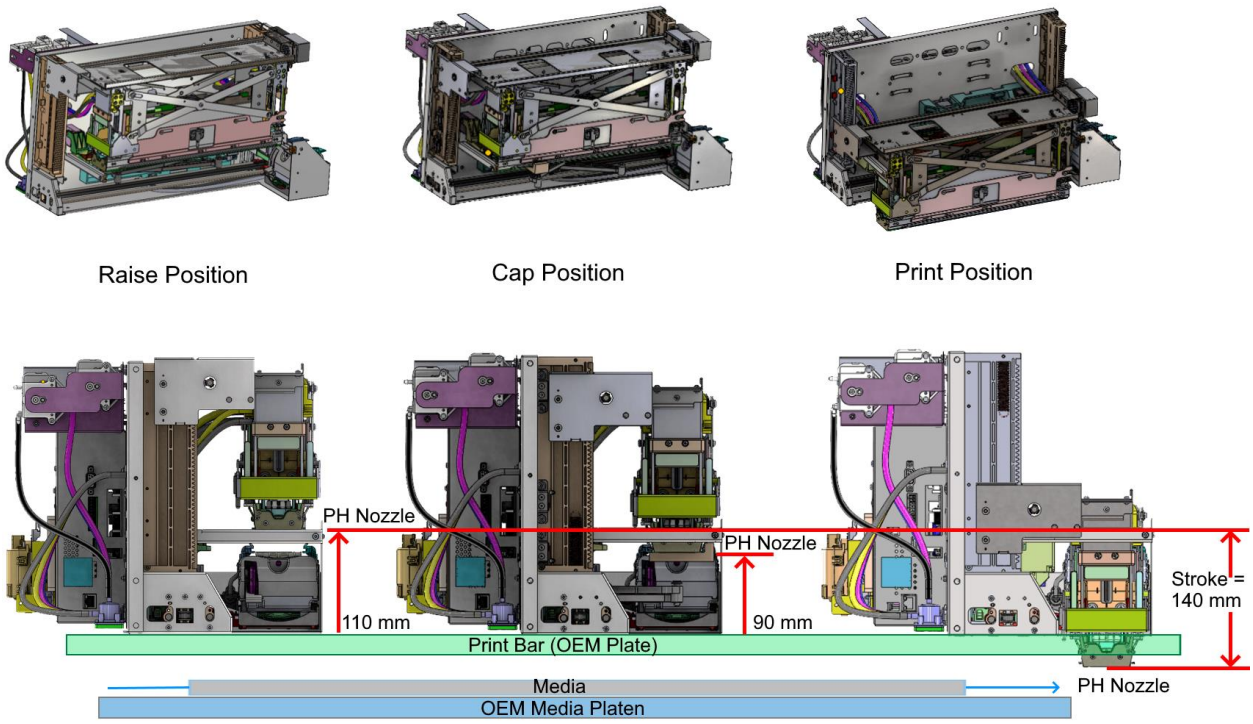
The Printhead Cradle Lift Mechanism moves the Printhead Cradle up and down to the Raise, Engage, and Print positions.

The Printhead Cradle travels up and down the Print Module lift mechanism to different positions detected by three limit switches, all heights are defined from the printhead nozzle plane.

Table 6 – Printhead Cradle Positions

Position	Printhead Nozzle Plane	Description
RAISE	~110 mm above the Print Bar	• highest position • printhead replacement occurs at this position
CAP	~90 mm above the Print Bar	• middle position • capping and wiping occur at this position
PRINT	~140 mm total stroke from RAISE position to PRINT position	• lowest position • printing occurs at this position

Figure 11 – Printhead Cradle Positions



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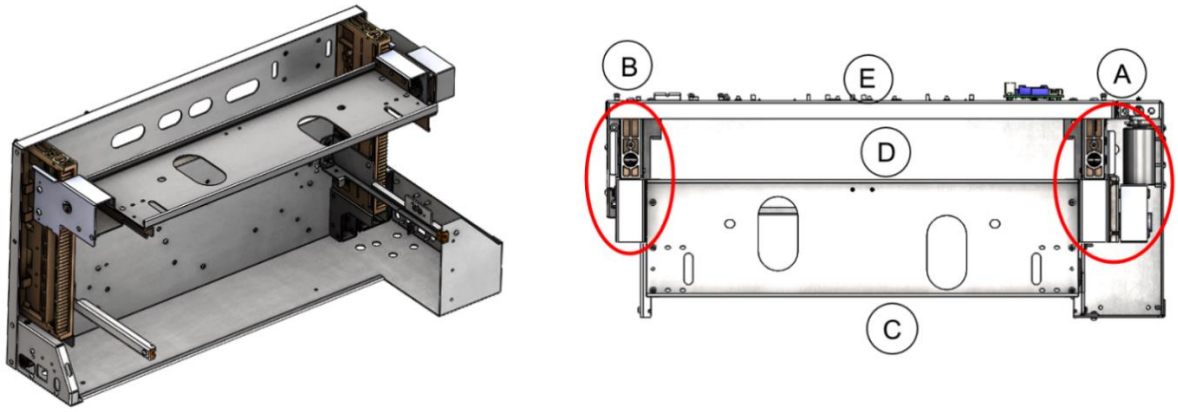
3.5.1 Lift Mechanism Components

The main components of the Printhead Cradle Lift Mechanism are shown below.

Table 7 – Print Cradle Lift Mechanism Components

Item	Description
A	Printhead Cradle Active Driving Lift
B	Printhead Cradle Passive Driven Lift
C	Interlink Bracket
D	Interlink Shaft
E	Frame Base

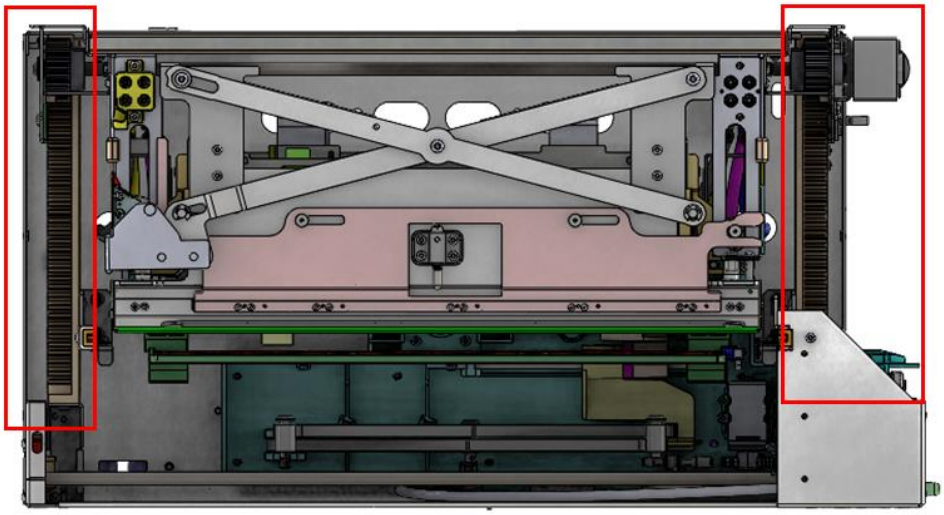
Figure 19 – Print Cradle Lift Mechanism Components



3.5.2 Lifting

The Lift Mechanism operates based on the rack and pinion concept whereby a DC motor drives the rotation of the pinions/gears and causes the cradle to move up or down the racks.

Figure 20 – Rack and Pinion Lift Mechanism

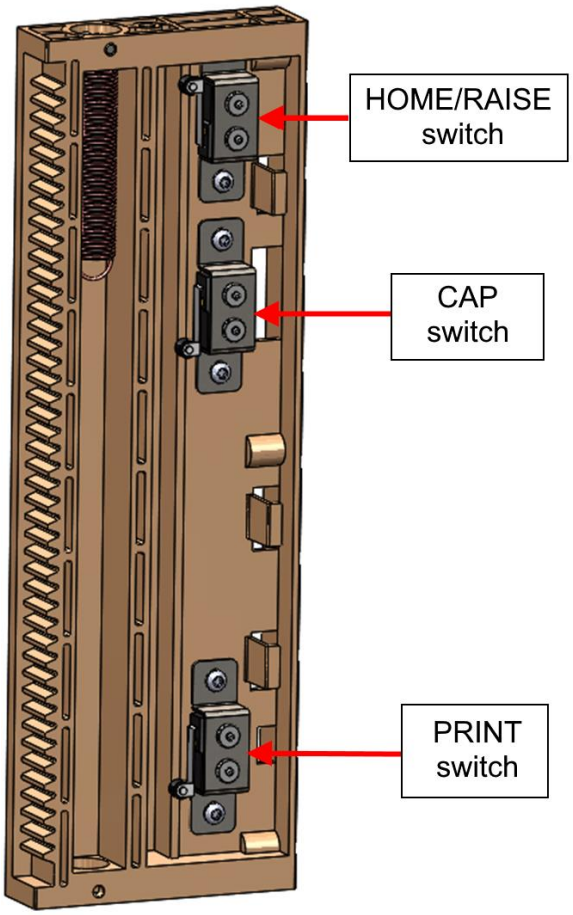


3.5.3 Position Sensors

Three limit switches are mounted on the rack lift for the RAISE, CAP, and PRINT positions. The lift stops whenever one of these switches is triggered.

Note:	In the Demo GUI PES Operation pane, the Lift Home Switch correlates to the RAISE option. This is also the `POSITION.MAINT` PES command to raise the printhead cradle.

Figure 21 – Lift Mechanism Limit Switches – Untriggered Positions



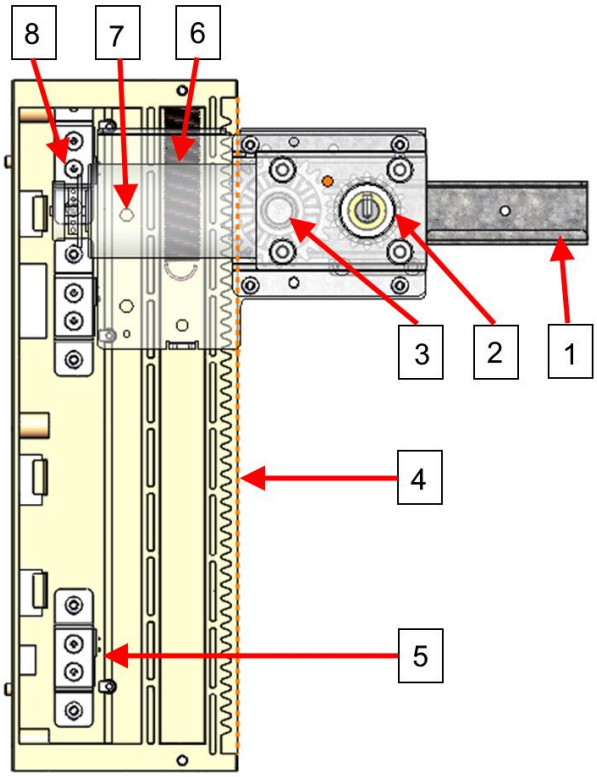
3.5.4 Drive Lift Assembly

The main components of the Drive Lift Assembly are listed below and shown in *Figure 22*.

Table 8 – Drive Lift Assembly Components

Number	Component	Description
1	Drive Lift Frame	Supports the weight of the Printhead Cradle and provides a mounting surface for the motor and pinion.
2	Drive Pinion	Drives the idler pinion to rotate at specific speed.
3	Idler Pinion	Translates rotational movement into vertical elevation.
4	Rack Frame	Provides linear movement in the Z-direction and enables the mounting of various components of the lift mechanism.
5	Limit Switch (×3)	Stops the cradle at three different positions: RAISE, CAP, and PRINT.
6	Lift Spring	An extension spring that assists the upward lifting of the cradle.
7	Roller Assembly	Controls the tilting of the lift mechanism and enables frictionless movement.
8	DC Motor	Connected to the Mechanical Controller PCA and provides driving torque to lift the Printhead Cradle.

Figure 22 – Drive Lift Assembly



4 Ink Delivery System (IDS)

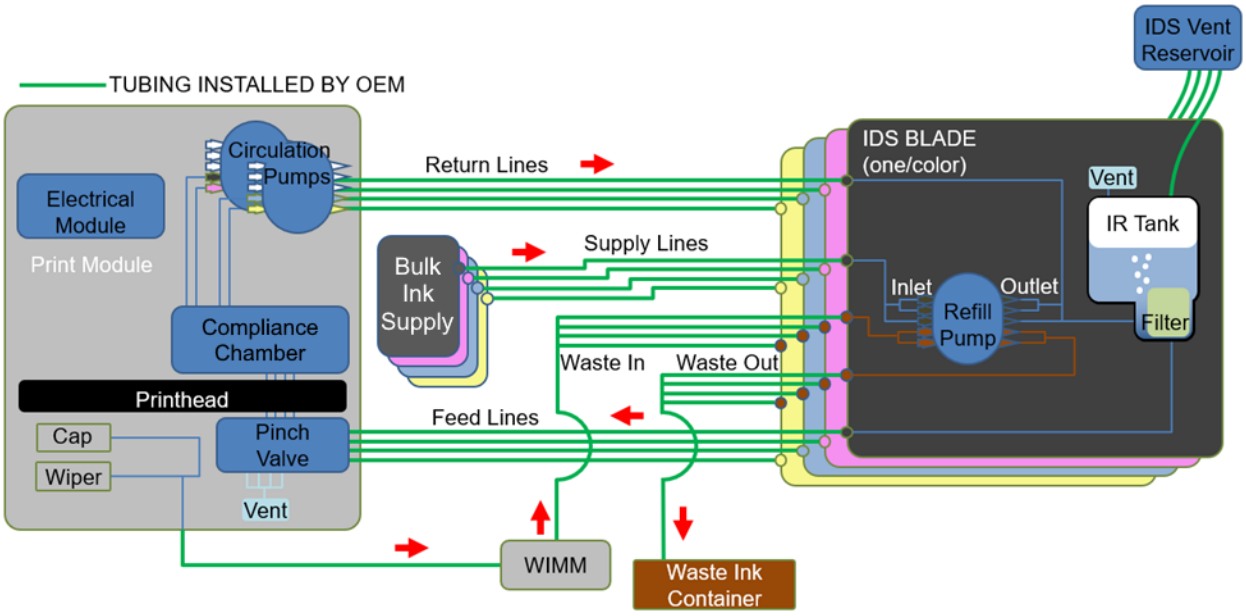
The DuraFlex Ink Delivery System (IDS) comprises a Front IDS (FIDS) and four IDS blades that form a Back IDS (BIDS). This module primes ink into the printing system, delivers ink to the printhead nozzles, and deprimes the system.

4.1 IDS Architectural Overview

Figure 23 shows how the FIDS and IDS blades (BIDS) connect to other DuraFlex modules.

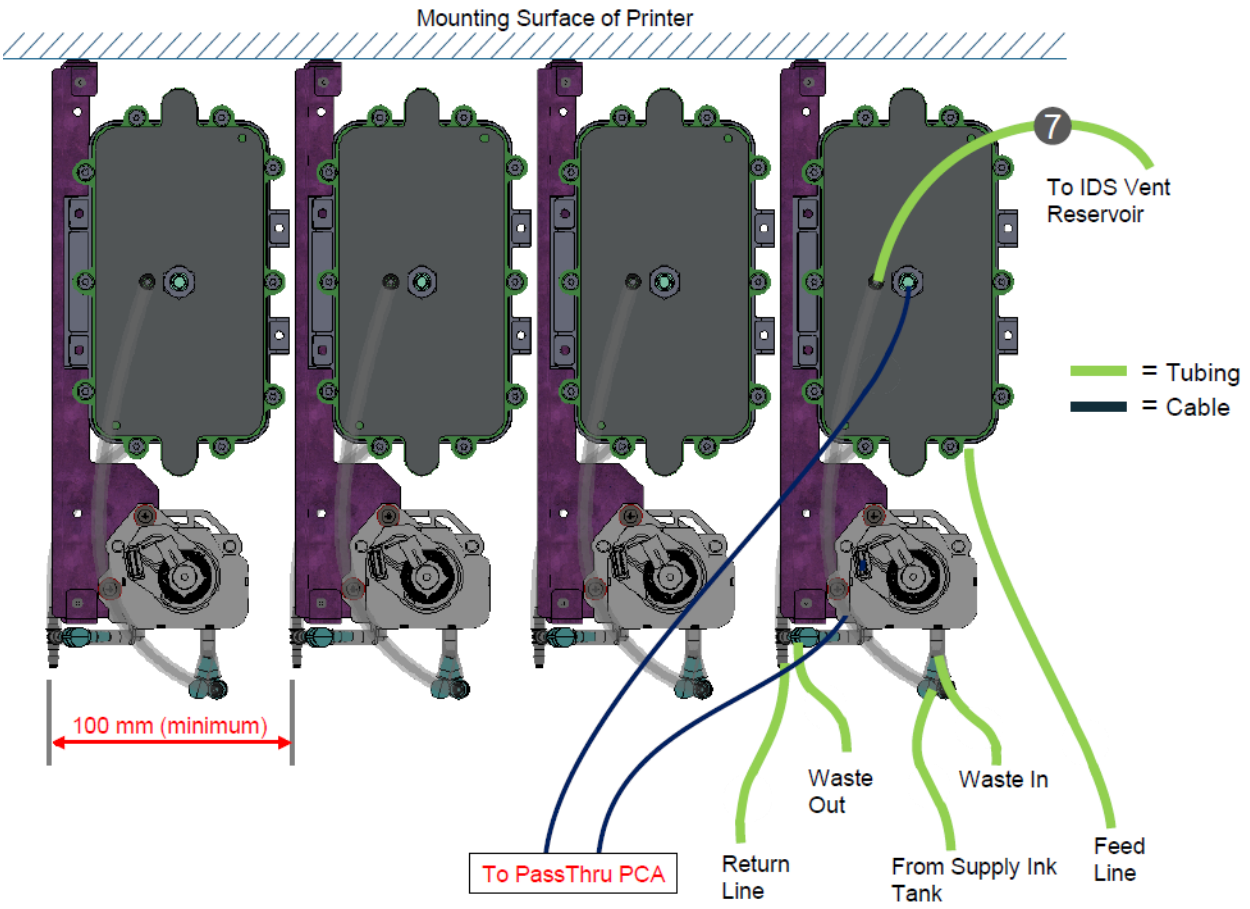
- IDS blades (BIDS): The IDS blades pull ink from the bulk ink supply and report the availability of ink (via sensors). Four IDS blades are required for a 4-color ink system (CMYK).
- FIDS: The Front IDS includes two circulation pumps, a pinch valve, and a compliance chamber that are all mounted to the Print Module. The main function of the FIDS is to circulate the ink by priming and depriming the printhead. In addition, the FIDS provides a flushing operation to clear trapped bubbles in the ink line. One FIDS is installed for each printhead.
- Fluidic couplings: A pair of fluidic couplings, one on each end of the printhead, make it possible to replace the printhead. They also link the printhead to the IDS for ink flow from the FIDS and back to the IDS blades.
- Bulk ink supply: The source of ink for the IDS blades. Available in 2-liter and 10-liter sizes.

Figure 23 – IDS Architecture



The figure below shows one example IDS topology. Other configurations are also possible.

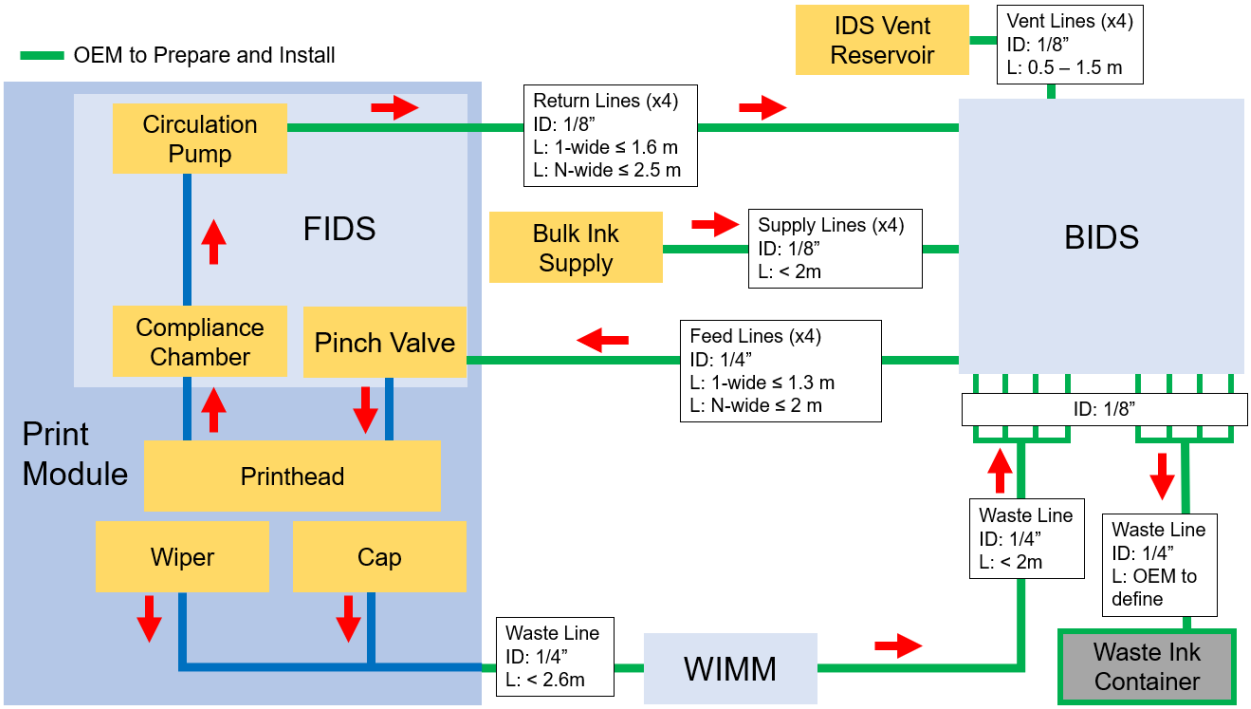
Figure 24 – IDS Mechanical Layout Example



4.2 Connecting IDS Tubing

IDS tubing must be installed adhering to contamination prevention procedures. For more information on how to connect the tubing, see the *DuraFlex Installation and Commissioning Guide*.

Figure 25 – IDS Tubing Interface



4.3 IDS Ink Flow

The DuraFlex printing system supports a CMYK configuration. Each FIDS unit consists of 2 circulation pumps, a pinch valve, and a compliance chamber all mounted on the Print Module. Each IDS blade consists of a refill pump, an Intermediate Reservoir (IR) tank, and a filter. One IDS blade is required for each color (*Figure 23*). An N-wide system requires N number of FIDS and 4 x N number of IDS blades.

This section describes the IDS ink flow when the DuraFlex printing system is priming or depriming the printhead, printing, or flushing.

4.3.1 Priming

Priming is the act of filling the printhead with ink and removing any trapped air in preparation for printing. The velocity of ink in the tubes from pinch valve to printhead must be the same to eliminate color mixing. Color mixing can occur when one or two channels have higher resistance or partial blockage, therefore the OEM must ensure that all sections of the tubes are free of kinks or bends.

4.3.2 Depriming

Depriming is the process of removing ink from the printhead, in preparation of the printhead removal. Depriming ensures that the ink is removed from the pinch valve to the circulation pumps and sent back to the IR tank.

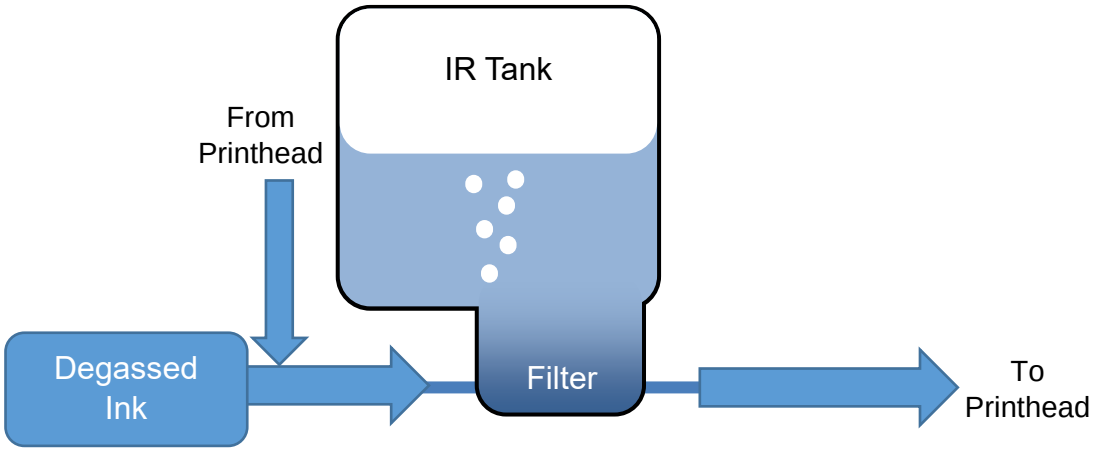
4.3.3 Flushing

Flushing is the act of removing small air bubbles in the ink that may accumulate after multiple print jobs, or after the system has been left idle.

4.4 Last In, First Out (LIFO) Ink Consumption

By default, ink is consumed based on the Last In, First Out (LIFO) approach. This method ensures that the printhead always gets the freshest and most de-gassed ink. When the bulk ink supply is empty, the printhead then consumes the oldest and most saturated ink from the IR tank.

Figure 26 – LIFO Ink Consumption



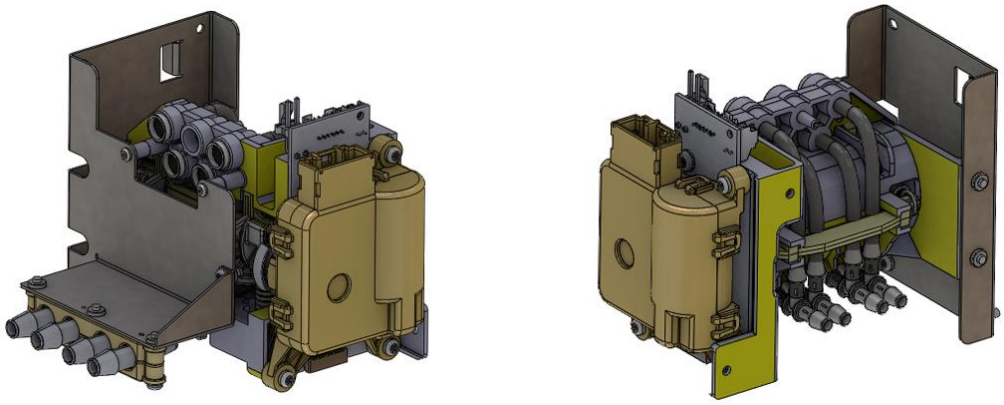
4.5 Front Ink Delivery System (FIDS)

The Front Ink Delivery System (FIDS) receives ink from the IDS blades for printhead priming and returns ink to the IDS blades after printing.

The Front IDS (FIDS) consists of the following components:

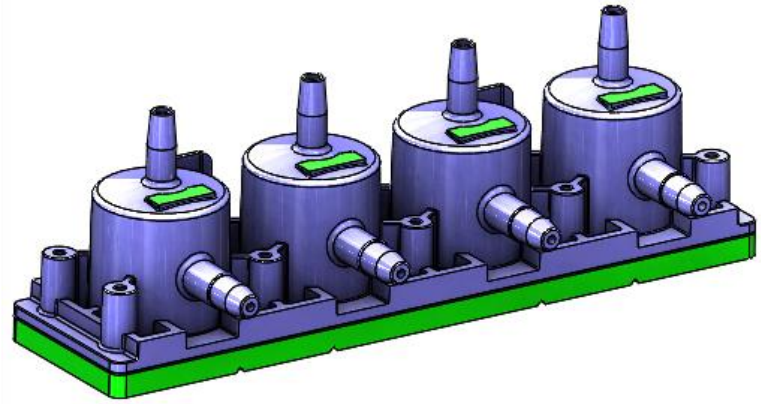
- Pinch Valve: works in sequence with the circulation pumps to enable prime and deprime operations. When the printing system is in idle mode, the pinch valve closes the ink line to maintain static pressure to prevent ink drooling at the printhead.

Figure 27 – Pinch Valve



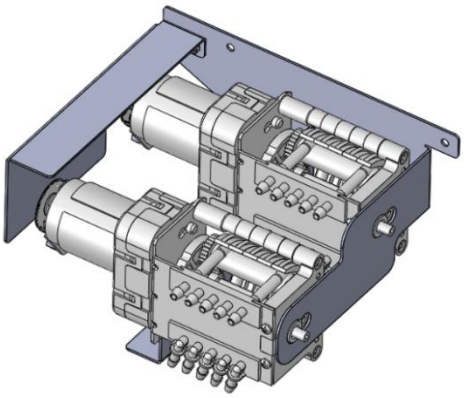
- Compliance Chamber: provides a buffer to stabilize the ink waves caused by pumping.

Figure 28 – Compliance Chamber



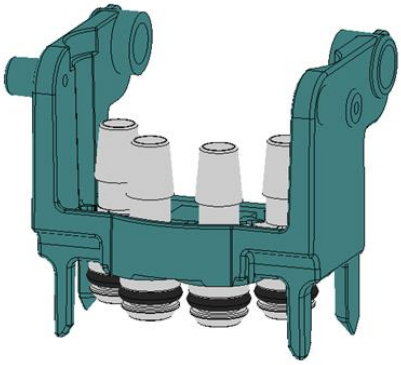
- Circulation Pumps: circulate ink within the IDS and work in sequence with the pinch valve to enable prime and deprime operation.

Figure 29 – Circulation Pumps



- Fluidic Couplings: interlocked to the printhead cradle and connected to the ink ports on both ends of the printhead (inlet and outlet).

Figure 30 – Fluidic Coupling

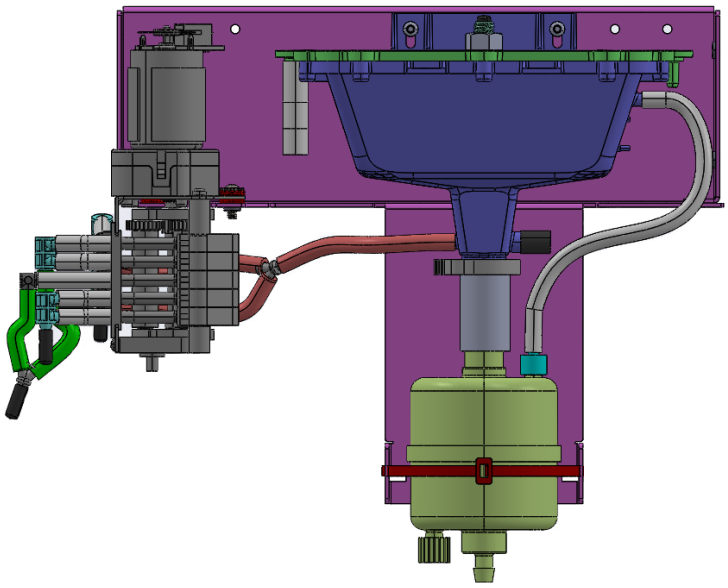


4.6 IDS Blades or BIDS

The four (4) IDS blades can be installed separately or housed in a frame. Collectively they are referred to as the Back Ink Delivery System or “BIDS”. The BIDS pulls ink from the bulk ink supply and its sensors monitor the availability of ink.

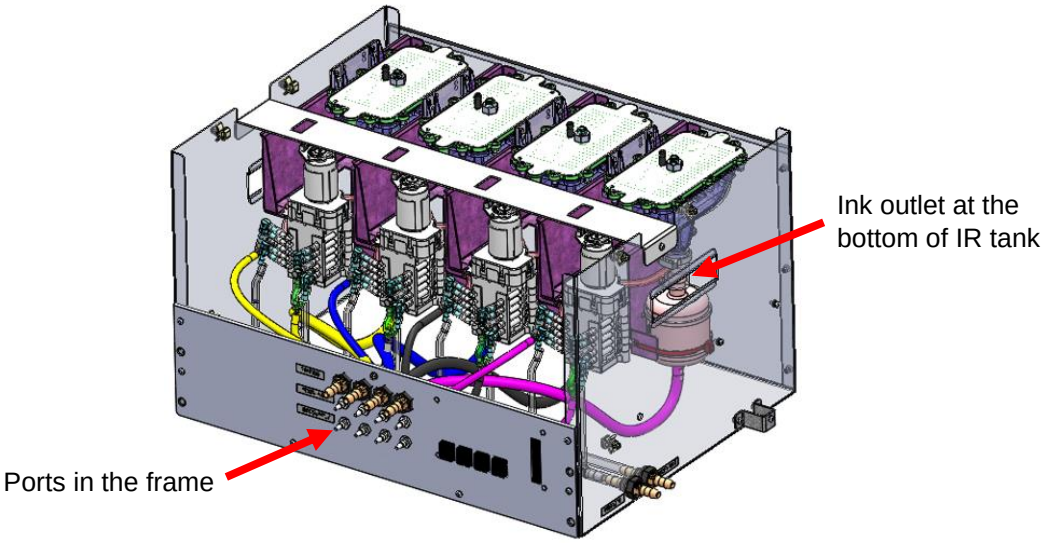
A single IDS blade includes an IR tank with non-integrated filter, which is connected to the ink outlet at the bottom of IR tank.

Figure 31 – Single IDS Blade with Non-Integrated Filter



IDS blades in a frame include four (4) IR tanks. Each IR tank has a non-integrated filter connected to its ink outlet at the bottom and to the ports in the frame. OEM can choose to design a frame to contain the IDS blades.

Figure 32 – Four IDS Blades in a Frame (Example Design with Non-Integrated Filters)



Each IDS blade consists of the following components:

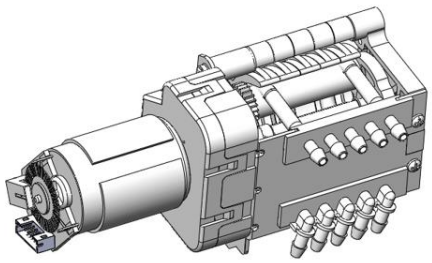
- Refill Pump: pulls ink from the bulk ink supply to the IR tank and drains waste ink from the WIMM.
- Filter: removes contaminants and particles from ink. It can filter particles larger than 5 µm in diameter. The filter is non-integrated and installed below the IR tank.
- IR Tank: provides working ink volume and storages the ink.
- Ink Level Sensor (ILS): senses the ink level and provides ink status signal feedback to the Mechanical Controller PCA.
- BIDS PassThrough PCA: contains electrical connections to the Mechanical Controller PCA, refill pumps, ink level sensors, bulk ink supply, and temperature sensor. The temperature sensor on the PCA measures the ambient level in the BIDS for calibrating ink firing from the printhead. For more information, see the *DuraFlex Electrical Databook and Design Guide*.

OEMs should mount four (4) IDS blades (for CMYK colors) or the BIDS to the printing system. An IDS blade provides the flexibility for the OEM in designing their printing system. At the same time, there are limitations in cable and tube lengths, as well as the relative height between components. For more details, see Section *2.4 Mechanical Limitations in Defining Mounting Position*.

4.6.1 Refill Pump

The refill pump fills the IR tank with ink drawn from the bulk ink supply. This is a 5-channel pump, which includes 3 channels used for pulling ink from the bulk ink supply and two (2) channels for delivering waste ink from the WIMM to the waste ink container.

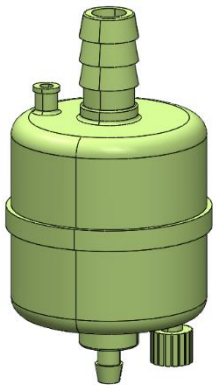
Figure 33 – Refill Pump



4.6.2 Filter

The filter prevents particles of critical size from entering the printhead.

Figure 34 – Non-Integrated Filter



4.6.3 IR Tank

The four Intermediate Reservoir (IR) Tanks receive ink from the bulk ink supply, channel ink to the FIDS for printing, and receive return ink from the FIDS.

Figure 35 – Intermediate Reservoir (IR) Tank

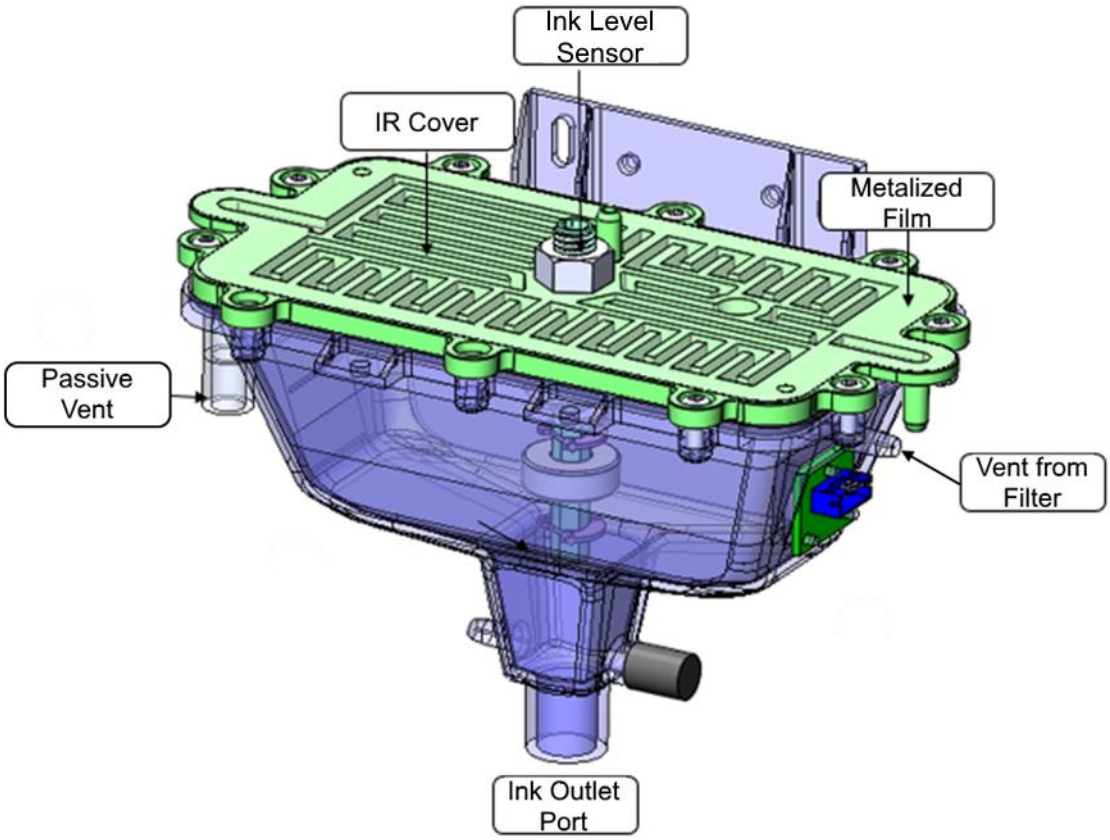


Table 9 – IR Tank Key Components

Component	Description
IR Cover	Tortuous path design on the IR Cover provides air venting to atmosphere with minimal ink evaporation.
Metalized Film (on cover)	Seals off the tortuous path.
Ink Level Sensor (2 levels)	Senses and reports ink volume. For more information, see *Table 10* and *Figure 36*.
Passive Vent (Primary air vent outlet)	When ink is pumped into the IR tank via the refill pump, an equal volume of air leaves the IR tank through the Passive Vent.
Vent from Filter	Channel for removing the air from filter to IR Tank.
Ink Outlet Port	This is where ink is channeled to the FIDS.

Table 10 – IR Tank Ink Level Sensor Levels

Upper Sensor Level	Lower Sensor Level	Description
Low	Low	Indicates low ink level. The system will fill the bulk ink supply. A warning message is triggered and sent to the Mechanical Controller PCA if the ink level remains unchanged after one minute's timeout. If ink is not filled after the timeout, the system will use the standby ink to continue print operations.
High	High	Indicates ink overfill.
High	Low	Indicates a sensor error. This will stop ink refill.
Low	High	Indicates print level.

Figure 36 – IR Ink Volume

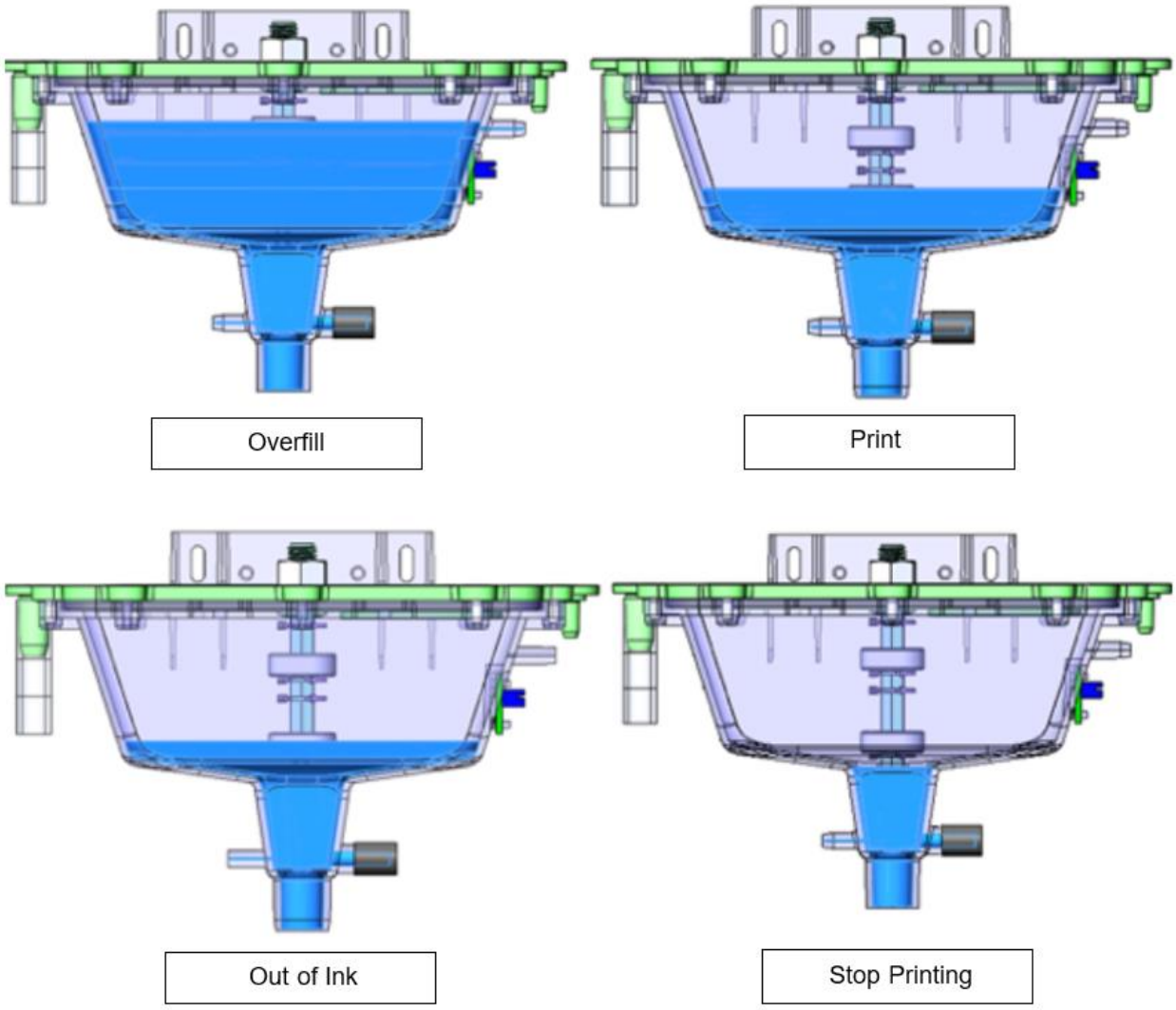


Table 11 – Ink Volume

Status	Volume (mL)
Overfill	150
Print	58.8
Out of Ink	50.4
Stop Printing	8.4

4.7 N-Wide IDS Tubing

An N-Wide system requires one (1) dual IDS controlled by Print Engine #1. The dual IDS can be mounted on the side or below the 2-wide print bar. The nominal printing level of the reservoirs must be 100 mm below the platen. The ink tubing between the BIDS outlet and the valve should continuously rise and no part of the tubing have a negative slope. A slope of no less than 1 degree will ensure that bubbles will be properly cleared from the tubing. The tubing needs to be supported over the full distance to achieve this. The maximum recommended tubing lengths are 1.5m (BIDS to Pinch Valve inlet) and 1.85 m (Circulation Pump to BIDS).

5 Bulk Ink Supply

5.1 Capacity and Package Dimensions

Bulk ink supply is available in 2-liter and 10-liter sizes. See specific dimensions in the figures below.

Figure 37 – 2-Liter Bulk Ink Supply

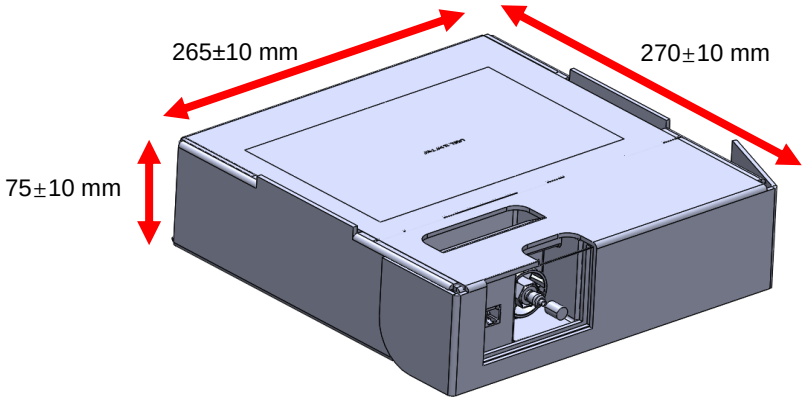
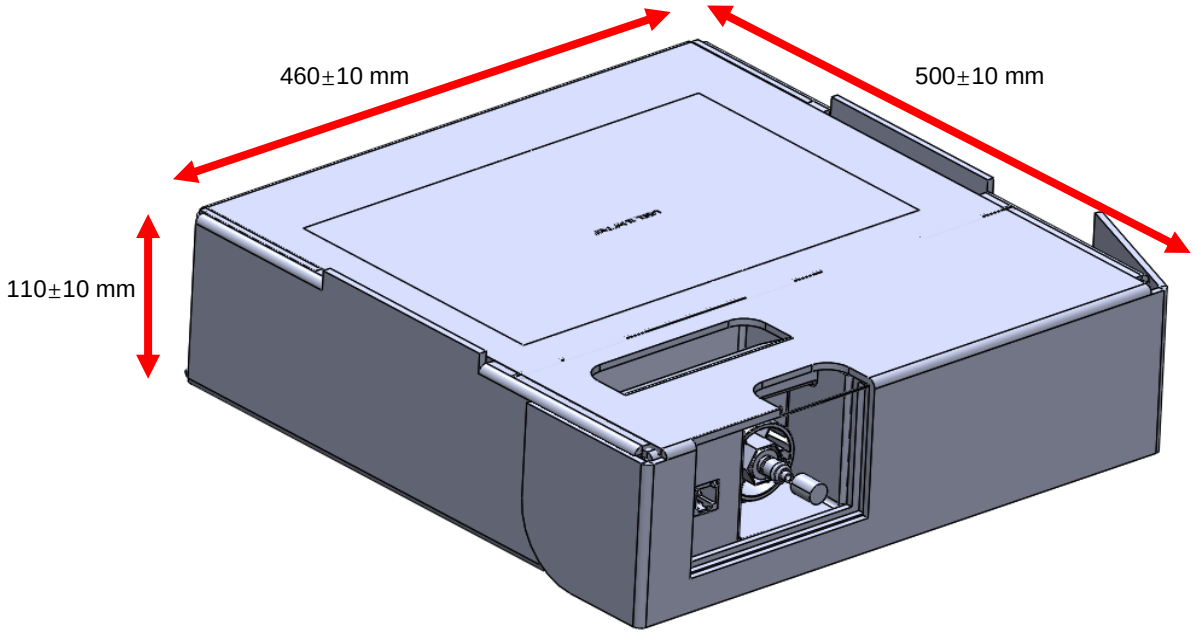


Figure 38 – 10-Liter Bulk Ink Supply



5.2 Bulk Ink Supply Coupling Connector

Bulk ink supplies are fitted with CPC male connectors. CPC female connectors are supplied with the DuraFlex module set. The table below shows the connector details.

Table 12 – CPC Connector Sub-Components

Name	MPN/Spec	Illustration
CPC Male Connector (on bulk ink supply)	PMCD220212	
CPC Female Connector (supplied by Memjet)	PMCD170212	

CAUTION:	Keep the female connector in factory packaging until installation on the bulk ink supply. The connector is pre-cleaned. No extra cleaning is required.

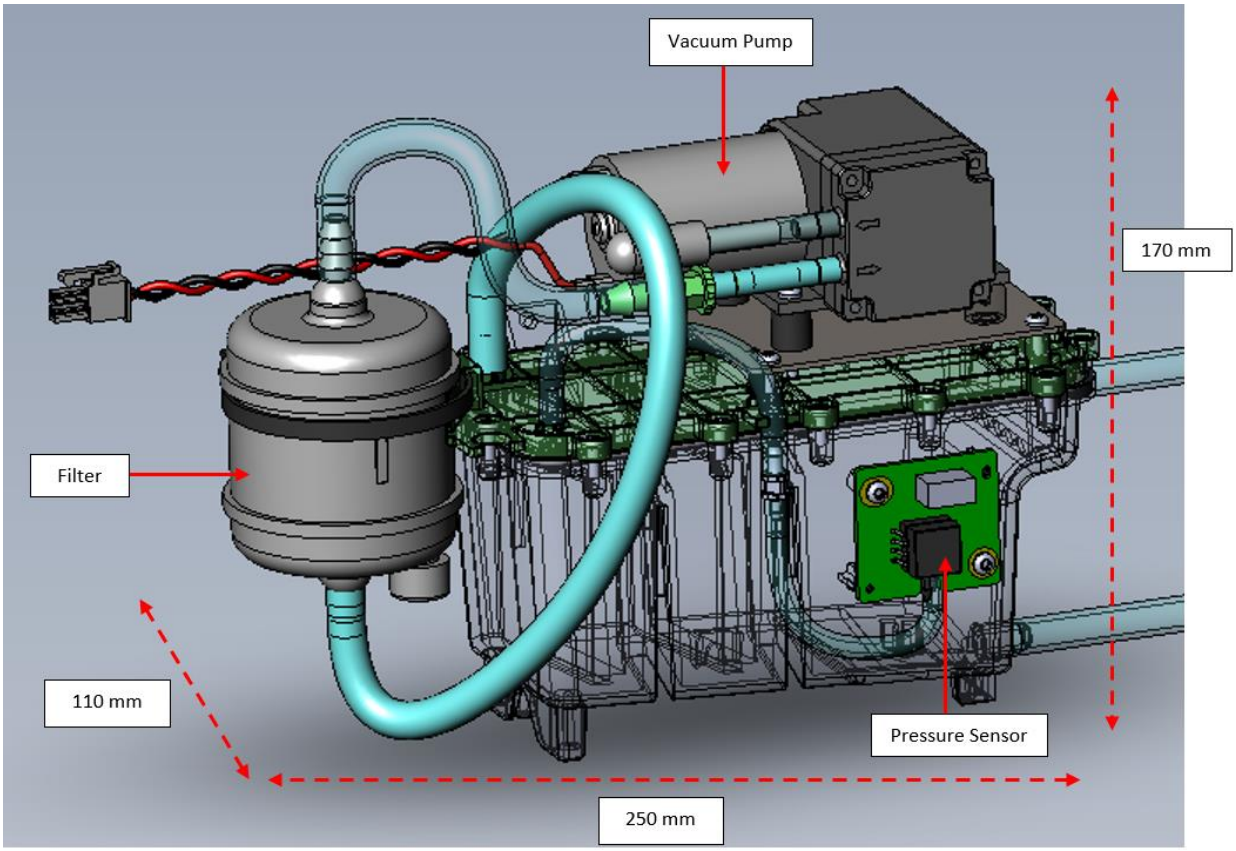
5.3 NGQ Connector

Each bulk ink supply connects to the BIDS PassThrough PCA with OEM-supplied QAI cables (RJ12). For more information, refer to the *DuraFlex Electrical Databook and Design Guide*.

6 Waste Ink Management Module (WIMM)

The Waste Ink Management Module (WIMM) extracts waste ink from two sources on the DuraFlex Maintenance Module; the wiper and the cap.

Figure 39 – WIMM Components and Envelope Size



6.1 Components

The Waste Ink Management Module (WIMM) module consists of:

- Vacuum Pump: extracts waste ink from the wiper or cap. The BIDS refill pump drains the waste ink in the WIMM tank to the OEM waste ink container every time the pump is triggered to refill the IR tank. This ensures that the waste ink in the WIMM tank does not overfill. The vacuum pump on the WIMM tank can produce negative pressure up to -55 kPa during heavy service, and -25 kPa during light service.
- WIMM Tank: a 0.5 liter tank that contains a built-in baffle rib feature to separate ink mist from liquid ink. It provides first-level filtering to prevent liquid ink from entering and damaging the vacuum pump.
- Filter: provides second-level filtering to block ink mist and other particles from entering and damaging the vacuum pump.
- PCA Board: houses the pressure sensor and connector and receives its power supply from the Mechanical Controller PCA.

- Pressure Sensor: detects pressure in the WIMM tank, exerted by the vacuum pump, and provides feedback to the Mechanical Controller PCA to regulate to the desired pressure (-55 kPa or -25 kPa) through Pulse Width Modulation (PWM).
- Tubing: transports waste ink from the wiper or cap to the WIMM tank and out to the BIDS for removal into the OEM waste ink container.

Note:	OEMs are responsible for providing a waste ink container and tubing between modules.

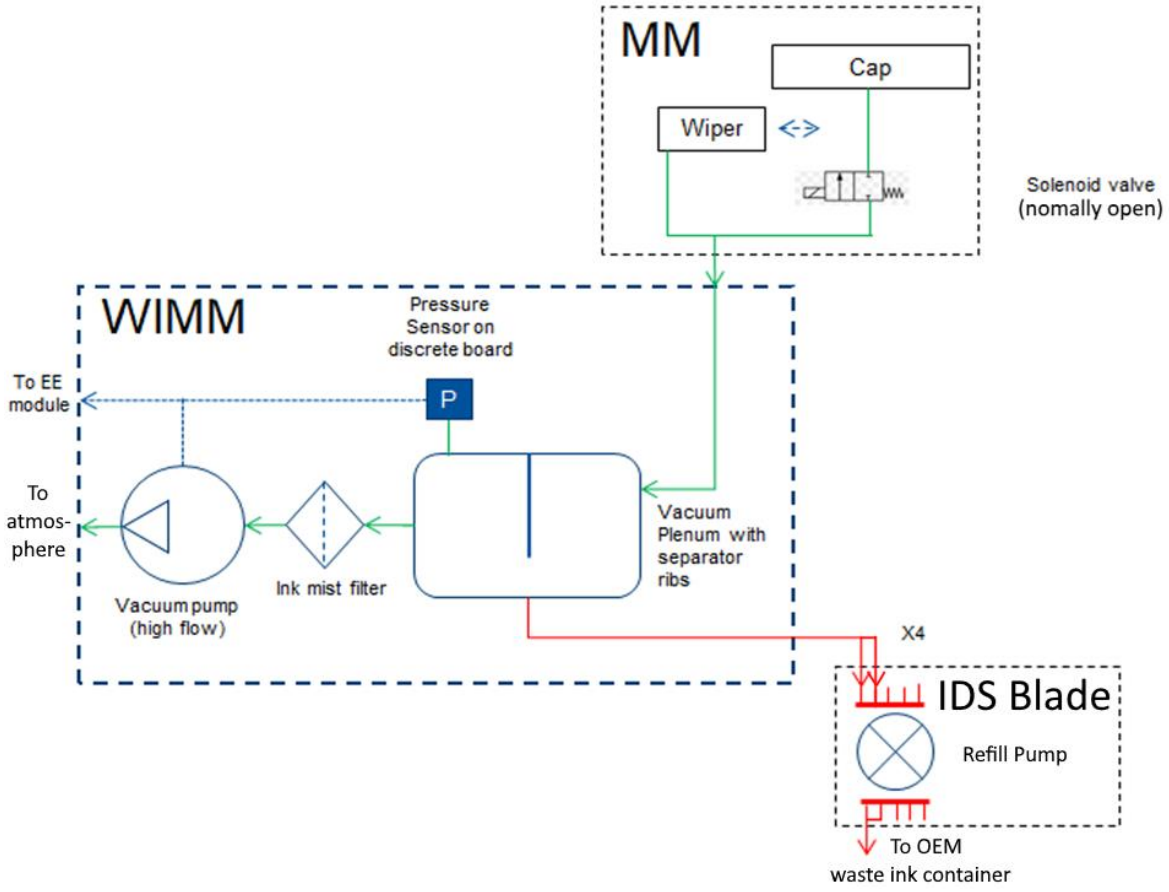
6.2 Waste Ink Flow

Waste ink comes from two sources in the Maintenance Module, the wiper and the cap. The waste ink from both locations drains to the WIMM tank, then to the BIDS via the waste ink drain port, and finally to the OEM waste ink container.

Since both the wiper and cap share a single vacuum pump, a solenoid valve on the drain line regulates the waste ink draining process. During heavy and light services, the negative pressure (vacuum) created by the vacuum pump drains waste ink from the wiper to the WIMM tank. The solenoid valve is closed to maintain sufficient pressure (-55 kPa) during wiping and to ensure there is no pressure leak to the cap's drain tube. Pressure from the vacuum pump drains waste ink from the cap. The solenoid valve is open during this process.

Figure 40 shows the WIMM interface with the Maintenance Module and the BIDS.

Figure 40 – WIMM Interface with Other Modules



6.3 WIMM Tank Design Overview

The DuraFlex WIMM tank contains a built-in baffle rib feature to separate liquid ink from ink mist. Waste ink from the wiper cartridge enters the WIMM tank via the tube connecting the wiper cartridge tube interface to the waste ink inlet port on the tank. *Figure 41* shows how the wall changes the air flow direction, while the baffle ribs (*Figure 42*) cause ink mist to condense and drop to the bottom of the WIMM tank to guide the condensed ink to the drain port connected to the BIDS refill pump (*Figure 43*). Whenever the BIDS refill pump refills the IR tank, the condensed ink in the WIMM tank then drains into the BIDS.

Figure 41 – Change Air Flow Direction

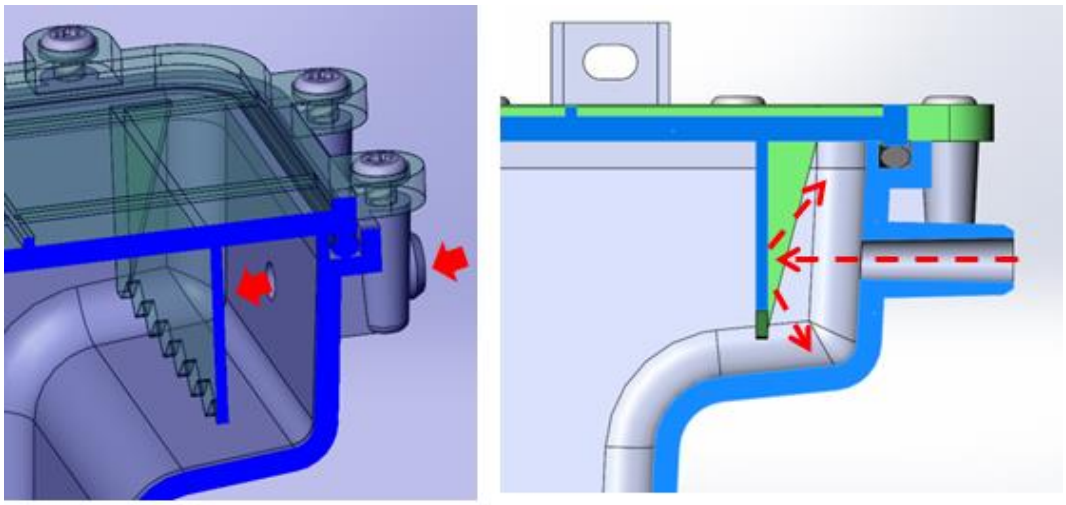


Figure 42 – WIMM Tank Baffle Ribs

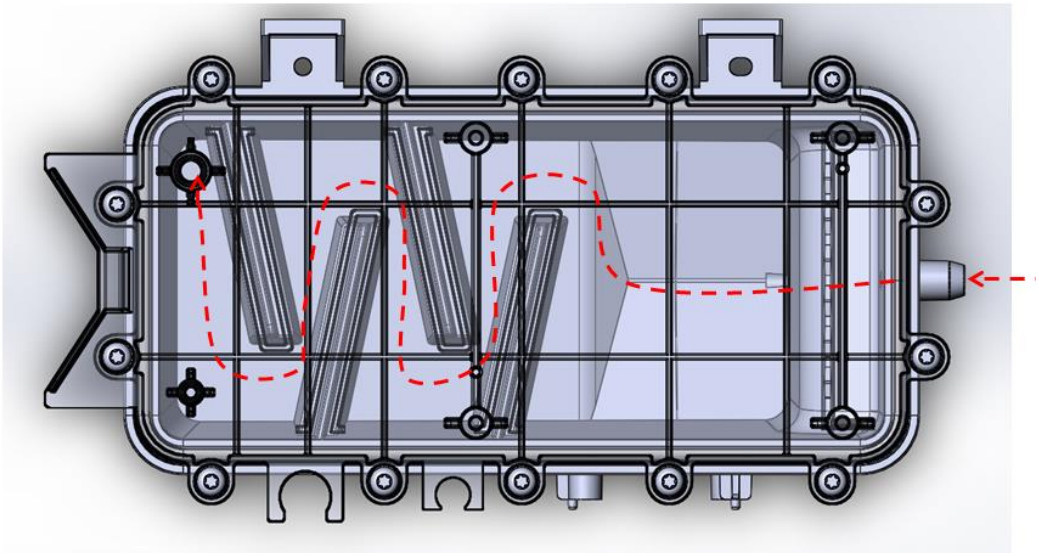
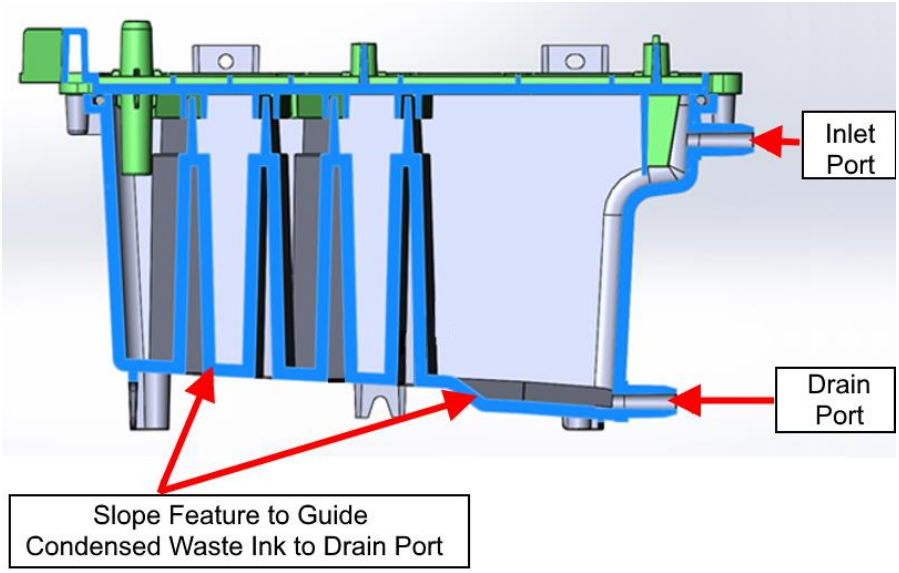


Figure 43 – WIMM Tank Slope Feature



6.4 N-Wide WIMM

For N-wide systems, N number of WIMMs are required.

The WIMM tubing can be routed with the IDS tubing but not required to have a continual positive slope towards the print engine.

7 DuraFlex Printhead

The DuraFlex printhead delivers high-speed printing with a nozzle density of 1600 dpi and nozzle firing frequency of 15.2 kHz per nozzle (maximum). The printhead supports four separate ink colors (CMYK) and uses two, independent dual-rows of 20436 print nozzles for each ink channel. Eight separate nozzles for each 1600 dpi full-color pixel column together deliver improved dot placement, sharper images, and more reliable color image quality.

7.1 Printhead Technical Specifications

Table 13 – DuraFlex Printhead Technical Specifications

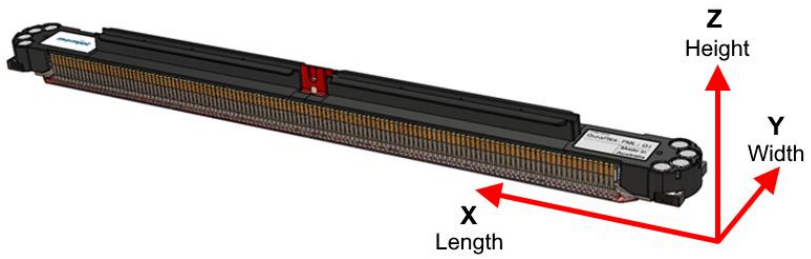
Description	A3 Printhead
PRINTING CAPABILITIES	
Printing Method	Drop-on-demand thermal inkjet
Printhead Configuration	Four colors
Maximum Printable Width	324.4 mm for a single A3 printhead. Multiple A3 printheads (up to 4) can be stitched together with a maximum 10 mm overlap to achieve wider print widths.
Nozzle Count	163840 at 1600 dpi with dual-row redundancy per ink channel
Maximum Firing Frequency	15.2 kHz per nozzle/ 121.6 kHz effective row printing
RELIABILITY	
Nominal Firing Frequency	14.4 kHz per nozzle
Shelf Life (Original Packaging)	24 months
Installed Life	36 months
Printhead Life (Application Dependent)	In excess of 1 billion ejections per nozzle.
INK	
Ink Type	Memjet aqueous pigment (DuraFlex Ink) Aqueous dye compatible
Ink Drop Volume (Nominal)	2.1 pL at 15.2 kHz
OPERATIONAL ENVIRONMENT	
Temperature	15°C to 35°C (59°F to 104°F)
Humidity	20% to 80% RH non-condensing
Atmospheric Pressure	70 kPa to 106 kPa
Physical Orientation	Up to ±1.5° from horizontal across the page width. Up to ±5° from horizontal in the direction of media travel.

7.1.1 Printhead Coordinates

Figure 44 shows the coordinate reference axes of the DuraFlex Printhead.

- X-axis is across the media, parallel to the printhead, considered “page width”.
- Y-axis is the media travel direction, considered “page length”.
- Z-axis is perpendicular to the plane of the media and is the direction of PPS.

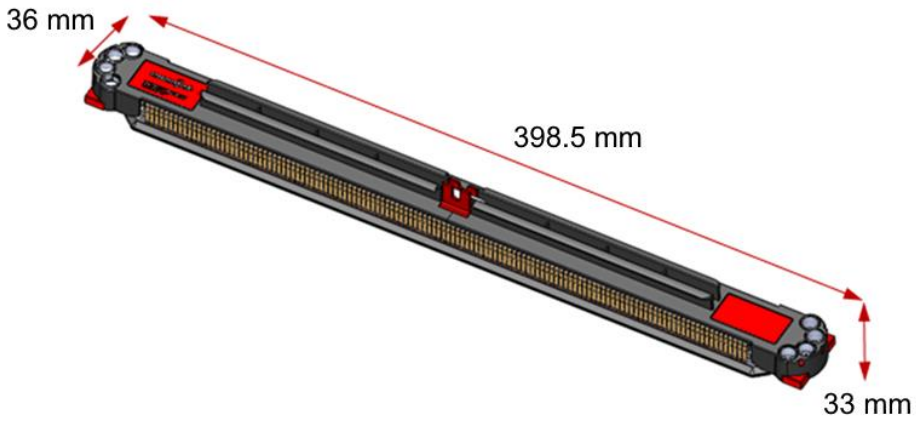
Figure 44 – Printhead Coordinates



7.2 Printhead Dimensions and Components

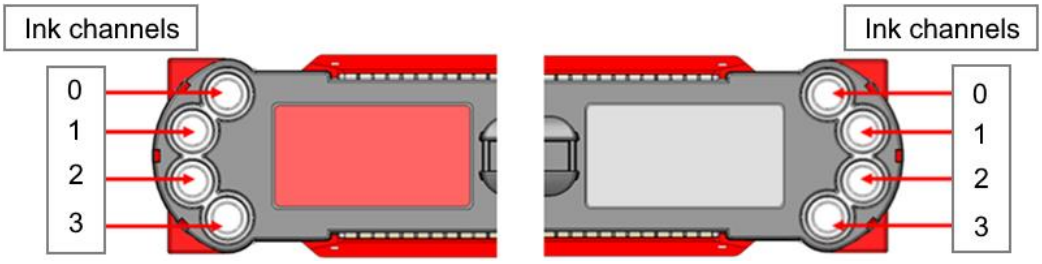
The A3 printhead provides a print swath of 324.4 mm (12.77”) at over 2 billion dots per second. Multiple printheads can be stitched to support wider print requirements.

Figure 45 – A3 Printhead Dimensions



Four ink ports on each end of the printhead serve as inlets/outlets to receive or dispose of ink via the ink couplings. There is no risk of ink mixing since the printhead can only be inserted in one direction with the orientation key on the top side.

Figure 46 – Printhead Ink Ports

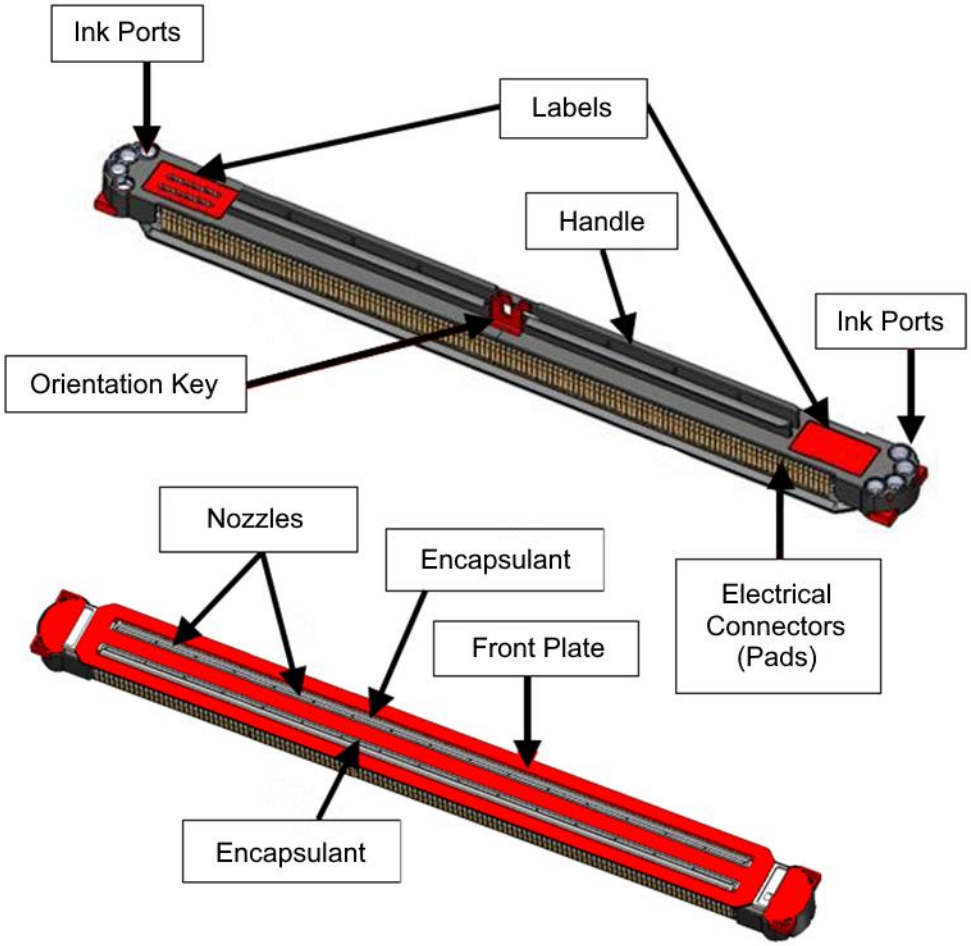


A dry DuraFlex A3 printhead weighs approximately 450 g and contains multiple components as shown in *Table 14* and *Figure 47*.

Table 14 – DuraFlex Printhead Components

Component	Descriptions
Nozzle	A single Micro-Electro-Mechanical System (MEMS) actuator capable of producing a drop of ink.
Labels	Show the serial number barcode and branding.
Encapsulant	Polymeric material that protects the bond pads, the wires interconnecting the printhead dies, and the PCB from ink and mechanical damage.
Front plate	Rigid, smooth surface that protrudes beyond the nozzle plane.
Electrical connectors (pads)	Electrical conductors through which power and data are supplied to the printhead.
Ink ports	Orifices through which ink is supplied to and removed from the printhead.
Orientation key	Used during installation to align the printhead in the correct position

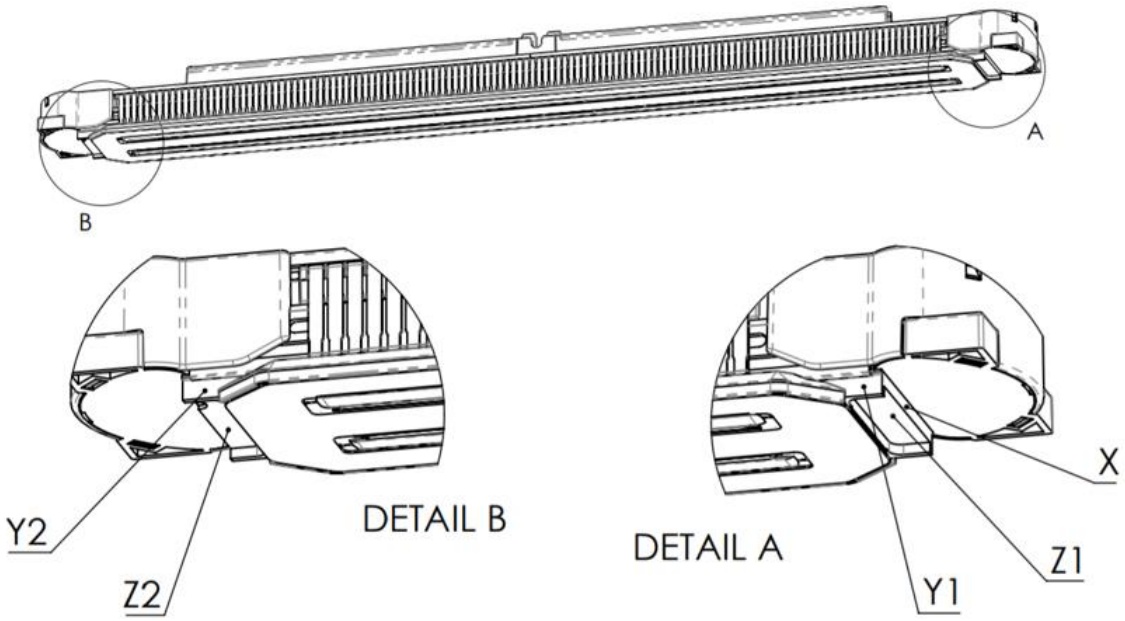
Figure 47 – DuraFlex Printhead Components



7.3 Printhead Datums

The printhead X, Y, and Z datums ensure secure and accurate positioning of the printhead to the DuraFlex printhead nest, hence to the media. During printing, in an N-wide configuration, these datums also enable the printhead to maintain its position relative to adjacent printheads.

Figure 48 – Printhead X, Y, and Z Datums



7.4 Replacing the Printhead

Printhead life varies and is application dependent. Average printhead replacement time is 1-2 minutes. For printhead insertion and removal procedures, see the *DuraFlex Installation and Commissioning Guide*.

8 Print Module to Printer Interface

Memjet provides an example print bar and allows the OEM to customize it as needed. The OEM can also design their own print bar for more flexibility.

The print bar can be used for:

- Mounting the Print Module
- Accurately locating the Printhead Cradle relative to media
- Increasing the height of the Printhead Cradle for thicker media
- Mounting the Aerosol Extraction System (AES)
- Mounting the encoder
- Mounting the TOF sensor

Note:	Memjet can provide reference CAD files for the print bar. Optionally, OEMs can mount the Print Module without using a print bar depending on the application. To guide or review the design, contact your Memjet Technical Account Manager.

8.1 Mount the Print Module to Print Bar

It is important to locate the Print Module in the correct location, so that the Datum Pins on the Printhead Cradle engage the three Datum Plates every time the Printhead goes to the PRINT position. Datum Plate/Datum Pin interaction ensures the correct and consistent alignment of images printed on the media in terms of X and Y alignment. For more information about Datum Pins, refer to Section *9.3 Align Printhead Cradle with Datum Pins or Datum Plates*.

To mount the DuraFlex Print Module onto the Print Bar:

1. Align the Print Module in XY axis with two locating pins on the Print Bar and two locating holes/slots on the Print Module Frame Base.

   The location of the locating pins on the Print Bar is defined in the CAD file. Refer to the 3D file provided by Memjet.

2. Secure the Print Module with five (5) M4 × 8 ultra-low head mounting screws (CBSTSR4-8) (*Figure 49*). Move the wiper cradle from its HOME position as needed to access the mounting holes underneath.

Figure 49 – Locating Holes and Locating Pins

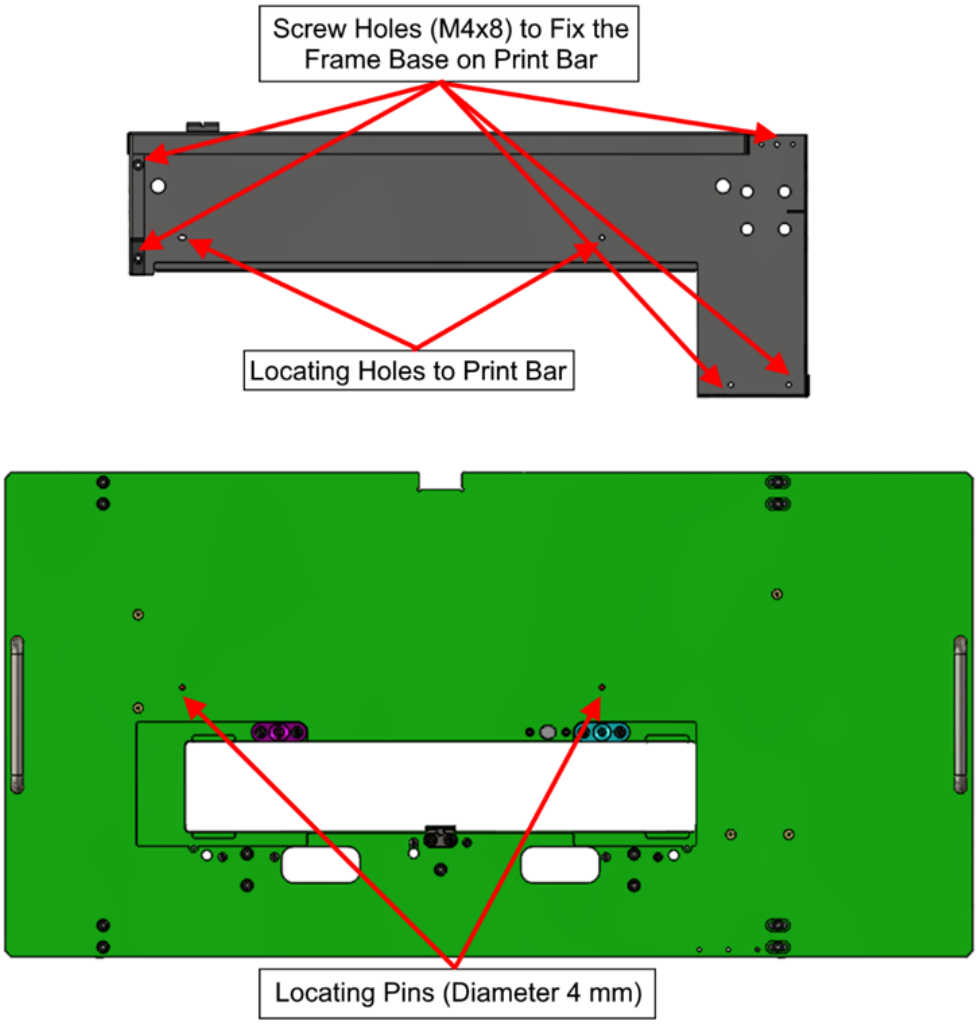


Figure 50 – Mount Print Module onto Print Bar

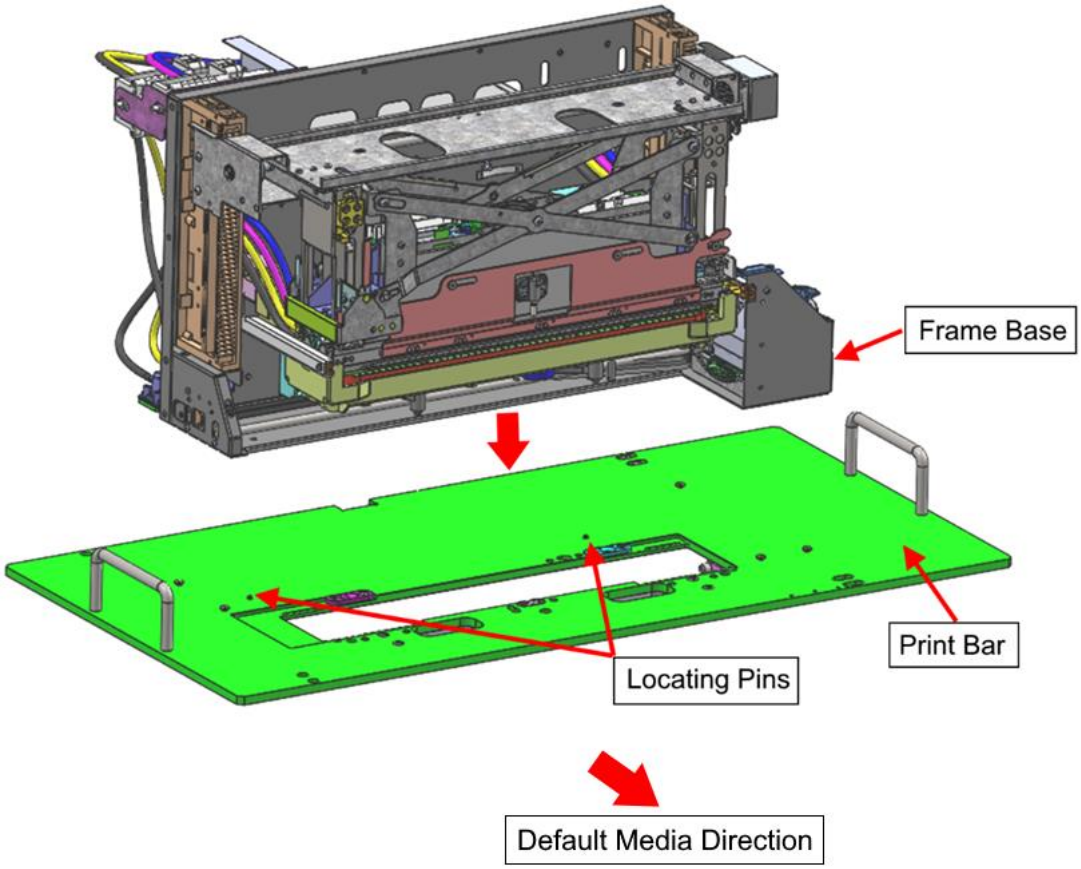


Figure 51 – Print Module Mounted

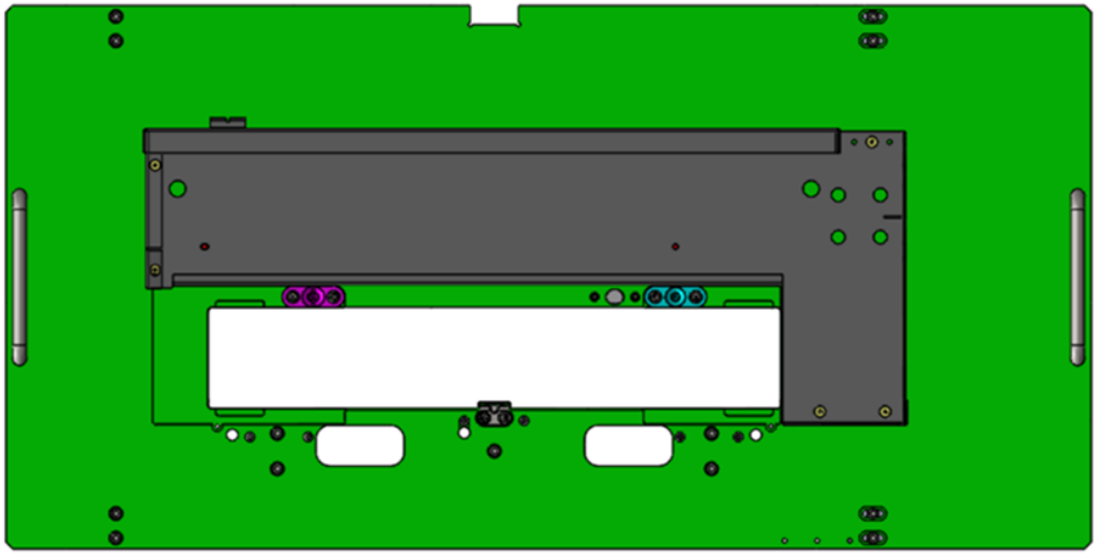
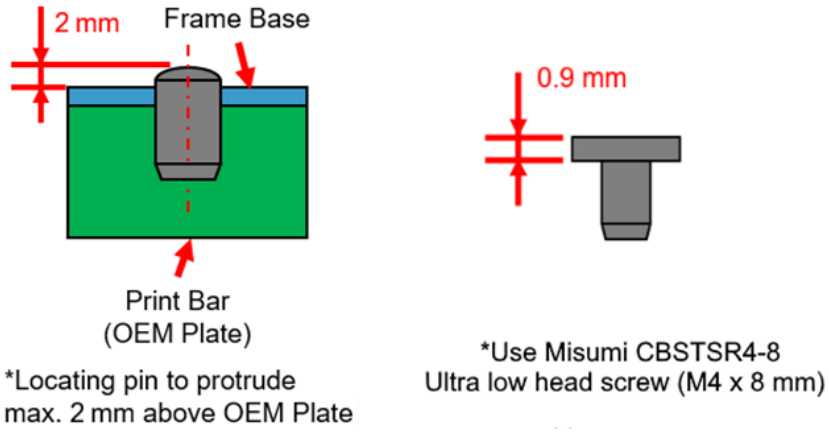


Figure 52 – Locating Pins and Recommended Screw



Note:	OEMs need to source the M4 × 8 ultra-low head screws (CBSTSR4-8). For more details, see https://us.misumi-ec.com/vona2/detail/110302280540/?HissuCode=CBSTSR4-8

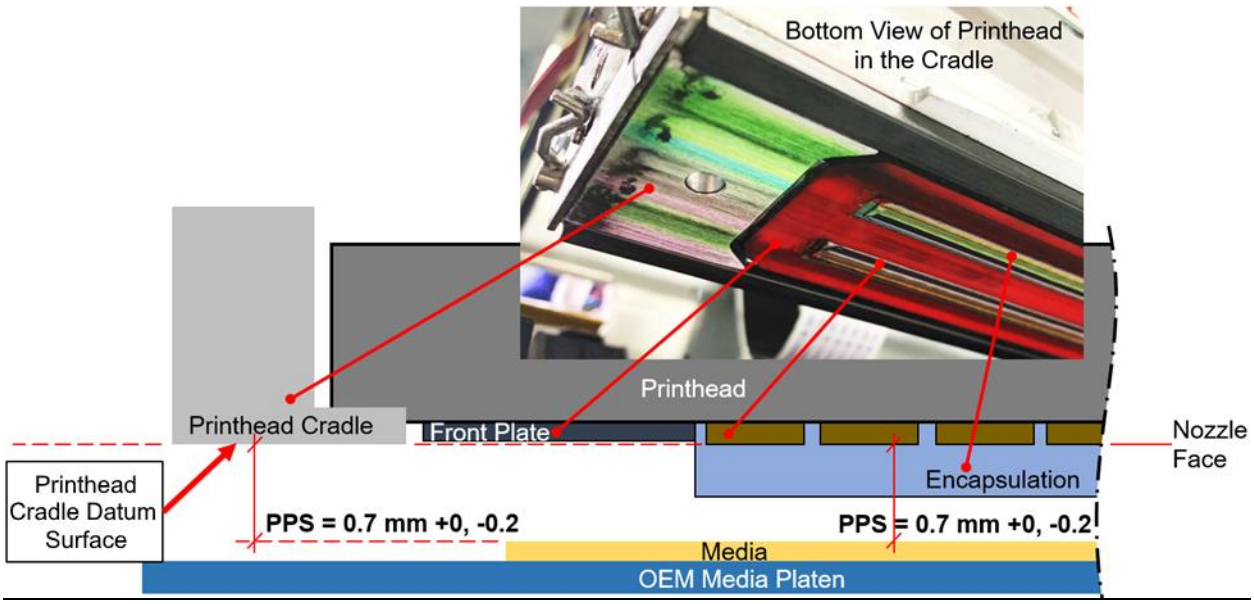
8.2 Set Printhead-to-Paper Spacing (PPS)

Note:	If the OEM design does not use Datum Plates or Datum Pins, skip this section.

Pen-to-Paper Spacing (PPS) is defined as the distance from the printhead (also known as the pen) to the paper (also known as media). As PPS increases, the print quality degrades. To ensure optimum print quality, set the PPS to a distance of 0.7 mm (+0 mm, -0.2 mm) between the media surface and printhead nozzles.

Setting PPS within the specification minimizes the detrimental (and unquantified) effects on print quality, such as issues related to nozzle directionality, deceleration of ink droplets after ejection, droplet satellites, and ink mist.

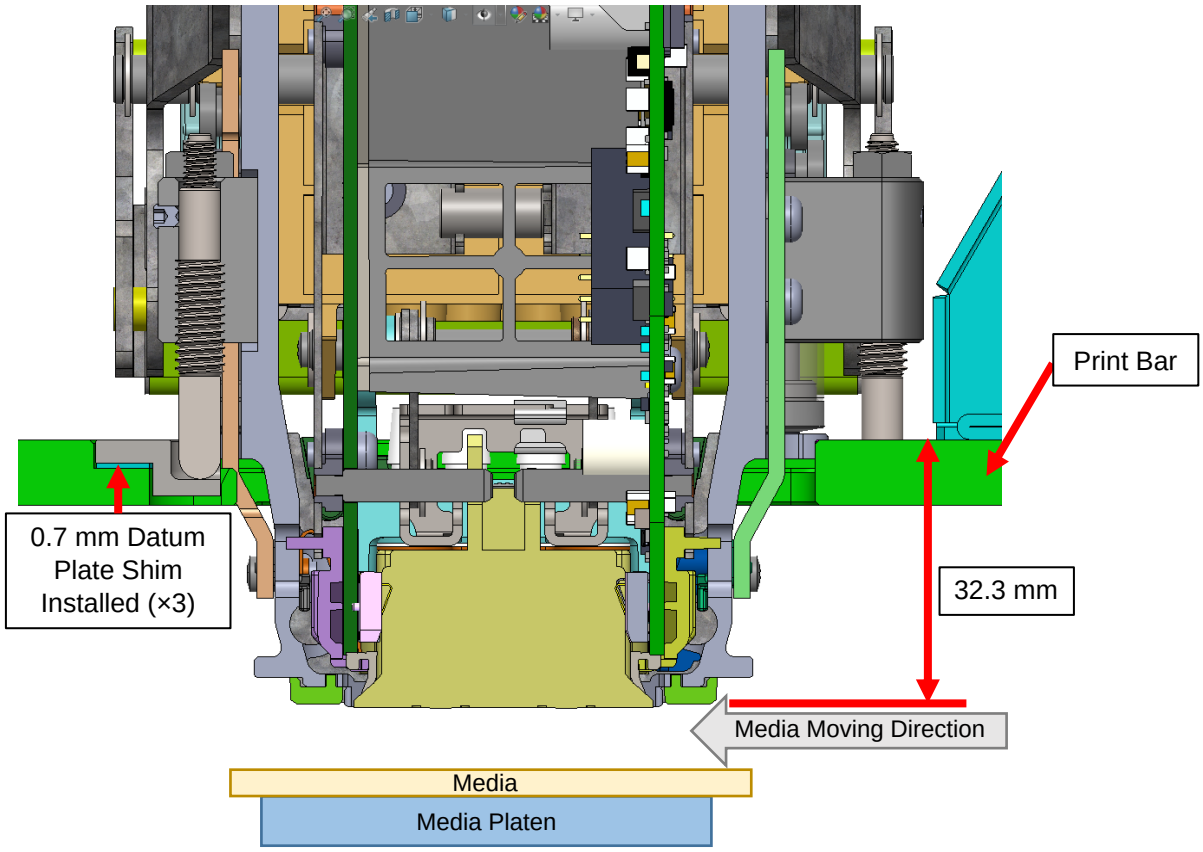
Figure 53 – PPS



The theoretical PPS of 0.7 mm can be obtained by setting the distance of 32.3 mm from the top of Print Bar (bottom of Print Module) to the Printhead Cradle Datum Surface. Datum plates are required to be set at a certain depth from the top of Print Bar (refer to the CAD files). To achieve PPS within this specification, the OEM needs to tune the Datum Plate height by adding or removing shims under the Datum Plates, to eliminate possible manufacturing tolerances.

The diagram below shows the PPS being set with 0.7 mm shims.

Figure 54 – Print Module Height to Media



Media path transport is an OEM responsibility, including setting PPS for the chosen media.

Choose one or more PPS Setting options (listed in *Table 15*) that are applicable to the printing system, based on the following factors:

- Required printable width: the maximum width of the printing area that an OEM intends to print on the media. This defines the number of printheads needed in the system.
- Media width: the widest media the OEM intends to print on.
- Intended media handling system: options may be roll-to-roll, cut sheet, or belt-driven. (If belt driven, the OEM needs to consider belt width too). Depending on the option chosen, there might be moving parts in the print zone.
- Media thickness variation: the difference from the thinnest to thickest media. It is recommended to design the media handling system for the thinnest media and then increase the PPS setting for thicker media.

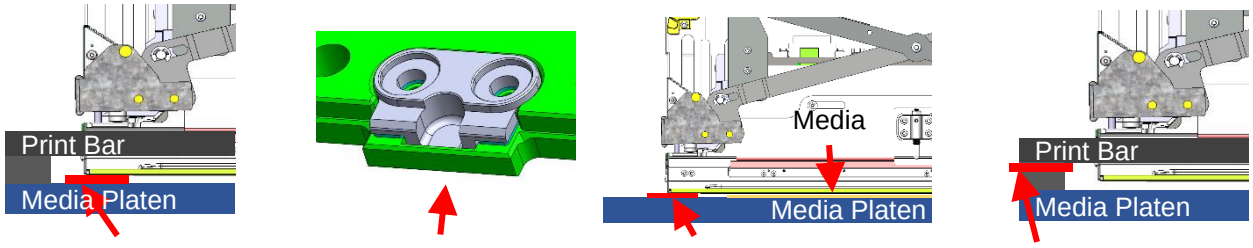
Table 15 – PPS Setting and Adjusting Options

Option	Method	Application
1-Wide, Option 1	**Datum Plate Shim:** Use Datum Plate Shim under Datum Plates	The OEM needs to use the Print Bar, Datum Plates, and Datum Plate Shims: • When media transport is not solid for ~330 mm wide. • When media width is more than ~330 mm, the use of Verification Shim is essential for setting PPS.
1-Wide, Option 2	**Direct to Platen:** Use Platen Shim under Printhead Cradle	When media width is less than 350 mm and media transport platen is hard surface.
1-Wide, Option 1a	**Print Bar Shim:** Use Print Bar Shim under Print Bar	When there is a need to adjust the PPS height due to the increase in media thickness.
N-Wide, Option 3	Use Datum Plate Shim under Datum Plates (The access to Datum Plates is restricted)	• Print Bar is required. • The use of Verification Shim is essential for setting PPS.
N-Wide, Option 4	Use adjustable kinematic pins (The OEM needs to design these pins)	
N-Wide, Option 3a	**Print Bar Shim:** Use Print Bar Shim under Print Bar	When there is a need to adjust the PPS height due to the increase in media thickness.

Table 16 – Shim Definitions

Type	Definition
Verification Shim	• Shim for verification and to prevent nozzle plate crashes. • Placed under the Printhead Cradle.
Datum Plate Shim	• Shim for setting PPS. • Placed under Datum Plates (Standard item in the Memjet Print Bar Assembly).
Platen Shim	• Permanent shim. • Placed on the Media Platen under the Printhead Cradle.
Print Bar Shim	• Shim for adjusting PPS. • Placed under the Print Bar for printing applications on thicker media.

Figure 55 – Shim Types



Verification Shim | Datum Plate Shim | Platen Shim | Print Bar Shim

Note: "Set PPS" means the initial setting of PPS based on thinnest media. "Adjust PPS" means, when OEMs need to use thicker media, they need to change the setting based on media thickness.

8.2.1 PPS Setting for 1-Wide Configuration (Option 1)

Datum Pins on the Printhead Cradle are factory set so that 0.7 mm PPS can be achieved with all of the following items:

- Print Bar
- Datum Plate
- Datum Plate Shim (0.7 mm)
- Distance from top of Print Bar to thinnest media is 33 mm to design media path or Print Bar Mount.

8.2.1.1 *Prerequisites for Using Option 1*

Gather 2 sets of shims:

- **One Set of Verification Shims:**

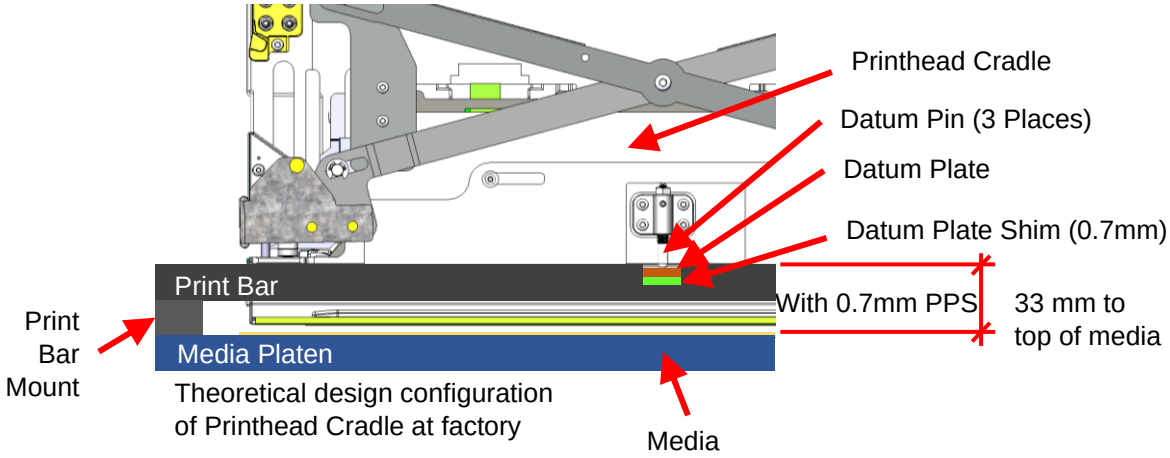
  0.7 mm shim or feeler gauge long enough to access Printhead Cradle Datum Surface.

- **One Set of Datum Plate Shims:**

  0.7 mm to achieve and set target PPS.

Note:	The range of tolerance value is dependent on OEM manufacturing precision.

Figure 56 – Prepare for PPS Setting (Option 1)



To set PPS (Option 1):

1. With Print Bar, Datum Plate, Datum Plate Shim (0.7 mm) and distance between top of Print Bar and top of media set to 33 mm, move the Printhead Cradle to the Print position.

2. Use a feeler gauge to measure the gap between the Printhead Cradle Datum Surface and top of media. The target is 0.7 mm on both sides. It may require some adjusting to compensate for manufacturing tolerance.

3. Adjust the Datum Plate Shim thickness under the Datum Plates (in 3 places) to achieve 0.7 mm gap at both ends:

   - Remove the 2 screws and Datum Plate
   - Place appropriate thickness shim(s) to achieve desired PPS
   - Reinstall Datum Plate and 2 screws

4. Verify the correct PPS by sliding media under the printhead.
    - Slide media under Printhead to ensure that the media movement is smooth, which indicates that there is no contact with Printhead.
    - The Verification Shim can move in X and Y axis between Printhead Cradle Datum Surface and media on the Media Platen. There should be some friction.
5. Remove Verification Shim.

Figure 57 – PPS Setting (Option 1)

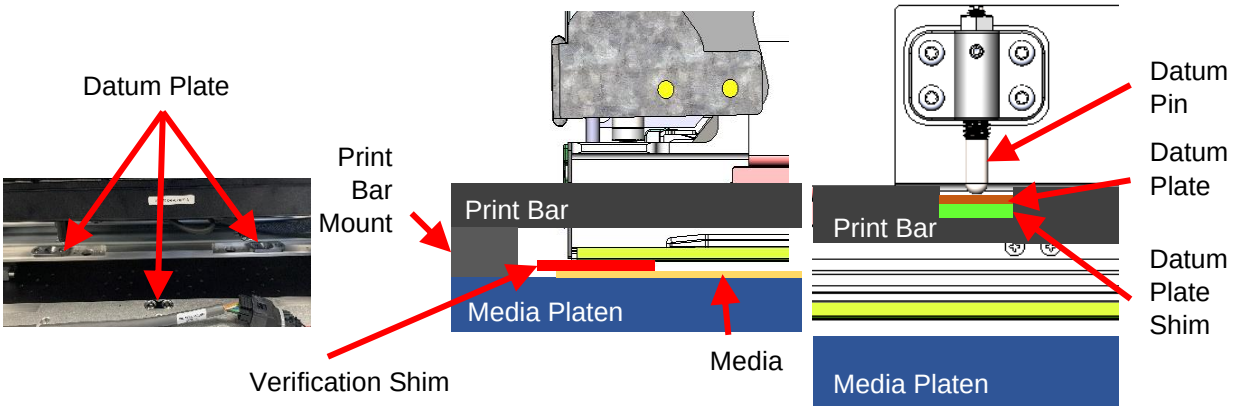
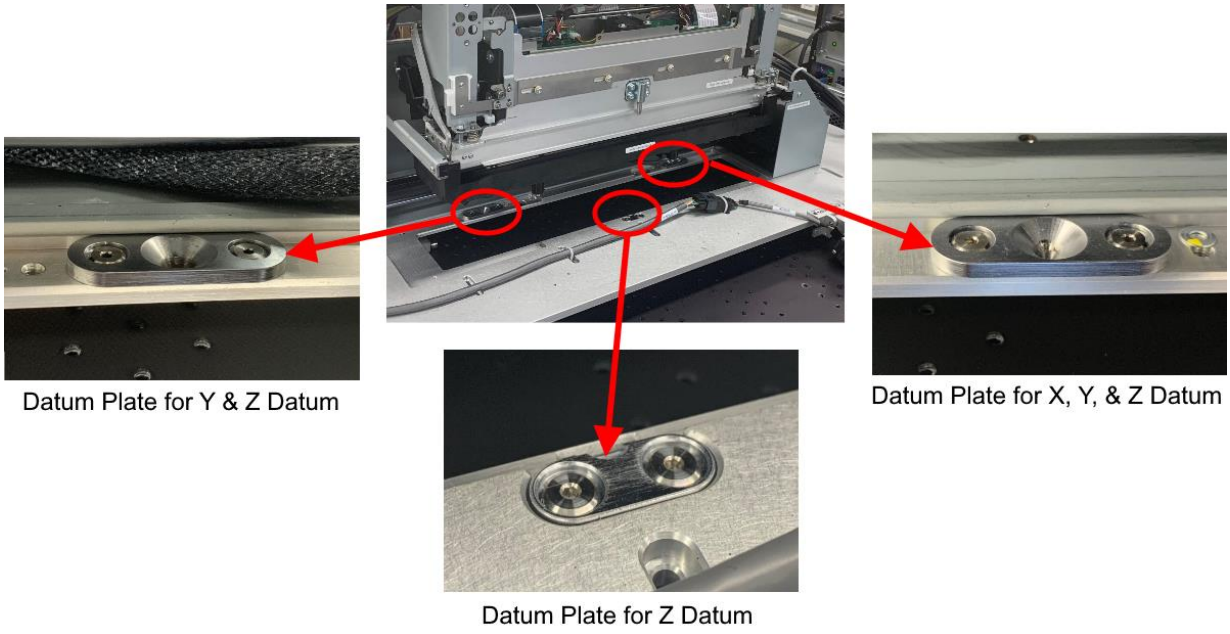


Figure 58 – Datum Plates (Option 1)

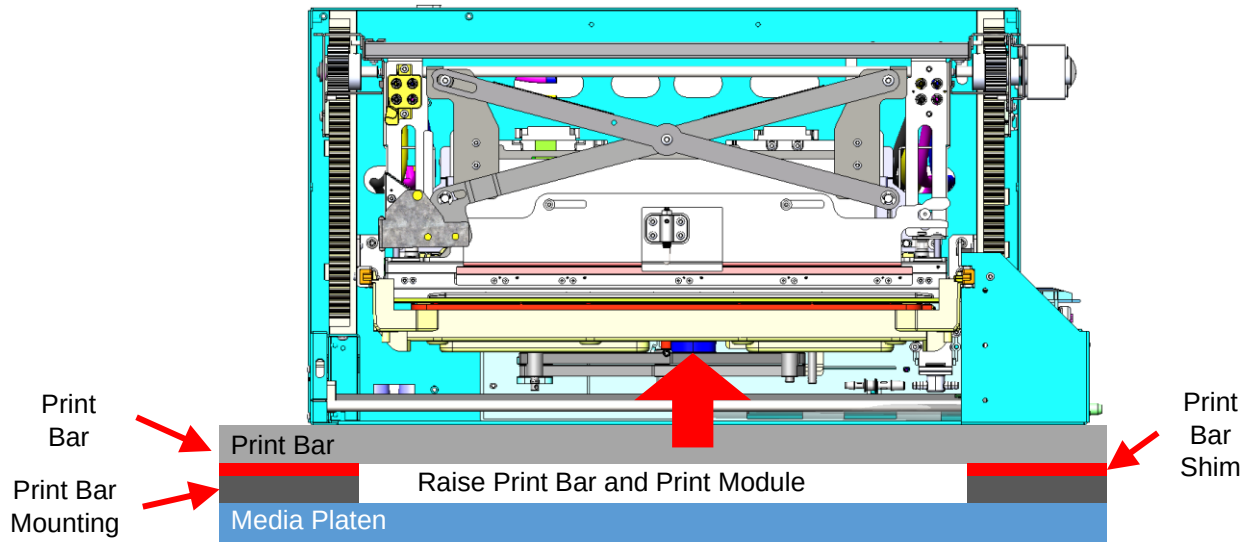


8.2.1.2 *Adjust PPS for Thicker Media (Option 1a, 1-Wide)*

To increase PPS from an initially set position to allow the space for thicker media:

1. Prepare the Print Bar Shim with a thickness of the difference between the thinnest media and the new media.
   a. Place Print Bar Shim between Print Bar and Print Bar Mounting.
   b. Maintain 100 mm (±10 mm) relative height between Printhead nozzle surface (at the Print position) and ink level in the IR tank.

Figure 59 – PPS Adjusting (Option 1a, 1-Wide)



2. Alternatively, the OEM could design a mechanism to raise the whole Print Bar Assembly as long as it ensures that the Printhead and Media Platen are in parallel.

8.2.2 PPS Setting for 1-Wide Configuration (Option 2)

8.2.2.1 *Prerequisites for Using Option 2*

Follow the prerequisites below:

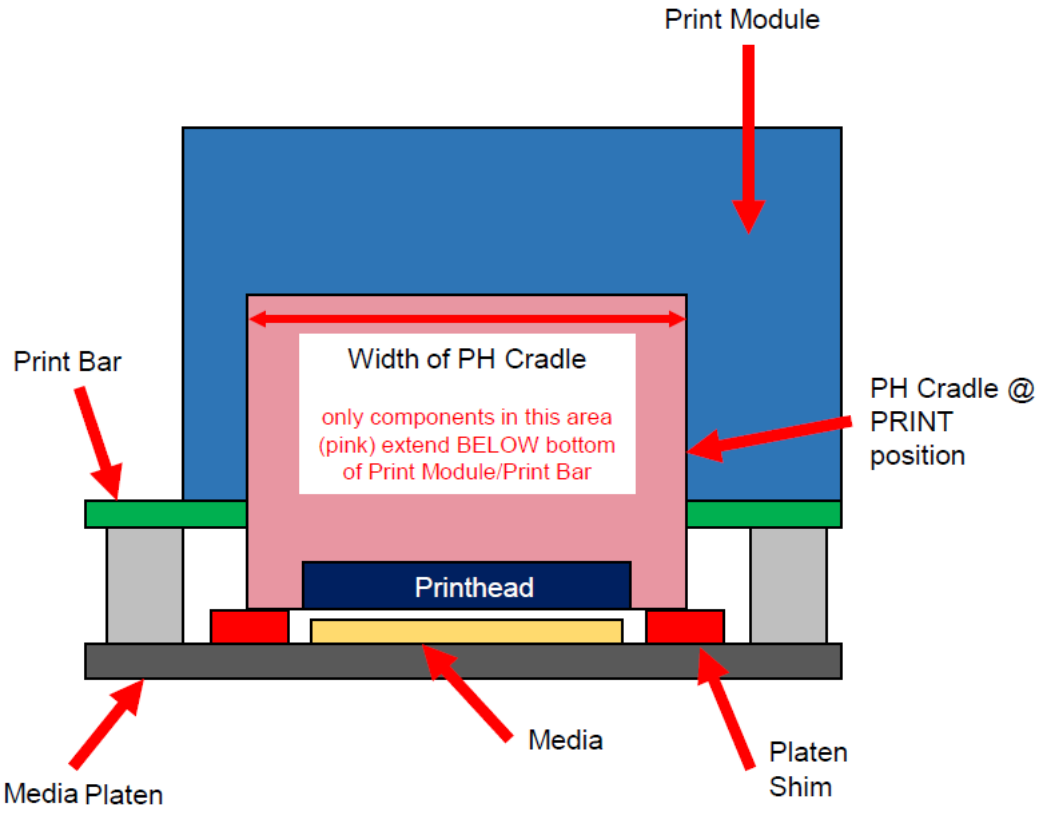
- Design the system to ensure that the distance from the Printhead Cradle Datum Surface to the top of media is 33 mm.
- Prepare Platen Shim: For PPS of 0.7 mm, prepare shim with 0.7 mm height plus media thickness.

To set PPS (Option 2):

1. Permanently adhere the Platen Shim directly to the Media Platen.
2. Move the Printhead Cradle to the Print position.
3. Slide media under the printhead to verify correct PPS. The media must move freely indicating that there is no contact with the printhead.

Note:	In this option, datum pins are not used.

Figure 60 – PPS Setting (Option 2)



This method increases PPS from initially set position to allow space for thicker media.

Prepare Print Bar Shim and Platen Shim with thickness of the difference between thinnest media and new media. Alternatively, the OEM needs to design mechanism to raise the whole Print Bar Assembly and ensure the Printhead and Media Platen are in parallel, as well as increase Platen Shim.

To adjust PPS for thicker media:

1. Add Platen Shim and Print Bar Shim under the Print Module to raise the whole Print Engine.

8.2.3 PPS Setting for N-Wide Configuration (Option 3)

8.2.3.1 *Prerequisites for Using Option 3*

Follow the prerequisites below:

- Prepare 2 sets of shims:
  - **Verification Shim:** 0.7 mm shim or feeler gauge long enough to access the Printhead Cradle Datum Surface.
  - **Datum Plate Shim:** 0.7 mm ± tolerances to achieve and set target PPS.

To set PPS (Option 3):

1. With Print Bar, Datum Plate, Datum Plate Shim (0.7 mm) and distance between top of Print Bar and top of media set to 33 mm, move the Printhead Cradle to the Print position.
2. Measure the gap between the Printhead Cradle Datum Surface and top of media with feeler gauge.

   The target is 0.7 mm on both sides. It may require some adjusting to compensate for manufacturing tolerance.
3. Adjust the Datum Plate Shim thickness under the Datum Plates (3 places) to achieve 0.7 mm gap on both sides:
   - Remove the 2 screws and Datum Plate
   - Place desired shim(s) for PPS
   - Reinstall Datum Plate and secure with 2 screws
4. Verify the correct PPS by sliding media under the Printhead.
   - Slide media under Printhead to ensure that the media movement is smooth, which indicates that there is no contact with Printhead.
   - The Verification Shim can move in X and Y axis between Printhead Cradle Datum Surface and media on the Media Platen. There should be some friction.
5. Remove Verification Shim.
6. Perform the steps above for each Print Module.

This method increases PPS from the initially set position to allow the space for thicker media.

Prepare Print Bar Shim with thickness of the difference between thinnest media and new media.

Figure 61 – Shims Used in PPS Setting (Option 3)

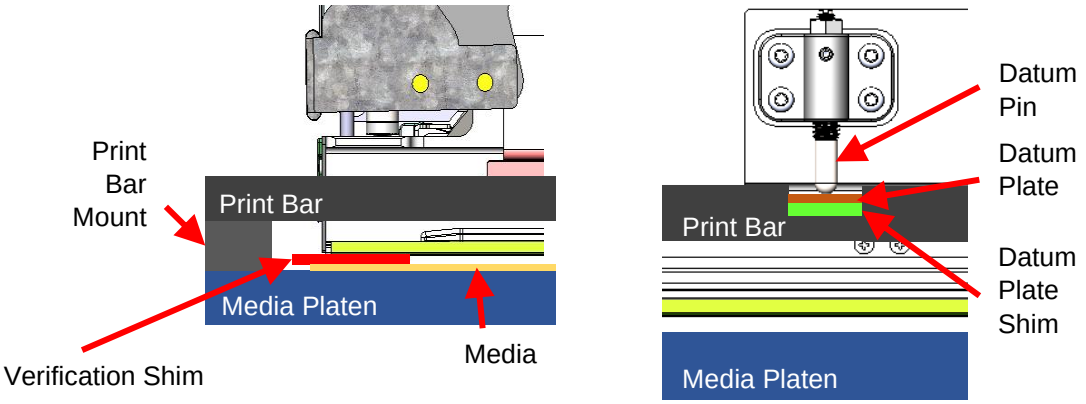


Figure 62 – PPS Setting (4-Wide)

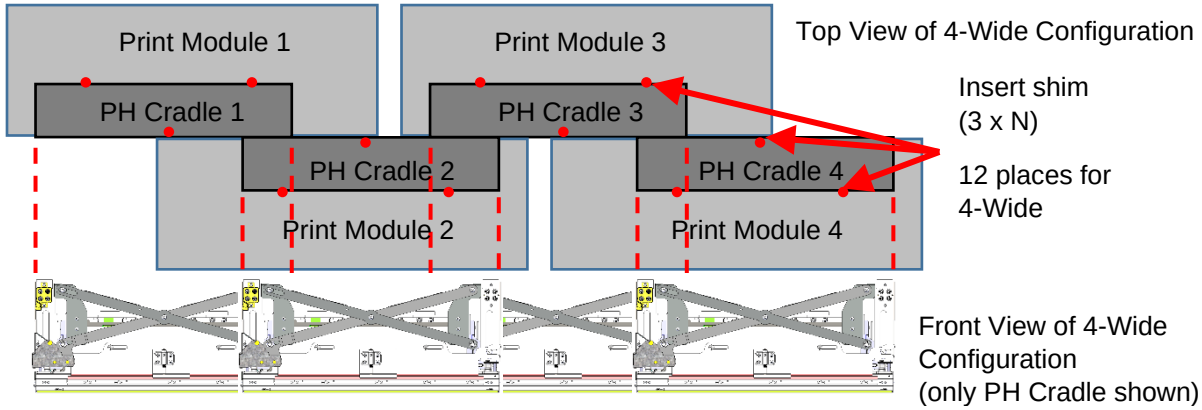


Figure 63 – Areas with Difficult Access (4-Wide)

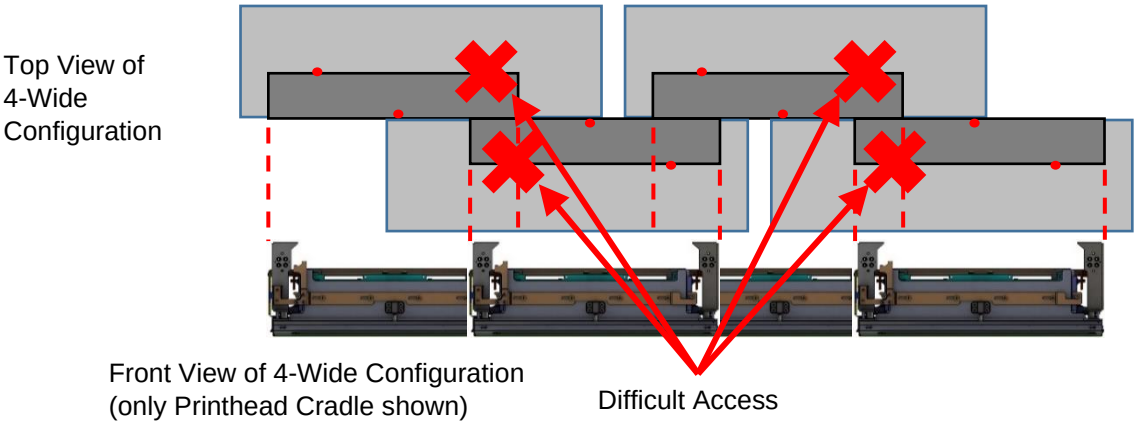
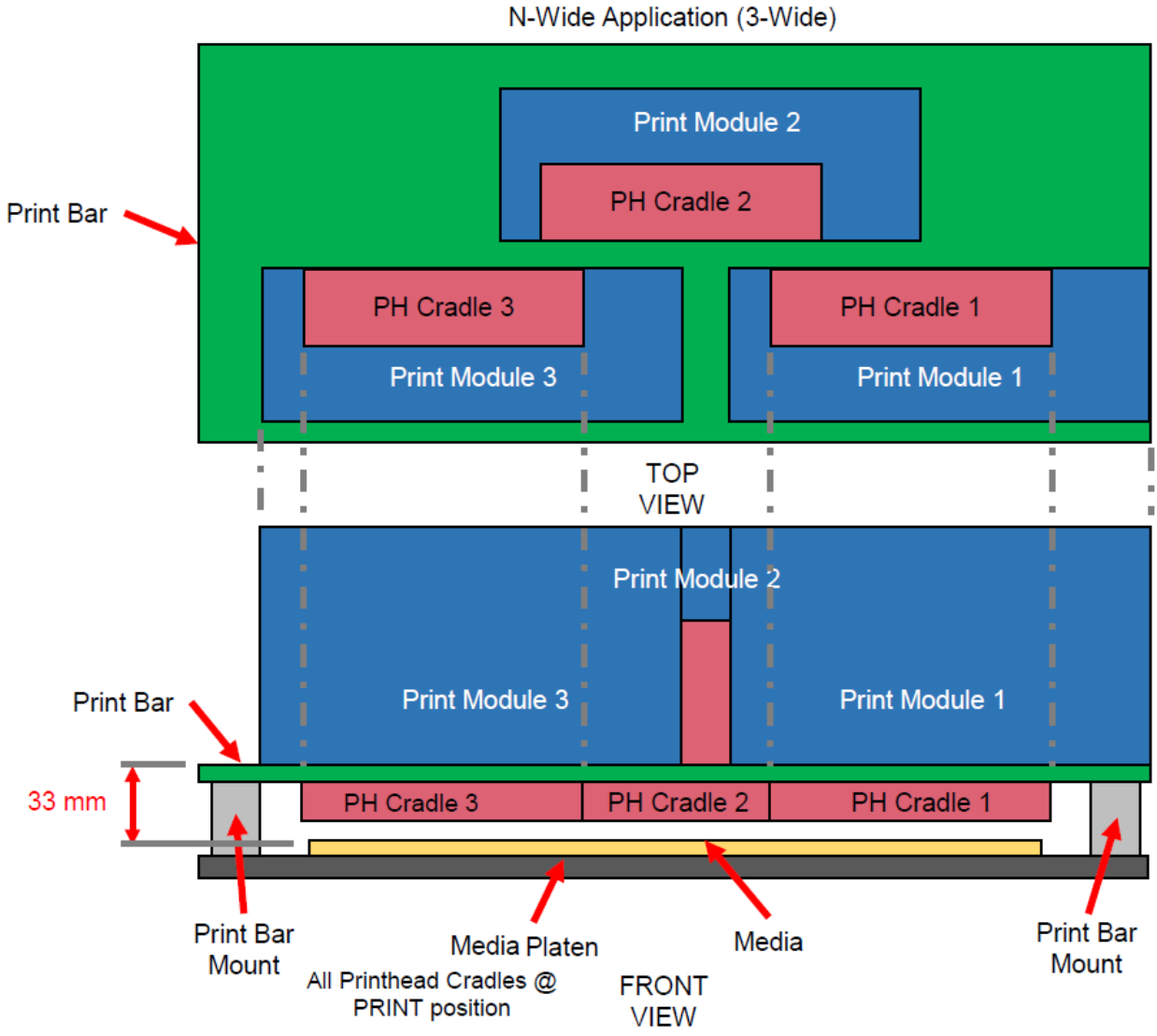


Figure 64 – PPS Setting Application (3-Wide)

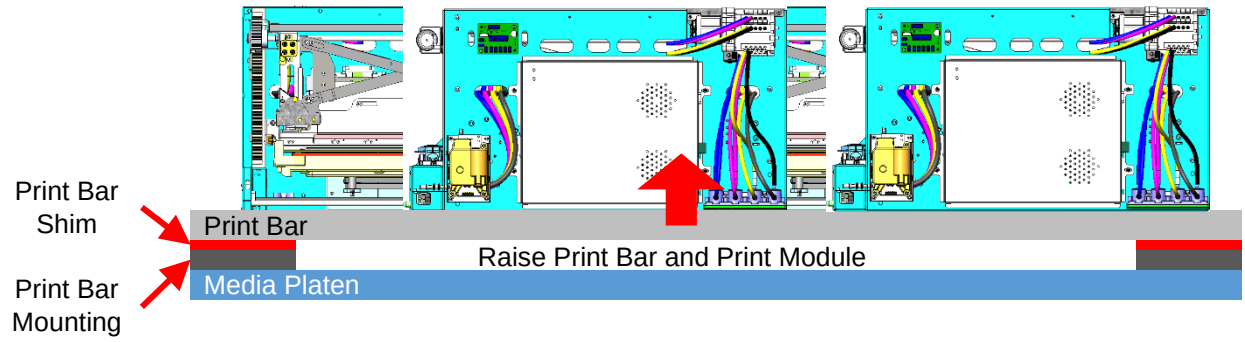


8.2.3.2 *Adjust PPS for Thicker Media (Option 3a, N-Wide)*

To increase PPS from an initially set position to allow the space for thicker media:

1. Prepare the Print Bar Shim with a thickness of the difference between the thinnest media and the new media.
   a. Place Print Bar Shim between Print Bar and Print Bar Mounting.
   b. Maintain 100 mm relative height between Printhead nozzle surface (at the Print position) and ink level in the IR tank.

Figure 65 – PPS Adjusting (Option 3a, N-Wide)



2. Alternatively, the OEM needs to design mechanism to raise the whole Print Bar Assembly and ensure that the Printheads and Media Platen are in parallel.

8.2.4 PPS Setting for N-Wide Configuration (Option 4)

8.2.4.1 *Prerequisites for Using Option 4*

Follow the prerequisites below:

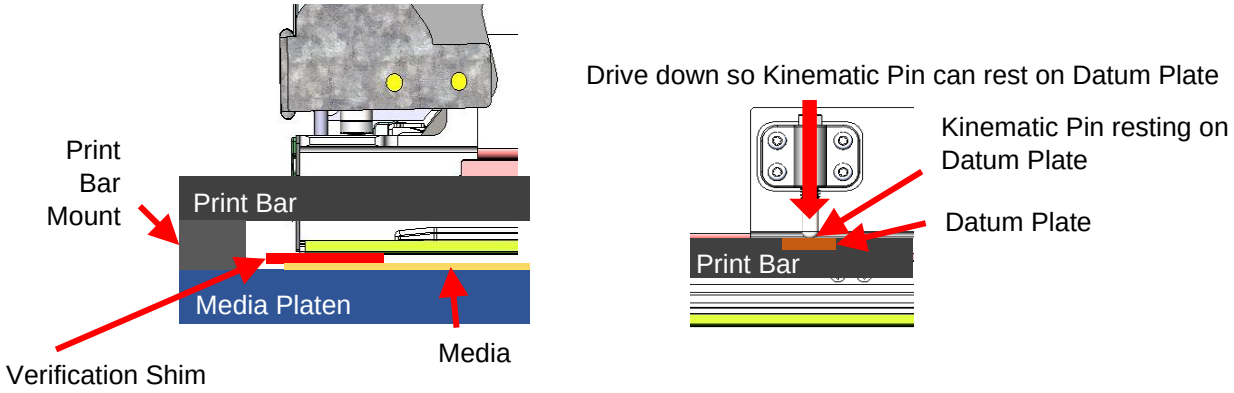
- The OEM needs to design and fabricate adjustable Kinematic Pins. After setting the PPS, these pins will be locked.
- Prepare Verification Shim: For PPS of 0.7 mm, prepare shim with height 0.7 mm plus media thickness.

To set PPS (Option 4), refer to *Figure 62* and *Figure 63*, and do the following:

1. Place Verification Shim on Media Platen at the two ends under Printhead Cradle datum surface.
2. Lower the Printhead Cradle to Verification Shim. Ensure that the Kinematic Pins are clear of Datum Plates (three places).
3. Unscrew the lower pin till all Kinematic Pins are resting on the Datum Plates (three places).
4. Verify the correct PPS by sliding media under the Printhead. Ensure that media movement is smooth, which indicates that there is no contact with Media Platen or Printhead, and Verification Shim can move (in X and Y axis) between Media Platen and Printhead Cradle (there should be some friction).
5. Remove Verification Shim.

6. Perform the above steps for each Print Module.

Figure 66 – Shims Used in PPS Setting (Option 4)



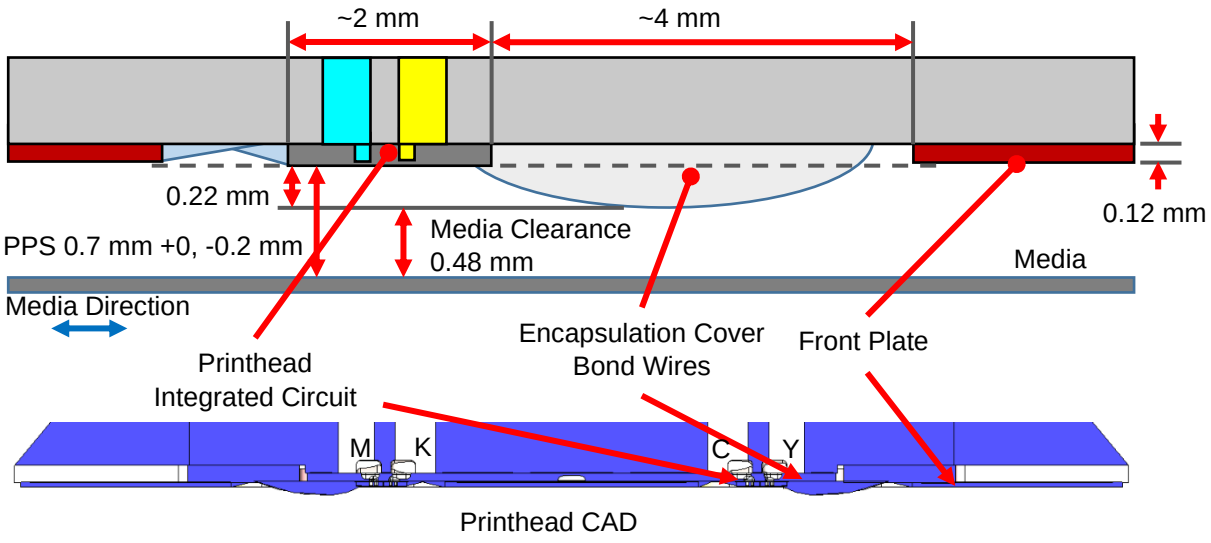
8.3 Media Clearance

The value of PPS equals the height of the encapsulation plus the height of media clearance.

The value of PPS is nominal 0.7 mm, and the height of encapsulation is 0.22 mm.

Therefore, the height of media clearance is 0.48 mm.

Figure 67 – Media Clearance (Y-Axis)



8.4 Keep Out Zones

OEMs are required to accommodate keep out zones around the DuraFlex modules when designing their systems. The following graphics show top and bottom views of the printing system and the dimensions of required keep out zones. The OEM should also plan for cable and tube routing between modules.

Figure 68 – Keep Out Zones (Top View)

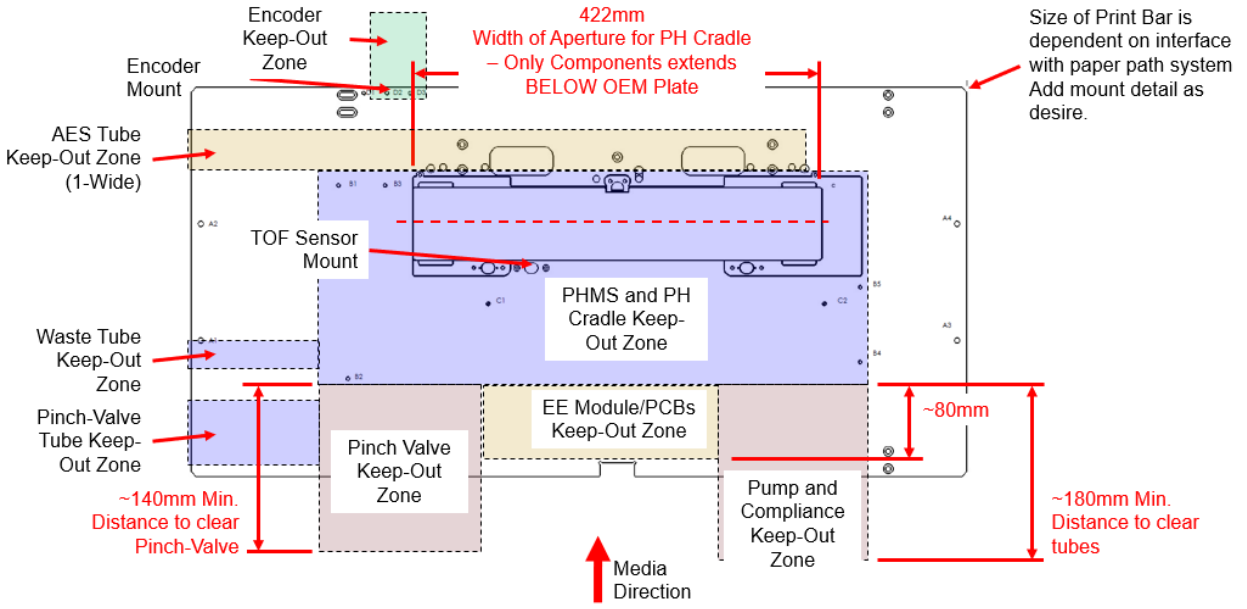
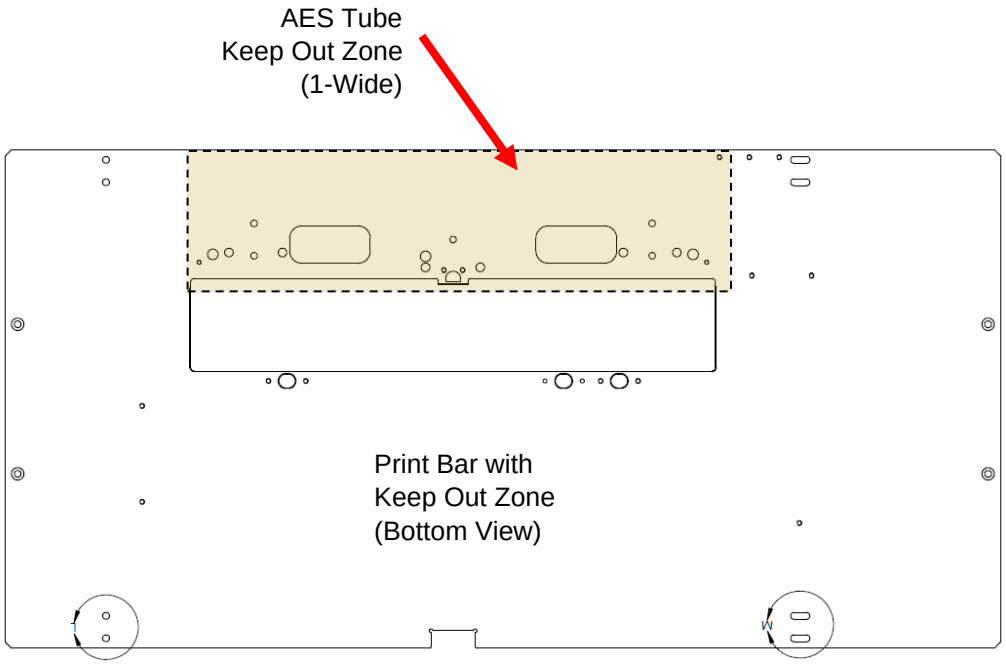


Figure 69 – Keep Out Zone (Bottom View)



9 Media Handling System Alignment

In printing applications where media width or the width of moving media path (e.g. belt conveyor) is more than 350 mm, the OEMs must use Datum Plates, so that the Printhead position is defined relative to Datum X.

To align the Printhead Cradle to Print Bar, there are two options:

- Option A – Align from the center of Printhead to the center of media (the distance is 133.5 mm).
- Option B – Align from the Nozzle 0 on Printhead to the edge of media (the distance is 28.7 mm).

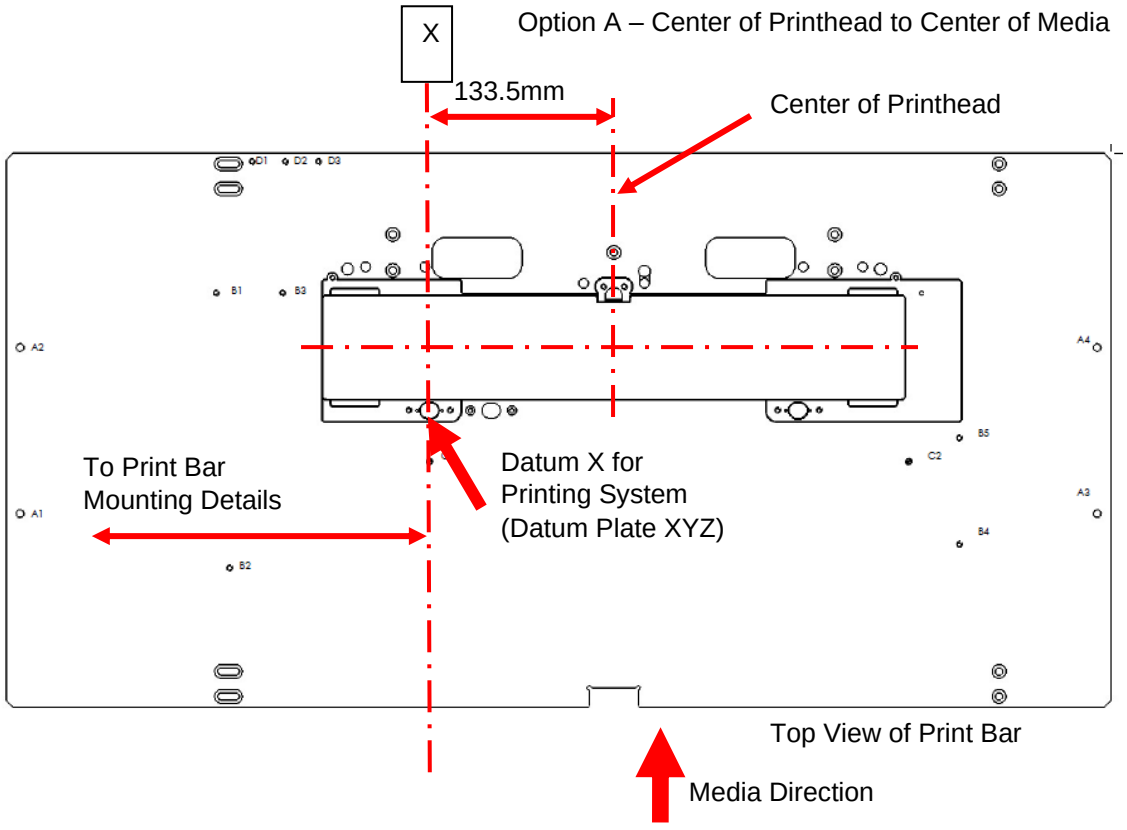
Printhead Cradle lands on the Datum Plates XYZ, YZ, and Z, which are the interfaces between Printhead Cradle and Print Bar. Datum Plate XYZ defines the Printhead positioning in X-axis.

9.1 Align from the Center of Printhead to the Center of Media

The distance from the center of Printhead to Datum X (Datum Plate XYZ) is set to be 133.5 mm. The OEMs need to take this into consideration when they:

- Design how to mount Print Bar to the media handling system, so that Datum X positioning can be defined relative to the center of media.

Figure 70 – Option A

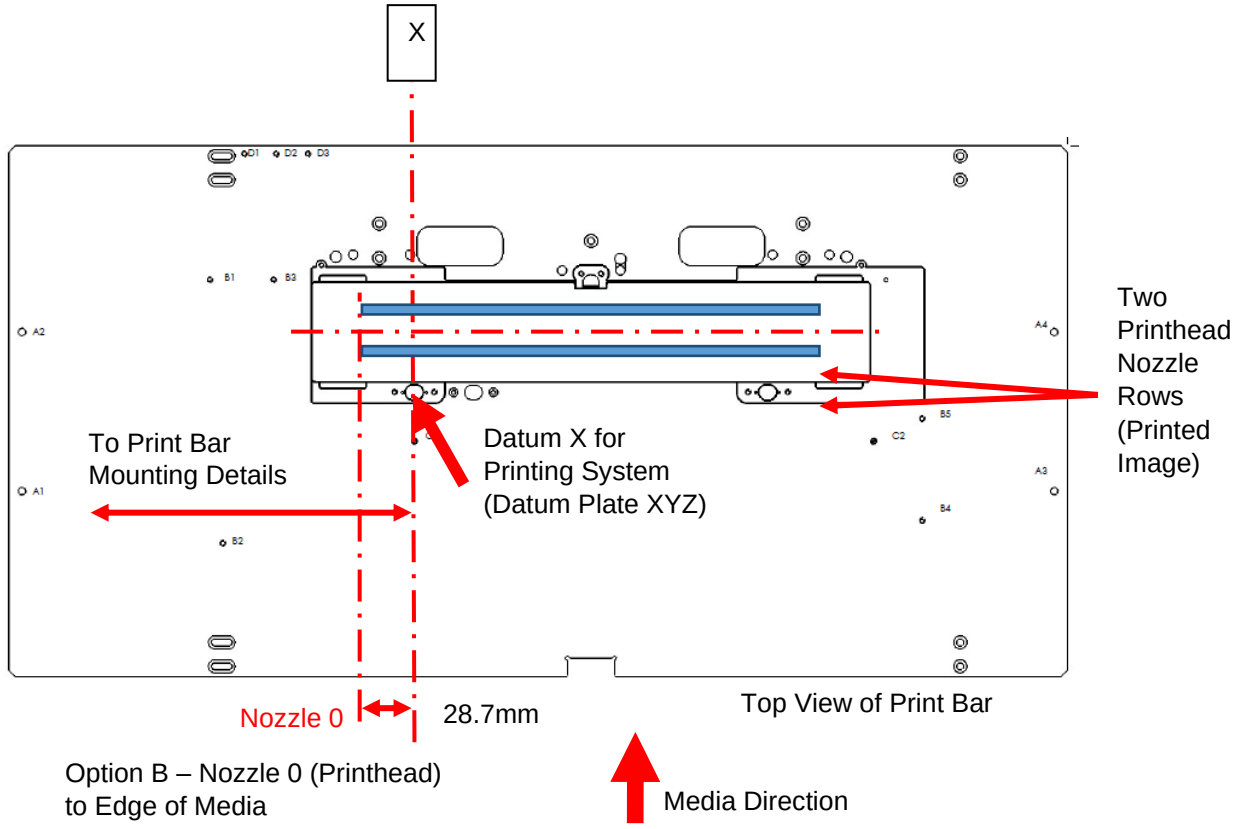


9.2 Align from Nozzle 0 on Printhead to Edge of Media

The distance from Nozzle 0 to Datum X (Datum Plate XYZ) is 28.7 mm. The OEMs need to take this into consideration when they:

- Design how to mount Print Bar to the media handling system, so that Datum X positioning can be defined relative to the edge of media.

Figure 71 – Option B



9.3 Align Printhead Cradle with Datum Pins or Datum Plates

Three datum pins are used to align the Printhead Cradle to the media via Datum Plates on the Print Bar (*Figure 72*).

- Z datum pin: Sits on the flat Datum Plate on the Print Bar (*Figure 73*)
- Y, Z datum pin: Sits on the slotted slope Datum Plate on the Print Bar
- X, Y, Z datum pin: Sits on the conical Datum Plate on the Print Bar

Note:	The location of Datum Plates on the Print Bar is defined in the CAD file provided by Memjet. Contact your Technical Account Manager for CAD file access.

Figure 72 – Locating the Printhead Cradle Datum Pins

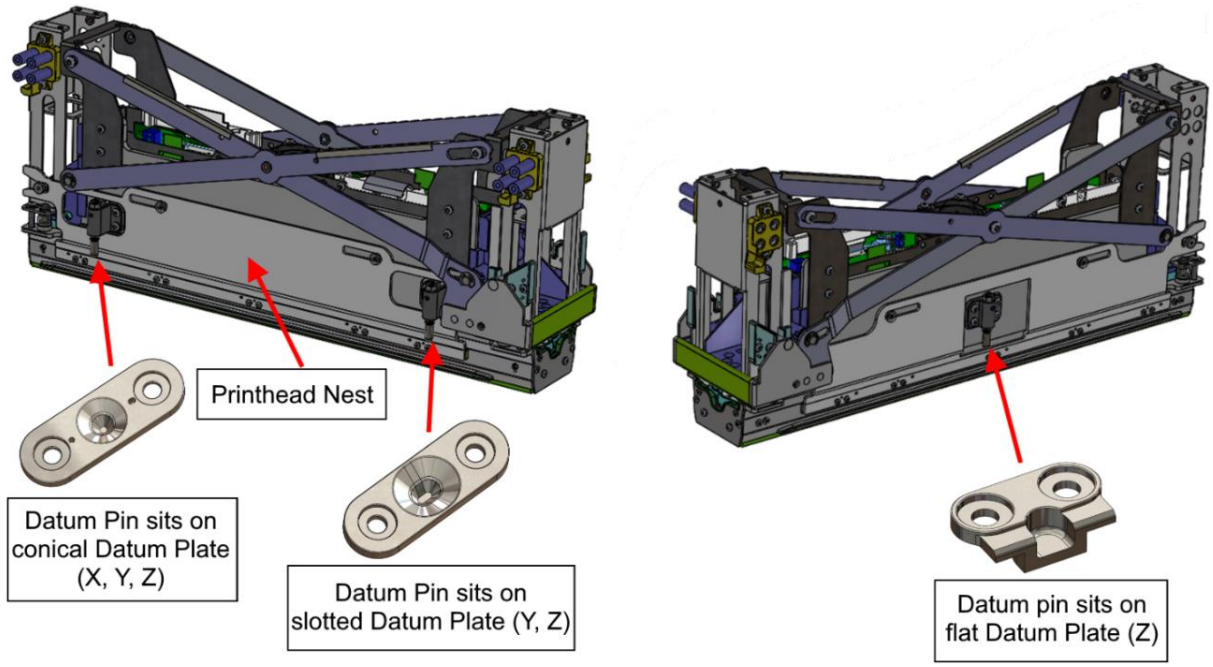


Figure 73 – Datum Plate Types

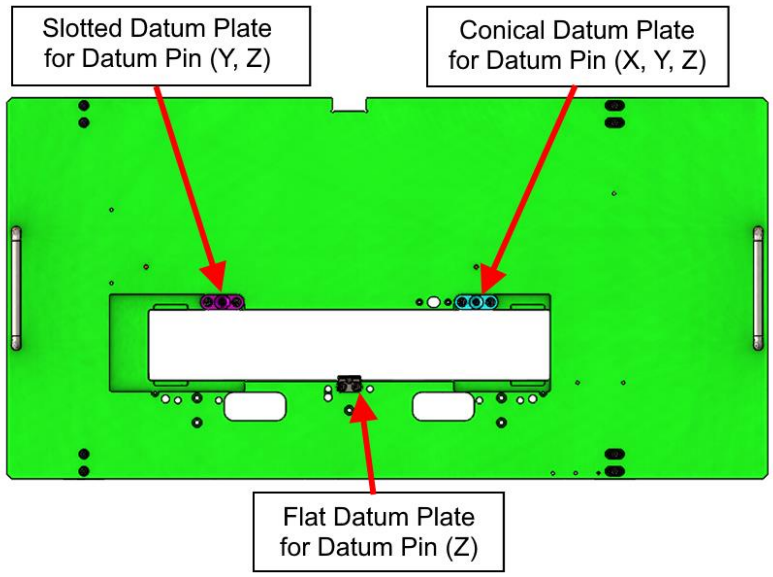


Figure 74 shows a closer view of the slotted, conical, and flat Datum Plates on the Print Bar.

Figure 74 – Datum Plates on Print Bar (CAP Position Shown)

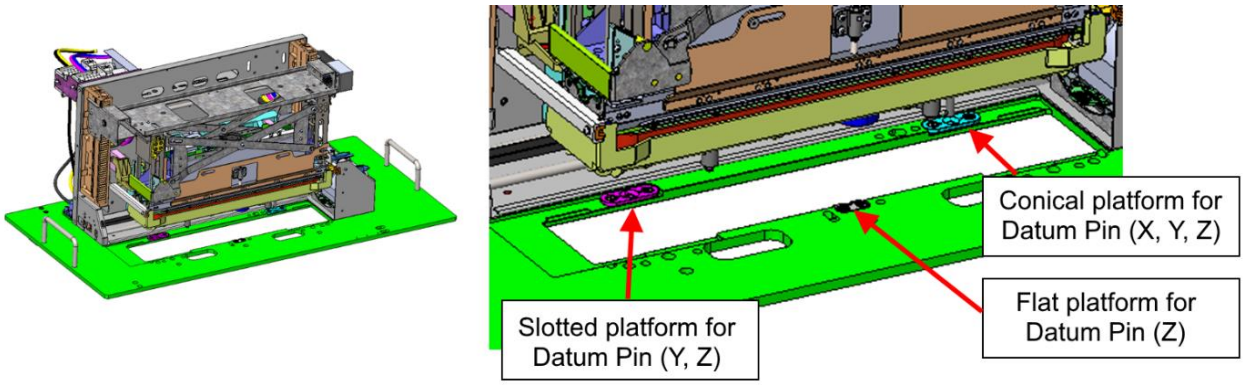
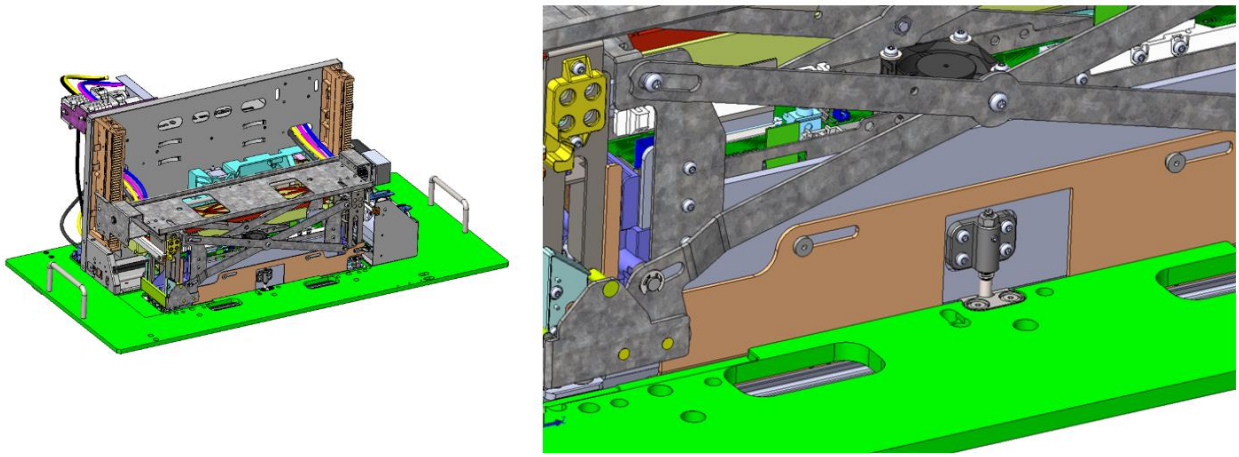


Figure 75 – Datum Pins on Datum Plates (PRINT Position Shown)



9.4 Angular Alignment

To avoid Dot Shift in printed image, the OEM must consider angular alignment of Printhead and media.

If the media travel direction is not perpendicular to the long side of Printhead, and the angle exceeds ±0.4º, Dot Shift may be visible when the system is printing on high-gloss media or printing images that show dot misalignment with 4 colors.

Figure 76 – Upper Limit of Angular Alignment to Avoid Dot Shift

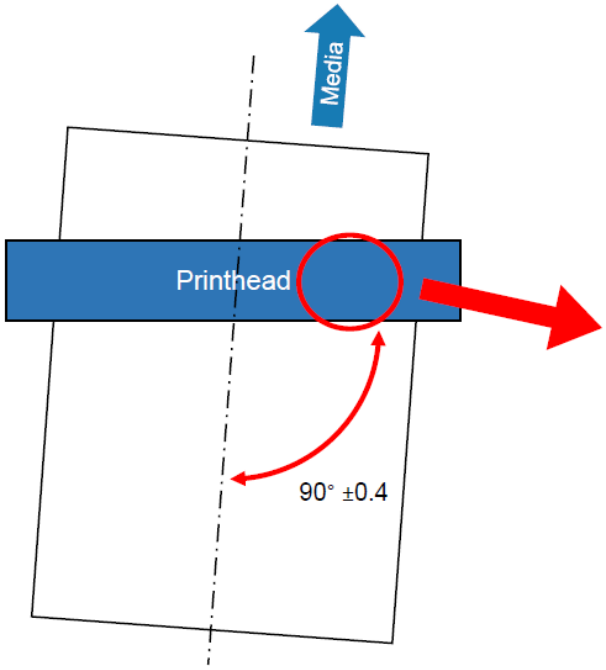
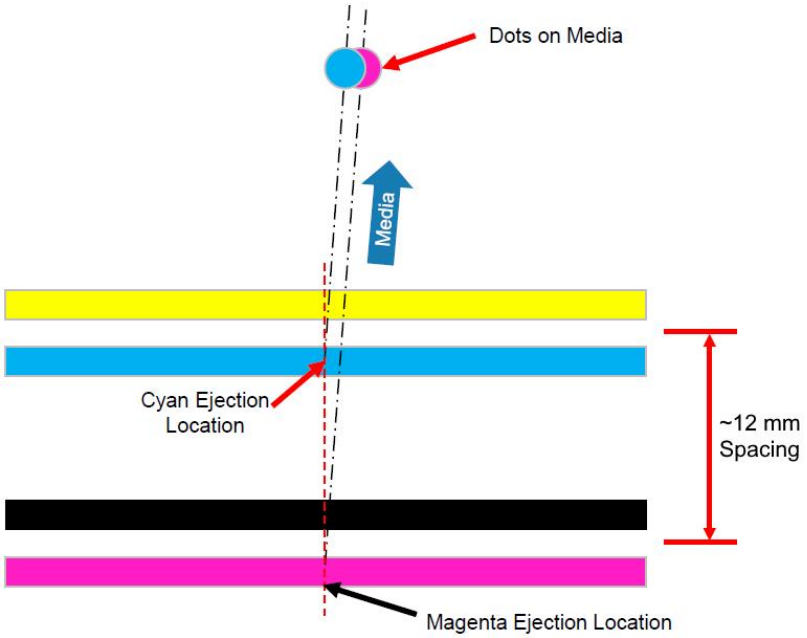
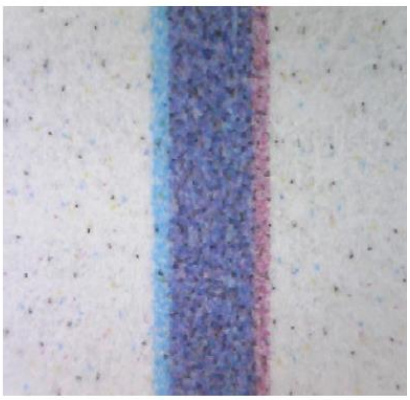


Figure 77 – Example of Dot Shift Due to Angular Misalignment



Dot Shift on Media



10 IDS to Printer Interface

10.1 Mount the IDS Blades

During design, OEMs must account for the vertical datum tab (*Figure 79*) on the IDS blade to ensure mounting at the correct height. The relative height of IDS blades is the most critical aspect of mounting since the ink level in the IR tank generates the negative pressure at the nozzles.

The design specification is 100 ±10 mm and is measured from the nozzle surface (with the Printhead Cradle in the PRINT position) to the nominal ink level sensor in the IR tank. If the specification requirement is not met, the ink refill rate to the nozzle chamber will vary and affect drop size and print quality; in the worst case, it might flood the printhead and cause color mixing.

- Ensure that the distance from the datum tab of each IDS blade is 158 mm (±10 mm) below the top surface of the print bar (bottom surface of Print Module).
- Ensure that the distance from the bottom of IDS blade mounting frame to the top surface of print bar is 343 mm (minimum), which allows adequate bend radius on the filter tubing.
- Each IDS blade can be mounted in the available space in any layout in the printing system (in X and Y), though length, routing, and the accessibility of cables and tubes will be the limiting factors (see Section *2.4 Mechanical Limitations in Defining Mounting Position*).

Refer to the next two figures for references to mount IDS blades with non-integrated filter.

Figure 78 – IDS Relative Height

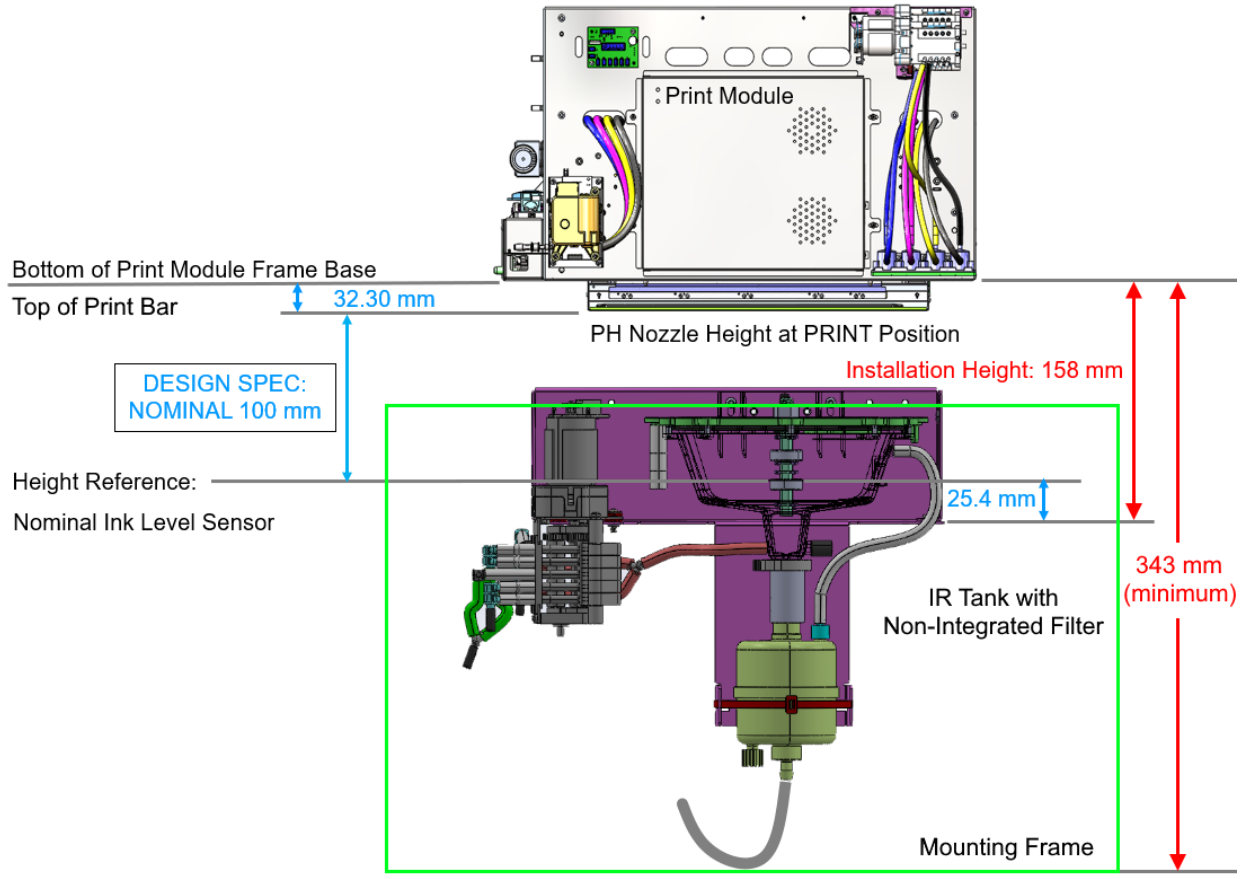
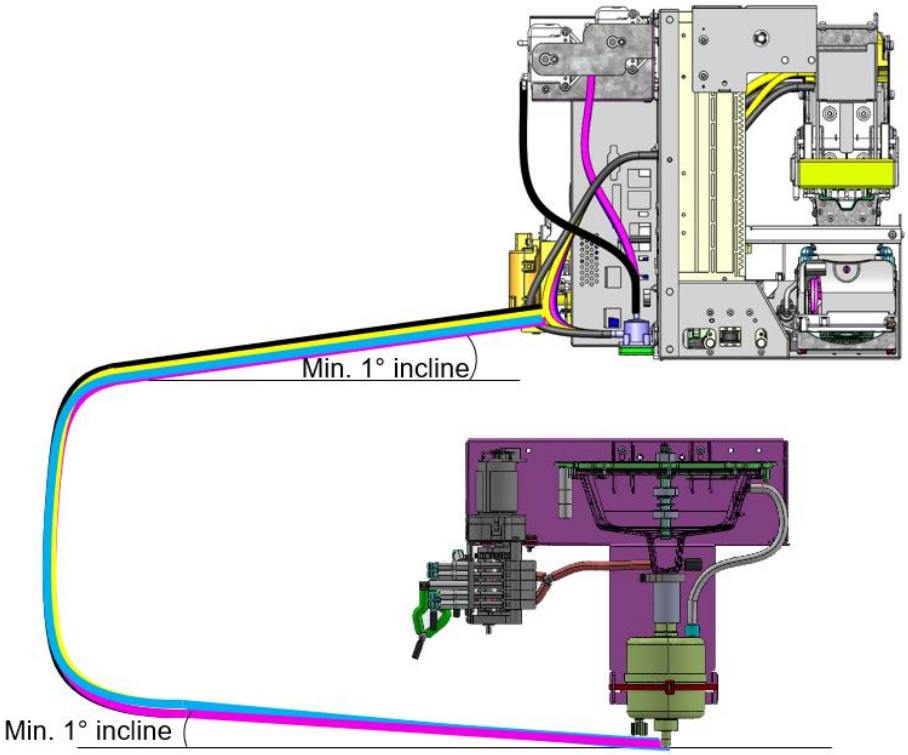


Figure 79 – Datum Tab

Feed Line tubes (from IDS blade to Pinch Valve in Print Module) need to be constantly inclined as shown below. The OEM can mount each IDS blade by inserting 2 screws in the mounting bracket. The OEM needs to consider the access to these screws for servicing and replacement.

Figure 80 – Feed Line Tubes Inclined



10.2 Mount the BIDS PassThrough PCA

To decide mounting location for the BIDS PassThrough PCA, consider the length, routing, and accessibility of cables.

Figure 81 – BIDS PassThrough PCA

The following cables connect to the BIDS PassThrough PCA:

- Refill Pump (×4)
- Ink Level Sensor (×4)
- Cable to the Print Module (×1)
- Bulk Ink Supply (×4)

10.3 Use Absorbent Pads or Vent Reservoir

To minimize the chances of ink foaming, use one of the following methods:

- Method 1 – Absorbent Pad Under Tubes (*Figure 82*)
- Method 2 – Separate IDS Vent Reservoirs (*Figure 83* and *Figure 84*)

See the *DuraFlex Installation and Commissioning Guide* for more details.

Note:	The OEM is responsible to source for tubing, absorbent pad material, and separate IDS vent reservoirs (if used).

Figure 82 – Absorbent Pads

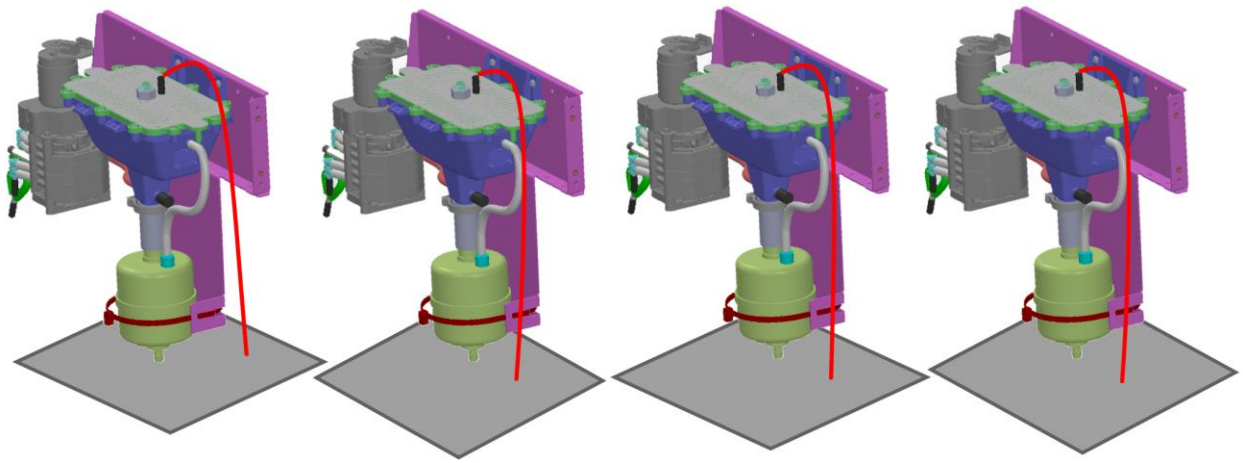


Figure 83 – Vent Reservoirs Connected to Each Tube

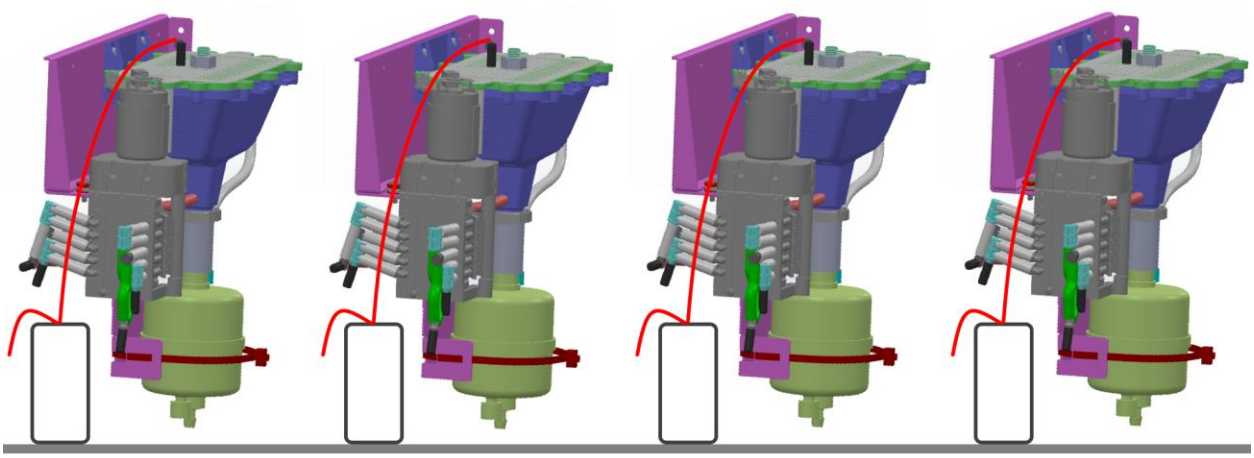
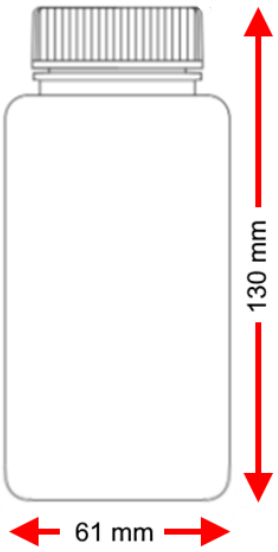


Figure 84 – Example Vent Reservoir



11 WIMM to Printer Interface

Each Print Module is connected to a single WIMM which also connects to a set of four IDS blades (CMYK). An N-wide system therefore has N number of WIMM.

11.1 Mount the WIMM

Mounting location is limited by tubing and cable length, routing, and accessibility.

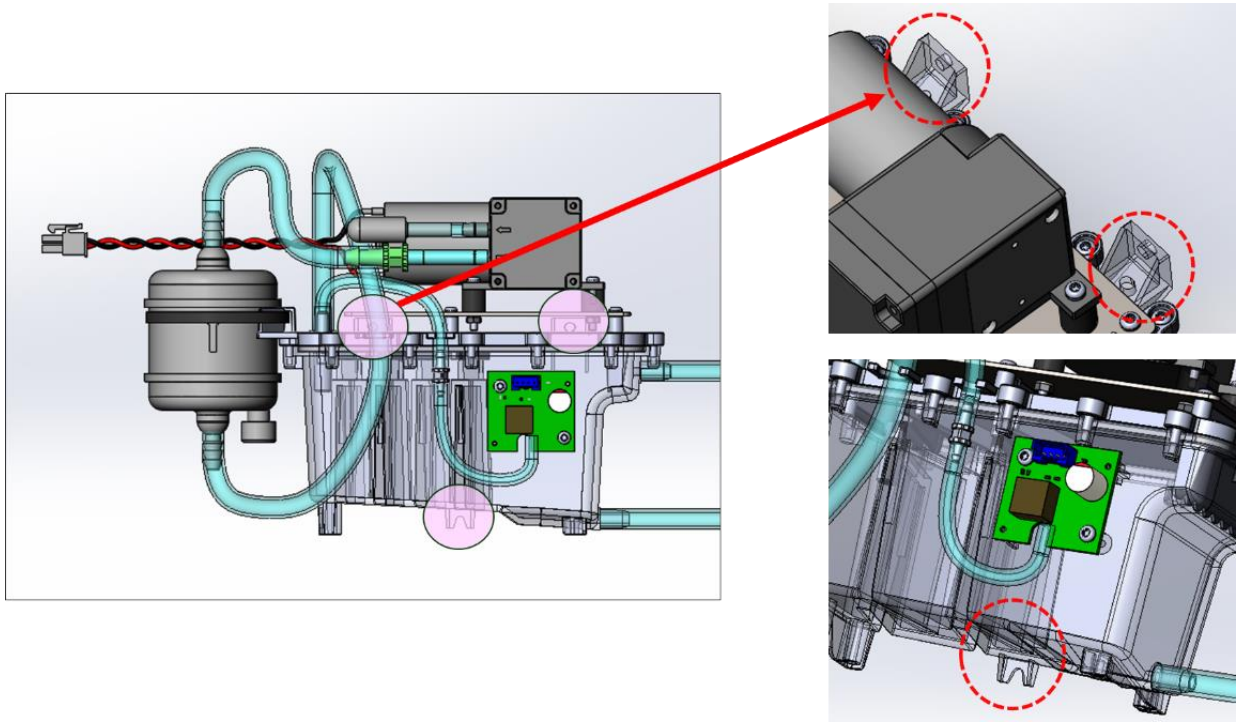
11.1.1 WIMM Mounting Features

The WIMM has side and bottom mounting features:

- Use the side mounting features (two on the top and one on the bottom) to mount the WIMM on a vertical surface (*Figure 85*).

  Access to the mounting screw may be very limited and require a screwdriver with a long extension.

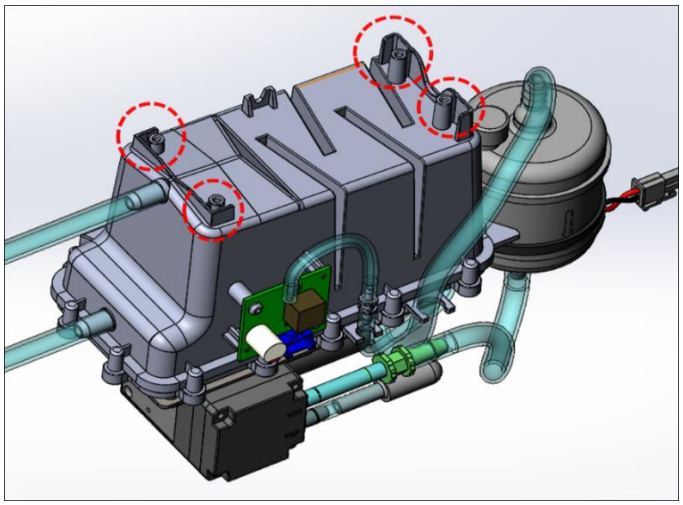
Figure 85 – WIMM Side Mounting Features



- Secure the WIMM to a horizontal surface with the four bottom mounting features (*Figure 86*).

  The WIMM Vacuum Pump vibrates. During design, consider isolating the WIMM from the printer chassis to reduce or eliminate the resonating noise.

Figure 86 – WIMM Bottom Mounting Features



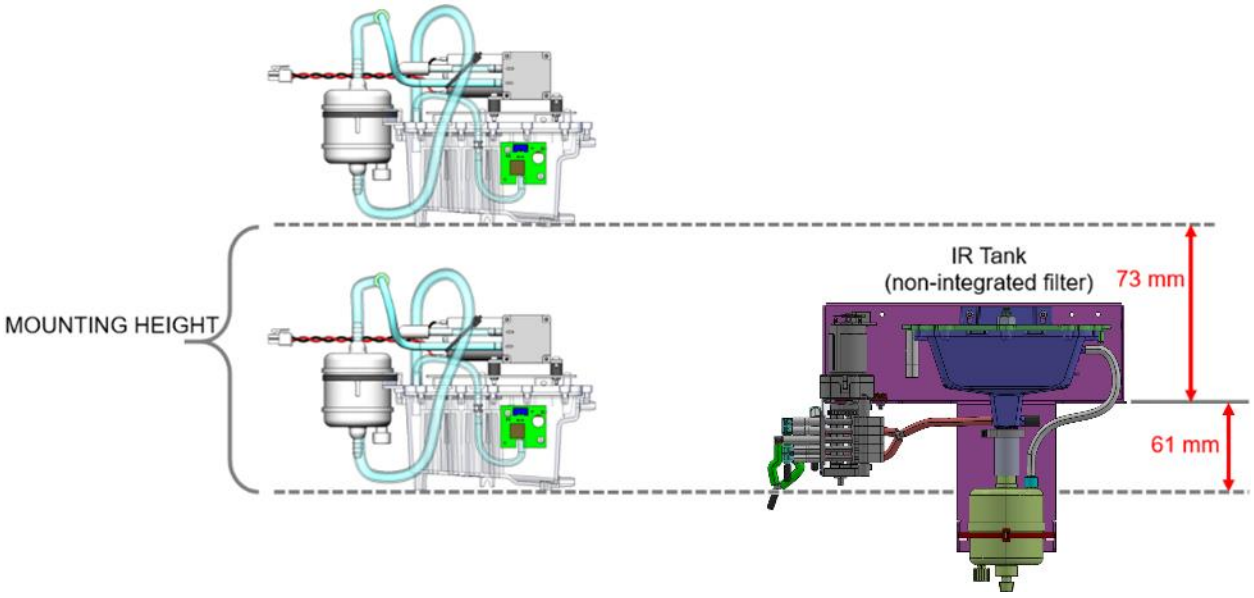
For additional details and specifications, refer to the Memjet-provided CAD files.

11.1.2 WIMM Mount Relative Height

Memjet recommends mounting the WIMM as shown in the diagram below for best results.

For an IDS blade with a non-integrated filter, when mounted, the bottom of the WIMM should be between ~73 mm above and ~61 mm below the IDS blade Z datum tab.

Figure 87 – WIMM Mounting Height (for IDS Blade with Non-Integrated Filter)



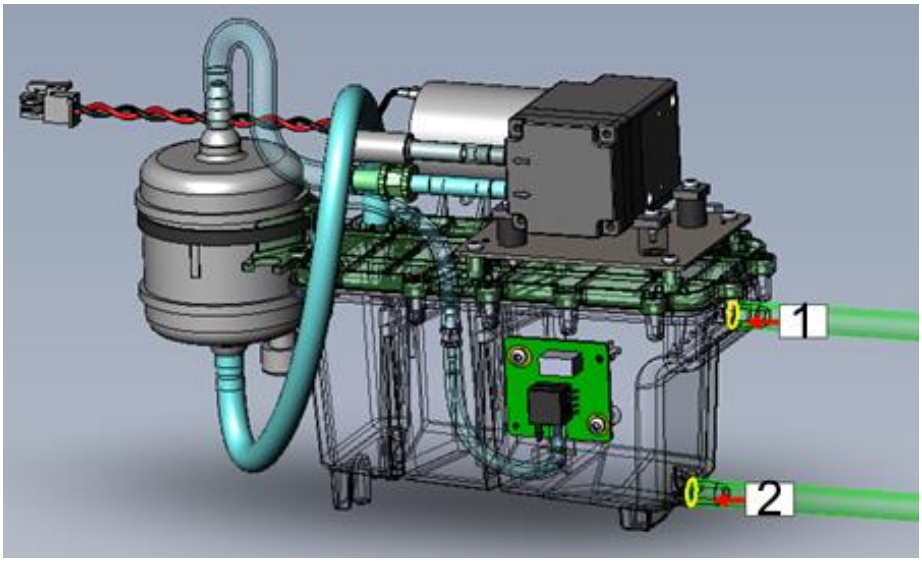
11.2 Connect WIMM Tubing

There are multiple ports on the WIMM. Most tubing is provided pre-installed with the module. OEMs need to make only two tubing connections; one to the inlet port and one to the waste ink drain port (*Figure 88*). Both tubes must follow the tube length specifications in *Table 3*. See *Figure 25* for illustration.

Table 17 – WIMM Tubing

Number	Port	Description
1	Inlet Port	WIMM vacuum pump pulls waste ink from the wiper and cap in the Print Module.
2	Waste Ink Drain Port	Refill pumps in the IDS blade pull waste ink out of the WIMM tank and drains to the OEM waste ink container. This must be the lowest point of the WIMM for the drainage efficiency.

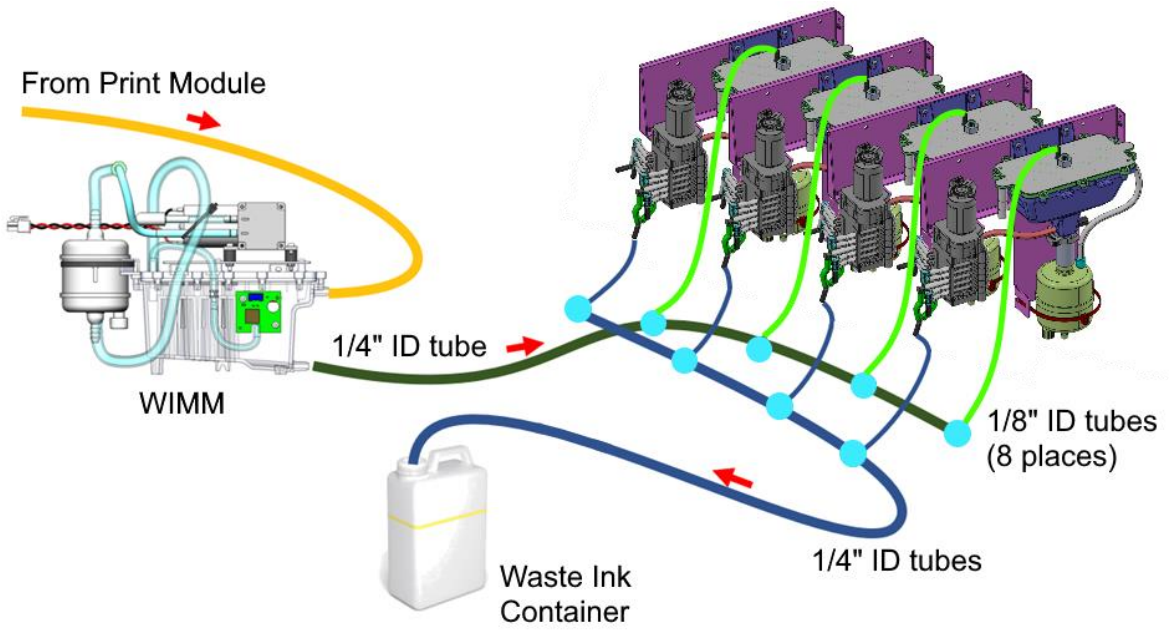
Figure 88 – WIMM Tubing



11.3 Connect Waste Tubing to IDS Blades

The refill pump in each IDS blade pulls waste ink out of the WIMM tank. OEMs must connect tubing and fittings so that one main tube splits into 4 narrower tubes before connecting to the refill pump, and then the 4 tubes from the refill pump join into one main tube, an example is shown below.

Figure 89 – Waste Tubing



11.3.1 Waste Tubing Guidelines

- Tubing connecting WIMM to each IDS blade should be as short as practical
- Different fitting sizes at WIMM (1/4” ID) and IDS blade (1/8” ID)
  - Reducers are required (marked with light blue dot in the *Figure 89*)
- Location of reducer to be defined by OEM
- Reducer format varies: “T”, “L”, “Y”, multi-port (1-in, 4-out), straight, etc.
- Use nylon fittings (other material can be used, check material compatibility)
- Sample waste line assemblies shown in *Figure 90* and *Figure 91*. The color of the dot marked above the reducers must match the color of the connection endpoint marked on the tubing.

Figure 90 – Sample Assemblies with “T” and Other Reducers

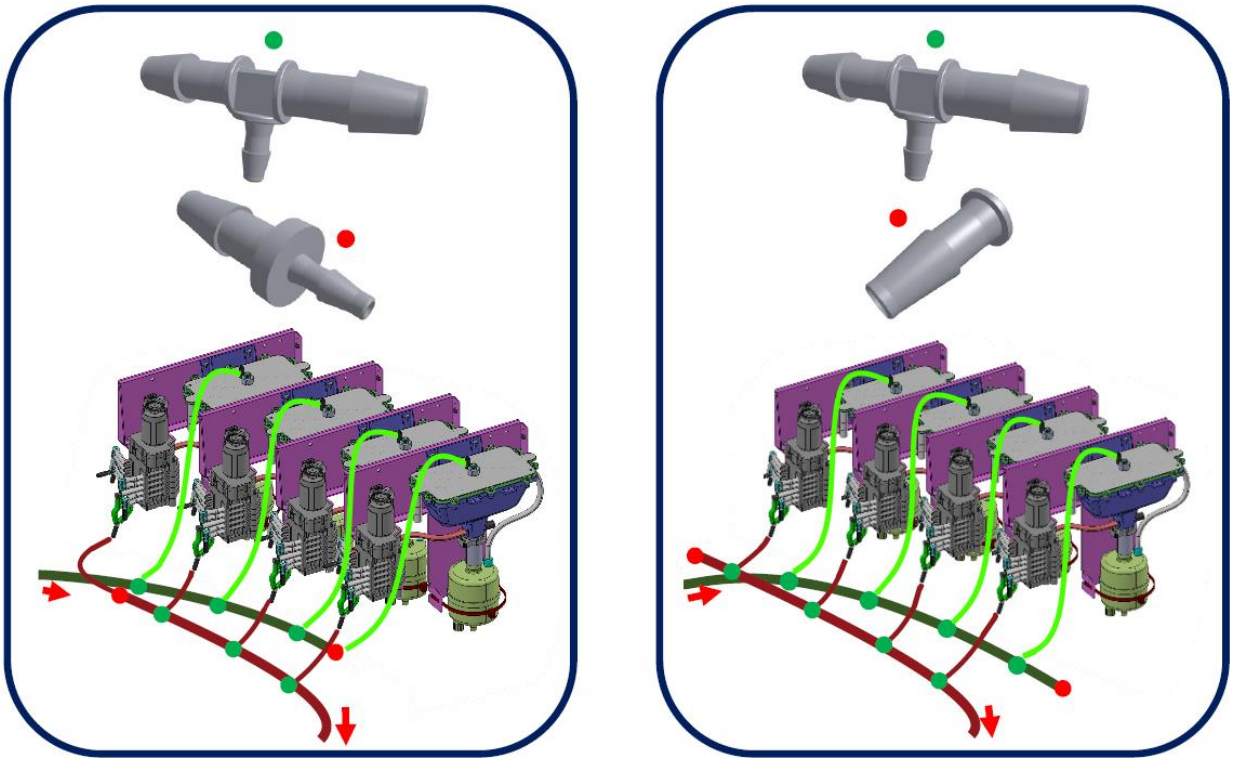
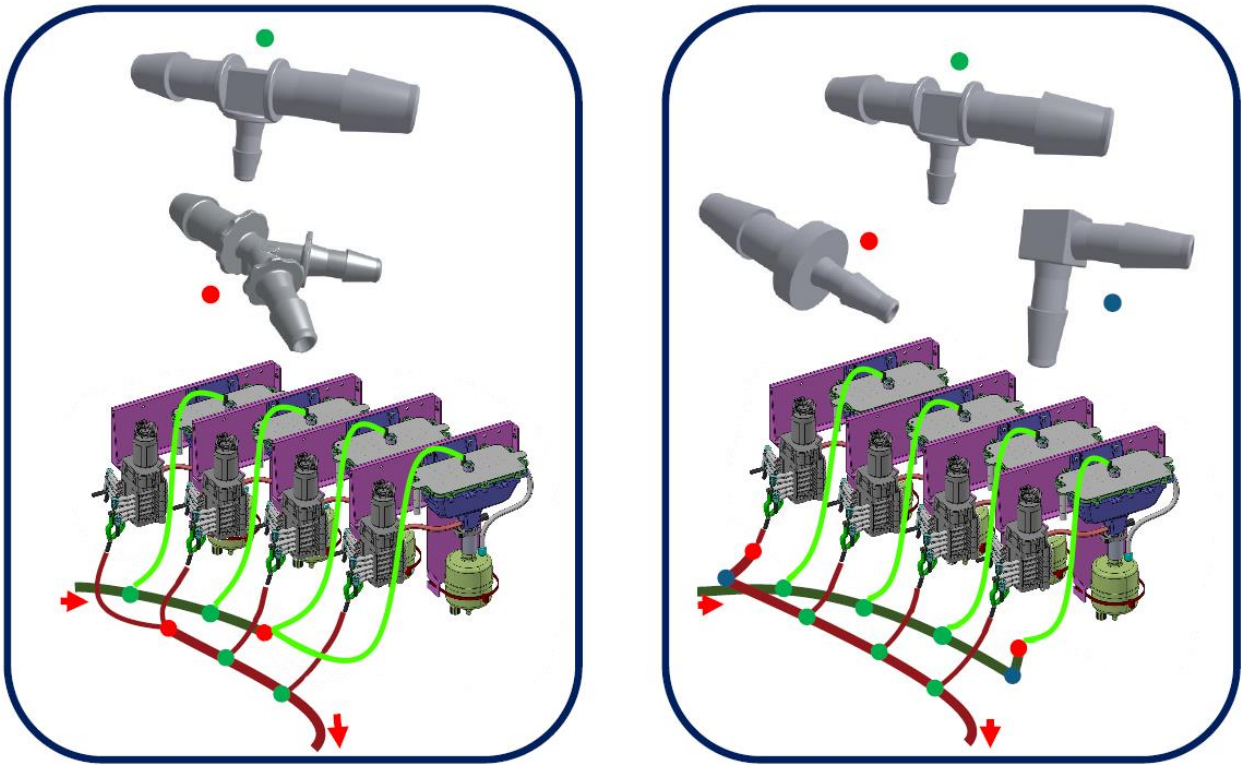


Figure 91 – Sample Assemblies with “Y” and Other Reducers



11.4 Waste Ink Container

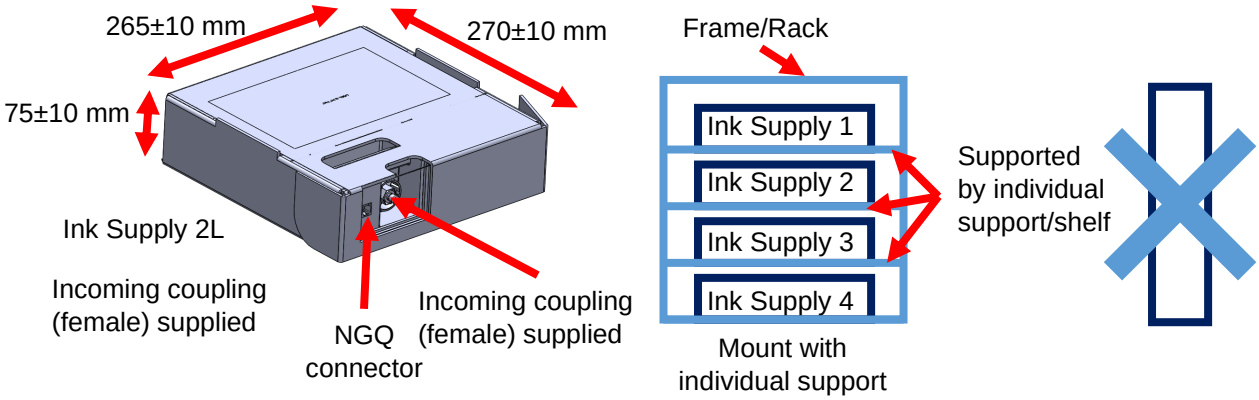
OEMs need to prepare and install the Waste Ink Container. It should be of a sufficient volume and must be vented to prevent pressure buildup. A level sensor may be desired to warn users of an overfill condition before spilling occurs.

12 Bulk Ink Supply Mounting

OEMs are required to mount the bulk ink supplies and should consider the following:

- Due to its weight, mount each bulk ink supply on an individual shelf or rack
- For draining efficiency, keep the bulk ink supplies in a vertical position and avoid vertical installation.
- Mounting location is constrained by length, routing, and accessibility of tubing and cables.

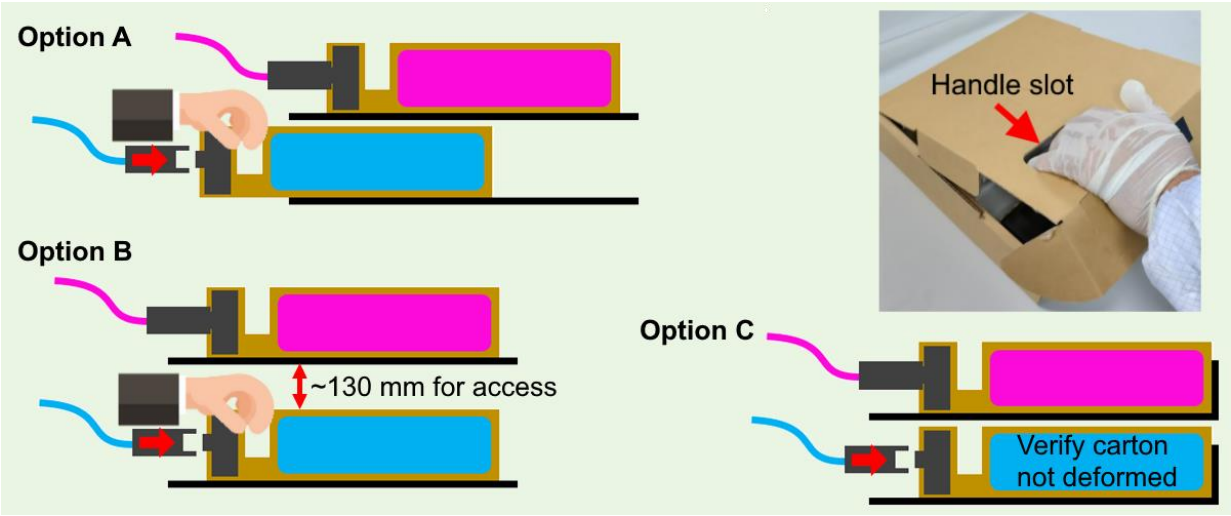
Figure 92 – Bulk Ink Supply Mounting



Refer to the diagram below for bulk ink supply mounting options:

- **Option A:** Minimum height between mounted bulk ink supplies.
- **Option B:** Allows space for access between mounted bulk ink supplies. The distance should be approximately 130 mm.
- **Option C:** A physical stop at the rear of the rack or shelf. Check that the carton is not deformed when contacting the stop.

Figure 93 – Bulk Ink Supply Mounting Options



Each bulk ink supply includes a built-in handle. OEM can hold it when connecting to an incoming coupling.

13 Design Considerations

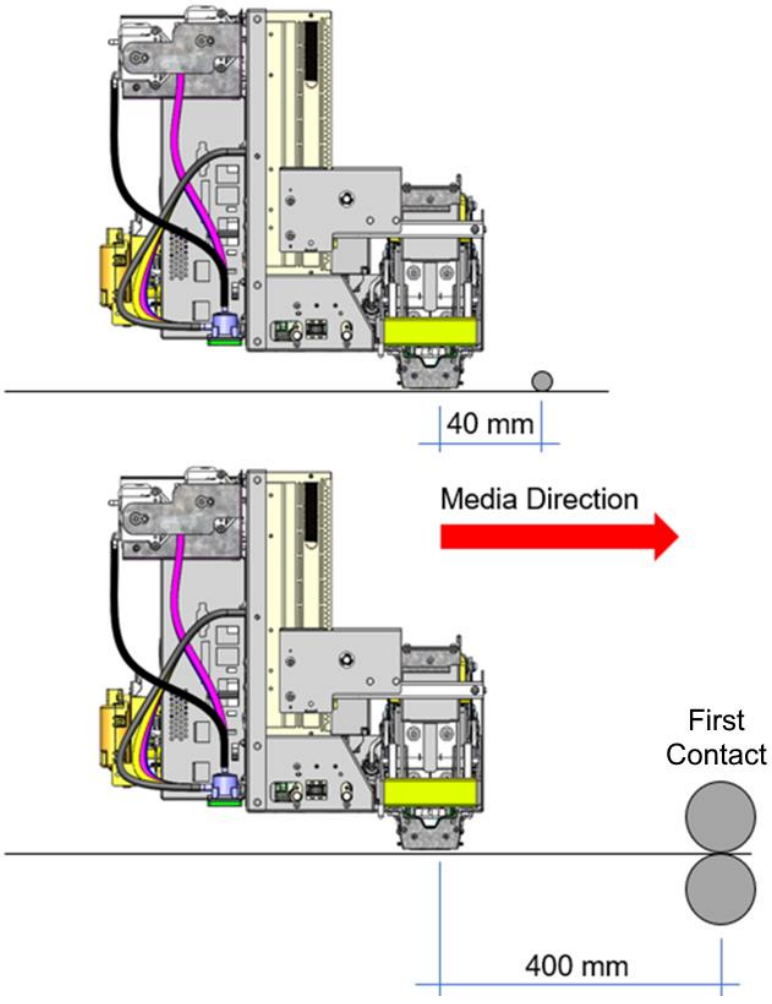
13.1 Excess Ink Management

Ink overspray may occur depending on system setup and printing application. For example, when using media that is not as wide as the printable width of the printhead, a spittoon or an equivalent device may be considered for capturing the excessive ink to minimize the spread of ink. This helps to prevent issues such as ink markings on the back of media.

13.1.1 Dry Time Distance

Dry Time Distance is the distance between printing and the point where the freshly-printed media first comes into contact with a surface (roller, etc.). To allow for some ink drying on the media, the OEM should allow a dry time distance of 40 mm for light load (star wheels, etc.) and 400 mm for heavier load (rollers, pinch rollers, etc.) before the first contact after printing.

Figure 94 – Distance to First Contact after Printing



Drying time may vary based on the following conditions:

- Media type and weight
- Print density (coverage)
- Print resolution
- Media speed
- Distance to first contact/wet wrap
- Print width
- Room temperature
- Room humidity

Memjet can provide print samples for OEMs who are evaluating the technology and do not have their own systems.

13.1.2 Media

DuraFlex-based printing systems are designed for use with fast-drying, aqueous, inkjet-receptive media. Memjet has tested a range of media that is compatible with DuraFlex-based printing systems.

OEMs must test and assess media performance (including gamut, optical density, bleed, curl, drying time, etc.) to evaluate their specific media selections based on their application(s) and system configuration. Contact your Memjet Technical Account Manager for guidelines and print samples for evaluation purpose.

OEMs may choose to incorporate a heater within the printing system to accelerate drying. Heater testing is the OEM's responsibility. Once system design is finalized, OEMs are also responsible for final system testing and media selection based on end user application(s).

13.2 Media Transport

13.2.1 Fluctuation of Media Speed

A DuraFlex-based printing system prints based on the encoder signal and fluctuation in media speed should not affect printing. However, a sharp increase or decrease in media speed will affect the print size, accuracy, color alignment, and possibly other print artifacts. Therefore, media speed should be constant while printing. The loss of encoder traction can affect print quality, and OEMs need to ensure that the encoder wheel/shaft to media traction is always present, especially during printing.

13.2.2 Transitional Error

OEMs who divide the media path into two parts (before and after the print zone) need to keep a minimum relative media speed to minimize transitional print artifacts.

13.2.3 Introduced Airflow

Vacuum suction may be used in belt-driven system to transport media. As a result, the introduced airflow may have a negative impact on nozzle dehydration rates, which can cause print quality defects. OEMs need to consider minimizing the airflow within the print zone, which is immediately underneath the nozzle rows.

13.3 Environmental Condition Control

The OEM is responsible to control against environmental conditions, such as temperature, humidity, and external contamination. Encasing the Print Module in a box or housing can be helpful.

13.4 Contaminant Control

All types of media can create dust. A device such as an air blade or a brush, used before the media enters the print zone, may extend maintenance intervals and the life of the printhead.

13.5 Accessibility

OEMs need to design their printing systems with accessibility in mind to allow ease of consumable replacement. Standard consumables, including the printhead and wiper cartridge, should be easy to reach for end users. Other components, such as cables, tubing, and pumps should also be accessible for periodic inspection and maintenance.