Mechanical Calibration Kit

DataSheet

EN03A

SIGLENT TECHNOLOGIES CO.,LTD

Introduction

Mechanical calibration kit contains individual standards to characterize systematic errors, used to calibrate scalar or vector network analyzers.

SIGLENT mechanical calibration kit includes coaxial calibration kit and waveguide calibration kit. The coaxial calibration kit includes termination loads, open circuits, short circuits, and through adapters, in both sexes.

Model*1*2	Frequency	Type*3	Connector	Impendence	Similar
F503ME	DC - 4.5 GHz	OSLT	N Type - Male	50 Ω	85032B/E
F503FE	DC - 4.5 GHz	OSLT	N Type - Female	50 Ω	85032B/E
F603ME	DC - 4.5 GHz	OSLT	3.5mm - Male	50 Ω	85033E
F603FE	DC - 4.5 GHz	OSLT	3.5mm - Female	50 Ω	85033E
F504MS	DC - 9 GHz	OSLT	N Type - Male	50 Ω	85032F
Y504MS	DC - 9 GHz	OSLT	N Type - Male	50 Ω	85032F
F504FS	DC - 9 GHz	OSLT	N Type - Female	50 Ω	85032F
Y504FS	DC - 9 GHz	OSLT	N Type - Female	50 Ω	85032F
F504TS	DC - 9 GHz	OSLT	N Type - Male AND Female	50 Ω	85032F
F604MS	DC - 9 GHz	OSLT	3.5mm - Male	50 Ω	85033E
F604FS	DC - 9 GHz	OSLT	3.5mm - Female	50 Ω	85033E
F604TS	DC - 9 GHz	OSLT	3.5mm - Male AND Female	50 Ω	85033E
F505MS	DC - 18 GHz	OSLT	N Type - Male	50 Ω	85054D
F505FS	DC - 18 GHz	OSLT	N Type - Female	50 Ω	85054D
F505TS	DC - 18 GHz	OSLT	N Type - Male AND Female	50 Ω	85054D
F606MS	DC – 26.5 GHz	OSLT	3.5mm - Male	50 Ω	85052D
Y606MS	DC – 26.5 GHz	OSLT	3.5mm - Male	50 Ω	85052D
F606FS	DC – 26.5 GHz	OSLT	3.5mm - Female	50 Ω	85052D
Y606FS	DC – 26.5 GHz	OSLT	3.5mm - Female	50 Ω	85052D
F606TS	DC – 26.5 GHz	OSLT	3.5mm - Male AND Female	50 Ω	85052D
KWR42A	18 – 26.5 GHz	Waveguide	2.92mm-Male AND Female	50 Ω	K11644A

*1: Mechanical coaxial calibration kit naming rule

F/Y/S	Separate/Integrated/Electrical
5/6/7/8/9	N/3.5/2.92/2.4/1.85 mm
0/1	50/75 Ohm
3/4/5/6/7/8/9	4.5/9/18/26.5/40/50/67 GHz
M/F/T	Male/Female/Both
E/S	Economy/Standard

*2: Mechanical Waveguide calibration kit naming rule

Band	EIA	Version	Frequency range
W	WR10	A	75 to 110 GHz
V	WR15	A	50 to 75 GHz
U	WR19	A	40 to 60 GHz
Q	WR22	A	33 to 50 GHz
R	WR28	A	26.5 to 40 GHz
K	WR42	A	18 to 26.5 GHz
P	WR62	A	12.4 to 18 GHz
X	WR90	A	8.2 to 12.4 GHz

*3: OSLT = Open + Short + 50Ω termination Load + Through Adapter

F503 Series

The F503ME and F503FE economy 50Ω N type coaxial mechanical calibration kit include termination loads, open circuits, short circuits, and through adapters, specified from DC to 4.5 GHz.

The F503 series performance specifications are very similar to the Keysight 85032B/E mechanical calibration kit and it can be used as an approximate replacement of 85032B/E, or use the STD of 85032B/E in network analyzers.

Performance

Model	Type	Connector	Specification
F503ME	Open	N - Male	DC – 4.5 GHz, Phase Deviation* ≤ ± 0.8°
	Short	N - Male	DC – 4.5 GHz, Phase Deviation ≤ ± 0.8°
	Load	N - Male	DC – 4.5 GHz, SWR ≤ 1.02
	Adapter	N - Male to N - Male	DC – 3 GHz, SWR ≤ 1.03 3 – 6 GHz, SWR ≤ 1.05 6 – 9 GHz, SWR ≤ 1.08
F503FE	Open	N - Female	DC – 4.5 GHz, Phase Deviation ≤ ± 0.8°
	Short	N - Female	DC – 4.5 GHz, Phase Deviation ≤ ± 0.8°
	Load	N - Female	DC – 4.5 GHz, SWR ≤ 1.02
	Adapter	N - Female to N - Female	DC – 3 GHz, SWR ≤ 1.03 3 – 6 GHz, SWR ≤ 1.05 6 – 9 GHz, SWR ≤ 1.08

* Relative error to the standard phase

General Specification

Impendence	50 Ω
Power	≤ 1 W
Interfaces Standard	IEC 60169-16 Grade 0
Durability	> 2000
Torque	1.35 Nm
Spanner	19 mm
Temperature	+ 15 °C ~ + 35 °C

F603 Series

The F603ME and F603FE economy 50Ω 3.5mm type coaxial mechanical calibration kit include terminations loads, open circuits, short circuits, and through adapters, specified from DC to 4.5 GHz.
The F603 series performance specifications are very similar to the Keysight 85033E mechanical calibration kit and it can be used as an approximate replacement of 85033E, or use the STD of 85033E in network analyzers.

Performance

Model	Type	Connector	Specification
F603ME	Open	3.5mm - Male	DC – 4.5 GHz, Phase Deviation* ≤ ± 0.8°
	Short	3.5mm - Male	DC – 4.5 GHz, Phase Deviation ≤ ± 0.8°
	Load	3.5mm - Male	DC – 4.5 GHz, SWR ≤ 1.028
	Adapter	3.5mm - Male to 3.5mm - Male	DC – 6 GHz, SWR ≤ 1.04 6 – 9 GHz, SWR ≤ 1.06 9 – 26.5 GHz, SWR ≤ 1.1
F603FE	Open	3.5mm - Female	DC – 4.5 GHz, Phase Deviation ≤ ± 0.8°
	Short	3.5mm - Female	DC – 4.5 GHz, Phase Deviation ≤ ± 0.8°
	Load	3.5mm - Female	DC – 4.5 GHz, SWR ≤ 1.028
	Adapter	3.5mm - Female to 3.5mm - Female	DC – 6 GHz, SWR ≤ 1.04 6 – 9 GHz, SWR ≤ 1.06 9 – 26.5 GHz, SWR ≤ 1.1

* Relative error to the standard phase

General Specification

Impendence	50 Ω
Power	≤ 1 W
Interfaces Standard	IEEE Std 287
Durability	> 2000
Torque	0.9 Nm
Spanner	8 mm
Temperature	+ 15 °C ~ + 35 °C

F504 and Y504 Series

The F504MS and F504FS 50Ω N type coaxial mechanical calibration kit include termination loads, open circuits, short circuits, and through adapters, specified from DC to 9 GHz. The F504TS is a coaxial calibration kit consisting of F504MS and F504FS.

Y504MS shares the same parts and specs as F504MS, but in integrated exterior. So does Y504FS and F504FS.

The F504 and Y504 series performance specifications are very similar to the Keysight 85032F mechanical calibration kit and it can be used as an approximate replacement of 85032F, or use the STD of 85032F in network analyzers.

Performance

Model		Type	Connector	Specification
F504TS	F504MS/ Y504MS	Open	N - Male	DC – 9 GHz, Phase Deviation* ≤ ± 0.8°
		Short	N - Male	DC – 9 GHz, Phase Deviation ≤ ± 0.8°
		Load	N - Male	DC – 9 GHz, SWR ≤ 1.025
		Adapter	N - Male to N - Male	DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31 dB), 9 – 18 GHz, SWR ≤ 1.1 (Return Loss ≥ -26 dB), Insert Loss ≤ 0.2 dB, Delay= 197.1 ps
	F504FS/ Y504FS	Open	N - Female	DC – 9 GHz, Phase Deviation ≤ ± 0.8°
		Short	N - Female	DC – 9 GHz, Phase Deviation ≤ ± 0.8°
		Load	N - Female	DC – 9 GHz, SWR ≤ 1.025
		Adapter	N - Female to N - Female	DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31 dB), 9 – 18 GHz, SWR ≤ 1.1 (Return Loss ≥ -26 dB), Insert Loss ≤ 0.15 dB, Delay= 136.2 ps
	Adapter		N - male to N - Female	DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31 dB), 9 – 18 GHz, SWR ≤ 1.1 (Return Loss ≥ -26 dB), Insert Loss ≤ 0.15 dB
	Wrench		N - 19mm	1.35 Nm

* Relative error to the standard phase

General Specification

Impendence	50 Ω	Power	≤ 1 W
Interfaces Standard	IEC 60169-16 Grade 0	Durability	> 2000
Torque	1.35 Nm	Spanner	19 mm
Temperature	+ 15 °C ~ + 35 °C		

F505 Series

The F505MS and F505FS 50Ω N type coaxial mechanical calibration kit include termination loads, open circuits, short circuits, and through adapters, specified from DC to 18 GHz. The F505TS is a coaxial calibration kit consisting of F505MS and F505FS.

The F505 series performance specifications are very similar to the Keysight 85054D mechanical calibration kit and it can be used as an approximate replacement of 85054D, or use the STD of 85054D in network analyzers.

Performance

Model		Type	Connector	Specification
F505TS	F505MS	Open	N - Male	DC – 18 GHz, Phase Deviation* ≤ ± 1°
		Short	N - Male	DC –18 GHz, Phase Deviation ≤ ± 1°
		Load	N - Male	DC – 18 GHz, SWR ≤ 1.048 (Return Loss ≥ -32.6 dB)
		Adapter	N - Male to N - Male	DC – 18 GHz, SWR ≤ 1.06 (Return Loss ≥ -30.7 dB), Insert Loss ≤ 0.2 dB, Delay= 197.1 ps
	F505FS	Open	N - Female	DC – 18 GHz, Phase Deviation ≤ ± 1°
		Short	N - Female	DC – 18 GHz, Phase Deviation ≤ ± 1°
		Load	N - Female	DC – 18 GHz, SWR ≤ 1.048 (Return Loss ≥ -30.7 dB)
		Adapter	N - Female to N - Female	DC – 18 GHz, SWR ≤ 1.06 (Return Loss ≥ -30.7 dB), Insert Loss ≤ 0.15 dB, Delay= 136.2 ps
	Adapter		N - male to N - Female	DC – 18 GHz, SWR ≤ 1.06 (Return Loss ≥ -30.7 dB), Insert Loss ≤ 0.15 dB
	Wrench		N - 19mm	1.35 Nm

* Relative error to the standard phase

General Specification

Impendence	50 Ω	Power	≤ 1 W
Interfaces Standard	IEC 60169-16	Durability	> 2000
Torque	1.35 Nm	Spanner	19 mm
Temperature	+ 15 °C ~ + 35 °C		

F604 Series

The F604MS and F604FS 50Ω 3.5mm type coaxial mechanical calibration kit include termination loads, open circuits, short circuits, and through adapters, specified from DC to 9 GHz. The F604TS is a coaxial calibration kit consisting of F604MS and F604FS.

The F604 series performance specifications are very similar to the Keysight 85033E mechanical calibration kit and it can be used as an approximate replacement of 85033E, or use the STD of 85033E in network analyzers.

Performance

Model		Type	Connector	Specification
F604TS	F604MS	Open	3.5mm - Male	DC – 9 GHz, Phase Deviation* ≤ ± 0.8°
		Short	3.5mm - Male	DC – 9 GHz, Phase Deviation ≤ ± 0.8°
		Load	3.5mm - Male	DC – 9 GHz, SWR ≤ 1.02
		Adapter	3.5mm - Male to 3.5mm - Male	DC – 6 GHz, SWR ≤ 1.04 6 – 9 GHz, SWR ≤ 1.06 9 – 26.5 GHz, SWR ≤ 1.1
	F604FS	Open	3.5mm - Female	DC – 9 GHz, Phase Deviation ≤ ± 0.8°
		Short	3.5mm - Female	DC – 9 GHz, Phase Deviation ≤ ± 0.8°
		Load	3.5mm - Female	DC – 9 GHz, SWR ≤ 1.02
		Adapter	3.5mm - Female to 3.5mm - Female	DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31dB), 9 – 26.5 GHz, SWR ≤ 1.1 (Return Loss ≥ -26dB), Insert Loss ≤ 0.1 dB, Delay= 83.0 ps
	Adapter		3.5mm - male to 3.5mm - Female	DC – 6 GHz, SWR ≤ 1.04 6 – 9 GHz, SWR ≤ 1.06 9 – 26.5 GHz, SWR ≤ 1.1
	Wrench		3.5mm - 8mm	0.9 Nm

* Relative error to the standard phase

General Specification

Impendence	50 Ω	Power	≤ 1 W
Interfaces Standard	IEEE Std 287	Durability	> 2000
Torque	0.9 Nm	Spanner	8 mm
Temperature	+ 15 °C ~ + 35 °C		

F606 and Y606 Series

The F606MS and F606FS 50Ω 3.5mm type coaxial mechanical calibration kit include termination loads, open circuits, short circuits, and through adapters, specified from DC to 26.5 GHz. The F606TS is a coaxial calibration kit consisting of F606MS and F606FS.

Y606MS shares the same parts and specs as F606MS, but in integrated exterior. So does Y606FS and F606FS.

The F606 and Y606 series performance specifications are very similar to the Keysight 85052D mechanical calibration kit and it can be used as an approximate replacement of 85052D, or use the STD of 85052D in network analyzers.

Performance

Model		Type	Connector	Specification
F606TS	F606MS /Y606MS	Open	3.5mm - Male	DC – 26.5 GHz, Phase Deviation* ≤ ± 1.5°
		Short	3.5mm - Male	DC – 26.5 GHz, Phase Deviation ≤ ± 1.5°
		Load	3.5mm - Male	DC – 26.5 GHz, SWR ≤ 1.04
		Adapter	3.5mm - Male to 3.5mm - Male	DC – 26.5 GHz, SWR ≤1.06
	F606FS /Y606FS	Open	3.5mm - Female	DC – 26.5 GHz, Phase Deviation ≤ ± 1.5°
		Short	3.5mm - Female	DC – 26.5 GHz, Phase Deviation ≤ ± 1.5°
		Load	3.5mm - Female	DC – 26.5 GHz, SWR ≤ 1.04
		Adapter	3.5mm - Female to 3.5mm - Female	DC – 26.5 GHz, SWR ≤ 1.06
	Adapter		3.5mm - male to 3.5mm - Female	DC – 26.5 GHz, SWR ≤ 1.06
	Wrench		3.5mm - 8mm	0.9 Nm

* Relative error to the standard phase

General Specification

Impendence	50 Ω	Power	≤ 0.5 W
Interfaces Standard	IEEE Std 287	Durability	> 2000
Torque	0.9 Nm	Spanner	8 mm
Temperature	+15 °C ~ + 35 °C		

KWR42A

The KWR42A precise K-band waveguide mechanical calibration kit contains K-band load, K-band short, 1/8λ waveguide line, 1/4λ waveguide line and 3/8λ waveguide line, specified from 17.6 GHz to 26.7 GHz. For measurement convenience, the KWR42A includes 2.92mm coax-to-waveguide converters and some fasteners like screws, nuts, nut collars, position bolts, etc.

The KWR42A performance specifications are very similar to the Keysight K11644A mechanical calibration kit and it can be used as an approximate replacement of K11644A, or use the STD of K11644A in network analyzers.

Performance

Model	Type	Connector	F min (MHz)	F max (MHz)	Specification
KWR42A	Short	Waveguide	14047	28094	Delay = 0, Loss = 0
	Load	Waveguide	14047	28094	Delay = 0, Loss = 0
	1/8λ Line	Waveguide	14047	28094	Delay = 0.751E-11 Sec, Loss = 2.75 Gohm/Sec
	1/4λ Line	Waveguide	14047	28094	Delay = 1.502E-11 Sec, Loss = 2.75 Gohm/Sec
	3/8λ Line	Waveguide	14047	28094	Delay = 2.253E-11 Sec, Loss = 2.75 Gohm/Sec
	Coax-to-waveguide converter	2.92mm - Female to Waveguide	14047	28094	VSWR≤1.25;IL≤0.5dB
		2.92mm - Male to Waveguide	14047	28094	VSWR≤1.25;IL≤0.5dB
	Fastener	Screw M3*12, Screw M3*16, Screw M3*20, Nut M3, Nut collar M3, Position bolt			

General Specification

Impendence	50 Ω	Power	≤ 0.5 W
Interfaces Standard	IEC 60169-23	Durability	> 2000
Torque	0.9 Nm	Spanner	8 mm
Temperature	+15 °C ~ + 35 °C		

Calibration Kit Definitions

Model	Type	C0 F(e-15)	C1 F(e-27)/Hz	C2 F(e-36)/Hz^2	C3 F(e-45)/Hz^3	L0 H(e-12)	L1 H(e-24)/Hz	L2 H(e-33)/Hz^2	L3 H(e-42)/Hz^3	Delay (pSec)	Loss (Gohm/Sec)
F503ME	Open	62.14	-143.07	82.92	0.76					17.4	0.7
	Short					0	0	0	0	17.8	2.1002
	Load									0	0.7
	Thru									0	0.7
F503FE	Open	119.09	-36.955	26.258	5.5136					0	0.7
	Short					0	0	0	0	0.093	0.7
	Load									0	0.7
	Thru									0	0.7
F603ME	Open	49.433	-310.13	23.168	-0.15966					29.2	2.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8	2.36
	Load									0	2.3
	Thru									0	2.3
F603FE	Open	49.433	-310.13	23.168	-.0.15966					29.2	2.3
	Short					2.0765	-108.54	2.1705	-0.01	31.8	2.36
	Load									0	0
	Thru									0	2.3
F504MS Y504MS	Open	89.939	2536.8	-264.99	13.4					40.856	0.93
	Short					3.3998	-496.4808	34.8314	-0.7847	45.955	1.087
	Load									0	0
	Thru									0	0

Model	Type	C0 F(e-15)	C1 F(e-27)/Hz	C2 F(e-36)/Hz^2	C3 F(e-45)/Hz^3	L0 H(e-12)	L1 H(e-24)/Hz	L2 H(e-33)/Hz^2	L3 H(e-42)/Hz^3	Delay (pSec)	Loss (Gohm/Sec)
F504FS Y504FS	Open	89.939	2536.8	-264.99	13.4					41.17	0.93
	Short					3.3998	-496.4808	34.8314	-0.7847	45.955	1.087
	Load									0	0
	Thru									0	0
F505MS	Open	89.939	2536.7999	-264.99	13.4					57.993	0.93
	Short					0.7653	459.8799	-52.429	1.5846	63.078	1.1273
	Load									0	0
	Thru									0	2.2
F505FS	Open	104.13	-1943.4008	144.62	2.2258					22.905	0.93
	Short					-0.1315	606.2089	-68.405	2.0206	27.99	1.3651
	Load									0	0
	Thru									0	2.2
F604MS	Open	49.433	-310.13	23.168	-0.15966					29.2	2.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8	2.36
	Load									0	2.3
	Thru									0	2.3
F604FS	Open	49.433	-310.13	23.168	-0.15966					29.2	2.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8	2.36
	Load									0	0
	Thru									0	2.3
F606MS Y606MS	Open	49.433	-310.13	23.168	-0.15966					29.2	2.2
	Thru					2.0765	-108.54	2.1705	-0.01	31.8	2.36

Model	Type	C0 F(e-15)	C1 F(e-27)/Hz	C2 F(e-36)/Hz^2	C3 F(e-45)/Hz^3	L0 H(e-12)	L1 H(e-24)/Hz	L2 H(e-33)/Hz^2	L3 H(e-42)/Hz^3	Delay (pSec)	Loss (Gohm/Sec)
	Load									0	0
	Thru									0	0
F606FS Y606FS	Open	49.433	-310.13	23.168	-0.15966					29.2	2.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8	2.36
	Load									0	0
	Thru									0	0
KWR42A	Short					0	0	0	0	0	0
	Load									0	0
	1/8λ Line									0.751	2.75
	1/4λ Line									1.502	2.75
	3/8λ Line									2.253	2.75

About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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