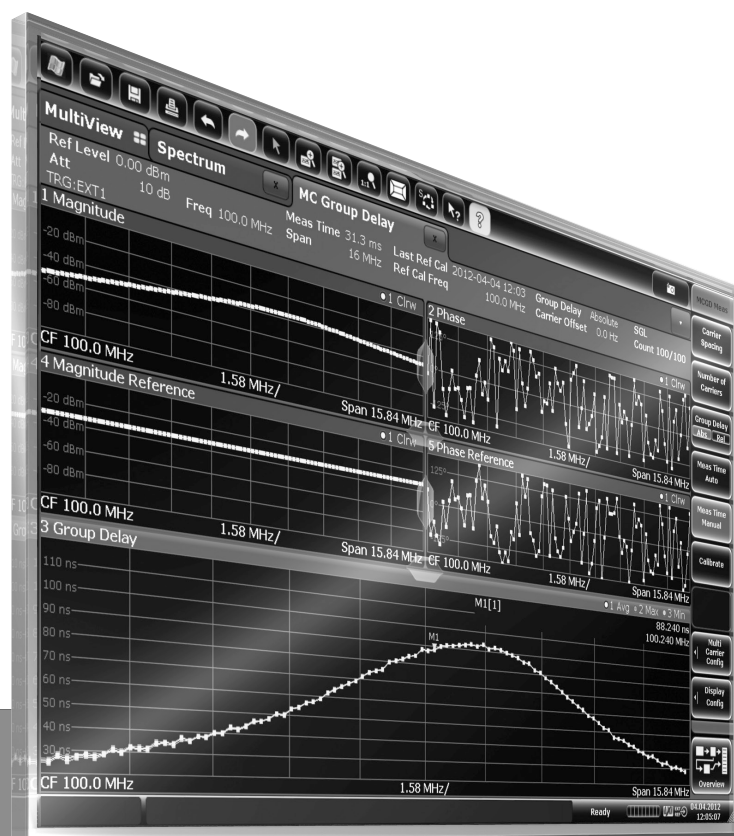


R&S®FSW-K17 MULTICARRIER GROUP DELAY MEASUREMENTS

Specifications



Data Sheet
Version 05.00

ROHDE & SCHWARZ

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Definitions

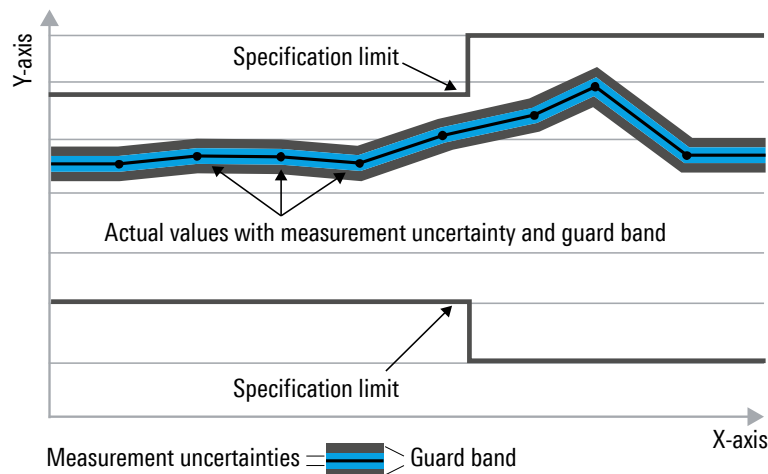
General

Product data applies under the following conditions:

- Three hours storage at ambient temperature followed by 30 minutes warm-up operation
- Specified environmental conditions met
- Recommended calibration interval adhered to
- All internal automatic adjustments performed, if applicable

Specifications with limits

Represent warranted product performance by means of a range of values for the specified parameter. These specifications are marked with limiting symbols such as $<$, \leq , $>$, \geq , \pm , or descriptions such as maximum, limit of, minimum. Compliance is ensured by testing or is derived from the design. Test limits are narrowed by guard bands to take into account measurement uncertainties, drift and aging, if applicable.



Non-traceable specifications with limits (n. trc.)

Represent product performance that is specified and tested as described under “Specifications with limits” above. However, product performance in this case cannot be warranted due to the lack of measuring equipment traceable to national metrology standards. In this case, measurements are referenced to standards used in the Rohde & Schwarz laboratories.

Specifications without limits

Represent warranted product performance for the specified parameter. These specifications are not specially marked and represent values with no or negligible deviations from the given value (e.g. dimensions or resolution of a setting parameter). Compliance is ensured by design.

Typical data (typ.)

Characterizes product performance by means of representative information for the given parameter. When marked with $<$, $>$ or as a range, it represents the performance met by approximately 80 % of the instruments at production time. Otherwise, it represents the mean value.

Nominal values (nom.)

Characterize product performance by means of a representative value for the given parameter (e.g. nominal impedance). In contrast to typical data, a statistical evaluation does not take place and the parameter is not tested during production.

Measured values (meas.)

Characterize expected product performance by means of measurement results gained from individual samples.

Uncertainties

Represent limits of measurement uncertainty for a given measurand. Uncertainty is defined with a coverage factor of 2 and has been calculated in line with the rules of the Guide to the Expression of Uncertainty in Measurement (GUM), taking into account environmental conditions, aging, wear and tear.

Device settings and GUI parameters are designated with the format “parameter: value”.

Non-traceable specifications with limits, typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Specifications

The R&S®FSW-K17 and R&S®FSW-K17S measurement specifications are based on the specifications in the data sheet for the R&S®FSW signal and spectrum analyzer. They have not been checked separately and are not verified during instrument calibration. The specified group delay measurement errors do not consider systematic errors due to reduced signal-to-noise (S/N) ratio.

Frequency

Frequency range	RF input	same as R&S®FSW ¹
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Level

Level range	RF input	-40 dBm to +30 dBm ¹
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Measurement parameters

Maximum span for R&S®FSW-K17	standard	10 MHz
	with R&S®FSW-B28 option	28 MHz
	with R&S®FSW-B40 option	40 MHz
	with R&S®FSW-B80 option	80 MHz
	with R&S®FSW-B160 option	160 MHz
	with R&S®FSW-B320 option	320 MHz
	with R&S®FSW-B512 option	512 MHz
	with R&S®FSW-B512R option	512 MHz
	with R&S®FSW-B1200 option	1200 MHz
	with R&S®FSW-B2001 option	2000 MHz
	with R&S®FSW-B4001 option	4400 MHz
	with R&S®FSW-B6001 option	6400 MHz
with R&S®FSW-B8001 option	8312 MHz	
Number of carriers		2 to 250001
Sweep count		1 to 32767
Group delay mode		absolute/relative
Carrier estimation		all carriers/offset/fixd
Trigger modes		free run, external, IF power ¹ , RF power ¹ , I/Q power

Display formats

Magnitude		multicarrier signal magnitude versus frequency of measurement signal
Magnitude reference		multicarrier signal magnitude versus frequency of calibration signal
Phase		multicarrier signal phase versus frequency of measurement signal
Phase reference		multicarrier signal phase versus frequency of calibration signal
Phase difference		difference of multicarrier signal phase between measurement signal and calibration signal versus frequency
Group delay		absolute/relative group delay
Gain		gain in magnitude of the multicarrier signal from the calibration signal to the measurement signal versus frequency
Marker table		marker result table

¹ Restricted IF overload, IF power trigger and auto level functionality depending on carrier frequency and bandwidth at carrier frequencies < 50 MHz.

Measurement accuracy for non-frequency-translating measurements (nom.)

The center frequency of the calibration is the same as for group delay measurements. Carrier spacing is ≥ 100 kHz. For absolute group delay measurements, the external trigger is applied. Generator output power per tone is ≥ -48 dBm, crest factor optimization "chirp" applied to the multicarrier signal. The reference level is properly adjusted. The group delay accuracy is defined as the deviation from group delay = 0 s after calibrating and measuring against the calibration signal with measurement time mode "Auto". If averaging is applied, the same average count is used for the calibration as well as for the measurement.

Measurement accuracy for relative group delay

Measurement accuracy for R&S®FSW-K17 and R&S®FSW-K17S ²		
Span ≤ 60 MHz	center frequency = 100 MHz to 34 GHz	± 300 ps
	center frequency = 34 GHz to 40 GHz	± 600 ps
60 MHz < span ≤ 160 MHz with R&S®FSW-B160 or R&S®FSW-B320	center frequency = 150 MHz to 34 GHz	± 300 ps
	center frequency = 34 GHz to 40 GHz	± 600 ps
160 MHz < span ≤ 320 MHz with R&S®FSW-B320	center frequency = 200 MHz to 34 GHz	± 300 ps
	center frequency = 34 GHz to 40 GHz	± 600 ps
60 MHz < span ≤ 512 MHz with R&S®FSW-B512 or R&S®FSW-B512R	60 MHz < span ≤ 160 MHz, center frequency = 150 MHz to 34 GHz	± 300 ps
	160 MHz < span ≤ 500 MHz, center frequency = 260 MHz to 34 GHz	
	500 MHz < span ≤ 512 MHz, center frequency = 460 MHz to 34 GHz	
	center frequency = 34 GHz to 40 GHz	± 600 ps

Additional constant offset for absolute group delay

Additional constant offset for R&S®FSW-K17		
Span ≤ 60 MHz ³ (100 averages)		± 20 ps
80 MHz < span ≤ 160 MHz with R&S®FSW-B160 or R&S®FSW-B320		± 10 ns
160 MHz < span ≤ 320 MHz with R&S®FSW-B320		± 10 ns
60 MHz < span ≤ 512 MHz with R&S®FSW-B512 or R&S®FSW-B512R (100 averages)		± 20 ps

² For R&S®FSW-K17S, the measurement accuracy applies to single subspans within the overall span measurement.

³ Not valid for detector boards with order number 1312.8175 and revision 04.07 or 06.02.
Please contact the central service of Rohde & Schwarz if upgrade is needed.

Measurement accuracy for frequency-translating measurements (nom.)

Uncertainty for relative group delay measurements

Measurement with center frequency for calibration f_1 and center frequency for group delay measurement f_2

Uncertainty for R&S®FSW-K17		
Span ≤ 60 MHz	f_1 and f_2 between 100 MHz and 40 GHz	±1 ns
60 MHz < span ≤ 160 MHz ⁴ with R&S®FSW-B160 or R&S®FSW-B320	f_1 and f_2 between 150 MHz and 40 GHz	
160 MHz < span ≤ 320 MHz ⁵ with R&S®FSW-B320	f_1 and f_2 between 200 MHz and 40 GHz	
60 MHz < span ≤ 512 MHz with R&S®FSW-B512 or R&S®FSW-B512R	60 MHz < span ≤ 160 MHz, f_1 and f_2 between 150 MHz and 40 GHz	
	160 MHz < span ≤ 500 MHz, f_1 and f_2 between 300 MHz and 40 GHz	
	500 MHz < span ≤ 512 MHz, f_1 and f_2 between 460 MHz and 40 GHz	

Additional constant offset between calibration and measurement for absolute group delay measurements

Additional constant offset for R&S®FSW-K17	carrier spacing = 100 kHz, span = 25 MHz	
	center frequency for calibration = 100 MHz	< 5 ns
	center frequency for measurement = 1 GHz	
	center frequency for calibration = 100 MHz	< 6 ns
	center frequency for measurement = 2 GHz	
	center frequency for calibration = 100 MHz	< 4 ns
center frequency for measurement = 4 GHz		

⁴ The specifications for 60 MHz to 160 MHz analysis bandwidth in this section apply to the following options: R&S®FSW-B160 (order no. 1325.4850.14), R&S®FSW-B320 (order no. 1325.4867.14).

⁵ The specifications in this section apply in combination with the R&S®FSW-B320 option (order no. 1325.4867.14).

Ordering information

Designation	Type	Order No.
Multicarrier group delay measurements	R&S®FSW-K17	1313.4150.02
Frequency subspan measurements for multicarrier group delay measurements (requires R&S®FSW-K17 as well as a minimum internal analysis bandwidth of 512 MHz)	R&S®FSW-K17S	1338.5896.02
Signal and spectrum analyzer, 2 Hz to 8 GHz	R&S®FSW8	1331.5003.08
Signal and spectrum analyzer, 2 Hz to 13.6 GHz	R&S®FSW13	1331.5003.13
Signal and spectrum analyzer, 2 Hz to 26.5 GHz	R&S®FSW26	1331.5003.26
Signal and spectrum analyzer, 2 Hz to 43.5 GHz	R&S®FSW43	1331.5003.43
Signal and spectrum analyzer, 2 Hz to 50 GHz	R&S®FSW50	1331.5003.50
Signal and spectrum analyzer, 2 Hz to 67 GHz	R&S®FSW67	1331.5003.67
Signal and spectrum analyzer, 2 Hz to 85 GHz	R&S®FSW85	1331.5003.85
Recommended options and extras		
28 MHz analysis bandwidth	R&S®FSW-B28	1313.1645.02
40 MHz analysis bandwidth	R&S®FSW-B40	1313.0861.02
80 MHz analysis bandwidth	R&S®FSW-B80	1313.0878.02
160 MHz analysis bandwidth	R&S®FSW-B160	1325.4850.14
320 MHz analysis bandwidth	R&S®FSW-B320	1325.4867.14
512 MHz analysis bandwidth	R&S®FSW-B512	1331.7106.14
1.2 GHz analysis bandwidth	R&S®FSW-B1200	1331.6400.14
2 GHz analysis bandwidth	R&S®FSW-B2001	1331.6916.14
4.4 GHz analysis bandwidth	R&S®FSW-B4001	1338.5215.14
6.4 GHz analysis bandwidth	R&S®FSW-B6001	1338.5221.14
8.312 GHz analysis bandwidth	R&S®FSW-B8001	1338.5238.14
Real-time spectrum analyzer 512 MHz, POI ≤ 15 µs	R&S®FSW-B512R	1331.7106.16
Real-time spectrum analyzer 800 MHz, POI ≤ 15 µs (includes 2 GHz analysis bandwidth)	R&S®FSW-B800R	1331.6400.16

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