



# Quantinuum System Model H2

## Product Data Sheet

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## • INTRODUCTION

This Product Data Sheet covers all features and characteristics of the **Quantinum System Model H2, Powered by Honeywell.**

## • FEATURES

- $N \geq 56$  qubit trapped-ion based quantum computers
- All-to-all connectivity
- Laser based quantum gates
- Quantum charge-coupled device (QCCD) architecture with four (or more) gate zones in a trap consisting of two connected linear sections
- Mid-circuit measurement conditioned circuit branching
- Qubit reuse after mid-circuit measurement
- Native gate set: single-qubit rotations, two-qubit ZZ gates, arbitrary-angle ZZ gates, general SU(4) entangler
- TKET supported in the stack provides circuit optimization to all submitted circuits. Additional details on TKET options can be found in the Quantinum Application Programming Interface (API) Specification.

## • SPECIFICATIONS

Table 1 lists the specifications for Quantinum System Model H2 quantum computers. Machine-specific data can be found in the [Quantinum Hardware Specifications repository](#).

*Table 1 Quantinum System Model H2 Specifications*

System Fundamentals				
Parameters	min	typ	max	
<b>General</b>				
Qubits	56			
Connectivity	All-to-all			
Parallel two-qubit operations	4			
<b>Errors</b>				
Single-qubit gate infidelity	$1 \times 10^{-5}$	$3 \times 10^{-5}$	$2 \times 10^{-4}$	
Two-qubit gate infidelity	$1.3 \times 10^{-3}$	$1.5 \times 10^{-3}$	$3 \times 10^{-3}$	
State preparation and measurement (SPAM) error	$1 \times 10^{-3}$	$1.5 \times 10^{-3}$	$5 \times 10^{-3}$	
Memory error per qubit at average depth-1 circuit	$2 \times 10^{-4}$	$5 \times 10^{-4}$	$2 \times 10^{-3}$	
Mid-circuit measurement cross-talk error	$1 \times 10^{-6}$	$1 \times 10^{-5}$	$2 \times 10^{-4}$	

- **SYSTEM OPERATION**

The **Quantinum System Model H2, Powered by Honeywell**, operates on qubits implemented through atomic hyperfine states of  $^{171}\text{Yb}^+$ . System Model H2 has 56 physical qubits (ions) that move, individually or in pairs, between four interaction zones where all quantum operations (initialization, measurement, single-, and two-qubit gates) are performed using lasers. By rearranging the physical location of the qubits, a two-qubit gate can be performed on any arbitrary pair, giving the system all-to-all connectivity. Additionally, because there are multiple interaction zones, multiple quantum operations may be performed in parallel.

Although the qubits are all identical, there may be differences in the errors associated with quantum operations depending on the location, i.e., interaction zone, in which the quantum operations take place, independent of the specific qubits that are in that location. However, the location for each quantum operation is determined by the compiler and may vary even for similar circuits, as each circuit is optimized to minimize the number of transport operations and the time required to run the circuit. The typical infidelities reported on this product data sheet are an average over all operational zones, with the minimum and maximum spanning both the difference between zones and the day-to-day variation.

More details as well as a user guide can be found at: [H-Series documentation](#).