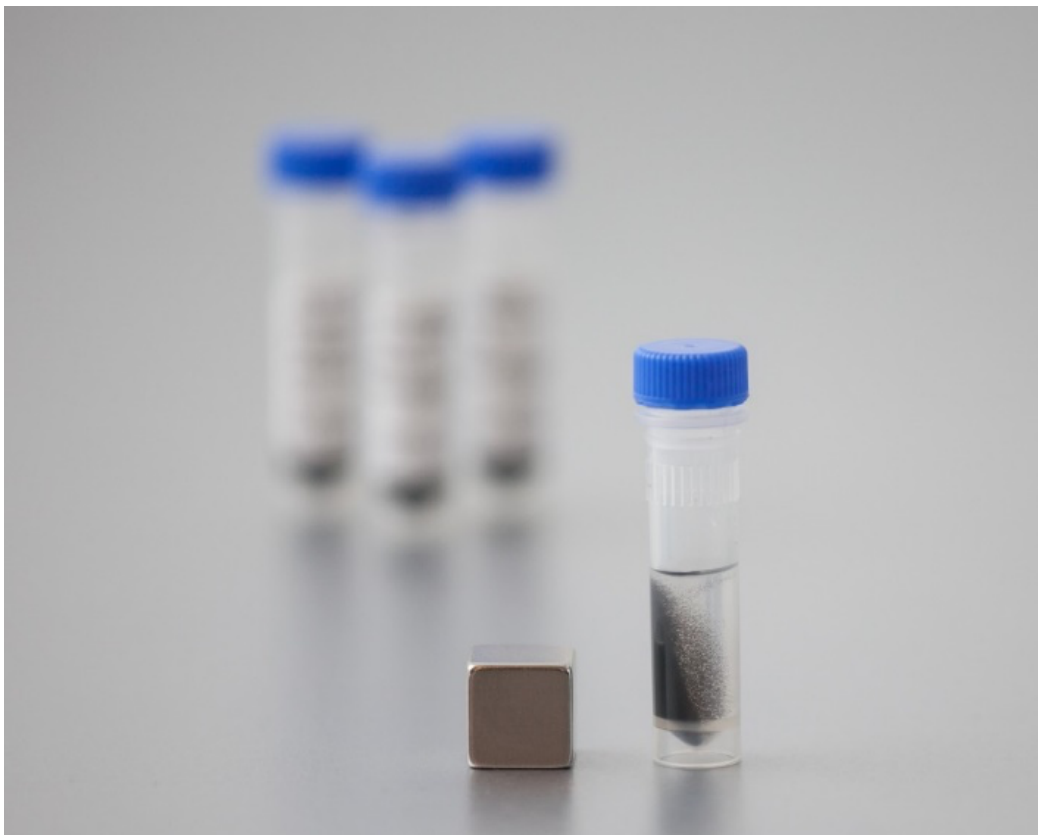
MAGic™ BioProcessing

DATA SHEET

MAGic™SPRI HMW

High molecular weight size selection



- Select for up to 5 kb single sided
- Precise size selections
- Easy & fast handling
- Reproducible
- Beads are liquid handler agnostic

MAGicSPRI HMW

High molecular weight size selection and cleanup

MAGicSPRI HMW offers a simple and efficient solution for DNA fragment cleanup, enabling size selection (e.g., prior to long read single molecule sequencing and NGS workflows). The magnetic bead–based system is compatible with both manual and automated magnetic liquid handling platforms, making it ideal for PCR purification, NGS library prep, as well as long read sequencing. Designed for seamless integration, MAGicSPRI HMW fits easily into existing DNA or RNA cleanup and size selection workflows. The protocol is fully interchangeable with standard SPRI-based methods, enabling straightforward adoption without the need for process modifications. By taking advantage of Magic's rapid pelleting and resuspension, optimized handling can increase throughput and increase the life of automation pipettors.

MAGicSPRI HMW consists of rapid super-paramagnetic beads optimized for high-efficiency DNA binding. The recommended bead-to-sample ratio for DNA cleanup is 1.8x, this ratio can be adjusted when size selection is required.

The MAGicSPRI HMW beads are excellent for long amplicon purification, efficiently depleting DNA fragments smaller than 5 kb.

The beads are stable and easily visible to the naked eye, making them simple to track and collect during manual handling. They do not clump or aggregate, which facilitates simple uniform resuspension. Magic's proprietary technology enables rapid magnetic separation and easy resuspension under surprisingly gentle conditions, making the system fully compatible with many long read single molecule sequencing and NGS applications.

Table 1. Main characteristics of MAGicSPRI HMW

Product	MAGicSPRI HMW
Target molecule	Nucleic acids
Beads	Small super-paramagnetic solids
Bead-sample ratio	1.8x for DNA clean up
Size selection	100 bp – <5kb
Processing mode	Manual or automatic
Storage	+2 to +8°C. Do not freeze

Applications

Principle

SPRI (Solid Phase Reversible Immobilization) technology uses paramagnetic beads and optimized buffer chemistry to selectively bind nucleic acids for purification and size selection. In the presence of a crowding agent and salt, DNA or RNA fragments reversibly bind to the bead surface, enabling removal of contaminants such as enzymes, primers, nucleotides, and salts through magnetic separation and washing steps.

By adjusting the bead-to-sample ratio, specific fragment size ranges can be retained or excluded. MAGicSPRI HMW provides a rapid, scalable, and automation-friendly solution for nucleic acid cleanup and industry leading high molecular weight size selection in molecular biology and single molecule sequencing.

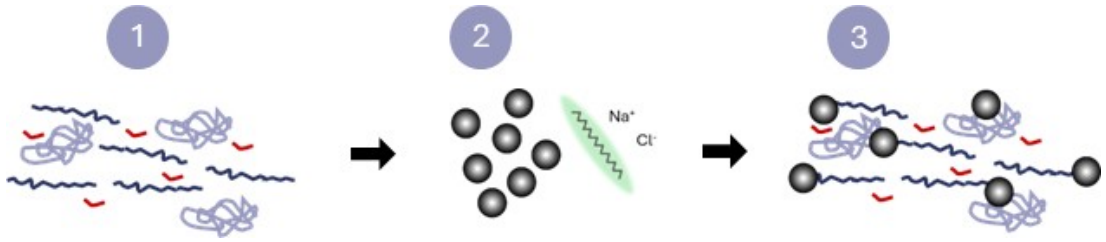


Figure 1. Principle of SPRI technology

1. Sample containing fragmented DNA
2. Add MAGicSPRI HMW in a solution of a crowding agent and salt
3. DNA precipitates and binds to beads

By modifying bead:sample ratio, selective binding of DNA sizes to beads occurs

Size selection

MAGicSPRI HMW bead-based technology enables precise and reproducible fragment size selection through adjustable bead-to-sample ratios.

The size-selective performance was evaluated using a DNA ladder containing fragments of defined sizes. Increasing volumes of bead solution were added to samples containing 0.8 µg DNA in 40 µL to perform single-sided size selection. Retained DNA fragment distributions obtained with increasing bead ratios are shown in Figure 2. Seven bead ratios, ranging from 0.3x to 1.8x, were evaluated. Lower bead ratios preferentially retained larger DNA fragments of up to 4 kb, while the 1.8x ratio enabled general DNA recovery, retaining fragments from 100 bp. This enables efficient depletion of DNA fragments <5 kb, thereby enriching large amplicons.

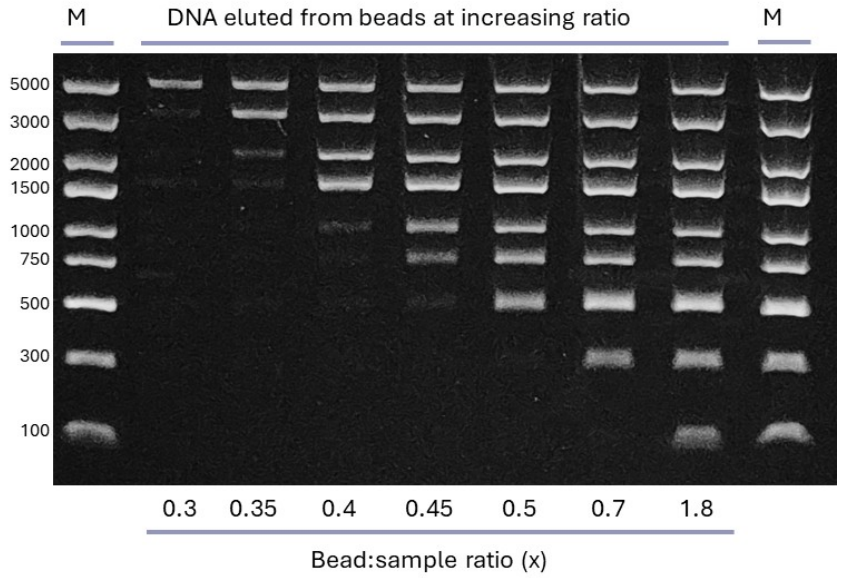


Figure 2. Size selection analyzed on E-Gel. DNA sample: 20 ng/µl in reactions (diluted 10x prior to analysis). Reaction size: 40 µl. Markers are shown on left and right side (M), lanes 2-8 is eluted DNA from beads at bead:sample ratios ranging from 0.3x – 1.8x.

Double-sided size selection was evaluated by combining lower and upper selection steps to enrich DNA fragments within defined size ranges. Different bead ratios were added to DNA samples containing 0.8 µg DNA in 40 µL according to the MAGicSPRI HMW protocol. Results are shown in Figure 3. Samples in lanes 2–3 were subjected only to lower size selection to visualize high molecular weight DNA fragments, whereas samples in lanes 4–8 underwent double-sided size selection. Bead ratios were selected according to the MAGicSPRI HMW instructions to obtain the desired fragment size distributions.

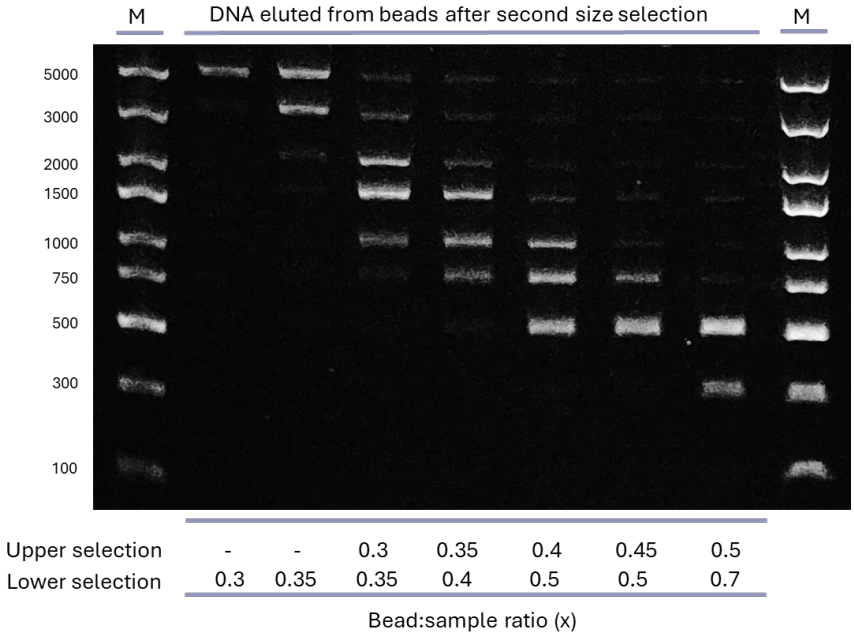


Figure 3. Size selection analyzed on E-Gel. DNA sample: 20 ng/µl in reactions (diluted 10x prior to analysis). Reaction size: 40 µl. Markers are shown on left and right side (M), lanes 2-8 is eluted DNA from beads at bead:sample ratios ranging from 0.3x – 0.7x in different combinations.

Next, pooled several 16S rRNA gene amplicon library was subjected to MAGicSPRI HMW as well as to market leading SPRI beads (as a reference) prior to sequencing.

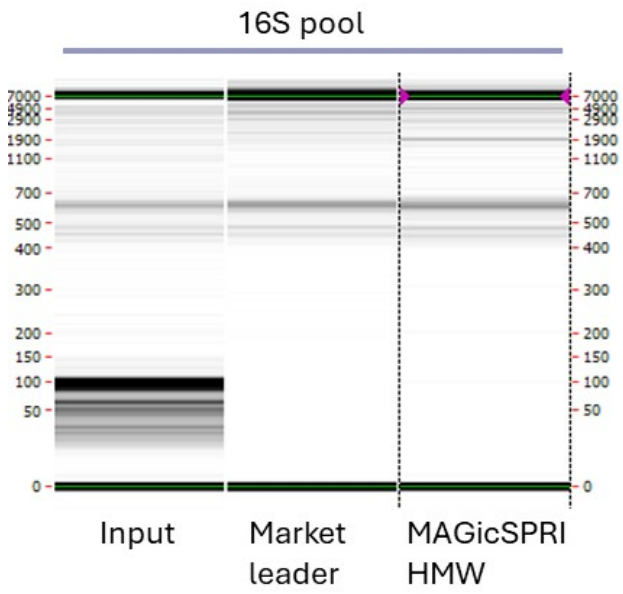


Figure 4. Size selection analyzed on LabChip GXII. Lane 1: unpurified 16S pool, lane 2: 16S pool purified with market leader and lane 3: 16S pool purified with MAGicSPRI HMW.

The 16S pooled libraries were successfully purified using MAGicSPRI HMW (see lane 3 in Figure 4). The purified 16S pools were subsequently subjected to long-read single molecule sequencing using Oxford Nanopore Technologies (ONT), where the sequencing outputs were identical between the samples.

Reproducibility

Key parameters affecting efficiency include size selection performance, robustness, and protocol speed.

To evaluate the robustness and reproducibility of MAGicSPRI HMW technology, four replicates from an RNA sequencing library pool were purified and analyzed based on selected fragment size. Each sample had a volume of 25 µL, and a bead ratio of 0.8× was applied. The reactions were performed on a liquid handling platform and subsequently analyzed using a TapeStation.

Figure 5 demonstrates the high reproducibility of the MAGicSPRI HMW method. The average size of the selected RNA fragments using a 0.8x bead ratio was 582.5 nucleotides, with minimal variation across replicates. The standard deviation was 3.5 nucleotides, corresponding to 0.6%, indicating excellent consistency in size selection.

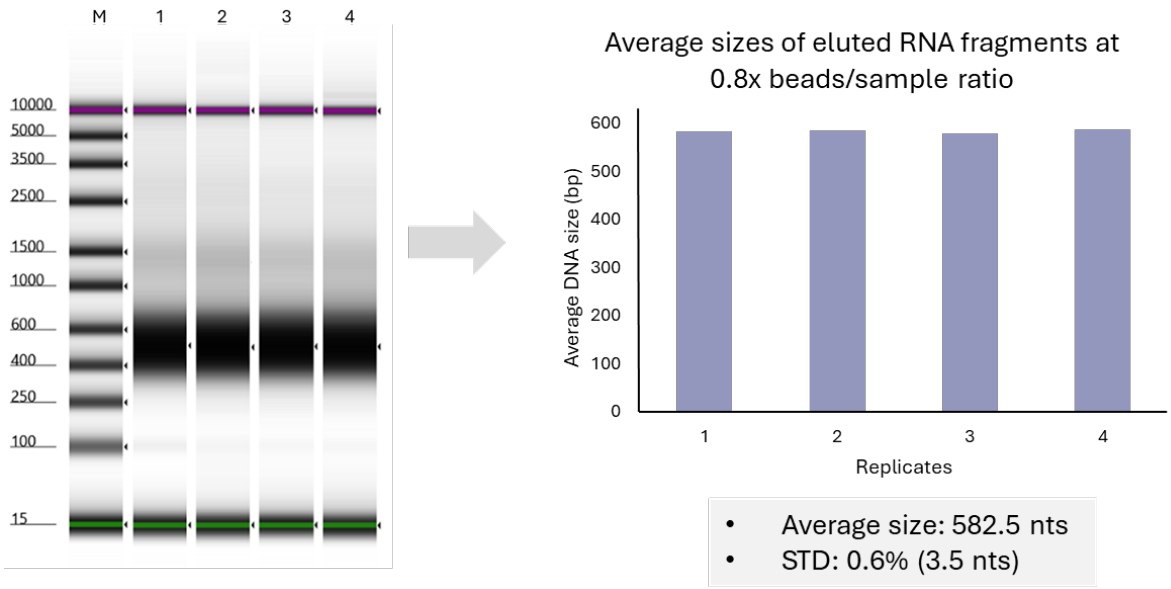


Figure 5. Evaluation of reproducibility in size selection. Four RNA pool replicates were purified using MAGicSPRI HMW at a bead ratio of 0.8x. The purified samples were analyzed using a TapeStation (left), and the resulting data were used to calculate average fragment sizes (right). The overall mean size and standard deviation (STD) are shown below the plot.

Easy handling, fast protocols

For SPRI technology the protocol speed and user-friendliness are very important. MAGicBeads are super-paramagnetic beads, where the magnetic separation occurs within seconds at small scale, due to our novel proprietary production method. These beads are surprisingly easy to resuspend without forming any difficult pellets facilitating simple handling process. The beads have been evaluated in both manual mode as well as in automatic platforms in which they do not stick to tips or other common surfaces thus speeding up protocols. In Figure 6 data from an evaluation of both the resuspension ability and the magnetic speed is shown.

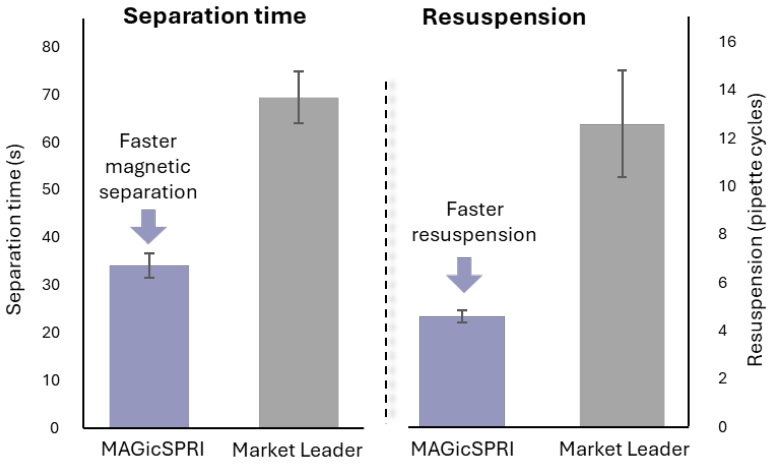


Figure 6. Separation time and resuspension. **Left**: bead separation time measured as time to complete magnetic settling. **Right**: resuspension efficiency measured as number of mixing steps required to fully resuspend beads after separation. Data are based on five replicates.

The data shown in Figure 6 are based on five replicates. The results demonstrate the rapid magnetic response of MAGicSPRI HMW beads, reflected in fast bead pelleting on magnet, as well as their efficient and consistent easy resuspension properties.

Ordering information

Products	Quantity	Product No.
MAGicSPRI HMW	5 mL beads	4105
MAGicSPRI HMW	50 mL beads	4150
MAGicSPRI HMW	500 mL beads	41500

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