

Twist Synthetic Infectious Disease Controls

Positive controls provide quality control measures for a wide range of applications from diagnostic assay development to day-to-day testing including the verification and validation of diagnostic tests of both next-generation sequencing (NGS) and reverse transcription polymerase chain reaction (RT-PCR) assays. Synthetic viral controls are a powerful alternative to “live virus” controls which are viral nucleic acids extracted from either an infected patient or from live virus propagated in cell culture. Synthetic controls created through gene synthesis broaden access across diverse strains while mitigating safety and security concerns.

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Twist Synthetic SARS-CoV-2 RNA Controls

The Twist Synthetic SARS-CoV-2 RNA controls consist of six non-overlapping 5 kb fragments generated from Twist Gene Fragments then transcribed into ssRNA. These provide coverage of greater than 99.9% of the bases of the viral genome.

All Standard Twist Synthetic SARS-CoV-2 RNA Controls are Biosafety Level 1. They are supplied frozen as 100 µL with a specification range of approximately 1x10⁶ copies/µL and should be stored at -70°C to -90°C.

| PART NUMBER | CONTROL | VOI/VOC | GENBANK/GISAID ID | GISAID NAME |
|-------------|------------------------|---------|-------------------|------------------------------------|
| 102019 | Control 1 | | MT007544.1 | Australia/VIC01/2020 |
| 102024 | Control 2* | | MN908947.3 | Wuhan-Hu-1 |
| 102860 | Control 3 | | LC528232.1 | Japan/Hu_DP_Kng_19-020/2020 |
| 102862 | Control 4 | | MT106054.1 | USA/TX1/2020 |
| 102917 | Control 5 | | MT188340 | USA/MN2-MDH2/2020 |
| 102918 | Control 6 | | MT118835 | USA/CA9/2020 |
| 102916 | Controls 1 – 6 | | N/A | N/A |
| 103087 | Control 7 | | EPI_ISL_418227 | France/HF2393/2020 |
| 103086 | Controls 1 – 7 | | N/A | N/A |
| 103511 | Control 8 | | MT066176 | Taiwan/NTU02/2020 |
| 103512 | Control 9 | | MT152824 | USA/WA2/2020 |
| 103513 | Control 10 | | EPI_ISL_414648 | USA/CA-PC101P/2020 |
| 103514 | Control 11 | | EPI_ISL_417739 | Iceland/5/2020 |
| 103515 | Control 12 | | EPI_ISL_420244 | England/SHEF-C05B2/2020 |
| 103533 | Control 13 | | EPI_ISL_421184 | Belgium/ULG-10004/2020 |
| 103907 | Control 14* (B.1.1.7) | Alpha | EPI_ISL_710528 | England/205041766/2020 |
| 103909 | Control 15* (B.1.1.7) | Alpha | EPI_ISL_601443 | England/MILK-9E05B3/2020 |
| 104043 | Control 16 (B.1.351) | Beta | EPI_ISL_678597 | South Africa/KRISP-EC-K005299/2020 |
| 104044 | Control 17 (P.1) | Gamma | EPI_ISL_792683 | Japan (Brazil)/IC-0564/2021 |
| 104338 | Control 18 (B.1.617.1) | Kappa | EPI_ISL_1662307 | India/CT-ILSGS00361/2021 |
| 104529 | Control 19 (B.1.526) | Iota | EPI_ISL_1300881 | USA/NY-MSHSPSP-PV24650/2020 |

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|--------|--------------------------------|----------------|--------------------|-----------------------------------|
| 104530 | Control 20 (B.1.427) | | EPI_ISL_730092 | USA/CA-ALSR-4704/2020 |
| 104531 | Control 21 (B.1.1.429) | Epsilon | EPI_ISL_672365 | USA/CA-CZB-12943/2020 |
| 104532 | Control 22 (B.1.1.519) | | EPI_ISL_933685 | Mexico/CMX-InDRE_208/2021 |
| 104533 | Control 23 (B.1.617.2) | Delta | EPI_ISL_1544014 | India/MH-NCCS-P1162000182735/2021 |
| 104534 | Control 24 (B.1.617.3) | | EPI_ISL_1939891 | India/MH-SEQ-221_S66_R1_001/2021 |
| 104538 | Control 28 (AY.1) | Delta | EPI_ISL_2695467 | Portugal/PT9543/2021 |
| 104539 | Control 29 (AY.2) | Delta | EPI_ISL_2693246 | USA/WA-CDC-UW21061750277/2021 |
| 105204 | Control 48 (B.1.1.529/BA.1) | Omicron | EPI_ISL_6841980 | Hong Kong/HKU-211129-001/2021 |
| 105345 | Control 50 (B.1.1.529/BA.2) | Omicron | EPI_ISL_7190366 | Australia/QLD2568/2021 |
| 105346 | Control 51 (B.1.1.529/BA.2) | Omicron | EPI_ISL_7718520 | England/MILK-2DF642C/2021 |
| 105865 | Control 62 (BA.2.12.1) | Omicron | EPI_ISL_12248637.1 | hCoV-19/Denmark/DCGC-493190/2022 |
| 105857 | Control 63 (BA.2.12.1) | Omicron | EPI_ISL_12303256.1 | hCoV-19/USA/NY-CDC-LC0579415/2022 |

*Indicates controls that are also available in the Assay Ready format

Assay Ready Synthetic RNA Controls

Twist Bioscience Assay Ready Control products are provided in desiccated pellet format that includes a nucleic acid stabilizer which enables greater stability and ease of use during the shipping and protocol processes. Due to the enhanced stability, they can be shipped at room temperature, reducing cost and improving accessibility. The Assay Ready Controls are supplied at approximately two million copies per tube.

All Assay Ready Controls are Biosafety Level 1. They are supplied as a dried down pellet with a specification range of approximately 2×10^6 copies/tube and should be stored at -20°C .

| PART NUMBER | CONTROL | VOI/VOC | GENBANK ID | GISAID NAME |
|-------------|----------------------------------|---------|----------------|--------------------------|
| 103925 | Assay Ready Control 2 | | MN908947.3 | Wuhan-Hu-1 |
| 103926 | Assay Ready Control 14 (B.1.1.7) | Alpha | EPI_ISL_710528 | England/205041766/2020 |
| 103927 | Assay Ready Control 15 (B.1.1.7) | Alpha | EPI_ISL_601443 | England/MILK-9E05B3/2020 |

Encapsulated Synthetic RNA Controls

Twist Bioscience Encapsulated Control products offer a unique storage and delivery method for Twist’s established Synthetic SARS-CoV-2 RNA controls. Just as protein encapsulation of viruses offers more stable molecular storage, Twist’s Encapsulated Control products leverage a novel method to seal a metal capsule around a desiccated pellet to enhance stability of the RNA controls. Due to the enhanced stability, they can be shipped and stored at room temperature, reducing cost, and improving accessibility globally. The Encapsulated Controls are supplied at approximately 50,000 copies per tube in a rack of 16 or 96 tubes, they are single use, and have a 5-year shelf life from the date of manufacture.

All Encapsulated Controls are Biosafety Level 1 and should be stored at 4°C to 40°C.

RACK OF 16 TUBES WITH TUBE OPENER

| PART NUMBER | CONTROL | VOI/VOC | GENBANK ID | GISAID NAME |
|-------------|--|----------------|-----------------|-------------------------------|
| 104422 | Encapsulated Control 2 | | MN908947.3 | Wuhan-Hu-1 |
| 104423 | Encapsulated Control 28 (AY.1) | Delta | EPI_ISL_2695467 | Portugal/PT9543/2021 |
| 104424 | Encapsulated Control 48 (B.1.1.529/BA.1) | Omicron | EPI_ISL_6841980 | Hong Kong/HKU-211129-001/2021 |

RACK OF 96 TUBES WITH 4 TUBE OPENERS

| PART NUMBER | CONTROL | VOI/VOC | GENBANK ID | GISAID NAME |
|-------------|--|----------------|-----------------|-------------------------------|
| 104426 | Encapsulated Control 2 | | MN908947.3 | Wuhan-Hu-1 |
| 104427 | Encapsulated Control 28 (AY.1) | Delta | EPI_ISL_2695467 | Portugal/PT9543/2021 |
| 104428 | Encapsulated Control 48 (B.1.1.529/BA.1) | Omicron | EPI_ISL_6841980 | Hong Kong/HKU-211129-001/2021 |

Twist Respiratory Virus Controls

The Twist Synthetic Respiratory Virus Controls cover a broad range of RNA and DNA viruses relevant to respiratory disease research. These controls are aligned with the content of the Twist Respiratory Virus Research Panel (PN 103067) and are suitable for use with Twist Fixed Panel NGS workflows or for use with RT-PCR or qPCR experiments of your own design.

All Twist Respiratory Virus Controls are Biosafety Level 1. They are supplied frozen as 100 µL with a specification range of approximately 1x10⁶ copies/µL and should be stored at -70°C to -90°C.

| PART NUMBER | NAME | ACCESSION NUMBER | VIRUS TYPE | LENGTH (BASES) |
|-------------|---|--|-----------------|----------------|
| 103001 | Twist Synthetic Influenza H1N1 (2009) RNA Control | NC_026438, NC_026435, NC_026437, NC_026433, NC_026436, NC_026434, NC_026431, NC_026432 | ssRNA (- sense) | 13158 |
| 103002 | Twist Synthetic Influenza H3N2 RNA Control | NC_007373, NC_007372, NC_007371, NC_007366, NC_007369, NC_007368, NC_007367, NC_007370 | ssRNA (- sense) | 13627 |
| 103003 | Twist Synthetic Influenza B RNA Control | NC_002204, NC_002205, NC_002206, NC_002207, NC_002208, NC_002209, NC_002210, NC_002211 | ssRNA (- sense) | 14452 |
| 103004 | Twist Synthetic Human bocavirus 1 DNA Control | MG953830.1 | ssDNA | 5164 |
| 103005 | Twist Synthetic Human enterovirus 68 RNA Control | NC_038308.1 | ssRNA (+ sense) | 7367 |
| 103006 | Twist Synthetic Human rhinovirus 89 RNA Control | NC_001617.1 | ssRNA (+ sense) | 7152 |
| 103007 | Twist Synthetic Mumps virus RNA Control | NC_002200.1 | ssRNA (- sense) | 15384 |
| 103008 | Twist Synthetic Human parainfluenza virus 1 RNA Control | NC_003461.1 | ssRNA (- sense) | 15600 |
| 103009 | Twist Synthetic measles virus RNA Control | NC_001498.1 | ssRNA (- sense) | 15894 |
| 103010 | Twist Synthetic Human parainfluenza virus 4 RNA Control | NC_021928.1 | ssRNA (- sense) | 17052 |
| 103011 | Twist Synthetic Human coronavirus 229E RNA Control | NC_002645.1 | ssRNA (+ sense) | 27317 |
| 103012 | Twist Synthetic Human coronavirus NL63 RNA Control | NC_005831.2 | ssRNA (+ sense) | 27553 |
| 103013 | Twist Synthetic Human coronavirus OC43 RNA Control | NC_006213.1 | ssRNA (+ sense) | 30741 |
| 103730 | Twist Respiratory Virus Controls (13 Count) | N/A | N/A | N/A |

Twist Synthetic Human Monkeypox Virus Controls

The Twist Synthetic human Monkeypox Virus (hMPXV) Controls are built based on sequences from either the Congo Basin (CB) or West Africa (WA) clades of hMPXV and provide coverage of $\geq 80\%$ of the viral genome. These controls are compatible with CDC real-time PCR procedures and also are suitable for use with Twist Fixed Panel NGS workflows.

The hMPXV controls are Biosafety Level 1. They are supplied frozen as 100 μL with a specification range of approximately 1×10^5 copies/ μL and should be stored at -70°C to -90°C .

| PART NUMBER | NAME | ACCESSION NUMBER | VIRUS TYPE | LENGTH (BASES) |
|-------------|--------------------------------------|------------------------------|------------|----------------|
| 106056 | Twist Synthetic hMPXV Control 1 (CB) | GISAID / EPI_ISL_13056236 | dsDNA | 164678 bp |
| 106059 | Twist Synthetic hMPXV Control 2 (WA) | NCBI / ON585037 | dsDNA | 166798 bp |