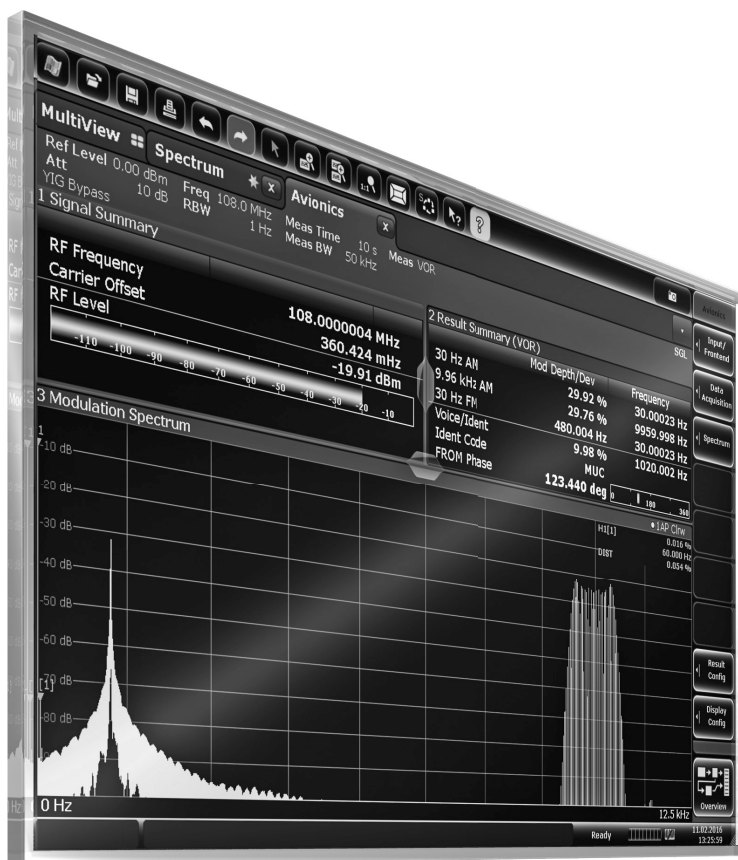


R&S®FSW-K15

VOR/ILS Measurement

Application

Specifications



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Definitions

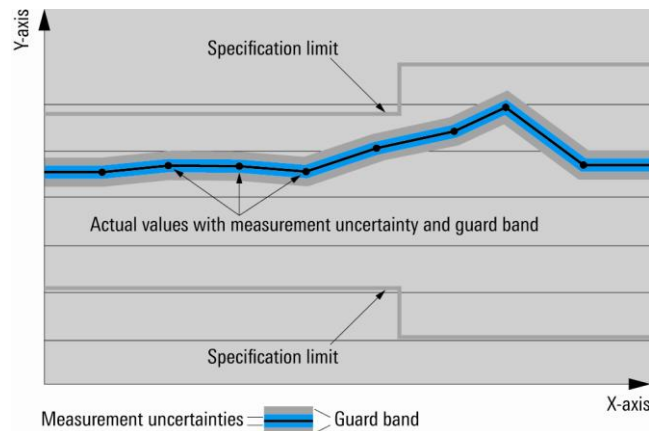
General

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.



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".

Typical data as well as nominal and measured values are not warranted by Rohde & Schwarz.

Specifications

The specifications of the R&S®FSW-K15 VOR/ILS Measurement application are based on the specifications in the data sheet for the R&S®FSW signal and spectrum analyzer. Measurement uncertainties are given as 95 % confidence intervals. They apply for the specified frequency ranges, signal levels and default measurement times. The specified accuracies do not take into account systematic errors due to reduced signal-to-noise ratio (S/N) and mismatch errors.

Frequency

Center frequency	usable frequency range	same as instrument frequency range
	specified frequency range	10 MHz to 12 MHz
		70 MHz to 120 MHz
		319 MHz to 341 MHz

Level

Reference level range	RF input	
	specified level range	–60 dBm to +30 dBm
Reference level setting		manual

Signal acquisition

Supported navigation systems		ILS localizer
		ILS glideslope
		VOR
		RF
Input		
		RF
Demodulation bandwidth	ILS	100 kHz, 50 kHz, 12.5 kHz, 3.2 kHz, 800 Hz
	VOR	100 kHz, 50 kHz, 25 kHz
Measurement time	ILS, demodulation bandwidth 100 kHz, 50 kHz, 12.5 kHz	100 ms to 8.356 s
	ILS demodulation bandwidth 3.2 kHz	100 ms to 33.4 s
	ILS demodulation bandwidth 800 Hz	100 ms to 133 s
	VOR	100 ms to 30 s
Triggering	RF input	free run, IF power, external

Result display

Signal Summary	RF frequency	resolution 1 Hz
	carrier offset	min. 4 digits
	RF level, numeric display and bar graph	resolution 0.01 dB
Result Summary ILS	for audio signals: 90 Hz AM, 150 Hz AM, SDM (90 Hz +150 Hz), voice/ident	
	AM modulation depth	resolution 0.01 %
	modulation or audio frequency	resolution 7 digits
	harmonic distortion (K2, K3) and total harmonic distortion (THD)	range –100 dB to 0 dB, 0.001 % to 100 % resolution 0.01 %, 0.01 dB unit dB, %
	ident morse code	
	phase difference 90/150 Hz	range $\pm 60^\circ$ resolution 0.001°
	DDM, numeric display and bar graph	resolution 0.000001 DDM range 0 to ± 0.999999 DDM unit 1, %
Result summary VOR	for audio signals: 30 Hz AM, 9960 Hz AM, voice/ident	
	AM modulation depth	resolution 0.01 %
	modulation or audio frequency	resolution 7 digits
	harmonic distortion (K2, K3) and total harmonic distortion (THD)	range –100 dB to 0 dB, 0.001 % to 100 % resolution 0.01 %, 0.01 dB unit: dB, %
	for audio signal 30 Hz FM	
	FM deviation	maximum deviation: 700 Hz resolution: 0.001 Hz
	modulation or audio frequency	resolution 7 digits
	harmonic distortion (K2, K3) and total harmonic distortion (THD)	range –100 dB to 0 dB, 0.001 % to 100 % resolution 0.01 %, 0.01 dB unit dB, %
	ident morse code	
	azimuth phase, numeric display and bar graph	notation: FROM, TO range: 0° to 360° resolution: 0.001°
Modulation spectrum	spectrum of the AF signal	logarithmic or linear scale.
	supports user specific distortion analysis (markers)	
Distortion summary ILS	K2, K3 and THD of 90 Hz AM 150 Hz AM SDM (90+150) voice/ident	range –100 dB to 0 dB, 0.001 % to 100 % resolution 0.01 %, 0.01 dB unit dB, %
Distortion summary VOR	K2, K3 and THD of 30 Hz AM 30 Hz FM 9960 Hz AM voice/ident	range –100 dB to 0 dB, 0.001 % to 100 % resolution 0.01 %, 0.01 dB unit dB, %
Marker table	marker x and y positions for modulation spectrum	

Measurement uncertainty

Level and frequency

Level measurement uncertainty		same as R&S®FSW (see R&S®FSW total measurement uncertainty)
RF frequency counter accuracy	S/N > 25 dB	same as R&S®FSW (see R&S®FSW count accuracy)

ILS signal analysis

Modulation depth measurement		
Accuracy 90/150 Hz $\pm 1\%$ and 300 Hz to 4 kHz (voice/identifier)	RF signal	< 0.4 %
Audio frequency counter		
Accuracy		< 0.002 %
DDM measurement		
Accuracy	F _{mod} : 90/150 Hz $\pm 1\%$, SDM 40% (localizer)	
	DDM < 0.1, RF signal	< 0.0002 DDM $\pm 0.1\%$ of reading
	DDM > 0.1, RF signal	< 0.0002 DDM $\pm 0.2\%$ of reading
Accuracy	F _{mod} : 90/150 Hz $\pm 1\%$, SDM 80% (glideslope)	
	DDM < 0.2, RF signal	< 0.0004 DDM $\pm 0.1\%$ of reading
	DDM > 0.2, RF signal	< 0.0004 DDM $\pm 0.2\%$ of reading
Phase measurement 90/150 Hz		
Accuracy	90/150 modulation depths > 5%, F _{mod} : 90/150 Hz $\pm 1\%$, RF signal	< 0.03°

VOR signal analysis

AM modulation depth		
Accuracy of reference and variable signal	30 Hz $\pm 1\%$, 9960 Hz $\pm 1\%$	
	RF signal	< 0.5 %
Accuracy 300 Hz to 4 kHz (voice/identifier)	RF signal	< 1 %
FM modulation deviation		
Accuracy	9960 Hz $\pm 1\%$	< 0.5 %
Audio frequency counter		
Accuracy		< 0.002 %
Azimuth phase measurement		
Accuracy	modulation depths not below 5%, F _{mod} : 30 Hz $\pm 1\%$, 9960 Hz $\pm 1\%$	< 0.03°

Distortion analysis

Level		
Accuracy		0.5 dB
Inherent harmonic distortion	VOR: 30 Hz, 1020 Hz signal	< 0.1 %

Ordering information

Designation	Type	Order No.	Retrofittable	Remarks
VOR/ILS Measurement Application	R&S®FSW-K15	1331.4388.02	yes	
Signal and Spectrum Analyzer, 2 Hz to 8 GHz	R&S®FSW8	1312.8000.08		
Recommended options and extras				
RF Preamplifier, 100 kHz to 8 GHz	R&S®FSW-B24	1313.0832.13	yes	for the R&S®FSW8/13 only. Contact service center
Electronic Attenuator, 1 dB steps	R&S®FSW-B25	1313.0990.02	yes	
OCXO Precision Frequency Reference	R&S®FSW-B4	1313.0703.02	yes	

For R&S®FSW product brochure, see PD 5214.5984.12,
for R&S®FSW data sheet, see PD 5214.5984.22
and www.rohde-schwarz.com