

# QRM / 0-300 MHz Qubit Readout Module | Cluster Series 19" Rack Mounted

Release November 2021\_V1.4

## Description

The QRM module has been designed for frequency-multiplexed readout of quantum systems. Combining inputs and outputs in one module makes reflectometry/transmission readout schemes ultimately convenient as the readout pulse and acquisition can be triggered from a single instruction.

Arbitrary pulse shapes and arbitrary complex integration functions can be uploaded to suppress crosstalk and optimize measurement efficiency under dynamic readout conditions.

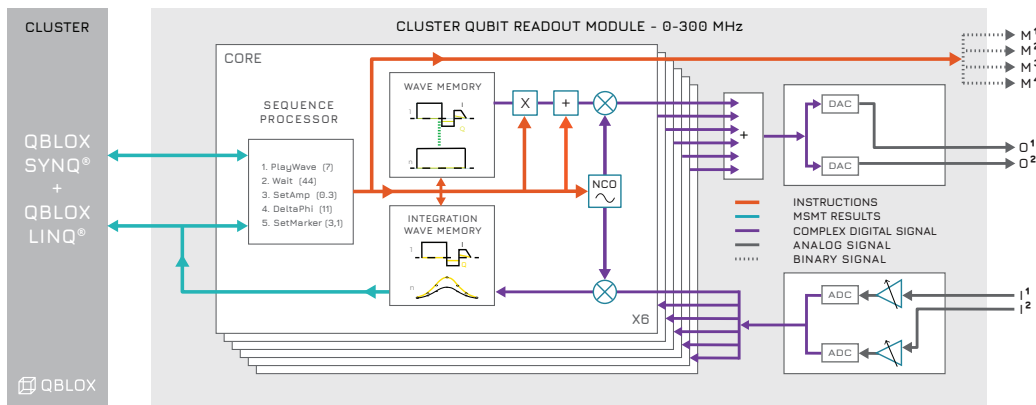
Measurements on up to 6 qubits can be multiplexed, however, their timing is completely independent, allowing arbitrary scheduling of measurement operations.

Up to 131.072 IQ shots can be stored. Onboard averaging (and binning) can be used to reduce data transfer overhead for averaged experiments that loop over parameters in multiple dimensions.



## Features

- Multiplexed readout of up to 6 frequencies.
- Synchronized to all other modules via SYNQ protocol.
- Arbitrarily Long pulse and integration times can be achieved by constructing them from sequencer instructions (for instance for spectroscopy).
- On-board integration and state assignment. Measurement outcomes are shared with all other modules via LINQ within 200 ns.
- On-board averaging and binning of measurement results with up to 131.072 IQ bins
- External instruments can be controlled from its 4 marker outputs



## Specifications

Analog input channels	2	Binary output markers	4 (3.3V LVTTTL)
ADC sample rate	1 GSPS	Measurement result memory (IQ shots)	131.072 (48 bit wide)
ADC resolution	12 bit	Frequency resolution (Input and Output)	0.25 Hz (1F)
ADC bandwidth (-3 dB)	300 MHz	Ethernet data rate	1 Gbit/s
Input range (in a 50 Ω load)	0.1 to 1 Vpp (controllable)	Driver/API	SCPI / Python / QCoDeS
Analogue output channels	2	Max. power consumption (via Cluster)	34 W
DAC sample rate	1 GSPS	Input/Output connector type	SMA
DAC resolution	12 bit	Marker connector type	SMP
DAC bandwidth (-3 dB)	350 MHz	Dimensions single module	269 x 130 x 20 mm <sup>3</sup>
Output range (in a 50 Ω load)	1 Vpp	Weight	0.303 kg