

MagXtract® 3200 Application Showcase: Automated viral RNA extraction and PCR setup using Omega Bio-tek Mag-Bind® Universal Pathogen 96 Kit

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Introduction

In response to the COVID-19 pandemic, the demands for nucleic acid purification and laboratory automation have increased dramatically. The Mag-Bind® Universal Pathogen 96 Kit (M4029) was developed by Omega Bio-tek to provide an automated solution for the purification of viral nucleic acids with pathogenic DNA from a range of samples. In this application note, we provide the automated workflow for viral RNA extraction and PCR set up for detection of SARS-CoV-2 RNA using the Mag-Bind Universal Pathogen 96 Kit on Chroma ATE's MagXtract 3200. The product specifications of Chroma ATE's MagXtract 3200 system are described in Table 1 below. The application note also discusses the performance of this automated workflow in terms of sensitivity of viral detection using real-time RT-PCR.

Table 1. Product specifications of Chroma ATE's MagXtract 3200 system

Description	Automated nucleic acid extraction and PCR setup system
Capacity	Max. 32, 16-samples per run
Weight	70 kg (± 5 kg)
Dimensions	721 mm x 530 mm x 567 mm (W x D x H)

Materials and Methods

Inactivated SARS-CoV-2 from Amplirun® Total SARS-CoV-2 Control (Swab) (Vircell Microbiologists) was used as the source for viral RNA extraction. 20-fold and 40-fold serial dilutions of inactivated SARS-CoV-2 was purified using the Mag-Bind Universal Pathogen 96 Kit, following the manufacturer recommended procedure on the MagXtract 3200 instrument. Briefly, 250 µL of the serial dilutions of the viral samples were thoroughly mixed with 275 µL SLX-Mlus Buffer. The initial lysis and homogenization steps were performed manually, offline. The remaining steps in the Kit's protocol: bind, wash, dry, and elute, in addition to the qRT-PCR setup, were fully automated on the MagXtract 3200. The liquid handler performs all bead collection, transfer, and dispense operations as necessary. The layout of the extraction workflow in a 96-well deep-well plate is as described in Figure 1.

Extracted viral RNA was analyzed using a qRT-PCR kit from Vircell microbiologists on the LightCycler® 96 from Roche.

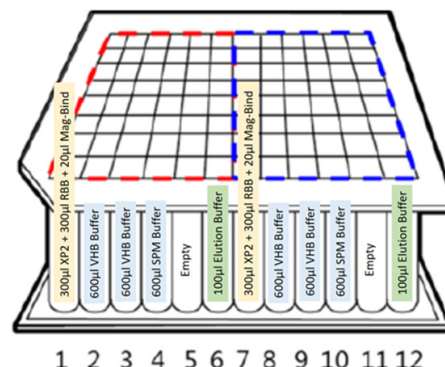


Figure 1. Extraction layout of the buffers in a 96-well deep-well plate on MagXtract 3200 platform.

MagXtract 3200 Open System and Automation Solution

The MagXtract 3200 allows the authorized user to edit its protocols, including nucleic acid extraction and PCR preparation. The MagXtract 3200 is highly flexible and can easily fit into the workflows of most magnetic bead-based extraction kits and PCR reagent kits.

Open System

Following manufacturer's protocols, the automated steps on MagXtract 3200 can be optimized to achieve excellent performance.

Automation Solution

Automation of the magnetic bead-based system reduces the number of manual steps required for extraction and PCR preparation.

GUI

The MagXtract 3200 has three operating modes: full run, preparation, and extraction.

MagXtract 3200 software provides protocol-based control to streamline workflows. The stepwise GUI and touchscreen control guide the user through the completion of the assay setup, from sample loading to the consumable placement.

Results and Discussion

The sensitivity of the Mag-Bind Universal Pathogen 96 Kit was evaluated with a qRT-PCR reaction. Figure 2 shows the amplification curves of the extracted viral RNA as detected using a qPCR kit from Vircell on the LightCycler 96 from Roche. According to the manufacturer specifications, Amplirun total SARS-CoV-2 Control (Swab) at 20-fold dilution is equivalent to 1500 copies/mL (9.36 copies/qPCR vial) and at 40-fold dilution, it is equivalent to 750 copies/mL (4.68 copies/qPCR vial). The amplification curves at 20-fold and 40-fold dilutions of viral RNA

are illustrated in Figure 2. The discernible exponential region at even 40-fold dilution suggests high sensitivity of SARS-CoV-2 detection using Mag-Bind Universal Pathogen 96 Kit (M4029) at viral loads as low as 4.68 copies/qPCR vial.

High Sensitivity of Viral RNA Detection at Low Viral Loads

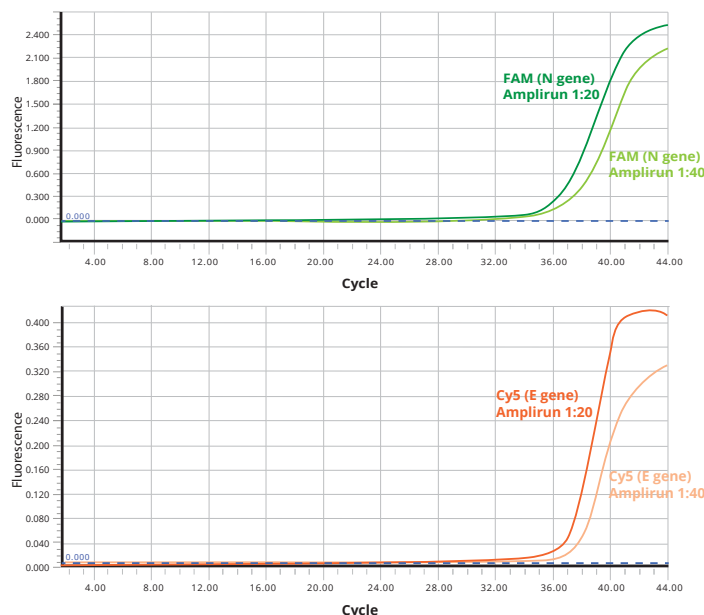


Figure 2. Amplification curves of 20-fold and 40-fold dilutions of inactivated SARS-CoV-2 virus extracted using Omega Bio-tek's Mag-Bind Universal Pathogen 96 Kit on the MagXtract 3200.

Conclusions

Omega Bio-tek's Mag-Bind Universal Pathogen 96 Kit in conjunction with Chroma ATE's MagXtract 3200 for viral RNA extraction presents a solution to the increasing demand for timely high throughput viral RNA purifications by streamlining the workflow for extraction and qPCR setup. The Mag-Bind Universal Pathogen 96 Kit has been shown to yield viral RNA which can be detected even at a low viral load, making it useful for detecting viruses such as SARS-CoV-2 via RT-PCR. This workflow can potentially save 80% of the hands-on time and provide researchers and scientists to conduct clinical work in a safe, accurate, and efficient manner.

Product	Description
Omega Bio-tek Mag-Bind® Universal Pathogen 96 Kit	M4029-00, 1 x 96 preps M4029-01, 4 x 96 preps
MagXtract 3200 (CE-IVD)	9-49200002
Spin tip in box	A94-000135
Filtered tip (50 µL)	A94-000130
Filtered tip (1000 µL)	A94-000131
96 deep-well plate	Please Contact Chroma ATE
Customized Accessories	
Sample Drawer	13 x 75 mm / 16 x 100 mm
Elute and Storage Deck	Modification available

Product Information



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