

Genetic Sequencer

DNBSEQ-G400*



Strengthen your daily sequencing capability



Flexible, stable, and well-qualified, offering more choices

- 2** sequencing technologies
DNBSEQ™ + CoolMPST™ technologies
- 2** Flow Cell Types
- 5** Sequencing Modes
- 6** Sequencing Lengths

© About MGI

MGI Tech Co., Ltd. (referred to as MGI) is committed to building core tools and technologies to lead life science through intelligent innovation. MGI focuses on R&D, production and sales of DNA sequencing instruments, reagents, and related products to support life science research, agriculture, precision medicine and healthcare. MGI is a leading producer of clinical high-throughput gene sequencers, and its multi-omics platforms include genetic sequencing, medical imaging, and laboratory automation.

Founded in 2016, MGI has 1578 employees, 34% of whom are R&D personnel. MGI operates in more than 50 countries and regions, serving more than 1000 customers. It has established scientific research and production bases, global training and service network in many countries and regions around the world. MGI is one of the companies in the world that have the ability to independently develop and mass-produce clinical high-throughput gene sequencers. Providing real-time, comprehensive, life-long packages, its vision is to lead life science innovation.

© About

DNBSEQ-G400

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Flexible, high quality
Activate your daily sequencing capability

Product Introduction

DNBSEQ-G400 is a versatile benchtop sequencer providing users with comprehensive, flexible and efficient sequencing options. In addition to the high-throughput sequencing reagents (StandardMPS), the CoolMPS high-throughput sequencing reagents provide more choices for users in pursuing higher sequencing quality. With stable high-intensity signals and random low sequencing error rate, CoolMPS reagents exhibit excellent performance in scientific and clinical applications, especially in the detection of low-frequency mutations in tumors.

DNBSEQ-G400 sequencer supports a wide range of applications including scientific research, clinical research, disease prevention, environment studies and agriculture, etc., increasing the popularity of high-throughput sequencing systems in medical and scientific research fields.



- **Two flow cell types**
FCL 1800M reads, FCS 550M reads
- **Dual flow cell system**
One or two flow cells covering 550M~3600M reads/run



- **Advantages of DNBSEQ™ technology**
Zero error accumulation, low amplification bias, low index hopping
- **Advantages of CoolMPS™ technology**
MGI'S proprietary CoolMPS sequencing reagents make low-frequency mutation detection in cancer more accurate



- **Short sequencing & time**
FCS SE100 from DNB to FASTQ takes only 13 hours



- **Wide range of application fields**
Satisfy both scientific research and clinical test

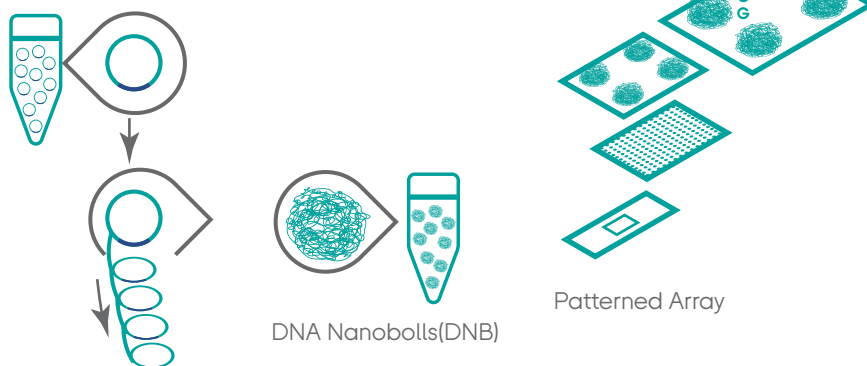
DNBSEQ-G400 is built with a dual flow cell system that can perform different types of flow cell individually in a single run, giving users a more flexible and streamlined sequencing experience.



Sequencer	Reagent type	FCS	FCL
DNBSEQ-G400RS	StandardMPS	●	●
	CoolMPS		●
DNBSEQ-G400	StandardMPS	●	●
	CoolMPS		●

© Technical principle

MGI'S PROPRIETARY DNBSEQ™ TECHNOLOGY



- ↑ INCREASED ACCURACY
- ↓ DECREASED DUPLICATES
- ↓ REDUCED INDEX HOPPING

DNA Nanoball sequencing technology - No accumulation of amplification errors

CoolMPS™ Sequencing Reagent--- Natural bases make base recognition clearer

CoolMPS is the first antibody based massively parallel sequencing chemistry for DNBSEQ platforms produced by MGI. The dNTPs of CoolMPS are not fluorescently labeled (called cold dNTPs) and they are incorporated into the sequencing strand by DNA polymerase, where base calling is achieved by specific binding of fluorescently labeled antibodies. During this process, the incorporated bases are unmodified, ultimately resulting in clearer base calling.

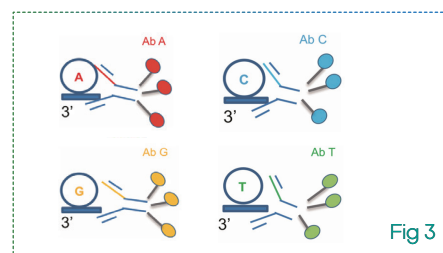
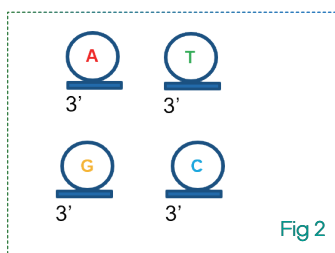
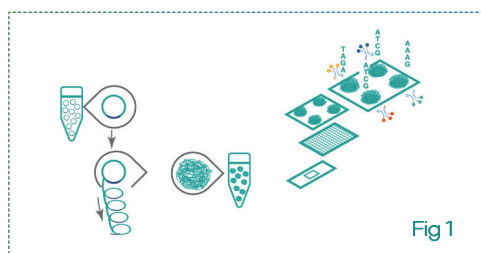
CoolMPS High-throughput Sequencing Set is a novel antibody-based sequencing product based on this method, adapted to the MGI DNBSEQ sequencing platform, and compatible with conventional library preparation methods.

CoolMPS™ chemistry principles

The CoolMPS is the sequencing method used in DNBSEQ technology (Fig 1). It uses

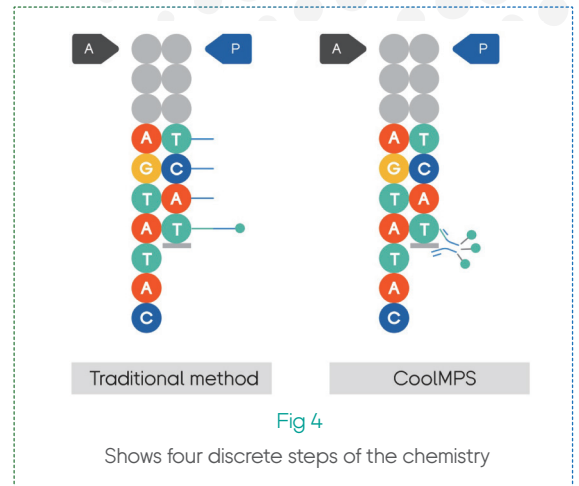
- Four cold dNTPs with an extension block (Fig 2)
- Four antibodies that are both base specific and block dependent (Fig 3). The A, T, G and C specific antibodies have almost zero cross reactivity. Each antibody has a specific dye (label) molecules attached to it.

The CoolMPS chemistry is compatible with all commonly used library preparation methods

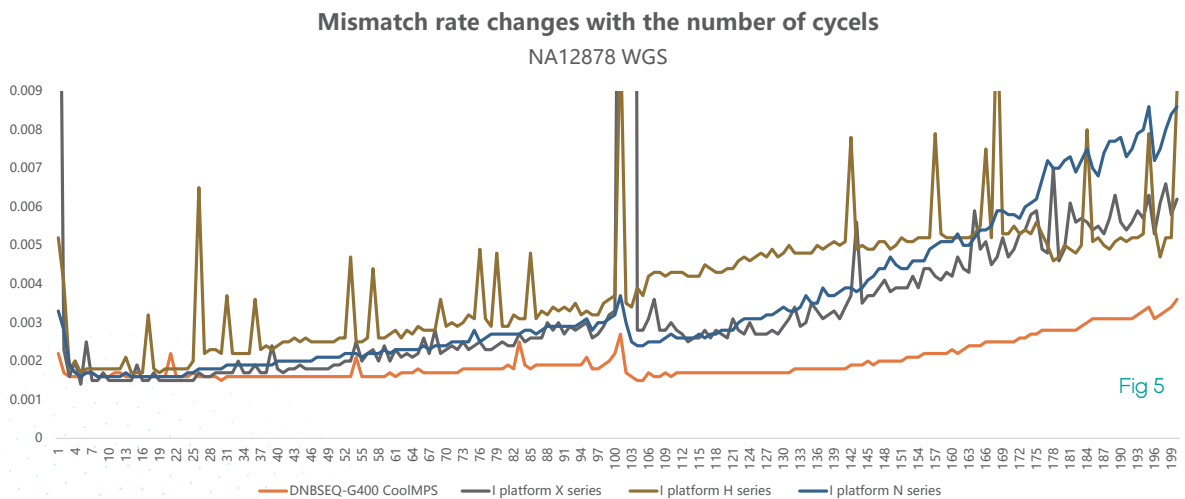


CoolMPS sequencing steps

- The cold unlabeled dNTPs are polymerized using DNA polymerase on the flow cell
- The incorporated base is recognized by a fluorescently labeled antibody that binds specifically to the incorporated cold dNTP
- The flow cell is imaged
- A regeneration agent then cleanly removes the block and the antibody. No scarring of bases.
- The newly added bases are completely natural without any modification
- The sequencing cycles are repeated for necessary read length



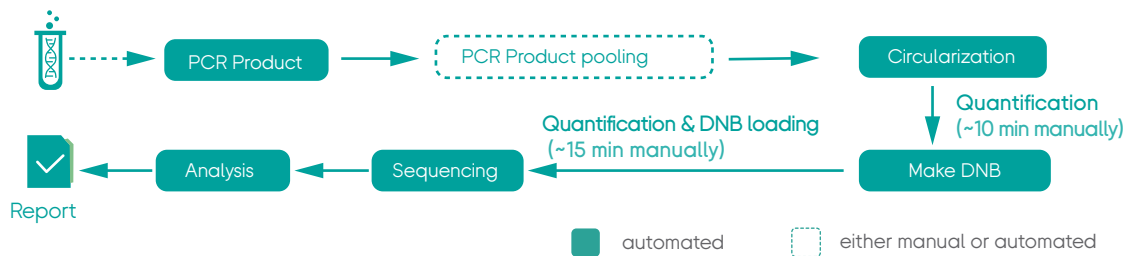
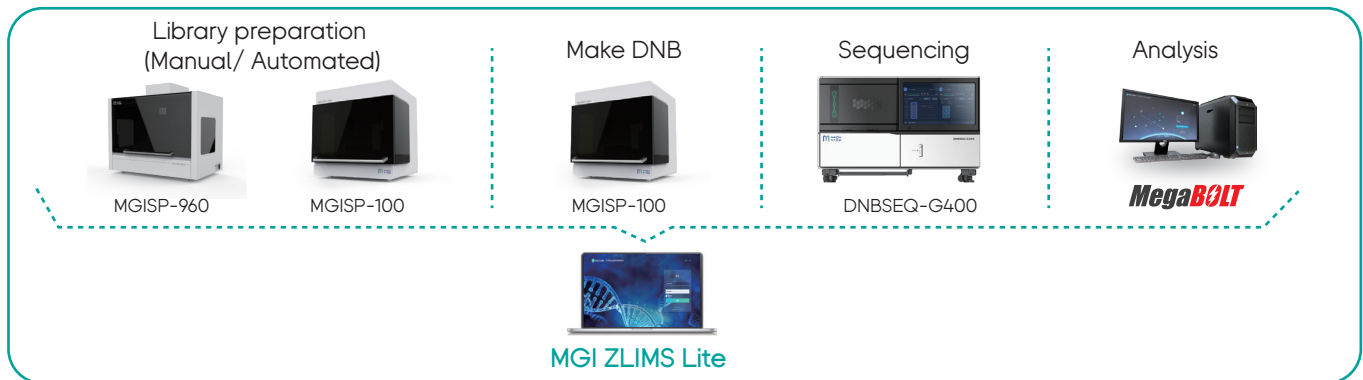
Lower mismatch rate of CoolMPS reagent



Total Packages

Versatile Library Prep, Sequencing & Analysis Package

Genetic Sequencer DNBSEQ-G400RS 2006A Fully automated workflow & all scenarios applicable



Highlights

Efficient

- High efficiency with fully automated comprehensive workflow from sample to report
- Less than 30 min of manual operations from sample to sequencing

Intelligent

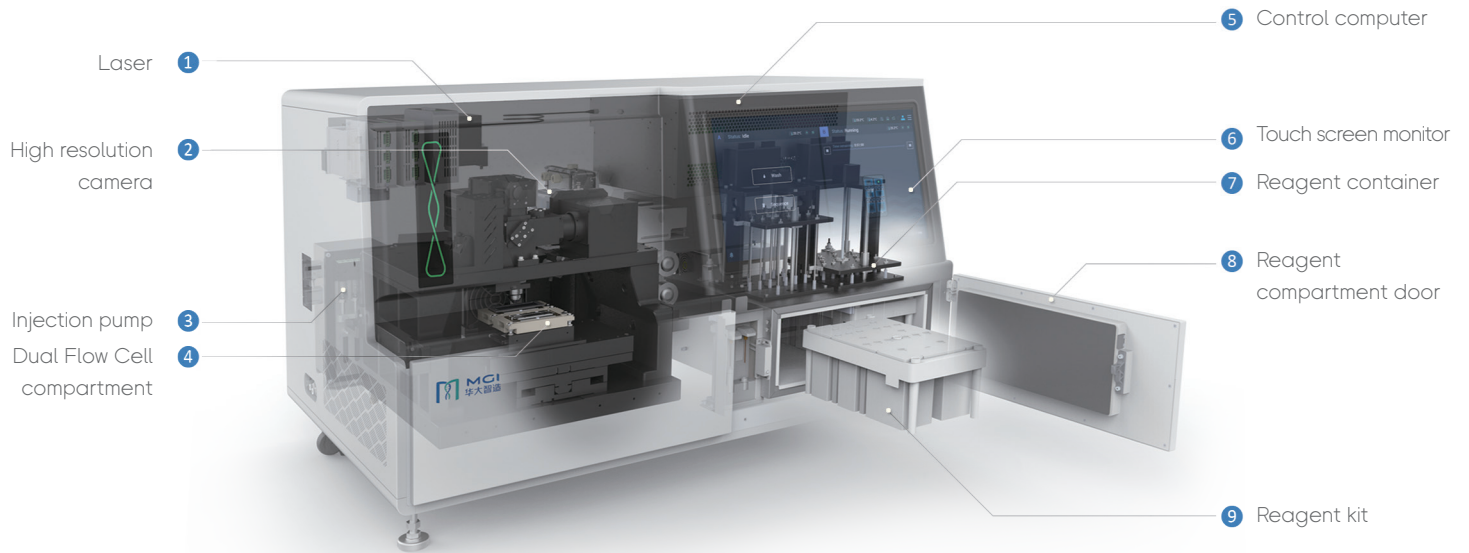
- ZIIMS controls fully automated workflow from sample to report
- Compatible with multiple MGI and third-party software
- MegaBOLT compatible with MGI and third-party data

Flexible

- Multiple sequencing and analysis options to expand application scenarios
- The equipments can be selected and matched according to needs

© Hardware Platform

DNBSEQ-G400 sequencer utilizes an innovative flow cell system which can support various sequencing modes and an optimized optical and biochemical system that enables the whole sequencing process to be completed within a short period of time, offering the user a simplified and streamlined sequencing experience.



© Performance Parameters

Reagent Type	Flow Cell Type	Effective Reads /Flow Cell*	Reads Lengths	Data Output /Flow Cell	Run Time**	Q30***
StandardMPS	FCS	550M	SE100	55G	13H	>85%
			PE100	110G	26H	>85%
			PE150	165G	37H	>75%
	FCL	1500-1800M	SE50	75-90G	14H	>85%
			SE100	150-180G	25H	>85%
			PE100	300-360G	48H	>85%
			PE150	450-540G	66H	>75%
			SE400	600-720G	109H	>70%
CoolMPS	1500-2000M	SE50	75-100G	17H	>90%	
		SE100	150-200G	30H	>90%	
		PE100	300-400G	58H	>90%	

* The maximum number of effective reads are based on the sequencing of an internal standard library. Actual output may vary depending on sample type and library preparation method.

** Run time was calculated based on dual-slides mode and takes sample loading, sequencing, base calling and data processing in account.

*** The percentage of base above Q30 is the average of an internal standard library over the entire run. Actual performance is affected by factors such as sample type, library quality, and insert fragment length.

Adapted applications

DNBSEQ-G400 supports 6 read lengths, from fertility testing and rapid pathogen detection (SE50, SE100), to tumor detection, transcriptome, WGBS, WES, WGS (PE100, PE150), to individual identification (SE400) and plants and animal genome sequencing (PE200), comprehensively covers the application needs of scientific research and clinical fields.

Application type	Recommended read length	Recommended sample numbers for a single run on DNBSEQ-G400*				
		1*FCS	2*FCS	1*FCL	1*FCL+1*FCS	2*FCL
		550M reads	1100M reads	1800M reads	2350M reads	3600M reads
NIPT 5M reads/sample	SE50	85 samples	170 samples	275 samples	360 samples	550 samples
Pathogen Fast Identification 25M reads/sample	SE50/SE100	17 samples	34 samples	55 samples	72 samples	110 samples
Single cell RNA-Seq 5000cells, 100K reads/cell, 100 Gb/sample	PE100	1 sample	2 samples	4 samples	5 samples	8 samples
Cancer small panel 1 Gb/sample		85 samples	170 samples	275 samples	360 samples	550 samples
Cancer large panel 5 Gb/sample		17 samples	34 samples	55 samples	72 samples	110 samples
Transcriptome 40M reads/sample	PE150	11 samples	22 samples	35 samples	46 samples	70 samples
WES 100×average sequencing depth, 15 Gb/sample		8 samples	16 samples	28 samples	36 samples	56 samples
WGS 30×average sequencing depth, 100 Gb/sample		1 sample	2 samples	4 samples	5 samples	8 samples
Individual identification 1M reads/sample	SE400	/	/	1500 samples	/	3000 samples

* Sample numbers are calculated with consideration to pooling variation and applications. For reference only.

Application Cases

Pathogen detection

Case 1: Pathogen detection - COVID-19

Sample: 6 serial dilutions of extracted RNA from isolated culture were subjected to ATOplex Sequencing and RT-qPCR.

Sequencing Platform: DNBSEQ-G400

Results:

Table 1 Summary of ATOplex Sequencing

ID	Raw reads	SARS-CoV-2 mean depth	100XSARS-CoV-2 coverage	Ct value of RT-qPCR	SAS-CoV-2%#
Dilution 10 ⁻¹	9,455,876	61102.3	99.8%	24.3	99.95%
Dilution 10 ⁻²	10,232,235	59012.7	99.8%	27.1	99.43%
Dilution 10 ⁻³	9,122,357	31140.3	99.8%	30.6	94.82%
Dilution 10 ⁻⁴	5,965,846	2951.4	99.8%	33.5	63.13%
Dilution 10 ⁻⁵	4,536,254	1036.6	95.3%	36.9	15.36%
Dilution 10 ⁻⁶	17,563,253	206.9	75.4%	NO CT	1.87%
Negative control	5,245,547	0.3	0.0%	NO CT	0.00%

#SARS-CoV-2 detection; SARS-CoV-2% < 0.05%,negative; SARS-CoV-2% > 0.1%,positive; SARS-CoV-2% = 0.05-0.1%, gray zone.

Conclusion:

ATOplex Sequencing can detect SARS-CoV-2 with 10 gradient dilutions (about 10-100 copies per ml) and assemble nearly full-length genome with 10 gradient dilutions (about 100-1000 copies per ml).

WGS

Case 2: Human WGS

Sample: 1025 DNA samples of Han Chinese in the Central Plains

Library: MGIEasy PCR-Free DNA Library Preparation Set

Sequencing Strategy: DNBSEQ-G400 PE150

Results:

Table 2-1 Sequencing data quality

		Min	Median	Mean	Max	High quality	PASS
Total Reads		601727956	726056164	726494436	952285662	/	/
Mean Reads Length		150	150	150	150	/	/
Reads*	R1	100%	100%	100%	100%	=100%	=100%
	R2	100%	100%	100%	100%	=100%	=100%
Q30	R1	87.21%	90.43%	90.34%	92.91%	>=85%	>=80%
	R2	84.22%	89.79%	89.56%	92.00 %	>=85%	>=80%

*passed filter

Table 2-2 Key indicators of sequencing data analysis

	Min	Median	Mean	Max	High quality	PASS
Properly Paired	96.38%	98.27%	98.26%	98.88%	>=95%	>=90%
Raw Depth (GRCh38)	29.23	35.27	35.29	46.25	>=30	>=10
Mapping Rate	97.81%	99.99%	99.99%	100.00%	>=99%	>=95%
Duplication	0.25%	0.88%	0.99%	3.22%	/	/
Mean Insert Size	262.38	329.40	332.64	382.18	/	/
Insert Size SD	51.23	71.40	71.75	82.80	/	/

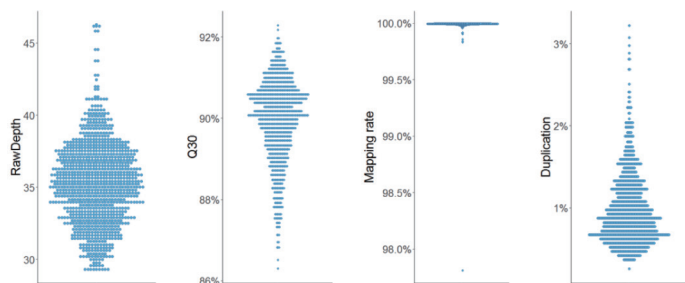


Figure 2. Excellent overall sequencing quality

Conclusion:

- 1) The raw depth of more than 98% of the samples is above 30X, with a lowest raw depth of 29.226X;
- 2) The Q30 ratios of the bases in all samples are over 85%;
- 3) Except for one sample (97%), the mapping rates of all other samples are greater than 99.5%
- 4) More than 95% of the samples have a duplication rate of less than 2%, with the highest rate also less than 4%;

The DNBSEQ-G400 platform can produce high-quality WGS sequencing data with high Q30 and mapping rate, and low duplication rate, which can generate accurate and reliable whole-genome sequencing data.

Single Cell sequencing

Case3: DNBelab C4 RNA sequencing

DNBelab C Series Single-Cell Omics Package is comprised of DNBelab C4 Pocket Single-Cell Lab, DNBelab C Series Single-Cell Library Preparation Set, DNBSEQTM sequencing platform and Single-Cell Analysis Suite, all as part of a portable, instant, and one-stop single-cell research workflow.

Sample: Human 293T cell line :Murine 3T3 cell line =1:1

Library Preparation: DNBelab C Series Single-Cell Library Preparation Set

Sequencing Strategy: DNBSEQ-G400 PE100

Data Results:

Table 3-1 Cell data results

Estimated Number of Cells	2,544
Estimated Number of Human Cells	1,309
Estimated Number of Mouse Cells	1,155
Fraction Reads in Cells	79.70%
Fraction Reads in Human Cells	80%
Fraction Reads in Mouse Cells	79.30%
Mean Reads per Cell	40,882
Mean Reads per Human Cell	41,485
Mean Reads per Mouse Cell	39,518
Median UMI Counts per Human Cell	28,915
Median UMI Counts per Mouse Cell	26,411
Median Genes per Human Cell	6,168
Median Genes per Mouse Cell	5,395

Table 3-2 Sequencing data results

Number of Reads	172,491,759
Reads Pass QC	148,377,085
Reads with Valid Barcodes	148,377,085
Filtered Reads with Failed Barcodes	23,040,453
Filtered Reads with Low Quality	1,074,221
Filtered Reads with Unknown Sample Barcodes	0
Q30 Bases in Cell Barcode	89.30%
Q30 Bases in Sample Barcode	0.00%
Q30 Bases in UMI	86.50%
Q30 Bases in RNA Read	79.80%

Table 3-3 Mapping results

Reads Mapped Confidently to Genome	95.20%
Reads Mapped Confidently to Gene	95.10%
Reads Mapped Confidently to Exonic Regions	66.30%
Reads Mapped Confidently to Intronic Regions	2.80%
Reads Mapped Antisense to Gene	5.70%

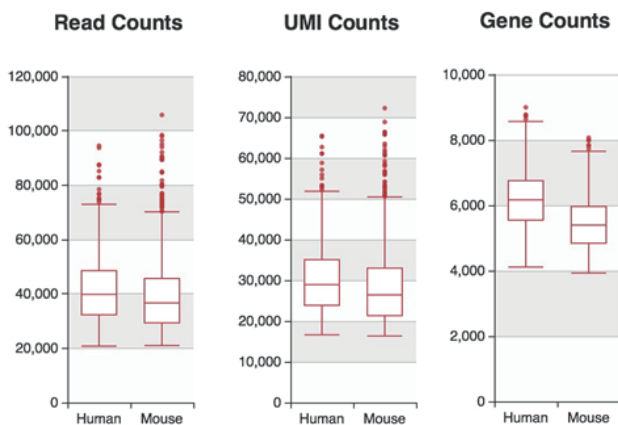


Figure 3. Data distribution

Conclusion:

The data output and quality performance of MGI DNBelab C4 single-cell library preparation products on the DNBSEQ-G400 platform meet expectations.

Oncology

Case 4: CoolMPS detects low frequency mutations

Sample: GeneWell Pancancer 800 gDNA Reference Standard

Library Preparation: WES (IDT probe)

Sequencing Strategy: Illumina X10 PE150, DNBSEQ-G400RS CoolMPS PE100

Sequencing Depth: 700X (filter duplication)

Data Results:

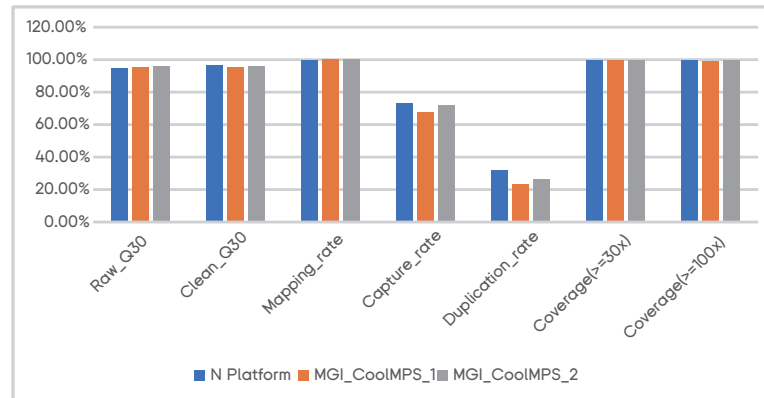


Figure 4. Comparison of quality data on different platforms

Table 4 Detection of specific site mutations on different platform

Gene	AA	STD_FREQ	N 平台	MGI_1	MGI_2
EGFR	V769_D770insASV	3%	1.73%	1.27%	2.32%
EGFR	L858R	1%	1.44%	0.62%	1%
EGFR	T790M	2%	2.00%	0.53%	1.49%
EGFR	E746_A750del	2%	NA	NA	1.03%
KRAS	G12D	2%	1.29%	1.93%	1.62%
KRAS	G13D	4%	3.67%	4.66%	2.60%
KRAS	A146T	1%	NA	2.02%	NA
NRAS	Q61K	1%	NA	1.26%	1.02%
KIT	D816V	2%	2.21%	2.61%	2.56%
FLT3	I836del	2%	2.16%	1.51%	1.75%
EGFR	G719S	4%	4.23%	2.86%	2.97%
BRAF	V600E	7%	4.34%	4.72%	5.47%
PIK3CA	H1047R	7%	7.76%	4.91%	10.14%

Conclusion:

The performance of Q30, mapping rate and coverage of the two platform is consistent, but the duplication rate of CoolMPS reagent on DNBSEQ-G400 platform is lower;

In the 13 loci of the low-frequency mutation standard with a preset mutation rate of 1%-7%, the detection rate of N platform was 76.9% (10/13), which is lower compared to the 92.3% of DNBSEQ-G400 CoolMPS reagent (12/13).

Appendix

© Hardware Parameters

	Model*	Intended Market
Model*	DNBSEQ-G400	IVD
	DNBSEQ-G400RS	RUO
Dimensions	1086 mm(L)×756 mm(W)×710 mm(H)	
Net Weight	200 kg	
Power	Type	100-240 V, 50/60 Hz
	Rated Power	1200 VA
Operating Environment Requirements**	Temperature	19°C-25°C
	Relative Humidity	20% RH-80% RH, non-condensing
	Atmospheric Pressure	70 kPa-106 kPa
	Waterproof Rating	IPX0
Control Computer Configurations***	CPU	Intel Xeon E5 10Core * 2 2.2GHz
	Internal Storage	256 GB RAM
	HDD	16 Tb
	SSD	480 Gb
	Operating System	Windows 10 Enterprise

* Only for model classification

** For indoor use only; The Flow Cells can be stored and transported at room temperature. No liquid medium is needed

*** Supporting the computer' s configurations and system updates

Ordering Information

Table: DNBSEQ-G400 Series products

Cat. No.	Product Name
900-000168-00	Genetic Sequencer DNBSEQ-G400
900-000170-00	Genetic Sequencer DNBSEQ-G400RS
1000016941	DNBSEQ-G400RS High-throughput Sequencing Set (FCL SE50)
1000016943	DNBSEQ-G400RS High-throughput Sequencing Set (FCL SE100)
1000016946	DNBSEQ-G400RS High-throughput Sequencing Set (FCL SE400)
1000016950	DNBSEQ-G400RS High-throughput Sequencing Set (FCL PE100)
1000016952	DNBSEQ-G400RS High-throughput Sequencing Set (FCL PE150)
1000016955	DNBSEQ-G400RS High-throughput Sequencing Set (FCL PE200)
1000016978	DNBSEQ-G400RS High-throughput Rapid Sequencing Set (FCS SE100)
1000016980	DNBSEQ-G400RS High-throughput Rapid Sequencing Set (FCS PE100)
1000016982	DNBSEQ-G400RS High-throughput Rapid Sequencing Set (FCS PE150)
1000016984	DNBSEQ-G400RS High-throughput Sequencing Set (stLFR FCL PE100)
1000016993	DNBSEQ-G400RS High-Throughput Sequencing Set (App-A FCL SE50)
1000016994	DNBSEQ-G400RS High-Throughput Sequencing Set (App-A FCL PE100)
1000016995	DNBSEQ-G400RS High-Throughput Sequencing Set (App-A FCL PE150)
1000016998	DNBSEQ-G400RS High-throughput Sequencing Set (Small RNA FCL SE50)
1000023783	DNBSEQ-G400RS High-throughput Rapid Sequencing Set (App-A FCS SE100)
1000023784	DNBSEQ-G400RS High-throughput Rapid Sequencing Set (App-A FCS PE100)
1000023785	DNBSEQ-G400RS High-throughput Rapid Sequencing Set (App-A FCS PE150)
1000017992	CoolMPS High-throughput Sequencing Set (DNBSEQ-G400RS FCL SE50)
1000019478	CoolMPS High-throughput Sequencing (DNBSEQ-G400RS Small RNA FCL SE50)
1000016933	CoolMPS High-throughput Sequencing (DNBSEQ-G400RS FCL SE100)
1000016935	CoolMPS High-throughput Sequencing (DNBSEQ-G400RS FCL PE100)
1000022483	Universal Sequencing Reaction Kit (G400 SM FCS SE100) (CE-IVD)
1000022484	Universal Sequencing Reaction Kit (G400 SM FCS PE100) (CE-IVD)
1000022485	Universal Sequencing Reaction Kit (G400 SM FCS PE150) (CE-IVD)
1000022477	Universal Sequencing Reaction Kit (G400 SM FCL SE35) (CE-IVD)
1000022478	Universal Sequencing Reaction Kit (G400 SM FCL SE50) (CE-IVD)
1000022479	Universal Sequencing Reaction Kit (G400 SM FCL SE100) (CE-IVD)
1000022480	Universal Sequencing Reaction Kit (G400 SM FCL PE50) (CE-IVD)
1000022481	Universal Sequencing Reaction Kit (G400 SM FCL PE100) (CE-IVD)
1000022482	Universal Sequencing Reaction Kit (G400 SM FCL PE150) (CE-IVD)
1000022466	Universal Sequencing Reaction Kit (G400 CM FCL SE50) (CE-IVD)
1000022467	Universal Sequencing Reaction Kit (G400 CM FCL SE100) (CE-IVD)
1000022468	Universal Sequencing Reaction Kit(G400 CM FCL PE100) (CE-IVD)
1000022549	Universal Sequencing Reaction Kit (G400 SM FCS SE100) (IVD for Vietnam and Thailand)
1000022550	Universal Sequencing Reaction Kit (G400 SM FCS PE100) (IVD for Vietnam and Thailand)
1000022551	Universal Sequencing Reaction Kit (G400 SM FCS PE150) (IVD for Vietnam and Thailand)
1000017811	Universal Sequencing Reaction Kit(G400 SM FCL SE35) (IVD for Vietnam and Thailand)
1000017812	Universal Sequencing Reaction Kit (G400 SM FCL SE35) (IVD for Vietnam and Thailand)
1000017813	Universal Sequencing Reaction Kit (G400 SM FCL SE100) (IVD for Vietnam and Thailand)
1000017814	Universal Sequencing Reaction Kit (G400 SM FCL PE50) (IVD for Vietnam and Thailand)
1000017815	Universal Sequencing Reaction Kit (G400 SM FCL PE100) (IVD for Vietnam and Thailand)
1000017816	Universal Sequencing Reaction Kit (G400 SM FCL PE150) (IVD for Vietnam and Thailand)

© MGI Global Presence

✓ Technical Support Globally

The technical support team has a complete global coverage including technical services centers and multiple locations in major international regions to maximize customer satisfaction.



Multiple local technical support centers around the world provide timely and effective technical support and training



Spare part centers in Shenzhen, Wuhan, Qingdao, Tianjin, Hong Kong (China); Brisbane (Australia); and Riga (Latvia), to ensure sufficient supply of parts for machine maintenance;



Online technical support accessible worldwide, with a fully functioning call center (Toll-Free Hotline: 4000-966-988) (9:00-12:00,13:00-18:00, Beijing time, workday) and multi-language online training courses coming soon

✓ Comprehensive Instrument Service and Warranty Plans Globally



Warehouses in Shenzhen, Wuhan, Qingdao, Tianjin, Hong Kong, Taipei, Bangkok (Thailand,Asia-Pacific); Brisbane (Australia, Oceania); Riga (Latvia, Europe); and San Jose (the USA, Americas) are established to ensure sufficient supply of maintenance parts for major regions.



Free installation and system verification services (including the QC reagents and consumables) are provided to turn your investment into production quickly.



MGI is responsible for any manufacturing defects or faults on the system within the warranty. Warranty covers labor, parts and travel charges.

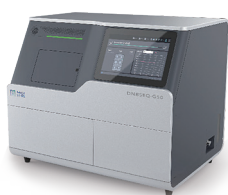


One Free instrument preventive maintenance provided with warranty, along with a variety of available extended warranty support plans.

*Unless otherwise informed, all sequencers and sequencing reagents are not available in Germany, USA, Spain, UK, Hong Kong, Sweden and Belgium.

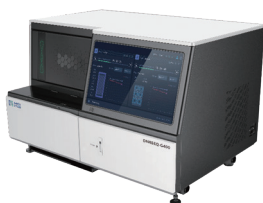
All products

High, medium and low throughput, all included



DNBSEQ-G50

Compact and flexible sequencers for small whole genome and targeted sequencing offered as part of total packages.



DNBSEQ-G400

Stable and flexible sequencer, for medium to large genome sequencing projects.



DNBSEQ-T7

Fast and flexible ultra-high-throughput sequencer, for large genome sequencing projects and population studies.



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