

Mechanical Calibration Kit



DataSheet

EN02A

Introduction

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

The Siglent standards include fixed terminations, open circuits, short circuits, and through adaptors, in both sexes.

Model*1	Frequency	Type*3	Connector	Impedence	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
F505TS	DC - 18 GHz	OSLT	N Type-Male AND Female	50 Ω	85054D
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
Y606MS	DC – 26.5 GHz	OSLT	3.5mm-Male	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 code 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/Femae/Both
E/S	Economy/Standard

*2: Mechanical Waveguide calibration kit code 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 adaptor

F503ME and F503FE

The F503ME and F503FE economy 50Ω N type coaxial mechanical calibration standards include fixed terminations, open circuits, short circuits, and through adaptors, specified from DC to 4.5 GHz.

The F503ME and F503FE 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* $\leq \pm 1.0^\circ$
	Short	N-Male	DC – 4.5 GHz, Phase Deviation $\leq \pm 1.0^\circ$
	Load	N-Male	DC – 4.5 GHz, SWR ≤ 1.04 (Return Loss ≥ -34 dB)
	Adapter	N-Male to N-Male	DC – 9 GHz, SWR ≤ 1.035 (Return Loss ≥ -35 dB), Insert Loss ≤ 0.1 dB, Delay= 125.4 ps
F503FE	Open	N-Female	DC – 4.5 GHz, Phase Deviation $\leq \pm 1.0^\circ$
	Short	N-Female	DC – 4.5 GHz, Phase Deviation $\leq \pm 1.0^\circ$
	Load	N-Female	DC – 4.5 GHz, SWR ≤ 1.04 (Return Loss ≥ -34 dB)
	Adapter	N-Female to N-Female	DC – 9 GHz, SWR ≤ 1.035 (Return Loss ≥ -35 dB), Insert Loss ≤ 0.1 dB, Delay= 55.3 ps

* Relative error to the standard phase

General Specification

Impedance	50 Ω
Power	1 W
Interfaces Standard	IEC 60169-16
Durability	> 2000
Torque	1.35 Nm
Spanner	19 mm
Temperature	-15 $^\circ\text{C}$ ~ + 35 $^\circ\text{C}$

F603ME and F603FE

The F603ME and F603FE economy 50Ω 3.5mm/SMA type coaxial mechanical calibration standards include fixed terminations, open circuits, short circuits, and through adaptors, specified from DC to 4.5 GHz.

The F603ME and F603FE 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* $\leq \pm 1.0^\circ$
	Short	3.5mm-Male	DC – 4.5 GHz, Phase Deviation $\leq \pm 1.0^\circ$
	Load	3.5mm-Male	DC – 4.5 GHz, SWR ≤ 1.04 (Return Loss ≥ -34 dB)
	Adapter	3.5mm-Male to 3.5mm-Male	DC – 9 GHz, SWR ≤ 1.035 (Return Loss ≥ -35 dB), Insert Loss ≤ 0.2 dB, Delay= 56.6 ps
F603FE	Open	3.5mm-Female	DC – 4.5 GHz, Phase Deviation $\leq \pm 1.0^\circ$
	Short	3.5mm-Female	DC – 4.5 GHz, Phase Deviation $\leq \pm 1.0^\circ$
	Load	3.5mm-Female	DC – 4.5 GHz, SWR ≤ 1.04 (Return Loss ≥ -34 dB)
	Adapter	3.5mm-Female to 3.5mm-Female	DC – 9 GHz, SWR ≤ 1.035 (Return Loss ≥ -35 dB), Insert Loss ≤ 0.2 dB, Delay= 56.8 ps

* Relative error to the standard phase.

General Specification

Impedance	50 Ω
Power	1 W
Interfaces Standard	IEC 60169-23
Durability	> 2000
Torque	0.9 Nm
Spanner	8 mm
Temperature	-15 °C ~ + 35 °C

F504MS, Y504FS, F504FS, Y504FS and F504TS

The F504TS is a coaxial calibration member consisting of a set of F504MS and a set of F504FS. The F504MS and F504FS economy 50Ω N type coaxial mechanical calibration standards include fixed terminations, open circuits, short circuits, and through adaptors, specified from DC to 9 GHz.

The F504MS and F504FS 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.

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



Performance

Model	Type	Connector	Specification	
F504TS	F504MS/ Y504MS	Open	N-Male	DC – 9 GHz, Phase Deviation* $\leq \pm 0.8^\circ$
		Short	N-Male	DC – 9 GHz, Phase Deviation $\leq \pm 0.8^\circ$
		Load	N-Male	DC – 9 GHz, SWR ≤ 1.032 (Return Loss ≥ -36 dB)
		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 $\leq \pm 0.8^\circ$
		Short	N-Female	DC – 9 GHz, Phase Deviation $\leq \pm 0.8^\circ$
		Load	N-Female	DC – 9 GHz, SWR ≤ 1.032 (Return Loss ≥ -36 dB)
		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

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

F505TS

The F505TS is a coaxial calibration member consisting of a set of F505MS and a set of F505FS. The F505MS and F505FS economy 50Ω N type coaxial mechanical calibration standards include fixed terminations, open circuits, short circuits, and through adaptors, specified from DC to 18 GHz.

The F505MS and F505FS 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* $\leq \pm 1^\circ$
		Short	N-Male DC – 18 GHz, Phase Deviation $\leq \pm 1^\circ$
		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 $\leq \pm 1^\circ$
		Short	N-Female DC – 18 GHz, Phase Deviation $\leq \pm 1^\circ$
		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

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

F604MS, F604FS and F604TS

The F604TS is a coaxial calibration member consisting of a set of F604MS and a set of F604FS. The F604MS and F604FS economy 50Ω 3.5mm/SMA type coaxial mechanical calibration standards include fixed terminations, open circuits, short circuits, and through adapters, specified from DC to 9 GHz.

The F604MS and F604FS 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* $\leq \pm 0.8^\circ$
		Short	3.5mm-Male DC – 9 GHz, Phase Deviation $\leq \pm 0.8^\circ$
		Load	3.5mm-Male DC – 9 GHz, SWR ≤ 1.032 (Return Loss ≥ -36 dB)
		Adapter	3.5mm-Male to 3.5mm-Male DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31 dB), 9 – 26.5 GHz, SWR ≤ 1.1 (Return Loss ≥ -26 dB), Insert Loss ≤ 0.1 dB, Delay= 82.0 ps
	F604FS	Open	3.5mm-Female DC – 9 GHz, Phase Deviation $\leq \pm 0.8^\circ$
		Short	3.5mm-Female DC – 9 GHz, Phase Deviation $\leq \pm 0.8^\circ$
		Load	3.5mm-Female DC – 9 GHz, SWR ≤ 1.04 (Return Loss ≥ -34 dB)
		Adapter	3.5mm-Female to 3.5mm-Female DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31 dB), 9 – 26.5 GHz, SWR ≤ 1.1 (Return Loss ≥ -26 dB), Insert Loss ≤ 0.1 dB, Delay= 83.0 ps
	Adapter		3.5mm-male to 3.5mm-Female DC – 9 GHz, SWR ≤ 1.06 (Return Loss ≥ -31 dB), 9 – 26.5 GHz, SWR ≤ 1.1 (Return Loss ≥ -26 dB), Insert Loss ≤ 0.1 dB
	Wrench		3.5mm-8mm 0.9 Nm

* Relative error to the standard phase.

General Specification

Impedance	50 Ω	Power	1 W
Interfaces Standard	IEC 60169-23	Durability	> 2000
Torque	0.9 Nm	Spanner	8 mm
Temperature	-15 $^\circ\text{C}$ ~ + 35 $^\circ\text{C}$		

Y606MS, Y606FS, F606FS, F606MS and F606TS

The F606TS is a coaxial calibration member consisting of a set of F606MS and a set of F606FS. The F606MS and F606FS economy 50Ω 3.5mm/SMA type coaxial mechanical calibration standards include fixed terminations, open circuits, short circuits, and through adapters, specified from DC to 26.5 GHz. The F606MS and F606FS 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* $\leq \pm 1.5^\circ$
		Short	3.5mm-Male	DC – 26.5 GHz, Phase Deviation $\leq \pm 1.5^\circ$
		Load	3.5mm-Male	DC – 26.5 GHz, SWR ≤ 1.055
		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 $\leq \pm 1.5^\circ$
		Short	3.5mm-Female	DC – 26.5 GHz, Phase Deviation $\leq \pm 1.5^\circ$
		Load	3.5mm-Female	DC – 26.5 GHz, SWR ≤ 1.055
		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

Impedance	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		

KWR42A

The KWR42A is a precise 50Ω waveguide mechanical calibration standards include fixed terminations, 2.92mm female Waveguide coaxial converter circuits, 2.92mm male Waveguide coaxial converter circuits, Waveguide load circuits, short circuits, 1/8λ Waveguide circuits, 1/4λ Waveguide circuits and 3/8λ Waveguide circuits, specified from 18 GHz to 26.5 GHz.

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)	Delay (Sec)	Loss (Gohm/Sec)
KWR42A	Short	K-band waveguide	14047	28094	0	0
	1/8λ line	K-band waveguide	14047	28094	0.751E-11	2.75
	1/4λ line	K-band waveguide	14047	28094	1.502E-11	2.75
	3/8λ line	K-band waveguide	14047	28094	2.253E-11	2.75
	Load	K-band waveguide	14047	28094	0	0
	2.92mm female Waveguide coaxial converter		14047	28094	VSWR≤1.25;IL≤0.5dB	
	2.92mm male Waveguide coaxial converter		14047	28094	VSWR≤1.25;IL≤0.5dB	

General Specification

Impedence	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 ps(1e-12*s)
F503ME	Open	62.14	-143.07	82.92	0.76					17.4
	Short					0	0	0	0	17.8
	Load									0
	Adapter									125.4
F503FE	Open	119.09	-36.955	26.258	5.5136					0
	Short					0	0	0	0	0.093
	Load									0
	Adapter									55.3
F603ME	Open	49.433	-310.13	23.168	-0.15966					29.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8
	Load									0
	Adapter									56.6
F603FE	Open	49.433	-310.13	23.168	-0.15966					29.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8
	Load									0
	Adapter									56.8
F504MS /Y504MS	Open	89.939	2536.8	-264.99	13.4					40.856
	Short					3.3998	-496.4808	34.8314	-0.7847	45.955
	Load									0
	Adapter									197.1

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 ps(1e-12*s)
F504FS /Y504FS	Open	89.939	2536.8	-264.99	13.4					41.17
	Short					3.3998	-496.4808	34.8314	-0.7847	45.955
	Load									0
	Adapter									136.2
F604MS	Open	49.433	-310.13	23.168	-0.15966					29.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8
	Load									0
	Adapter									82
F604FS	Open	49.433	-310.13	23.168	-0.15966					29.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8
	Load									0
	Adapter									82
F606MS	Open	49.433	-310.13	23.168	-0.15966					29.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8
	Load									0
	Adapter									82
F606FS	Open	49.433	-310.13	23.168	-0.15966					29.2
	Short					2.0765	-108.54	2.1705	-0.01	31.8
	Load									0
	Adapter									82



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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