NEBKATUM

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NK-RD Series

XYZ Precision Reagent Dispensing Platform

Catalog specification ranges for lateral flow rapid test kit manufacturing and other diagnostic dispensing applications

Document	Value
Document number	NBK-RD-CAT-001
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Intended reader	The AI / web developer building the Nebkatum website product page, and Nebkatum sales

Revision	Date	Description
REV0.00	2026-11-08	First issue

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1. Instructions for the website builder

This document holds the content for the NK-RD Series product page. Everything in sections 2 to 13 is meant for publication. Follow these rules when building the page:

- **Ranges only.** All values are ranges or "up to" figures across the whole series. Publish them as written. Do not narrow them, do not invent a single "exact" value, and do not add specifications that are not in this document.
- **Configured to order.** The series is configured to order. Each machine is built from the options in section 11. Present the page as a configurable product, not as one fixed machine.
- **No third-party names.** Do not name other manufacturers, competitor products or any customer anywhere on the site.
- **Disclaimer.** Every specification table on the site must carry the disclaimer text from section 13.
- **Compliance claims.** Do not claim certifications, approvals or test results beyond what section 10 states, and keep the "to be confirmed" notes off the public page until Nebkatum confirms them.
- **Revision tracking.** Show the document number and revision of this source in the page metadata or a downloadable datasheet footer, so later updates can be tracked.

1.1 Suggested page structure

Page block	Content source
Hero	Product name, one-line tagline and 4 to 6 key figures (section 2.3)
Overview	Product description (section 2.1) and key features (section 2.2)
Applications	Section 3, with rapid test kits as the lead application
Model range	Section 4 table
Technical specifications	Sections 5 to 9 as collapsible tables or tabs
Dispensing modules	Section 6 as cards, one card per module
Configure / order	Ordering code builder from section 11, plus the quote request form (section 12)
Downloads	Datasheet PDF generated from this content
Footer of spec area	Disclaimer text (section 13)

2. Product overview

2.1 Description

The Nebkatum NK-RD Series is a benchtop XYZ dispensing platform for placing exact volumes of reagent at exact positions on membranes, pads, cards, slides, chips and plates. A rigid Cartesian gantry moves up to eight dispensing channels over a vacuum hold-down work table, while precision syringe pumps meter each reagent independently.

The platform is built for lateral flow rapid test production: striping test and control lines on nitrocellulose, spraying conjugate and sample pads, and spotting dots or arrays. The same machine handles biosensor spotting, biochip printing and microplate filling by changing the dispensing module.

Every NK-RD machine is configured to order from a standard set of frame sizes, drive classes, dispensing modules and options, and is designed, built and supported by the Nebkatum engineering team.

2.2 Key features

- Contact line dispensing, non-contact spray, drop-on-demand jetting and piezo nano-dispensing on one platform
- Up to 8 independent channels, each with its own precision syringe pump, for simultaneous multi-line striping
- Volume set directly in µL/cm (lines) or nL/µL per drop (dots), independent of motion speed
- Positioning repeatability down to ±0.005 mm per axis (precision drive option)
- Vacuum hold-down table with registration pins and adjustable card guides for fast, repeatable loading
- Optional vision for alignment and line inspection, laser height sensing and clog detection

- Recipe-based touchscreen operation, PC software, user levels and batch records for regulated production
- Chemically resistant wetted path (PTFE, PEEK, borosilicate glass, ceramic, 316L stainless steel)

2.3 Key figures (for hero section)

Figure	Value
Dispense area	up to 600 × 400 mm
Dispensing channels	1 to 8
Line dispense rate	0.1 to 25 µL/cm
Drop volume	from 50 pL (piezo) / 10 nL (drop jet) up to 5 µL
Repeatability	down to ±0.005 mm per axis
Line speed	5 to 300 mm/s

3. Applications

3.1 Lateral flow rapid test kits (lead application)

Process step	What the NK-RD does	Typical module
Test and control lines	Stripes capture antibodies or antigens on nitrocellulose membrane cards, 1 to 8 lines in one pass	Contact line (CL)
Conjugate pad	Sprays gold or latex conjugate evenly onto glass fibre or polyester pads	Air-jet spray (AJ)
Sample pad treatment	Applies buffers, blockers and surfactants	Air-jet spray (AJ)
Multiplex and dot assays	Places dots or short lines for multi-analyte tests	Drop jet (DJ) or piezo (PJ)
Cassette and assembly	Places adhesive or sealant dots during cassette assembly	Time-pressure kit (TP)

Typical starting point for test and control lines on nitrocellulose is about 0.5 to 1 µL/cm with a line width near 1 mm; final values depend on the membrane and assay.

3.2 Other applications

- Electrochemical biosensor and test strip electrode spotting (for example glucose and lactate strips)
- Biochip, microarray and protein array spotting on slides and chips
- Reagent filling of SBS format microplates (96, 384 and 1536 wells) and microfluidic cartridges
- Freeze-dried reagent bead and reagent dot preparation
- Precision adhesive, coating and sealant dispensing in medical device assembly
- Research and development of new assays and pilot-scale production

4. Model range

The series is offered in four frame sizes. All frames accept every dispensing module and option.

Model	Dispense area X × Y	Z travel	Typical use	Benchtop footprint (W × D × H)	Weight
NK-RD 300C	300 × 100 mm	50 mm	Single lateral flow card, R&D	≈ 550 × 450 × 450 mm	≈ 25 to 30 kg
NK-RD 450C	450 × 100 mm	50 mm	Long cards, short master sheets	≈ 700 × 450 × 450 mm	≈ 30 to 35 kg
NK-RD 450M	450 × 260 mm	80 mm	Several cards per run, large membranes, slides	≈ 700 × 800 × 500 mm	≈ 40 to 50 kg
NK-RD 600M	600 × 400 mm	100 mm	Batch nests, plates, pilot production	≈ 900 × 900 × 600 mm	≈ 55 to 70 kg

Footprint and weight are without enclosure and depend on the installed modules. Custom frame sizes are available on request.

5. Motion system

Parameter	Specification / range
Kinematics	Cartesian XYZ gantry, 3 axes (optional 4th rotary axis for round parts)
Drive class S (standard)	Closed-loop stepper motors, ball screw X/Y, linear guides
Drive class P (precision)	AC servo motors with linear encoders, ball screw, linear guides
Repeatability	Class S: ±0.01 mm per axis Class P: ±0.005 mm per axis
Positioning accuracy (full travel)	Class S: ±0.02 mm Class P: ±0.01 mm
Resolution	0.001 mm per axis
Dispense (line) speed	5 to 300 mm/s, programmable per line
Maximum travel speed X/Y	Class S: up to 500 mm/s Class P: up to 800 mm/s
Maximum travel speed Z	up to 200 mm/s
Motion modes	Point-to-point, continuous path, linear and circular interpolation, step-and-repeat
Work table payload	5 to 15 kg (by frame size)
Tool (head) payload	3 to 5 kg
Work holding	Vacuum hold-down plate (anodised aluminium or stainless), registration pins, adjustable card guides; custom nests on request
Card / substrate width	20 to 100 mm per card guide; full table width with custom nests

Repeatability measured unloaded at constant temperature; results vary with measurement method.

6. Dispensing modules

Any combination of modules up to 8 channels can be fitted. Each channel is driven by its own precision syringe pump (section 6.2) unless stated otherwise.

6.1 Module overview

Code	Module	Principle	Output range	Repeatability (typical)	Main use
CL	Contact line dispenser	Syringe-pump metered, low-contact-pressure nozzle	0.1 to 10 µL/cm line width from ≈ 0.3 mm (typ. 0.6 to 1.2 mm)	CV ≤ 1 to 2 %	Test and control lines on nitrocellulose
AJ	Air-jet spray dispenser	Non-contact, air-atomised, syringe-pump metered	1 to 25 µL/cm spray width ≈ 3 to 10 mm	CV ≤ 2 %	Conjugate and sample pads
DJ	Drop-on-demand jet	Non-contact, micro-solenoid valve with syringe-pump metering	10 nL to 5 µL per drop; lines and dots	CV ≤ 2 % at ≥ 100 nL CV ≤ 5 % at 10 to 100 nL	Dots, arrays, multiplex lines, plates
PJ	Piezo nano-jet (option)	Non-contact, piezo-actuated capillary	50 pL to 100 nL per drop	CV ≤ 3 to 5 %	Biochips, microarrays, biosensors

Code	Module	Principle	Output range	Repeatability (typical)	Main use
TP	Time-pressure kit (option)	Pneumatic syringe barrel, 3 to 55 cc	Dots and beads from ≈ 0.05 µL; 1 to 100,000 cP	CV ≤ 3 to 5 %	Adhesives and sealants in assembly

Volumes and CV measured gravimetrically with deionised water or a buffer at 20 to 25 °C. Performance with real reagents depends on viscosity, surface tension, particle content and substrate.

6.2 Precision syringe pump (metering)

Parameter	Specification / range
Syringe sizes	25 µL to 5 mL (standard set: 100, 250, 500 and 1000 µL); larger on request
Resolution	up to 48,000 steps per full stroke (micro-step mode)
Precision	CV ≤ 0.3 % at full stroke
Accuracy	±1 % at full stroke
Flow range	from ≈ 1 nL/s up to ≈ 40 mL/s, depending on syringe size
Valves	3-port standard; multi-port distribution valves optional
Reservoirs	10 to 250 mL bottles per channel; refilling during operation
Functions	Auto-prime, purge, back-suction (anti-drip), pressure monitoring for clog and air detection (option)

6.3 Wetted materials

PTFE, PEEK, FEP, borosilicate glass, ceramic and 316L stainless steel. Compatible with aqueous buffers, protein and antibody solutions, gold and latex conjugates, alcohols and most laboratory solvents. Compatibility with aggressive solvents to be confirmed per application.

7. Sensing and vision options

Option	Function
Vision camera	Fiducial and card-edge alignment, teaching by image, automatic program offset when changing nozzles
Line inspection	Camera measurement of line position and width after dispensing, with pass/fail per card
Laser height sensor	Non-contact measurement of membrane or part height; automatic Z compensation for uneven substrates
Drop watcher	Stroboscopic camera to check drop formation of DJ and PJ modules before each run
Pressure monitoring	Detects clogs, empty reservoirs and air bubbles in each channel
Card presence sensor	Prevents dispensing on an empty position
Barcode / QR reader	Reads lot and card codes into the batch record

8. Control and software

Parameter	Specification / range
Operator interface	7 to 10 inch touchscreen HMI on the machine; PC software for programming and records
Programming	Parameter entry (µL/cm, mm/s, start/stop offsets, line spacing), teach by jog or camera, CSV and DXF coordinate import
Patterns	Lines, dots, arrays, multi-line simultaneous striping, step-and-repeat over several cards

Parameter	Specification / range
Recipe storage	100 or more recipes on board; unlimited on PC
User management	User levels (operator, supervisor, administrator) with password login
Records	Batch reports with recipe, settings, user and time stamp; export as CSV or PDF
Regulated use (option)	Audit trail and electronic records to support ISO 13485 and 21 CFR Part 11 processes
Interfaces	USB, Ethernet; RS-232/RS-485; 8 digital inputs / 8 digital outputs, 24 VDC
Integration (option)	Modbus TCP or OPC UA for MES and line integration
Languages	English standard; other languages on request

8.1 Typical throughput

With manual loading of single 300 mm cards and 2 to 4 lines striped simultaneously, typical throughput is about 120 to 300 cards per hour. Multi-card nests on the larger frames raise this further. Actual throughput depends on line count, speed, drying needs and loading method.

9. Enclosure, utilities and environment

9.1 Enclosure and process options

Option	Description
Safety enclosure	Polycarbonate cover with door interlock
Humidity-controlled enclosure	Keeps the dispensing zone at a set relative humidity for membrane stability
HEPA laminar flow	H14 filtered airflow over the work area
UV-C lamp	Surface decontamination between batches
Temperature-controlled reservoirs	4 to 40 °C for temperature-sensitive reagents
Reagent mixing	Magnetic stirring of conjugate reservoirs to prevent settling
Drying station (accessory)	Forced-air or IR drying for striped cards and pads
ESD protection	ESD-safe table and grounding kit

9.2 Utilities

Parameter	Specification / range
Power supply	100 to 240 VAC, 50/60 Hz, single phase
Power consumption	150 to 600 W, depending on frame size and options
Compressed air	0.4 to 0.7 MPa (4 to 7 bar), clean, dry, oil-free; only needed for AJ and TP modules
Vacuum	Built-in vacuum pump for hold-down plate (external vacuum connection optional)

9.3 Operating environment

Parameter	Specification / range
Ambient temperature	15 to 35 °C (18 to 25 °C recommended for production)
Relative humidity	20 to 80 % non-condensing; dispensing zone humidity set by the assay process
Installation	Laboratory or cleanroom bench, level and vibration-free
Noise	≤ 65 dB(A)

10. Compliance, documentation and service

Parameter	Specification / range
Conformity (to be confirmed)	CE marking: Machinery Directive 2006/42/EC (Machinery Regulation (EU) 2023/1230 from 20 January 2027), EMC Directive 2014/30/EU, Low Voltage Directive 2014/35/EU, RoHS Directive 2011/65/EU
Product status	Production and laboratory equipment. The NK-RD is not itself a medical or in-vitro diagnostic device.
Quality support	Designed for use in ISO 13485 manufacturing environments
Documentation	User manual, quick-start guide, spare parts list, electrical drawings, declaration of conformity
Validation package (option)	IQ/OQ protocols and execution support; PQ support for the customer's assay
Installation and training	On-site or remote installation; operator and maintenance training
Warranty	12 months standard (to be confirmed); extended warranty available
Support	Remote diagnostics, spare parts and preventive maintenance plans

11. Configuration and ordering code

Format: NK-RD - [Frame] - [Drive] - [Channels] - [Options]

Field	Code	Meaning
Frame	300C / 450C / 450M / 600M	Dispense area per section 4
Drive	S / P	S = standard (±0.01 mm), P = precision (±0.005 mm)
Channels	n × CL, AJ, DJ, PJ, TP	Number and type of dispensing modules, maximum 8 in total, e.g. 2CL1AJ
Options	V	Vision camera with alignment
	I	Line inspection (requires V)
	L	Laser height sensor
	W	Drop watcher (for DJ / PJ)
	M	Pressure monitoring on all channels
	B	Barcode / QR reader
	E	Safety enclosure
	RH	Humidity-controlled enclosure
	H	HEPA laminar flow
	U	UV-C lamp
	T	Temperature-controlled reservoirs
	A	Audit trail / electronic records software
	Q	IQ/OQ validation package
	X	MES integration (Modbus TCP / OPC UA)

11.1 Example configurations

Ordering code	Description
NK-RD-300C-S-2CL	Entry R&D striper: single card, two test/control lines

Ordering code	Description
NK-RD-450C-S-3CL1AJ-E-M	Rapid test production: 3 lines plus conjugate spray, enclosure, clog detection
NK-RD-450M-P-2CL2DJ-V-I-RH-A	Multiplex test production with vision inspection, humidity control and audit trail
NK-RD-600M-P-4DJ2PJ-V-W-H	Biochip and microarray spotting under HEPA

11.2 Standard scope of supply

- Robot frame with selected drive class and vacuum hold-down plate
- Selected dispensing modules with syringe pumps, reservoirs and tubing
- Touchscreen HMI, PC software licence and recipe library
- Starter nozzle and syringe kit, tool kit, user documentation

12. Quote request form fields

Use these fields on the website order / quote form so Nebkatum can configure the machine:

Field	Type	Options / hint
Application	Select	Lateral flow test lines; conjugate / sample pad; dots / arrays; biosensor; microplate; adhesive; other
Substrate	Select + text	Nitrocellulose; glass fibre; polyester; slide; chip; plate; other
Card or part size	Text (mm)	Length × width, e.g. 300 × 60 mm
Cards or parts per run	Number	
Number of lines / reagents	Number	1 to 8
Target volume	Text	µL/cm for lines, nL or µL per drop for dots
Reagent type and viscosity	Text	e.g. antibody in PBS, gold conjugate, ≈ 1 to 10 cP
Required throughput	Number	Cards or parts per hour
Environment needs	Checkboxes	Humidity control; HEPA; UV; temperature control
Regulated production	Yes / No	Audit trail and IQ/OQ needed?
Country of installation	Select	For power, language and compliance
Contact details	Text	Name, company, email, phone

13. Disclaimer text (publish with every specification table)

> *Specifications are typical ranges across the NK-RD Series. Each machine is configured to order, and the values for a delivered unit are stated in its quotation and acceptance documents. Dispensing performance depends on the reagent, substrate, nozzle and environmental conditions. Nebkatum reserves the right to change specifications without notice.*

End of document NBK-RD-CAT-001 REV0.00