applied biosystems

# MagMAX™-96 Viral RNA Isolation Kit

## USER GUIDE

**Catalog Numbers** AM1836 and AMB1836-5

**Publication Number** MAN0017826

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**For Laboratory Use Including Veterinary and Environmental Uses.**

ThermoFisher SCIENTIFIC

**Manufacturer:** Thermo Fisher Scientific Baltics UAB | V.A. Graiciuno 8, LT-02241 | Vilnius, Lithuania

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| Revision | Date | Description |
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| A.0 | 23 April 2018 | Initial release with new publication number format.<br>Supersedes publication number 1836M.<br>Updated to the current document template, with associated updates to trademarks, logos, licensing, and warranty. |

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# Contents

# 1 Product information

## Product description

The MagMAX™-96 Viral RNA Isolation Kit is designed for rapid high throughput purification of viral RNA and DNA from biofluid samples such as serum, plasma, nasal fluid, and swab samples in 96-well plates. 96 samples can be processed at one time with the MagMAX™-96 Viral RNA Isolation Kit. However, it can also be used to isolate RNA and DNA from fewer than 96 samples. For viral nucleic acid isolation from whole blood, semen or oral fluids, we recommend the MagMAX™ Pathogen RNA/DNA Kit (Cat. No. 4462359). For tissue samples, we recommend the MagMAX™-96 Total RNA Isolation Kit (Cat. No. AM1830).

The microspherical paramagnetic beads that are used in the kit have a large available binding surface and can be fully dispersed in solution, allowing efficient nucleic acid binding, washing, and elution. The procedure, therefore, delivers consistent yields of high-quality RNA and DNA with little sample-to-sample variation.

## Contents and storage

**Table 1** MagMAX™-96 Viral RNA Isolation Kit

| Contents | Cat. No. AM1836 (96 reactions) | Cat. No. AMB1836-5 (5 × 96 reactions) | Storage |
|---|---|---|---|
| Processing Plate and Lid | 1 | 5 | 15–30°C |
| Lysis/Binding Solution Concentrate[1] | 16 mL | 80 mL | 15–30°C |
| Wash Solution 1 Concentrate[2] | 36 mL | 180 mL | 15–30°C |
| Wash Solution 2 Concentrate[2] | 40 mL | 200 mL | 15–30°C |
| Elution Buffer | 9 mL | 45 mL | 15–30°C |
| RNA Binding Beads[1] | 1.1 mL | 5.5 mL | 4°C[3] |
| Carrier RNA | 125 µL | 2 × 313 µL | –20°C |
| Lysis/Binding Enhancer | 1.1 mL | 5.5 mL | –20°C |

[1] See "Before each use of the kit" on page 9 for preparation instructions.

[2] See "Before first use of the kit" on page 8 for preparation instructions.

[3] Do not freeze the RNA Binding Beads.

# Required materials not supplied

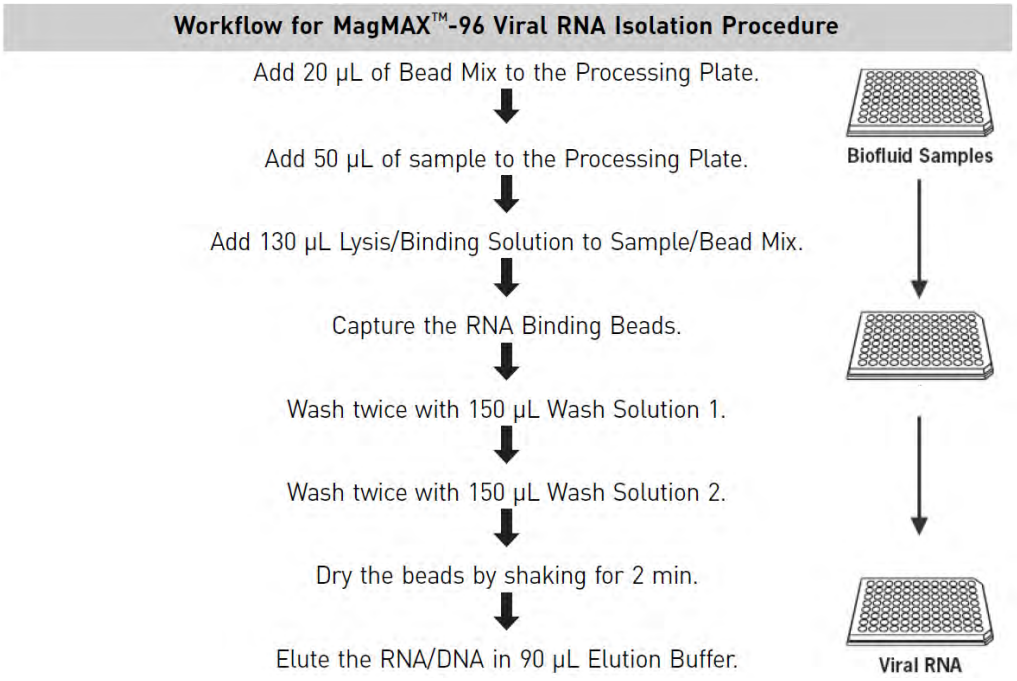
| Item | Source |
|---|---|
| **(*Optional*) Automation instruments, one of the following** | |
| MagMAX™ Express Magnetic Particle Processor | 4400074 |
| MagMAX™ Express-96 Magnetic Particle Processor | 4400077 |
| MagMAX™ Express-96 Deep Well Magnetic Particle Processor | 4400079 |
| **Equipment** | |
| Orbital shaker (96-well plates) | MLS |
| Magnetic stand, one of the following:<br>• Magnetic-Ring Stand (96 well)<br>• Magnetic Stand-96 | • AM10050<br>• AM10027 |
| **Plates, tips and accessories** | |
| Tip combs, one of the following[1]:<br>• MagMAX™ Express Tip Combs<br>• MagMAX™ Express-96 Deep Well Tip Combs | • 4388452<br>• 4388487 |
| MagMAX™ plates, one of the following[1]:<br>• MagMAX™ Express Plates<br>• MagMAX™ Express-96 Standard Plates<br>• MagMAX™ Express-96 Deep Well Plates | • 4388474<br>• 4388475<br>• 4388476 |
| 96-well U-bottom plates and lids | thermofisher.com/plastics |
| RNAse-free pipette tips | thermofisher.com/pipettetips |
| **Reagents** | |
| 100% ethanol, ACS grade or better | MLS |
| 100% isopropanol, ACS grade or better | MLS |
| RNase*Zap*™ RNase Decontamination Solution | AM9780 |

[1] For use with automated protocols.

# Overview of the procedure

The MagMAX™-96 Viral RNA Isolation Kit uses a classic method for disrupting samples in a guanidine isothiocyanate-based solution that rapidly releases viral RNA and DNA while simultaneously inactivating nucleases in the sample matrix. Paramagnetic beads with a nucleic acid binding surface are then added to the sample to bind nucleic acids. The beads/nucleic acids are captured on magnets, and proteins and other contaminants are washed away. The beads are then washed again to remove remaining binding solution. Nucleic acids are eluted in a small volume of elution buffer. Note that this procedure recovers total nucleic acids, so if cells are present in the sample, cellular DNA/RNA is recovered along with the viral RNA.

The MagMAX™-96 Viral RNA Isolation Kit can efficiently isolate viral RNA and DNA from 50 µL of sample. RNA recovery is dependant on sample type and is typically greater than 75%. The RNA recovered with the kit is of high quality and purity, and is appropriate for real-time RT-PCR.




## Manual or robotic high throughput processing

The MagMAX™-96 Viral RNA Isolation Kit is optimized both for robotic liquid handlers and for use manually with multichannel pipettors. Visit the resource page for detailed automation instructions and downloadable protocols for select robotic platforms: **www.thermofisher.com/us/en/home/life-science/dna-rna-purification-analysis/automated-purification-extraction/automated-protocols-software.html**.

# 2 Methods

## Guidelines for RNA isolation

- This kit is designed for isolation of viral RNA and DNA from cell-free, or mostly cell-free samples. Cell culture medium, swab samples, and biological fluids such as serum, plasma, urine, meconium, and nasal fluids can be used with the kit.
- The MagMAX™-96 Viral RNA Isolation Kit procedure accommodates up to 50-µL sample input, which is sufficient for most applications. Sample volumes up to 300 µL can be processed to increase the detection sensitivity of low titer samples using the MagMAX™ Pathogen RNA/DNA Kit (Cat. no. 4462359). Visit **thermofisher.com/animalhealth** for more information.
- 96 samples can be processed at one time. To process fewer samples at a time, additional polystyrene U-bottom 96-well plates and lids are needed
- Before working with RNA, clean the lab bench and pipettors with an RNase decontamination solution (e.g., RNase*Zap*™ RNase Decontamination Solution).
- Wear laboratory gloves for this procedure; they protect you from the reagents, and they protect the RNA from nucleases that are present on skin.
- Use RNase-free pipette tips to handle the kit reagents, and avoid putting used tips into the reagent containers.

## Before you begin

### Determine the maximum plate shaker setting

Using approximately 210 µL of water per well, determine the maximum shaking speed that can be used with your orbital shaker without spilling sample. Use this speed for all of the shaking incubations in the protocol.

### Before first use of the kit

1. Add the indicated volume of 100% isopropanol to Wash Solution 1 Concentrate bottle and mix well. The resulting mixture is called Wash Solution 1. Mark the label to indicate that the isopropanol was added. Store at room temperature.

| Component | Cat. No. AM1836 | Cat. No.AMB1836-5 |
|---|---|---|
| Wash Solution 1 Concentrate | (36 mL) | (180 mL) |
| 100% isopropanol | 12 mL | 60 mL |

2. Add the indicated volume of 100% ethanol to Wash Solution 2 Concentrate bottle and mix well. The resulting mixture is called Wash Solution 2. Mark the label to indicate that the ethanol was added. Store at room temperature.

| Component | Cat. No. AM1836 | Cat. No. AMB1836-5 |
|---|---|---|
| Wash Solution 2 Concentrate | (40 mL) | (200 mL) |
| 100% ethanol | 32 mL | 160 mL |

## Before each use of the kit

1. Prepare Lysis/Binding Solution for the required number of reactions, plus 10% overage, according to the following table.

   **Note:** Shipment on dry ice can cause the Carrier RNA to become gelatinous and difficult to pipet. If you experience problems when attempting to pipet the Carrier RNA, we recommend heating the tube of Carrier RNA at 37°C for 10–15 min.

   **Note:** Prepared Lysis/Binding Solution is stable at room temperature for one month, however we recommend preparing only sufficient Lysis/Binding Solution for one day.

| Component | Volume per reaction |
|---|---|
| **a. Combine the following:** | |
| Lysis/Binding Solution Concentrate | 65 µL |
| Carrier RNA (1 µg/rxn) | 1 µL |
| (*Optional*) Internal Positive Control Nucleic Acid[1] | 1 µL |
| **b. Mix briefly, then add:** | |
| 100% isopropanol | 65 µL |
| **c. Mix well by vortexing** | |

[1] If you have an internal positive control RNA to monitor viral RNA purification and detection, we recommend adding it to the Lysis/Binding Concentrate before adding the isopropanol.

   **Note:** Do not store the prepared Lysis/Binding Solution at 4°C or below. If the solution is inadvertently stored at 4°C, warm it at 37°C and shake to dissolve any precipitates before use.

2. Prepare 20 µL of Bead Mix for the required number of reactions, plus 10% overage.

   **Note:** Although prepared Bead Mix is stable at 4°C for up to two weeks, we recommend preparing Bead Mix on the day it is used.

   a. Vortex the RNA Binding Beads at moderate speed to form a uniform suspension before pipetting.

b. Combine the volumes of RNA Binding Beads and Lysis/Binding Enhancer, plus 10% overage, for the required number of isolation reactions. Mix thoroughly by gently vortexing.

| Component | Volume per reaction | Volume per plate (96 reactions + 10%) |
|---|---|---|
| RNA Binding Beads | 10 µL | 1.1 mL |
| Lysis/Binding Enhancer | 10 µL | 1.1 mL |

c. Place the prepared Bead Mix on ice.

## Isolate the RNA

This protocol is for the manual isolation of RNA. See "Isolate RNA using a MagMAX™ Express Magnetic Particle Processor" on page 15 for automated isolation protocols.

1. Vortex the Bead Mix at moderate speed to create a uniform suspension (see "Before each use of the kit" on page 9).
2. Add 20 µL Bead Mix into each well of the Processing Plate.
3. Add 50 µL of sample to the appropriate wells of the Processing Plate.

   **Note:** When adding sample, immerse pipette tips slightly in the Bead Mix to prevent creating aerosols that can lead to cross-contamination.
4. Shake the Processing Plate for 1 minute on an orbital shaker at maximum speed (see "Determine the maximum plate shaker setting" on page 8).
5. Add 130 µL Lysis/Binding Solution (see "Before each use of the kit" on page 9) to Sample/Bead Mix in the Processing Plate.
6. Shake the Processing Plate for 5 minutes on an orbital shaker at the maximal speed.

   **Note:** If you are working with viruses that are known to be difficult to lyse, extend this shaking incubation to 10 minutes to improve lysing efficiency.
7. Move the Processing Plate to a magnetic stand to capture the RNA Binding Beads. Leave the plate on the magnetic stand for at least 3 minutes. When capture is complete, the RNA Binding Beads form pellets against the magnets in the magnetic stand. The capture time depends on the magnetic stand used.

   We recommend using the Magnetic-Ring Stand (96 well) for the best consistency.
8. Carefully aspirate, then discard the supernatant without disturbing the beads. Remove the Processing Plate from the magnetic stand.

   **IMPORTANT!** To obtain pure RNA, it is important to remove completely the supernatant at this step.

9. Wash twice with 150 µL Wash Solution 1.
   a. Add 150 µL Wash Solution 1 (isopropanol added) to each sample, then shake the Processing Plate for 1 minute.
   b. Move the Processing Plate to a magnetic stand to capture the RNA Binding Beads for 1 minute, or until the mixture becomes clear, indicating that capture is complete.
   c. Carefully aspirate, then discard the supernatant without disturbing the beads. Remove the Processing Plate from the magnetic stand.

      **IMPORTANT!** It is critical to move the Processing Plate off the magnetic stand before the next wash.

   d. Repeat with a second 150 µL of Wash Solution 1.

      **IMPORTANT!** It is critical to move the Processing Plate off the magnetic stand before the next wash.

10. Wash twice with 150 µL Wash Solution 2.
   a. Add 150 µL Wash Solution 2 (ethanol added) to each sample, then shake the Processing Plate for 1 minute.
   b. Move the Processing Plate to a magnetic stand to capture the RNA Binding Beads for 1 minute.
   c. Carefully aspirate, then discard the supernatant without disturbing the beads. Remove the Processing Plate from the magnetic stand.

      **IMPORTANT!** It is critical to move the Processing Plate off the magnetic stand before the next wash.

   d. Repeat with a second 150 µL of Wash Solution 2.

      **IMPORTANT!** To obtain pure RNA, it is important to remove completely the supernatant at this step because otherwise it could inhibit downstream applications such as RT-PCR.

11. Shake the Processing Plate without a lid for 2 minutes to dry the beads. Inspect the wells and if there is remaining solution, shake the plate for another minute or two to let it evaporate.

    **IMPORTANT!** Do not shake the plate for more than 5 minutes, because it could over dry the beads and make it difficult to elute the RNA/DNA from the beads.

12. Add 90 µL Elution Buffer (room temperature or pre-warmed to 60–65°C) to each sample, then shake vigorously for 3 minutes (see "RNA Binding Beads were not fully resuspended" on page 14).

    **Note:** RNA/DNA can be eluted in 20–90 µL Elution Buffer to achieve the desired final nucleic acid concentration. The volume of Elution Buffer that is supplied with the kit is sufficient for 96 samples at 90 µL each.

13. Move the Processing Plate to a magnetic stand to capture the RNA Binding Beads for 1 minute.

    **IMPORTANT!** The purified RNA is in the supernatant.

14. Transfer the supernatant, which contains the purified RNA, to a nuclease-free container, then store at –20°C.

## Guidelines for viral RNA and DNA analysis

### Detect viral RNA by real-time RT-PCR and detect DNA by real-time PCR

This kit is designed for purification of RNA for RT-PCR amplification, and purification of DNA for qPCR. Quantitative real-time RT-PCR/PCR is a powerful method for viral RNA/DNA detection and is the recommended analysis tool. We recommend using VetMAX™-Plus One-Step RT-PCR Kit (Cat. No. 4415328) or VetMAX™-Plus Multiplex One-Step RT-PCR Kit (Cat. No. 4415330). Visit **thermofisher.com/cdna** and **thermofisher.com/qpcr** for more information.

### Quantify recovered Carrier RNA

The viral RNA recovered from most samples is present in limited amounts. Most RNA in the purified sample is the Carrier RNA that was added to the Lysis/Binding Solution. RNA recovery is heavily dependent on sample type (for example, plasma vs. swab samples). With most sample types, 35-75% of Carrier RNA is be recovered. Using the recommended volume (130 µL) of prepared Lysis/Binding Solution, each sample contains approximately 1 µg Carrier RNA. Therefore approximately 5 ng/µL RNA is recovered.

Quantify the amount of Carrier RNA by UV absorbance at 260 nm ($A_{260}$) using the NanoDrop™ 2000/2000c Spectrophotometer. Absorbance readings using the NanoDrop™ are fast and easy because 1.5 µL can be measured without dilution, and no cuvettes are needed.

Alternatively, the RNA concentration can be determined by diluting an aliquot of the preparation in TE buffer (10-mM Tris-HCl, pH 8; 1 mM EDTA) and reading the absorbance in a traditional spectrophotometer at 260 nm. Find the concentration in µg/mL by multiplying the $A_{260}$ by the dilution factor and the extinction coefficient (1 $A_{260}$= 40 µg RNA/mL):

$A_{260}$ × dilution factor × 40 = µg RNA/mL

A

# Troubleshooting

## Poor viral nucleic acid detection

Poor or no viral RNA or DNA signal observed by RT-PCR (i.e. the $C_t$ is later than expected), could result from inhibitors in the recovered nucleic acid or poor nucleic acid recovery.

### Inhibitors of RT-PCR

With most samples, the MagMAX™-96 Viral RNA Isolation Kit yields pure nucleic acid. However, with samples that contain excessively high amounts of reaction inhibitors, sufficient levels of inhibitors can be carried over to inhibit RT-PCR.

The effect of inhibitors can be limited by diluting out the inhibitors by diluting the eluted nucleic acid. Dilute the eluted nucleic acid 10-fold and repeat the RT-PCR or PCR. A signal is observed using the diluted sample, indicates the presence of inhibitors in the eluted nucleic acid. The use of an internal positive control that is included in the extraction can be used to monitor inhibition.

### Poor RNA or DNA recovery

- **Expected Carrier RNA recovery.** Using the MagMAX™-96 Viral RNA Isolation Kit, 35–75% of the input RNA is recovered (dependent on sample type). Using the recommended volume (130 µL) of prepared Lysis/Binding Solution, each sample contains approximately 1 µg Carrier RNA. Therefore 5 ng/µL RNA is recovered. See "Quantify recovered Carrier RNA" on page 12. Any cellular DNA or RNA in the prep leads to an overestimation of yield, because all nucleic acids absorb at 260 nm.
- **Good recovery of Carrier RNA, but viral RNA or DNA cannot be detected.** Carrier RNA recovered at expected levels (5 ng/µL RNA), but viral nucleic acid that cannot be detected using a proven qRT-PCR or qPCR assay system, suggests the absence of virus in the original sample, poor lysis of viral particles, or problems with the RT-PCR or PCR. Dilute your sample to minimize the effects of inhibitors. In addition, improper sample handling can also lead to poor results. Freezing and thawing samples multiple times can lead to nucleic acid degradation. If diluting the viral nucleic acid does not help, the problem is most likely due to incomplete lysis of viral particles. Increase the incubation time of the lysis/binding to 10–15 minutes.
- **Lower-than-expected Carrier RNA recovery.** Poor recovery of the Carrier RNA (0.5 ng/µL) could indicate a problem with the nucleic acid isolation process. See "Well-to-well variation in RNA/DNA yield" on page 14 for suggestions that can help with nucleic acid recovery. If these suggestions do not improve Carrier RNA recovery, the procedure can be optimized for use with different sample types. Visit **thermofisher.com/support** for technical support.

# Well-to-well variation in RNA/DNA yield

The Carrier RNA yield is expected to be uniform between wells of a 96-well plate with the same sample type. However, the efficiency of RNA/DNA recovery can differ between different matrices.

### RNA Binding Beads were not fully resuspended

RNA Binding Beads disperse more easily when the temperature of the mixture is warmer than 20°C.

- Ensure the Bead Mix is fully resuspended before adding it to the Processing Plate.
- Ensure that the RNA Binding Beads are fully resuspended in Elution Buffer to elute nucleic acids from the beads. Fully resuspended beads produce a homogeneous brown solution. If the solution is clear, with brown clumps, it means that the beads are not fully resuspended. Preheating the Elution Buffer to 60–65°C just before use facilitates resuspension of the beads. It may also be necessary to pipet the samples up and down to break up the beads.
- Avoid over drying the RNA Binding Beads before eluting the RNA/DNA because it can make the beads more difficult to resuspend. If the beads are inadvertently over dried, increase the mixing time to 10 minutes during the elution step to allow the beads to rehydrate.

### RNA binding beads were unintentionally lost

Because the principle of this procedure is to immobilize nucleic acids on the RNA Binding Beads, any loss of beads during the procedure results in loss of RNA/DNA. Avoid aspirating the RNA Binding Beads when removing supernatant from the captured beads.

To prevent aspiration of RNA Binding Beads in subsequent experiments, observe the following precautions:

- Use sufficient magnetic capture time.
- Aspirate supernatant slowly.
- Keep pipette tip openings away from the captured RNA Binding Beads when aspirating supernatant.

# RNA binding bead carryover

If RNA Binding Beads are carried over into the eluate, they cause the solution to be light brown in color. A small quantity of beads in the sample does not inhibit RT reactions or RT-PCR.

- See “"RNA binding beads were unintentionally lost“ on page 14” for suggestions for avoiding bead carryover.
- To remove RNA Binding Beads from RNA samples, place the Processing Plate on a magnetic stand to capture the beads for 1 minute. Transfer the nucleic acid solution to a fresh nuclease-free plate or tubes.

B

# Supplemental information

## Isolate RNA using a MagMAX™ Express Magnetic Particle Processor

The MagMAX™-96 Viral RNA Isolation Kit procedure can be adapted for use with Applied Biosystems™ MagMAX™ Express-96 Magnetic Particle Processor (for 1–96 samples per run) Standard, MagMAX™ Express-96 Deep Well Magnetic Particle Processor and the MagMAX™ Express Magnetic Particle Processor (for 1–24 samples per run).

Download instrument protocols at **www.thermofisher.com/us/en/home/life-science/dna-rna-purification-analysis/automated-purification-extraction/automated-protocols-software.html**.

### Isolate RNA using the MagMAX™ Express-96 instrument with a Deep Well Magnetic Head

General guidelines for purification using the MagMAX™ Express-96 instrument equipped with a Deep Well Magnetic Head:

- Prepare the plates in the order outlined below.
- **Use a Deep Well plate for the sample plate to prevent sample cross-contamination.**
- It is critical to prepare the sample plate **last** to minimize the time that sample, Bead Mix, and Lysis/Binding Solution are unmixed.
- Immediately load the sample plate onto the instrument for purification to ensure best results.

1. Select the **AM1836_DW_50v3** protocol on the instrument.
2. Add the reagents to the appropriate plates (see Table 2).
   a. Load 150 µl/well Wash Solution 1 into two standard well plates.
   b. Load 150 µl/well Wash Solution 2 into two standard well plates.
   c. Load 90 µl/well of Elution Buffer into one standard well plate.

d. Load reagents/sample into the appropriate well sample plate with the following volumes and order:

   1. 20 µL/well Bead Mix
   2. 50 µL/well sample
   3. 130 µL/well Lysis/Binding Solution

**Table 2** Instrument setup

| Plate position | | Reagent addition order | Plate type | Volume per well |
|---|---|---|---|---|
| 1 | Sample plate | NA binding bead mix | Sample plate (deep well plate) | 20 µL |
| | | Sample | | 50 µL |
| | | Lysis/Binding Solution | | 130 µL |
| 2 | 1st Wash 1 | Wash Solution 1 | Standard plate | 150 µL |
| 3 | 2nd Wash 1 | Wash Solution 1 | Standard plate | 150 µL |
| 4 | 1st Wash 2 | Wash Solution 2 | Standard plate | 150 µL |
| 5 | 2nd Wash 2 | Wash Solution 2 | Standard plate | 150 µL |
| 6 | Elution | Elution Buffer | Standard plate | 90 µL |
| 7 | Tip Comb Plate | Tip Comb (standard or deep well) in standard plate | | |

3. Load all plates onto the intrument in the appropriate position (see Table 2), then start the protocol.

## Isolate RNA using the MagMAX™ Express Magnetic Particle Processor (24 well)

Download instrument protocols at **www.thermofisher.com/us/en/home/life-science/dna-rna-purification-analysis/automated-purification-extraction/automated-protocols-software.html**

1. Select the **AM1836v2** protocol.
2. Insert tip combs into instrument head.
3. Add the reagents to the appropriate wells of the MagMAX™ Express plate (see Table 3).
   a. Load 150 µL/well Wash Solution 1 into Rows B and C of MagMAX™ Express plate .
   b. Load 150 µL/well Wash Solution 2 into Rows D and E of MagMAX™ Express plate.
   c. Load 90 µL/well of Elution Buffer to Row F of MagMAX™ Express plate.

**d.** Load in the following order into Row A:

1. 20 µL/well NA binding bead mix
2. 50 µL/well sample
3. 130 µL/well Lysis/Binding Solution

**Table 3** MagMAX™ Express Magnetic Particle Processor setup

| Row position | | Reagent addition order | Volume per well |
|---|---|---|---|
| A | Sample wells | NA binding bead mix | 20 µL |
| | | Sample | 50 µL |
| | | Lysis/Binding Solution | 130 µL |
| B | 1st Wash 1 | Wash Solution 1 | 150 µL |
| C | 2nd Wash 1 | Wash Solution 1 | 150 µL |
| D | 1st Wash 2 | Wash Solution 2 | 150 µL |
| E | 2nd Wash 2 | Wash Solution 2 | 150 µL |
| F | Elution | Elution Buffer | 90 µL |

**4.** Load sample plate onto the instrument, then start the protocol.

C

# Safety

**WARNING! GENERAL SAFETY.** Using this product in a manner not specified in the user documentation may result in personal injury or damage to the instrument or device. Ensure that anyone using this product has received instructions in general safety practices for laboratories and the safety information provided in this document.

- Before using an instrument or device, read and understand the safety information provided in the user documentation provided by the manufacturer of the instrument or device.
- Before handling chemicals, read and understand all applicable Safety Data Sheets (SDSs) and use appropriate personal protective equipment (gloves, gowns, eye protection, etc). To obtain SDSs, see the "Documentation and Support" section in this document.

# Chemical safety

**WARNING! GENERAL CHEMICAL HANDLING.** To minimize hazards, ensure laboratory personnel read and practice the general safety guidelines for chemical usage, storage, and waste provided below. Consult the relevant SDS for specific precautions and instructions:

- Read and understand the Safety Data Sheets (SDSs) provided by the chemical manufacturer before you store, handle, or work with any chemicals or hazardous materials. To obtain SDSs, see the "Documentation and Support" section in this document.
- Minimize contact with chemicals. Wear appropriate personal protective equipment when handling chemicals (for example, safety glasses, gloves, or protective clothing).
- Minimize the inhalation of chemicals. Do not leave chemical containers open. Use only with adequate ventilation (for example, fume hood).
- Check regularly for chemical leaks or spills. If a leak or spill occurs, follow the manufacturer's cleanup procedures as recommended in the SDS.
- Handle chemical wastes in a fume hood.
- Ensure use of primary and secondary waste containers. (A primary waste container holds the immediate waste. A secondary container contains spills or leaks from the primary container. Both containers must be compatible with the waste material and meet federal, state, and local requirements for container storage.)
- After emptying a waste container, seal it with the cap provided.
- Characterize (by analysis if necessary) the waste generated by the particular applications, reagents, and substrates used in your laboratory.
- Ensure that the waste is stored, transferred, transported, and disposed of according to all local, state/provincial, and/or national regulations.
- **IMPORTANT!** Radioactive or biohazardous materials may require special handling, and disposal limitations may apply.

# Biological hazard safety

**WARNING! BIOHAZARD.** Biological samples such as tissues, body fluids, infectious agents, and blood of humans and other animals have the potential to transmit infectious diseases. Conduct all work in properly equipped facilities with the appropriate safety equipment (for example, physical containment devices). Safety equipment can also include items for personal protection, such as gloves, coats, gowns, shoe covers, boots, respirators, face shields, safety glasses, or goggles. Individuals should be trained according to applicable regulatory and company/ institution requirements before working with potentially biohazardous materials. Follow all applicable local, state/provincial, and/or national regulations. The following references provide general guidelines when handling biological samples in laboratory environment.

- U.S. Department of Health and Human Services, *Biosafety in Microbiological and Biomedical Laboratories (BMBL)*, 5th Edition, HHS Publication No. (CDC) 21-1112, Revised December 2009; found at:
  **www.cdc.gov/biosafety/publications/bmbl5/BMBL.pdf**
- World Health Organization, *Laboratory Biosafety Manual*, 3rd Edition, WHO/CDS/CSR/LYO/2004.11; found at:
  **www.who.int/csr/resources/publications/biosafety/Biosafety7.pdf**

# Documentation and support

## Customer and technical support

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- Worldwide contact telephone numbers
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  - Software, patches, and updates
  - Training for many applications and instruments
- Order and web support
- Product documentation, including:
  - User guides, manuals, and protocols
  - Certificates of Analysis
  - Safety Data Sheets (SDSs; also known as MSDSs)

    **Note:** For SDSs for reagents and chemicals from other manufacturers, contact the manufacturer.

## Limited product warranty

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