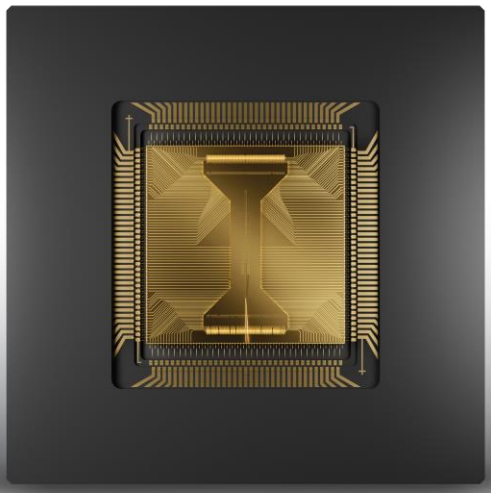
QUANTINUUM



Quantinuum System Model H1

Product Data Sheet

Version 7.0 October 15, 2024

INTRODUCTION

This Product Data Sheet covers all features and characteristics of the **Quantinuum System Model H1, Powered by Honeywell.**

FEATURES

- N ≥ 20 qubit trapped-ion based quantum computers
- All-to-all connectivity
- Laser based quantum gates
- Quantum charge-coupled device (QCCD) architecture with five parallel gate zones
- 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 Quantinuum Application Programming Interface (API) Specification.

SPECIFICATIONS

Table 1 lists the specifications for the Quantinuum H1-1 quantum computer. Machine-specific data can be found in the Quantinuum Hardware Specifications repository.

Table 1 Quantinuum H1-1 Specifications

System Fundamentals			
Parameters	**min**	**typ**	**max**
General			
Qubits		20	
Connectivity		All-to-all	
Parallel two-qubit operations		5	
Errors			
Single-qubit gate infidelity	1×10^{-5}	2×10^{-5}	2×10^{-4}
Two-qubit gate infidelity	8×10^{-4}	1×10^{-3}	3×10^{-3}
State preparation and measurement (SPAM) error	2×10^{-3}	3×10^{-3}	5×10^{-3}
Memory error per qubit at average depth-1 circuit	1×10^{-4}	2×10^{-4}	1×10^{-3}
Mid-circuit measurement cross-talk error	5×10^{-6}	1×10^{-5}	2×10^{-4}

SYSTEM OPERATION

The **Quantinuum System Model H1, Powered by Honeywell**, operates on qubits implemented through atomic hyperfine states of $^{171}Yb^{+}$. System Model H1 has twenty physical qubits (ions) that move, individually or in pairs, between five 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.