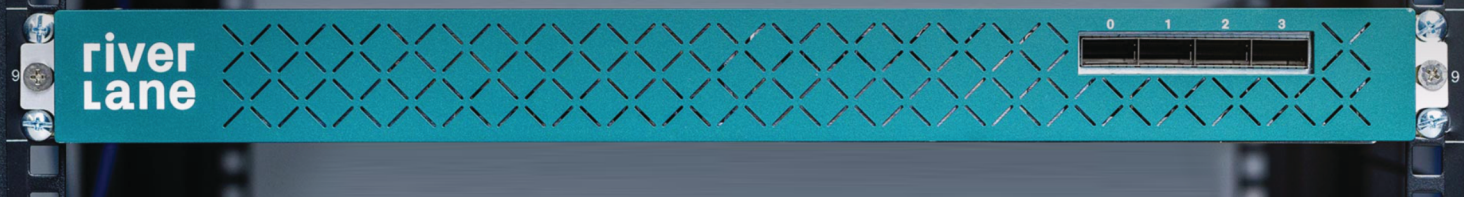
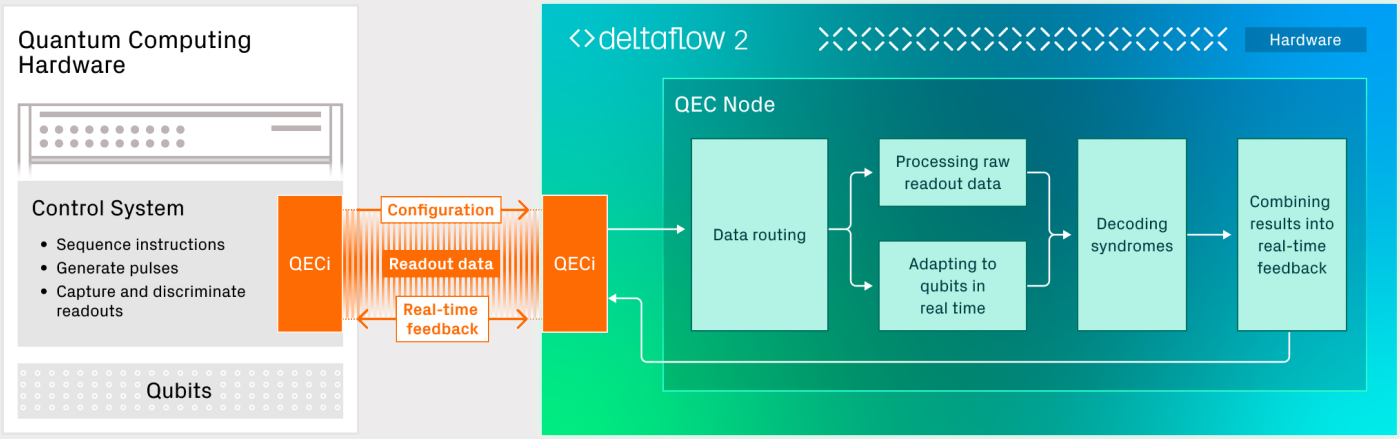
deltaflow 2
Technical Datasheet

The world's leading Quantum Error Correction (QEC) system for real-time quantum computing at utility scale

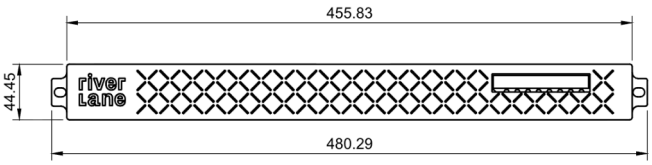


What is Deltaflow 2

Deltaflow 2 is an FPGA-based QEC system integrating Riverlane's proprietary hardware decoder with high-throughput data routing and real-time processing logic. Direct connection to the quantum control stack enables low-latency operation, rapid integration, and independent scaling of control and QEC subsystems. Deltaflow 2 is configurable across qubit modalities and QEC schemes, supporting evolving hardware roadmaps.



Hardware Specifications



Unit: mm

Form factor:	1U, 19" rackmount chassis
Connectivity:	Quad Small Form-Factor Pluggable (QSFP+) connector using the Quantum Error Correction interface (QECi) to communicate with the control system
Weight:	13.5 kg (30 lbs)
Power Supply:	1+1 redundant power supply to ensure uninterrupted operation. Up to 1300 W (operating), 110/220V single phase AC power.

Supported Applications

- Perpetual quantum memory and stability on up to 250 physical qubits
- Rotated surface code in square or rectangular lattice and the repetition code
- Rotated surface code up to code distance 11
- Wiggling and non-wiggling circuits with mid-circuit unconditional resets
- Circuits with native CZ or iSWAP two-qubit gates
- Adapts decoding graph in real time based on detected leakage events

What's in the box

- Deltaflow 2 system
- Deltaflow 2 power supply
- QSFP+ active optical cable (5m)
  - *SFP+ to QSFP+ adapter and SFP+ active optical cable also available*
- Type H PSU cable
- Ethernet cable (2m)
- Telescopic rail

Interfacing

Deltaflow 2 integrates with any control system via the QEC interface (QECi). Developed by Riverlane as an open standard to provide a way of communicating between the control system and the quantum error correction (QEC) system in any quantum computer. QECi facilitates efficient data transfer by defining the data format, runtime states and parameters for communicating QEC-specific messages over a standard data connection. The Specification of this interface is available at www.riverlane.com/qeci

The implementation of the physical layer of QECi (QECIPHY) is available to all customers open source at https://github.com/riverlane/qeciphy

Performance

All test cases are executed at an incoming readout data rate of 1µs per single QEC round. The performance of the product is measured under the defined test conditions using simulated data. Performance may vary based on physical qubit error rates.

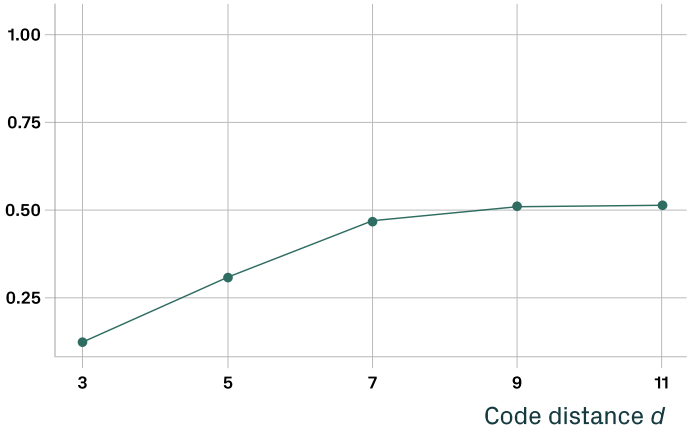
Latency

TEST CASE	SHOTS	MEAN (µs)	MIN (µs)	MAX (µs)	STDEV (µs)
Rotated surface code quantum memory at code distance 3 10,000 stabiliser rounds, SI1000 noise model with p = 0.1%	100	**6.51**	6.10	8.77	0.43
Rotated surface code quantum memory at code distance 5 10,000 stabiliser rounds, SI1000 noise model with p = 0.1%	100	**7.75**	6.10	18.52	1.91
Rotated surface code quantum memory at code distance 11 10,000 stabiliser rounds, SI1000 noise model with p = 0.1%	100	**25.51**	8.52	101.99	19.30
Rotated surface code quantum memory at code distance 7 20 stabiliser rounds, SI1000 noise model with p = 0.3% and leakage p_L = 0.05%	20,000	**23.48**	6.25	74.52	9.62
Rotated surface code quantum memory at code distance 7 19 stabiliser rounds, SI1000 noise model with p = 0.3% and leakage p_L = 0.05%, leakage-aware decoding, wiggling circuit	20,000	**19.65**	7.19	54.29	7.02
Repetition code quantum memory at code distance 11 31 stabiliser rounds, SI1000 noise model with p = 0.1%	20,000	**6.83**	5.98	20.31	0.84
Surface code stability-15 experiment 25 stabiliser rounds, SI1000 noise model with p = 0.1%	20,000	**6.92**	6.02	26.63	1.28

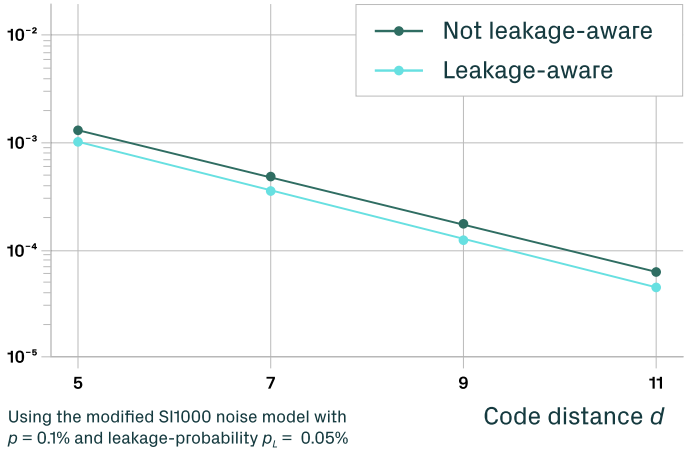
Decoder performance

FPGA implementation of the Local Clustering Decoder (LCD) inside Deltaflow 2, showing its logical error rate per round and decoding time per round consistently less than 1µs.

Decoding time per round (µs) vs code distance



Logical error rate vs code distance



Using the modified SI1000 noise model with p = 0.1% and leakage-probability p_L = 0.05%

This product is classified as US ECCN 4A906.c in the US for export control purposes (Export classifications are subject to change)

Documentation and Support

Comprehensive documentation including a getting started guide, tutorials and code examples is available. Riverlane also provides direct support from our dedicated team of systems engineers and quantum scientists, bringing over 30 years of combined experience. For more information, contact **BD@riverlane.com**