

INDUSTRIAL INKJET / PRODUCT GUIDE

S SERIES

High-Resolution Inkjet System with Full-Loop Ink Circulation

FCS • Full-loop Circulation System

Supply and return pressure feedback / Dual-pump PID coordination / Multi-orientation printing

**360°**

Multi-orientation printing solution

Dual-pump PID

Closed-loop supply and return pressure control

4 models

Printhead-module selection

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Full-loop circulation controls the entire ink path

FCS combines pressure feedback at both printhead ends, coordinated pumps and management of the full supply/return path.

FULL-LOOP

FCS — Full-Loop Ink Circulation System

Ink travels from tank through supply pump, head inlet and outlet, and return pump back to tank. Pressure is measured near the head to control target pressures and the supply/return differential.

Application focus compared with CCS

Control scope

CCS: circulation near the head and nozzle condition

FCS: full supply/return loop from tank to head

Key variables

CCS: ink renewal and circulation inside the head

FCS: inlet and return pressures, target differential and orientation-related pressure changes

Typical applications

CCS: white-ink restarts, continuous lines and reduced nozzle intervention

FCS: confined spaces, varied orientations and robot-motion printing

System relationship

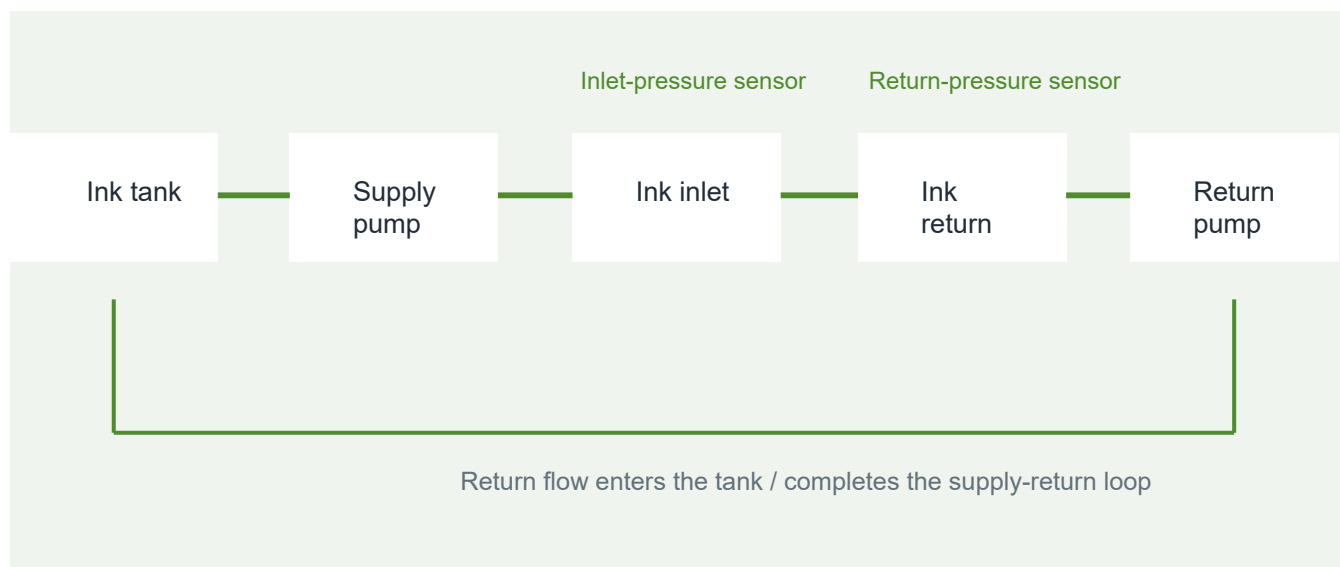
The jet's local cycle and the whole ink cycle can be designed in tandem

Whether or not the printhead is recirculated depends on the specific printhead structure

“Full-loop” describes a system-level path; it does not mean every nozzle has a recirculation channel behind it.

Two pressure measurements, two closed-loop pump controls

Measure and respond to pressure changes at the printhead inlet and return.



01 / INLET

Supply-side PID

Adjust the supply pump using inlet pressure near the head to maintain the set supply-pressure range.

02 / RETURN

Return-side PID

Follow the ink pressure, adjust the ink pump and manage the cycle drive with the P-in-P back as the control target.

Why measure pressure at both ends of the head?

■ Measure closer to the head

Reduce errors from long-hose pressure loss, temperature and pump fluctuations.

■ Feedback when orientation changes

Pressure changes can be sampled. Response still depends on sensors, pumps, hoses and control settings.

More freedom for 360° mounting orientations

Head orientation changes static pressure and dynamic load. Pressure feedback near the head provides a control basis for multiple orientations.

01 / SIDE

Side / angled printing

For bottles, side walls and curved surfaces; calibrate for part location and print distance.

02 / OVERHEAD

Overhead / upward printing

Expands layout options; validate nozzle negative-pressure range and air-ingress risk.

03 / MOTION

Robot-arm paths

Print in different orientations along six-axis paths; assess acceleration, deceleration and hose drag.

04 / SHAPE

Multiple faces of irregular parts

Reduce part flips using vision positioning, encoder or robot-path triggering.

The real limit of 360° operation is dynamic pressure

Static rotation changes the height difference between supply and return. Robot acceleration adds transient pressure differences. Validate nozzle meniscus pressure, fluid response, allowed head orientation, motion acceleration and curing position together.

FCS is a platform capability for multi-orientation applications. Confirm every ink/head combination under measured operating conditions.

Continuous circulation for demanding inks and long operation

System-level circulation renews ink in the path; improvement near nozzles depends on internal head channels.

01 / FCS

Reduce local settling

Pigment-rich ink flows through the supply/return path, reducing stagnant zones and local concentration differences.

02 / FCS

Remove bubbles from tubing

A properly designed loop carries entrained air away from the head for venting and filtration at the tank.

03 / FCS

Stabilize ink-supply conditions

Feedback from inlet and return pressures reduces the effect of hose pressure loss and ink-consumption changes on the operating point.

04 / FCS

Manage temperature changes

Circulation with temperature monitoring and heating helps reduce viscosity changes; circulation alone does not maintain constant temperature.

05 / FCS

Support restart maintenance

Record pressure, liquid level, temperature and alarms to support startup checks and fault recovery.

06 / FCS

Support multiple heads

For stitched or stacked heads, configure and calibrate zones by flow, pressure difference and return capacity.

Dual-end pressure feedback and supply/return circulation provide more stable ink-path conditions for demanding inks and continuous printing. Validate results for the head, ink and site.

Keep printing synchronized with products and line motion

Turn ink-path stability into a workable station by selecting orientation, confirming the workpiece and validating output.

Task	Application benefit	On-site verification
Packaging sides and angled faces	Less line remodeling; vision or photoelectric triggering for positioning	Negative pressure and print distance for side and angled orientations
Robot-arm multi-face printing	Print multiple faces by robot path without flipping the part	Acceleration, hose orientation and trigger timing
High-pigment white ink	Continuous renewal helps reduce settling in tubing	Tank agitation, filtration and ink stability
Wide or high-speed lines	Stitch modules for width; stack heads for capacity	Supply/return differential and flow margin per head
Intermittent / reciprocating printing	Controlled circulation can keep the ink path ready	Shutdown duration, moisture retention and first-print check
Complex content: text, images, QR codes, database fields, variable codes, UDI and scan association.		

Four models selected by width and speed

Choose a head module using print width, native resolution, speed and print distance.

Parameter	S1	S2	S3	S4
Printhead model	CF6R	RC1536	Xaar 2002	G5F
Print width / mm	53.95	108.3	70.5	54.1
Native resolution / npi	600	360	720	600
Print speed / m/min	30	157	75	76
Speed condition / dpi	600 × 600	360 × 360	720 × 720	600 × 600
Reference long-throw distance / mm	25	50	15	8

All stated speeds correspond to printing at native horizontal and vertical resolution.

Actual output depends on ink laydown, waveform, ink, content and site conditions. Verify long-throw distance with samples.

Coordinate machine, software and ink-path design

Combine capabilities for the production line. Follow the delivered list for options and applicable models.

Control platform	13.3-inch industrial capacitive touchscreen; expandable printing software
Enclosure and printing	304 stainless-steel enclosure; up to 6 nozzles per module
Connectivity and data	Gigabit Ethernet, USB, RS232; TCP/IP and I/O integration
Print content	Text, images, PDF, barcodes, database and variable data
Ink path and maintenance	FCS full-loop ink supply; one-touch automatic cleaning; secondary level detection
Ink and curing	Oil-based and UV-curable inks; colors and curing configured for the application
Expansion capability	Cascaded control units, template switching, remote status and scan-to-print
Power specifications	AC 220 V; machine power 500 W; rated current 5 A

Synchronized check on selection: for total ink flow, circulation channel, pipe length, wire beam, robotic motion envelope and security interlock.

Validate the full motion path, not only one orientation

Multi-orientation printing is a system-level capability. Use representative sample prints to confirm stability through the full travel range.

01

Static orientations

Record inlet/return pressure and nozzle status for horizontal, side and upward orientations.

02

Motion path

Monitor pressure peaks, hose bending and print position at maximum speed and during acceleration and deceleration.

03

Long-duration printing

Test missing lines and density variation with target ink, temperature and actual print coverage.

04

Recovery and maintenance

Check first-print quality after brief stops, shift changes and abnormal shutdowns.



Validate from printhead to entire line under actual conditions

Configure FCS full-loop circulation for the ink, head, motion path and production pace.