

# R&S® EDS300

## DME/Pulse Analyzer

Precise distance and pulse analysis for ground and air measurements



3 year warranty

# R&S®EDS300 DME/Pulse Analyzer At a glance

The R&S®EDS300 is a level and modulation analyzer designed for installing and maintaining pulsed, terrestrial navigation services. Its high sensitivity and compact design make the R&S®EDS300 ideal for conducting field measurements on the ground and in the air. The DME/pulse analyzer also features trigger and synchronization capabilities for easy integration into test vehicles and flight inspection systems.

The R&S®EDS300 offers high-precision distance measurements within a range of up to 400 nautical miles (NM) for terrestrial, pulsed navigation signals from 960 MHz to 1215 MHz (e.g. distance measurement equipment (DME)). The R&S®EDS300 can precisely determine peak power and reply efficiency and can identify the ground station to be measured.

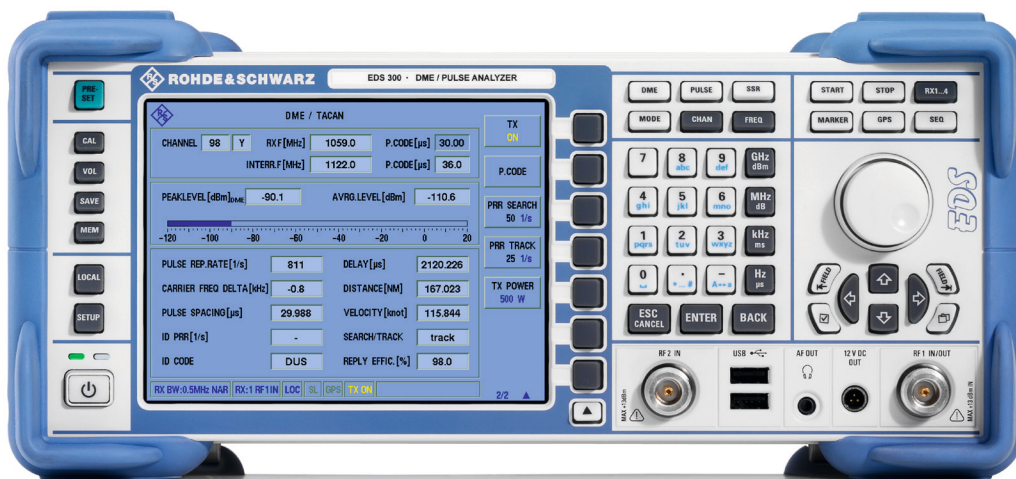
The modular design of the analyzer provides a high degree of flexibility to adapt it to the task at hand. An interrogator with selectable output power (up to 20 W peak) is available for ground measurements, making it possible to acquire all system parameters such as main delay and reply efficiency. Moreover, a high-power interrogator featuring up to 500 W (peak) can be used for flight inspections.

Using the R&S®EDS-B2 or R&S®EDS-B4 option, the R&S®EDS300 measures the distance to a DME ground station as well as various other DME parameters such as reply efficiency and pulse repetition rate. The R&S®EDS-K5 multi-DME mode option expands this functionality to include flight inspection measurements and diverse monitoring applications, making it possible to analyze up to ten ground stations within 50 ms.

The R&S®EDS300 also measures the parameters of TACAN stations (R&S®EDS-K1 TACAN analysis) and performs in-depth pulse analysis (R&S®EDS-K2 pulse shape analysis). Featuring a flat menu structure and a straightforward result representation on the 6.5" TFT color display, the R&S®EDS300 offers exceptional ease of operation. All data can be transmitted to a control system via remote control (LAN), or stored on a USB flash drive (using the data logger). With the R&S®EDS-K3 GPS synchronization option installed and an external NMEA-capable GPS receiver connected, the R&S®EDS300 stores the (D)GPS timestamp and location stamp for every data set.

## Key facts

- High-precision measurement of DME and TACAN systems on the ground and in the air (in line with ICAO Doc. 8071, ICAO Annex 10, STANAG 5034 and MIL-STD-291C)
- Total peak level deviation < 1 dB
- Receiver acquisition sensitivity -97 dBm
- 0.01 NM distance measurement uncertainty down to -80 dBm
- 0.2° TACAN bearing deviation for input levels ≥ -80 dBm
- Detailed automated pulse shape analysis
- Multi-DME mode for measuring up to ten DME stations quasi-simultaneously, i.e. within 50 ms (R&S®EDS-K5)
- Synchronization via GPS, trigger and remote interfaces



# R&S®EDS300 DME/Pulse Analyzer

## Benefits and key features

### Measurement functions for regular verification of pulsed navigation signals

- High-precision distance and level measurements on DME ground stations
- Accurate analysis of military TACAN stations
- High dynamic range of 105 dB
- Detailed analysis in line with ICAO requirements, STANAG and MIL-STD

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### Expanded functionality and adaptation using hardware and software options

- Precise distance measurements on the ground and in the air
- High-performance multi-DME mode for measuring up to ten DME stations (R&S®EDS-K5)
- Simultaneous measurement of two different signals using an additional RX unit (R&S®EDS-B1)
- Low-power interrogator for ground measurements with variable output power (R&S®EDS-B2)
- Flight inspection with integrated high-power interrogator (R&S®EDS-B4)
- Modulation and signal analysis of TACAN ground stations (R&S®EDS-K1)
- Detailed pulse shape analysis on DME systems (R&S®EDS-K2)
- GPS-based measurements (R&S®EDS-K3)

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### User-friendly design and application-specific extras

- Compact, robust design for stationary and mobile applications
- Remote control via LAN interface
- Easy measurement data transfer via USB data logger
- Various synchronization capabilities for integration into existing flight inspection systems
- Maintenance, repair and service

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# Measurement functions for regular verification of pulsed navigation signals

## **High-precision distance and level measurements on DME ground stations**

The R&S®EDS300 offers excellent accuracy for determining a DME station's pulse power within a measurement range of 105 dB in autorange mode using a switchable preamplifier or an electronically switched attenuator.

The built-in interrogator and digital signal processing enable distance measurements in a range of 400 NM. Once the distance to the ground station has been determined, the R&S®EDS300 switches from search mode to track mode, reduces the number of interrogation pulses and continuously displays all readings.

## **Accurate analysis of military TACAN stations**

The R&S®EDS300 features detailed analysis capabilities for orbital or radial flight inspection missions, ground measurements or monitoring of TACAN stations in line with STANAG 5034 and MIL-STD-291C. It offers a bearing deviation of  $< 0.2^\circ$  for input levels  $\geq -80$  dBm and performs measurements on 15 Hz and 135 Hz AM modulation.

## **Multi-DME measurements for regular flight inspection**

In order to reduce flight hours to a necessary minimum and save cost and time, flight inspection systems benefit from the multi-DME measurement capability of the R&S®EDS300. The R&S®EDS300 is able to analyze 10 different DME ground stations within 50 ms.

## **High dynamic range of 105 dB**

The analyzer's low noise figure yields excellent input sensitivity and allows highly accurate analysis even at large distances from the DME ground stations to be measured. The high dynamic range of 105 dB, intelligent signal analysis capabilities and excellent shielding of the analyzer casing ensure stable readings, even in environments that are subject to interference.

## **Detailed analysis in line with ICAO requirements, STANAG and MIL-STD**

ICAO Doc. 8071, ICAO Annex 10, STANAG 5034 and MIL-STD-291C specify exactly how to service DME systems and TACAN stations.

Thanks to the flexibility of the R&S®EDS300, the necessary measurements can be performed with just one instrument on the ground.

# Expanded functionality and adaptation using hardware and software options

## Precise distance measurements on the ground and in the air

Slant range measurements are crucial for DME system testing. Using the R&S®EDS-B2 or R&S®EDS-B4 interrogator option, the R&S®EDS300 can perform slant range measurements on the ground or in the air with an uncertainty of 0.01 NM in a dynamic range of 90 dB.

In this mode, the R&S®EDS300 additionally displays other relevant measurement values such as peak and average power, frequency, reply efficiency, pulse spacing and the station identifier.

## High-performance multi-DME mode for measuring up to ten DME stations (R&S®EDS-K5)

During flight inspection and for monitoring applications on the ground, it is very important to measure all DME stations within range. Using the R&S®EDS-K5 option, the R&S®EDS300 can analyze up to ten DME stations quasi-simultaneously, i.e. within 50 ms up to a distance of 310 NM. For every single DME station, the R&S®EDS300 measures reception level and distance with an uncertainty of 0.05 NM down to -95 dBm, as well as the reply efficiency, the pulse code and the ID. This feature is highly beneficial for flight inspection service providers, as it allows them to reduce flight hours and minimize costs.

## Simultaneous measurement of two different signals using an additional RX unit (R&S®EDS-B1)

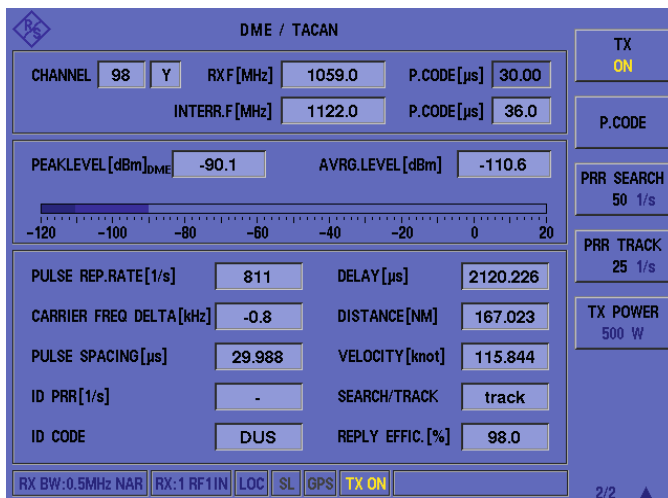
The R&S®EDS-B1 additional RX unit enables the R&S®EDS300 to simultaneously perform distance and level measurements for a ground station and pulse shape analysis using the R&S®EDS-K2 option. This makes it possible to evaluate the reply pulses from the ground station and to analyze any multipath propagation.

## Low-power interrogator for ground measurements with variable output power (R&S®EDS-B2)

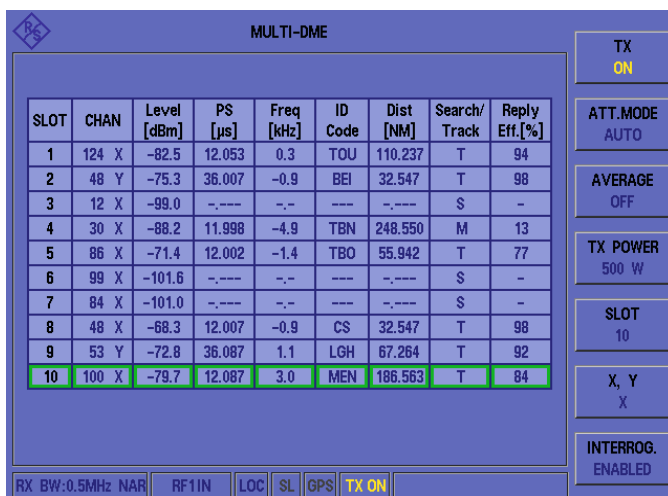
The R&S®EDS300 is able to perform a variety of measurements on the ground. The R&S®EDS-B2 low-power interrogator option with a selectable pulse power of -30 dBm to +43 dBm (= 20 W) can actively poll a DME system in the field, making the R&S®EDS300 the only instrument on the market to evaluate all relevant system parameters (e.g. distance, pulse power, spacing of double pulses, reply efficiency) on the ground.

On a directional coupler at the ground station, the R&S®EDS300 can directly determine the main delay and the RF system power, which eliminates the need for additional instruments such as oscilloscopes and power meters. The R&S®EDS300 determines the sensitivity of the station by lowering the interrogator's transmit power until the reply efficiency drops to 70%.

DME screen: all relevant signal parameters at a glance.



Multi-DME mode screen: simultaneous measurement of up to ten DME stations.



## Flight inspection with integrated high-power interrogator (R&S®EDS-B4)

When equipped with the R&S®EDS-B4 high-power interrogator option, the R&S®EDS300 can be operated with an output power of 100 W, 250 W or 500 W (peak), which turns it into a compact test and analysis device for advanced flight inspection applications.

When employed on board a flight inspection aircraft, the R&S®EDS-B4 allows extensive measurements on DME/TACAN systems. The high output power of the interrogator makes it possible to perform measurements on systems up to the boundaries of the service area (max. 400 NM).

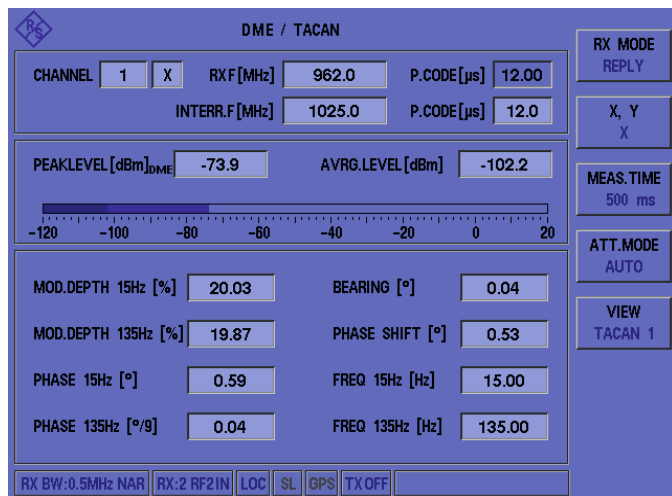
## Modulation and signal analysis of TACAN ground stations (R&S®EDS-K1)

The R&S®EDS-K1 TACAN analysis option expands the R&S®EDS300 to include measurement functions for fully analyzing TACAN signals. It delivers the TACAN bearing with a deviation of  $< 0.2^\circ$  for input levels down to  $-80$  dBm and measures the 15 Hz and 135 Hz AM modulation depth with an uncertainty of 0.5%. In addition, it measures the modulation frequency of the AM components and evaluates the main and auxiliary reference bursts (delivering pulse counts and pulse spacing).

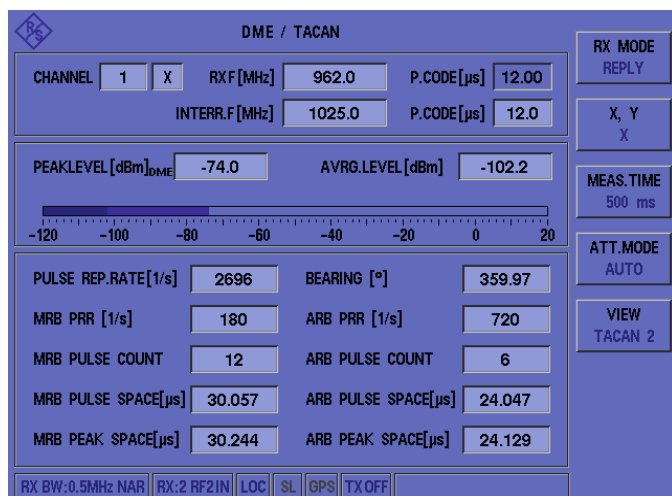
The R&S®EDS-K1 option comes as a USB flash drive (TACAN dongle) that is inserted into the analyzer. It is subject to export control.

The R&S®EDS-K1 TACAN analysis option is ideal for servicing and commissioning stationary and mobile TACAN stations and for regular flight inspection. In-flight operation often requires the connection of two different antennas to the receiver to be able to select the antenna that delivers the best signal. The R&S®EDS300 meets this requirement by providing two separate antenna inputs that can be switched between the receiver modules.

Analysis of TACAN bearing and modulation data (R&S®EDS-K1).



Analysis of main and auxiliary reference bursts (MRB, ARB).



## Detailed pulse shape analysis on DME systems (R&S®EDS-K2)

In addition to distance and power measurements, ICAO Doc. 8071 also stipulates a detailed analysis of the Gaussian pulses in order to verify the signal characteristics. Using the R&S®EDS-K2 pulse shape analysis option, the R&S®EDS300 can automatically determine the rise and decay times of the pulses, the pulse duration and the spacing of double pulses. Marker functions provide additional analysis options, and signals can be displayed on a linear or logarithmic scale in the pulse view (in V, W or dBm).

On board a flight inspection aircraft, the R&S®EDS-K2 option can be used to analyze multipath propagation effects in areas where pilots report problems with DME stations (unlocks).

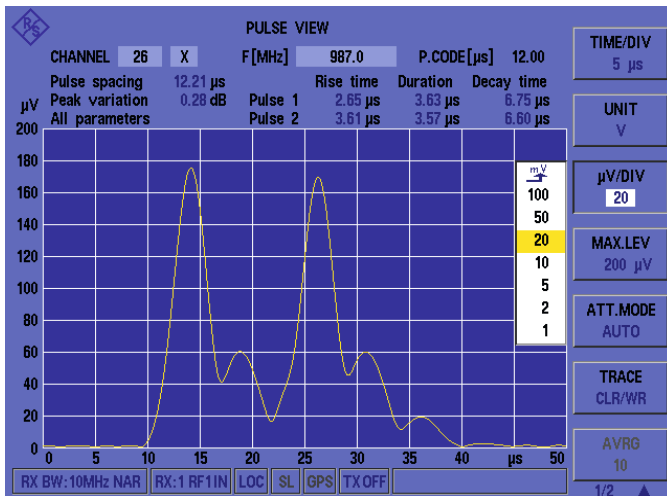
## GPS-based measurements (R&S®EDS-K3)

The R&S®EDS-K3 GPS synchronization option allows an external (D)GPS receiver to be connected to the serial interface of the R&S®EDS300 (NMEA protocol).

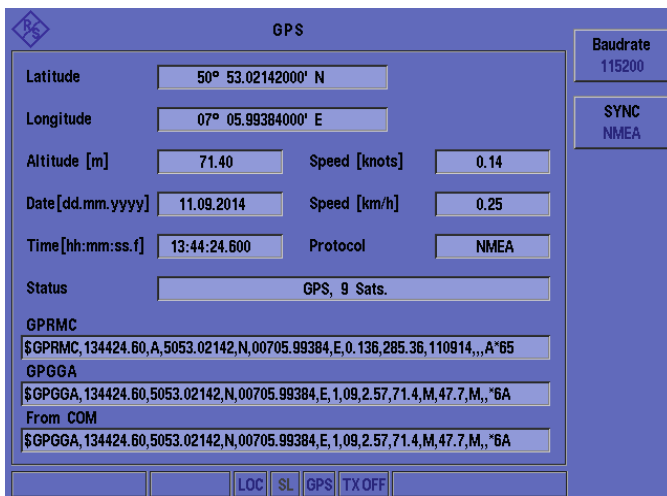
Every measured value is automatically linked to the corresponding (D)GPS timestamp and location stamp, which has been corrected with the analyzer's latency. The measured values – including the timestamp and location stamp – can be read out via the LAN interface or stored on an external USB flash drive using a USB data logger.

All this makes the R&S®EDS300 a standalone measuring system. There is no need for external devices or software to perform measurements in the field.

Detailed analysis on DME systems using R&S®EDS-K2.



GPS-based measurements using R&S®EDS-K3.



# User-friendly design and application- specific extras

## **Compact, robust design for stationary and mobile applications**

Its robust casing makes the R&S®EDS300 ideal for measurements in the field and for integration into flight inspection systems and test vehicles, while offering the measurement accuracy of lab equipment.

## **Remote control via LAN interface**

The analyzer is either controlled manually via the front panel or remotely via the LAN interface by means of TCP/IP commands. Measurement tasks can be automated via remote control, the R&S®EDS300 being controlled from a PC. This is an important prerequisite for integrating the analyzer into test vehicles or flight inspection aircraft.

## **Easy measurement data transfer via USB data logger**

The USB data logger makes it easy to transfer all measurement data (without the need for additional software) to an external storage medium. The data is evaluated and graphically displayed in the lab by means of spreadsheet software.

## **Various synchronization capabilities for integration into existing flight inspection systems**

The trigger input for capturing measurement data allows easy integration of the R&S®EDS300 into existing flight inspection systems. An external (D)GPS receiver synchronizes the triggered measurement data with the GPS data and ensures precise linking of measured value, time and position.

On board the flight inspection aircraft, the suppression line prevents the measurement from being influenced by the interrogator of the navigation system and also prevents the R&S®EDS300 interrogation pulses from interfering with the aircraft's electronics. All this ensures smooth operation on board the flight inspection aircraft.

## **Maintenance, repair and service**

The analyzer's modular design and its mechanical ruggedness make maintenance really convenient. For troubleshooting or servicing, simply follow the instructions in the R&S®EDS300 service manual (module replacement and calibration).



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- ▮ Technical startup/application development/integration
- ▮ Training
- ▮ Operation/calibration/repair



# Specifications in brief

Specifications in brief		
<b>Frequency</b>		
Frequency range		960 MHz to 1215 MHz
Reference frequency, internal		
Aging per year		≤ 1 ppm
<b>Level</b>		
Absolute level		
Measurement range (average) <sup>1)</sup>	autorange mode	-110 dBm to +13 dBm (nom.)
Measurement range (peak) <sup>1)</sup>	autorange mode	-100 dBm to +13 dBm (nom.)
<b>DME signal analysis</b>		
Standard		ICAO Annex 10, ICAO Doc. 8071
Input level range	pulse recognition efficiency > 70%	-95 dBm to +10 dBm (nom.)
DME measurement		
Total peak level deviation	standard DME signal in line with ICAO Annex 10, level range 0 dBm to -70 dBm, 95% confidence level, +20°C to +30°C	< 1 dB (nom.)
Pulse spacing uncertainty		< 0.05 μs
<b>TACAN signal analysis (R&amp;S®EDS-K1 option)</b>		
Standard		STANAG 5034, MIL-STD-291C
Input level range		-92 dBm to +10 dBm
Bearing		
Deviation	-90 dBm to +10 dBm, standard TACAN signal in line with STANAG 5034, modulation depth of 15 Hz and 135 Hz signals = 20%, measurement time ≥ 1 s	< 0.5°
Bearing acquisition time		< 3 s
<b>DME distance measurement<sup>2)</sup></b>		
Standard		ICAO Annex 10, ICAO Doc. 8071
Input level range		-97 dBm to +10 dBm (nom.)
Distance measurement		
Distance range		0 NM to 400 NM (nom.)
Deviation	-97 dBm to +10 dBm, measurement time ≥ 500 ms, 95% confidence level	≤ 500 ns, ≤ 75 m (nom.), ≤ 0.05 NM (nom.)
<b>Multi-DME (R&amp;S®EDS-K5 option)<sup>3)</sup></b>		
Standard		ICAO Annex 10, ICAO Doc. 8071
Distance measurement	search/track mode	up to 10 DME stations
Input level range		-95 dBm to +10 dBm (nom.)
Additional level measurement uncertainty		< 1 dB
Distance range		0 NM to 310 NM (nom.)
Deviation	-95 dBm to +10 dBm, measurement time: 100 ms/channel, 95% confidence level	≤ 0.05 NM (nom.), 75 m (nom.)
<b>Low-power interrogator (R&amp;S®EDS-B2 option)</b>		
Standard		ICAO Annex 10, ICAO Doc. 8071
Output power	DME peak power, into 50 Ω load	20 W (+43 dBm) ± 1.5 dB
Setting range		-30 dBm to +43 dBm in 0.5 dB steps
<b>High-power interrogator (R&amp;S®EDS-B4 option)</b>		
Standard		ICAO Annex 10, ICAO Doc. 8071
Maximum output power	DME peak power, into 50 Ω load	500 W (+57 dBm) ± 1.5 dB
Power steps		100 W, 250 W, 500 W

<sup>1)</sup> Overload display in the event of an overload condition caused by in-band or out-of-band signals.

<sup>2)</sup> Minimum requirement: 20 W low-power interrogator (R&S®EDS-B2), optional: 500 W high-power interrogator (R&S®EDS-B4).

<sup>3)</sup> Minimum requirement: additional RX unit (R&S®EDS-B1) and 20 W low-power interrogator (R&S®EDS-B2) or 500 W high-power interrogator (R&S®EDS-B4).

# Ordering information

Designation	Type	Order No.
<b>Base unit</b>		
DME/Pulse Analyzer	R&S®EDS300	5202.7006.02
<b>Hardware options</b>		
Additional RX Unit	R&S®EDS-B1	5202.7170.02
Low-Power Interrogator	R&S®EDS-B2	5202.8160.02
High-Power Interrogator	R&S®EDS-B4	5202.8177.02
High-Power Amplifier	R&S®EDS-B5	5202.7193.02
<b>Software options</b>		
TACAN Analysis	R&S®EDS-K1	5202.8102.02
Pulse Shape Analysis	R&S®EDS-K2	5202.8119.02
GPS Synchronization	R&S®EDS-K3	5202.8125.02
Multi-DME Mode	R&S®EDS-K5	5202.8131.02
<b>External accessories</b>		
Rugged transport case	R&S®EDS-Z2	5202.8202.02
Protection Cover	R&S®EVS-Z6	5201.7760.00
19" Adapter	R&S®EDS-Z7	5202.8225.00
Verification Test Dongle	R&S®EDS-Z10	5202.9980.03
Documentation of Calibration Values	R&S®DCV-2	0240.2193.24

<b>Warranty</b>		
Base unit		3 years
All other items		1 year
<b>Options</b>		
Extended Warranty, one year	R&S®WE1	Please contact your local Rohde & Schwarz sales office.
Extended Warranty, two years	R&S®WE2	
Extended Warranty with Calibration Coverage, one year	R&S®CW1	
Extended Warranty with Calibration Coverage, two years	R&S®CW2	
Extended Warranty with Accredited Calibration Coverage, one year	R&S®AW1	
Extended Warranty with Accredited Calibration Coverage, two years	R&S®AW2	

**For data sheet, see PD 5214.1220.22**

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R&S®EDS300 DME/Pulse Analyzer

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