3.5mm Cryogenic VNA Calibration Kits

Datasheet / 2Z-081

Models:

- 8050CK33 - Superconducting Qubits between 2-12 GHz
- 8050CK34 - Spin Qubits between 0.5-12 GHz
- 8050CK70 - Male Switch Kit



3.5mm Cryogenic VNA Calibration Kits

8050CK33 series, 8050CK34 series, and 8050CK70 series

Features

- 3.5mm Connectors
- DC to 26.5 GHz
- Compatible with Insight calibration SW and uncertainty analysis*
- Keysight, Rohde & Schwarz and Anritsu VNAs Supported

The Importance of VNA Calibration

Imperfections exist in even the finest test equipment. If un- corrected these systematic imperfections cause the equipment to yield less accurate measurements. The basis of network analyzer error correction is referred to as “calibration” of which multiple methods exist.

Calibration at Cryogenic Temperatures

Superconducting qubits operate at extremely low temperatures, with each qubit having its own resonant frequency. Microwave signals generated outside the cryogenic environment must be delivered to each qubit at its specific resonant frequency to manipulate and control quantum states.

As these signals travel through cryogenic cabling and components, temperature-induced losses and reflections can alter the signal that ultimately interacts with the qubit. These effects can impact measurement accuracy and make it more difficult to accurately identify the resonant frequency of each individual qubit.

Cryogenic scattering (S-) parameter calibration is required to correct for these effects. By accounting for losses and reflections introduced by cryogenic cabling and components, calibration enables the true resonant frequency of each individual qubit to be identified.

Maury offers specialized cryogenic calibration standards designed to improve S-parameter measurement accuracy inside a cryogenic environment.

The 8050CK33 is designed for superconducting qubit applications operating from 2–12 GHz.

The 8050CK34 is designed for spin qubit applications operating from 0.5–12 GHz.

The 8050CK70 is a male switch kit for cryogenic VNA calibration.

A050A



Recommended Accessories

A050A Digital Connector Gage Kit:

Contains two “thread-on” type, digital gages for measuring female and male contact pin location. They provide an easy and accurate way to measure critical linear interface dimensions of 2.92mm and 3.5mm coaxial connectors.

Cryogenic RF Cables:

Maury can provide custom phase-matched RF cables with specialized construction for use at cryogenic temperatures.

** Cal kit factory uncertainty only availble in conjunction with Insight MT940B option.*

Maury 3.5mm Cryogenic VNA Calibration Kits

Maury 3.5 mm Cryogenic VNA Calibration Kits provide specialized calibration standards for improving S-parameter measurement accuracy within cryogenic environments. Each kit includes the calibration standards and tools shown in the tables below.

Components Included in 8050CK33 Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm male-to-female 1cm beadless airline	8043S1
1	3.5mm female offset short circuit	8046F6
1	3.5mm male offset short circuit	8047F6
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	7/16-inch double end wrench	8770Z7
1	5/16-inch double end wrench	8770Z6
1	Cal kit box, small	CK-BOX-SM

Components Included in 8050CK34 Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm male-to-female 1cm beadless airline	8043S1
1	3.5mm male-to-female 5cm beadless airline	8043S5
1	3.5mm male-to-female 6cm beadless airline	8043S6
1	3.5mm male-to-female 7.5cm beadless airline	8043S7.5
1	3.5mm female offset short circuit	8046F6
1	3.5mm male offset short circuit	8047F6
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	7/16-inch double end wrench	8770Z7
1	5/16-inch double end wrench	8770Z6
1	Cal kit box, small	CK-BOX-SM

Components Included in 8050CK70 Kits

QUANTITY	DESCRIPTION	MODEL
1	3.5mm male fixed flush short circuit	360B
1	3.5mm male offset short circuit	8047F6
1	3.5mm male offset short circuit	8047P1.08
1	3.5mm male offset short circuit	8047P1.8
1	3.5mm male offset short circuit	8047A6
1	3.5mm male open circuit	8048B6
1	5/16-inch torque wrench — 8 in. lbs.	8799A1
1	7/16-inch double end wrench	8770Z7
1	5/16-inch double end wrench	8770Z6
1	Cal kit box, small	CK-BOX-SM

Component Specifications



Airlines – Models 8043S1, 8043S5, 8043S6, & 8043S7.5

Frequency Range — DC to 26.5 GHz
Electrical Length Accuracy — ±0.0025 cm
Maximum VSWR — <1.008



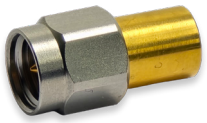
Open Circuit – Model 8048B6

Frequency Range -- DC to 26.5 GHz
Minimum Reflection Coefficient -- 0.98
Phase Accuracy -- ±1.4 degrees
Nominal Impedance -- 50 ohm



Offset Shorts – Models 8046F6, 8047F6, 8047P1.08, 8047P1.8, & 8047A6

Frequency Range -- DC to 26.5 GHz
Minimum Reflection Coefficient -- 0.98
Phase Accuracy -- ±2.0 degrees
Nominal Impedance -- 50 ohm



Fixed Flush Short – Model 360B

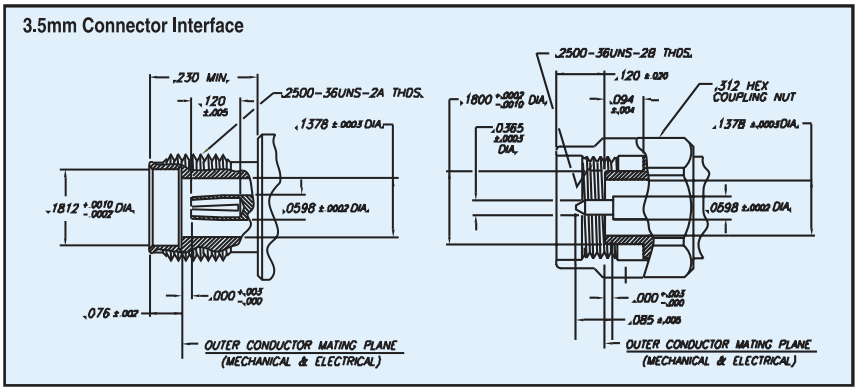
Frequency Range -- DC to 40.0 GHz
Minimum Reflection Coefficient -- 0.99
Phase Accuracy -- ±2.0 degrees
Nominal Impedance -- 50 ohm

Note: Components vary by calibration kit model. Refer to the component tables on page 3 for included models.

Connector Description

The precision 3.5mm connectors on the components in these kits are miniature, instrument grade, air-interface connectors that operate mode free up to 34 GHz, and comply with IEEE standard 287 general precision connector, instrument grade GPC3.5.

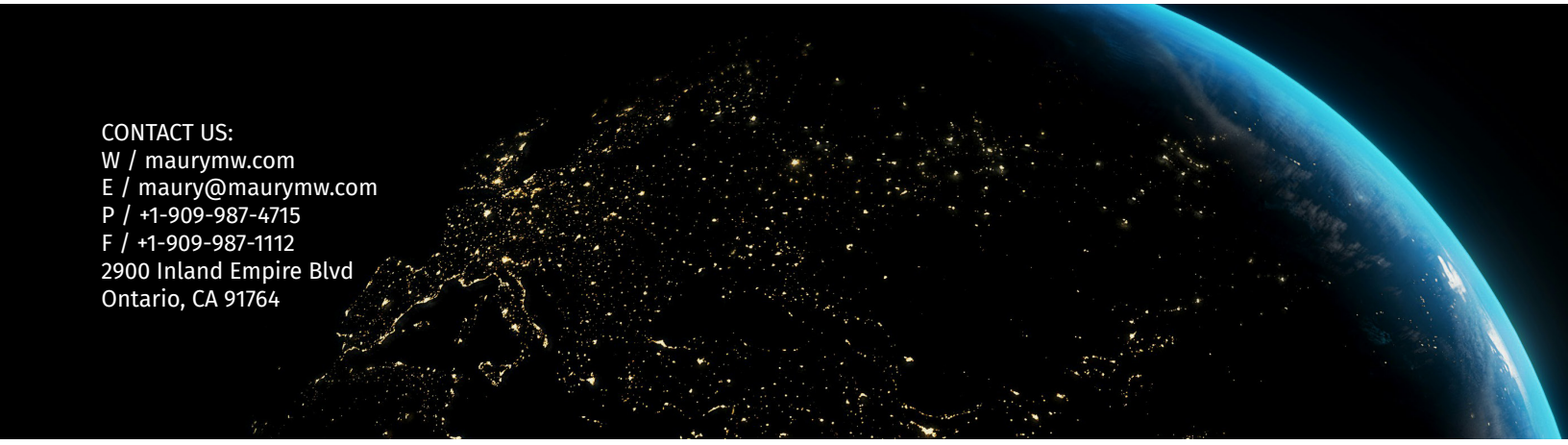
For detailed interface specifications please refer to Maury data sheet 5E-062.



References

1. S.-H. Shin, M. Stanley, J. Skinner, S. E. de Graaf, and N. M. Ridler, “Broadband Coaxial S-Parameter Measurements for Cryogenic Quantum Technologies,” IEEE Transactions on Microwave Theory and Techniques, vol. 72, no. 4, pp. 2193–2201, Apr. 2024, doi: 10.1109/TMTT.2023.3322909.

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