

Technical Data Sheet:

Quantitative Synthetic Influenza A Virus (H3N2) RNA

ATCC® Number	VR-3387SD™
Product Description	Quantitative Synthetic Influenza A virus (H3N2) RNA is a synthetically derived preparation that can be used for assay development, verification, and validation as well as monitoring of day-to-day test variation and lot-to-lot performance of molecular-based assays. The quantitative format allows for the generation of a standard curve for quantitative PCR (qPCR) to determine viral load.
Genetic Target	The synthetic RNA preparation includes two constructs. One construct includes the full genes for the HA and NP regions. The other construct includes the full genes for the NA, M1/M2, and NEP/NS1 regions. This product is based on the A/Hiroshima/52/2005 (H3N2) influenza virus sequence with few modifications to accommodate manufacturing and product compatibility with diagnostically relevant assays.

Publication	Assay Target	Oligo	Sequence (5' to 3')	Number of mismatches with ATCC® VR-3387SD™ based on <i>in silico</i> analysis
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	HA	Forward	CTATTGGACAATAGTAAAACCGGGRGA	0
		Reverse	GTCATTGGGRATGCTTCCATTGG	0
		Probe	AAGTAACCCCKAGGAGCAATTAG	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	HA	Forward	ACCCTCAGTGTGATGGCTTTCAA	0
		Reverse	TAAGGGAGGCATAATCCGGCACAT	0
		Probe	ACGAAGCAAAGCCTACAGCAACTGTT	0

World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	HA	Forward	GCACAGGGAATCTAATTGCTCC	0
		Reverse	ATGCTTCCATTTGGAGTGATGCATTC	0
		Probe	GATCAGATGCACCCATTGGCAAATGC	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	HA	Forward	ATGGTTGGGAGGGAATG	0
		Reverse	TGCTGCTTGAGTGCTT	0
		Probe	CTGCTGCTTGTCCTCTTCCCT	0
Hoffmann B, et al. Riems influenza a typing array (RITA): An RT-qPCR-based low density array for subtyping avian and mammalian influenza a viruses. Sci Rep 6: 27211, 2016. PubMed: 27256976	HA	Forward	CTCCTCGGGGTTAYTTYAAAAT	0
		Reverse	CCATTTGGAGTGATRCATTGAGA	0
		Probe	TGCATCTGAYCTCATTATTGAGCTTTTCCC	0
Hoffmann B, et al. Riems influenza a typing array (RITA): An RT-qPCR-based low density array for subtyping avian and mammalian influenza a viruses. Sci Rep 6: 27211, 2016. PubMed: 27256976	HA	Forward	TGGATTTCTTTGCCATATCATG	0
		Reverse	ATRCACCTCAAATGCAAATGTTGCA	0
		Probe	CTAATGTTGCCTYTYTGGCAGGCCACAT	0
Goecke NB, et al. Subtyping of Swine Influenza Viruses Using a High-Throughput Real-Time PCR Platform. Front Cell Infect Microbiol 8: 165, 2018. PubMed: 29872645	HA	Forward	TGATGGAGAAACTGCACACTA	0
		Reverse	CGTTCAACAAAAAGGTCCCATTTTC	0
		Probe	CACACTGAGGGTCTCCCAATAGAGCATCTA	0
Haach V, et al. One-step multiplex RT-qPCR for the detection and subtyping of influenza A virus in swine in Brazil. J Virol Methods 269: 43-48, 2019. PubMed: 30959063	HA	Forward	GTTGGTAYGGTTTCAGGCATC	0
		Reverse	TCCCAYTGATTTGGTCRATTG	0
		Probe	CAAGCWGCAGAYCTTAAAAGYACTCAAGCA	0
Hassan KE, et al. Improved Subtyping of Avian Influenza Viruses Using an RT-qPCR-Based Low Density Array: 'Riems Influenza a Typing Array', Version 2 (RITA-2). Viruses 14(2): 415, 2022. PubMed: 35216008	HA	Forward 1	CCTCGRGGCTAYTTCAARAT	1
		Forward 2	AGACTGGATCYTRTGGATTTTC	0
		Reverse 1	ATTTGGRGTGATRCATTGAGA	0
		Reverse 2	CTCAAATGCAAATGKTGCAYC	0
		Probe 1	TGCATCTGAYCTCATTATYGARCTTTT	0
		Probe 2	ACRCAAAGCAAAAAGCATGATATGGC	1
Leong NKC, et al. A six-plex droplet digital RT-PCR assay for seasonal influenza virus typing, subtyping, and lineage determination. Influenza Other Respir Viruses 14(6): 720-729, 2020. PubMed: 32519796	HA	Forward	GCGCAATMGCGGGTTTCATAG	0
		Reverse	CCTCTYCCCTCAGAATTTTGATGCCTG	0
		Probe	TTGGGAGGGAATGGTGGATGGTTGGTACGG	0

Suwannakarn K, et al. Typing (A/B) and subtyping (H1/H3/H5) of influenza A viruses by multiplex real-time RT-PCR assays. J Virol Methods 152(1-2): 25-31, 2008. PubMed: 18598722	HA	Forward	TGCTACTGAGCTGGTTCAGAGT	0
		Reverse	AGGGTAACAGTTGCTGTRGGC	0
		Probe	AGAT+GC+TC+TA+TT+GG+GAGACC	0
Centers for Disease Control and Prevention (U.S.); National Center for Immunization and Respiratory Diseases (U.S.). Influenza Division. Virology Surveillance and Diagnosis Branch. Genomics and Diagnostics Team. Research Use Only CDC Influenza SARS-CoV-2 (Flu SC2) Multiplex Assay Real-Time RT-PCR Primers and Probes. Publish date: July 14, 2020.	M	Forward 1	CAAGACCAATCYTGTCACCTCTGAC	0
		Forward 2	CAAGACCAATYCTGTACCTYTGAC	0
		Reverse 1	GCATTYTGGACAAVCGTCTACG	0
		Reverse 2	GCATTTTGGATAAAGCGTCTACG	1
		Probe	TGCAGTCCTCGCTCACTGGGCACG	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	M	Forward	GACCRATCCTGTCACCTCTGAC	0
		Reverse	AGGGCATTYTGGACAAKCGTCTA	0
		Probe	TGCAGTCCTCGCTCACTGGGCACG	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	M	Forward	ATGAGYCTTYTAACCGAGGTCGAAACG	0
		Reverse	TGGACAAANCCTCTACGCTGCAG	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	M	Forward	AGCAAAAGCAGGTAGATATTGAAAGA	0
		Reverse	AGTAGAAACAAGGTAGTTTTTACTC	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	M	Forward	CTTCTAACCGAGGTCGAAACGTA	0
		Reverse	GGTGACAGGATTGGTCTTGTCTTTA	0
		Probe	TCAGGCCCCCTCAAAGCCGAG	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	M	Forward	CCMAGGTCGAAACGTAYGTTCTCTCTATC	1
		Reverse	TGACAGRATYGGTCTTGTCTTTAGCCAYTCCA	0
		Probe	ATYTCGGCTTTGAGGGGGCCTG	0
Spackman E, et al. Development of a Real-Time Reverse Transcriptase PCR Assay for Type A Influenza Virus and the Avian H5 and H7 Hemagglutinin Subtypes. J Clin Microbiol 40(9): 3256-3260, 2022. PubMed: 12202562	M	Forward	AGATGAGTCTTCTAACCGAGGTCTG	0
		Reverse	TGCAAAAACATCTTCAAGTCTCTG	1
		Probe	TCAGGCCCCCTCAAAGCCGA	0
Hoffmann B, et al. Riems influenza a typing array (RITA): An RT-qPCR-based low density array for subtyping avian and mammalian influenza a viruses. Sci Rep 6: 27211, 2016. PubMed: 27256976	M	Forward	AGATGAGTCTTCTAACCGAGGTCTG	0
		Reverse	TGCAAAAACATCTTCAAGTYTCTG	1
		Probe	TCAGGCCCCCTCAAAGCCGA	0

Laconi A, et al. Detection of avian influenza virus: a comparative study of the in silico and in vitro performances of current RT-qPCR assays. Sci Rep 10(1): 8441, 2020. PubMed: 32439885	M	Forward	AGATGAGTCTTCTAACCGAGGTCG	0
		Reverse	TGCAAAACATCTTCAAGTYTCTG	0
		Probe	TCAGGCCCCCTCAAAGCCGA	0
Laconi A, et al. Detection of avian influenza virus: a comparative study of the in silico and in vitro performances of current RT-qPCR assays. Sci Rep 10(1): 8441, 2020. PubMed: 32439885	M	Forward	AGATGAGYCTTCTAACCGAGGTCG	0
		Reverse	TGCAANACATCYTCAAGTCTCTG	0
		Probe	TCAGGCCCCCTCAAAGCCGA	0
Laconi A, et al. Detection of avian influenza virus: a comparative study of the in silico and in vitro performances of current RT-qPCR assays. Sci Rep 10(1): 8441, 2020. PubMed: 32439885	M	Forward	GGCCCCCTCAAAGCCGA	0
		Reverse	CGTCTACGYTGAGTCC	0
		Probe	GTGCCCAG	0
Liu J, et al. Development and application of a triplex real-time PCR assay for the simultaneous detection of avian influenza virus subtype H5, H7 and H9. J Virol Methods 252: 49-56, 2018. PubMed: 29129489	M	Forward	GACCAATCCTGTACCTCTGAC	0
		Reverse	GGGCATTTTGGACAAAGCGTCTACG	0
Nagy A, et al. A universal RT-qPCR assay for "One Health" detection of influenza A viruses. PLoS One 16(1): e0244669, 2021. PubMed: 33471840	M	Forward	GGCCCCCTCAAAGCCGA	0
		Reverse	CGTCTACGYTGAGTCC	0
		Probe	TCACTKGGCACGGTGAGCGT	0
Goecke NB, et al. Subtyping of Swine Influenza Viruses Using a High-Throughput Real-Time PCR Platform. Front Cell Infect Microbiol 8: 165, 2018. PubMed: 29872645	M	Forward	CTTCTAACCGAGGTCGAAACGTA	0
		Reverse	CACTGGGCACGGTGAGC	0
		Probe	TCAGGCCCCCTCAAAGCCGA	0
Hassan KE, et al. Improved Subtyping of Avian Influenza Viruses Using an RT-qPCR-Based Low Density Array: 'Riems Influenza a Typing Array', Version 2 (RITA-2). Viruses 14(2): 415, 2022. PubMed: 35216008	M	Forward	AGATGAGYCTTCTAACCGAGGTCG	0
		Reverse 1	TGCAAAAACATCTTCAAGTYTCTG	1
		Reverse 2	TGCAAAIACATCYTCAAGTYTCTG	0
		Probe	TCAGGCCCCCTCAAAGCCGA	0
Leong NKC, et al. A six-plex droplet digital RT-PCR assay for seasonal influenza virus typing, subtyping, and lineage determination. Influenza Other Respir Viruses 14(6): 720-729, 2020. PubMed: 32519796	M	Forward	CTTCTAACCGAGGTCGAAACGTA	0
		Reverse	AGGGCATTYTGACAAKCGTCTA	0
		Probe	TCAGGCCCCCTCAAAGCCGAG	0
Suwannakarn K, et al. Typing (A/B) and subtyping (H1/H3/H5) of influenza A viruses by multiplex real-time RT-PCR assays. J Virol Methods 152(1-2): 25-31, 2008. PubMed: 18598722	M	Forward	CATGGARTGGCTAAAGACAAGACC	0
		Reverse	AGGGCATTTTGGACAAKCGTCTA	0
		Probe	ACGC+TCACCG+TGCCC+AGT	0

Van Elden LJ, et al. Simultaneous detection of influenza viruses A and B using real-time quantitative PCR. J Clin Microbiol 39(1): 196-200, 2001. PubMed: 11136770	M	Forward	GGACTGCAGCGTAGACGCTT	0
		Reverse 1	CATCCTGTTGTATATGAGGCCCAT	0
		Reverse 2	CATTCTGTTGTATATGAGGCCCAT	1
		Probe	CTCAGTTATTCTGCTGGTGCACCTTGCCA	0
Ward CL, et al. Design and performance testing of quantitative real time PCR assays for influenza A and B viral load measurement. J Clin Virol 29(3): 179-188, 2004. PubMed: 14962787	M	Forward	AAGACCAATCCTGTCACCTCTGA	0
		Reverse	CAAAGCGTCTACGCTGCAGTCC	0
		Probe	TTTGTGTTTCACGCTCACCGT	0
World Health Organization. WHO information for the molecular detection of influenza viruses. Publish date: February 2021.	NA	Forward	GTCCAACCCTAAGTCCAA	0
		Reverse	GCCACAAAACACAACAATAC	0
		Probe	CTTCCCCTTATCAACTCCACA	0
Hoffmann B, et al. Riems influenza a typing array (RITA): An RT-qPCR-based low density array for subtyping avian and mammalian influenza a viruses. Sci Rep 6: 27211, 2016. PubMed: 27256976	NA	Forward	AGTCTGGTGGACYTCAAAYAG	0
		Reverse	AATTGCGAAAGCTTATATAGVCAT	0
		Probe	CCATCAGGCCATGAGCCT	0
Goecke NB, et al. Subtyping of Swine Influenza Viruses Using a High-Throughput Real-Time PCR Platform. Front Cell Infect Microbiol 8: 165, 2018. PubMed: 29872645	NA	Forward	AGTCTGGTGGACYTCAAAYAG	0
		Reverse	TTGCGAAAGCTTATATAGVCATGA	0
		Probe	CCATCAGGCCATGAGCCTGWWCCATA	0
Hassan KE, et al. Improved Subtyping of Avian Influenza Viruses Using an RT-qPCR-Based Low Density Array: 'Riems Influenza a Typing Array', Version 2 (RITA-2). Viruses 14(2): 415, 2022. PubMed: 35216008	NA	Forward	AGTCTGGTGGACYTCAAAYAG	0
		Reverse	TTGCGAAAGCTTAYATNGVCAT	0
		Probe	CATCAGGCCATGAGCCTGTGCCAT	0

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