

# R&S®NH/NV8300 Family of UHF Transmitters

## Air-cooled transmitters for analog and digital TV



# R&S®NH/NV8300 Family of UHF Transmitters At a glance



## Standardized design for analog and digital TV

The new air-cooled R&S®NH/NV8300 family of transmitters has been designed for analog TV standards (B/G, K, M/N, I), color coding standards (SECAM, PAL, NTSC) and sound coding standards (FM mono, dual-sound/stereo IRT and NICAM) as well as for digital TV standards (DVB-T/-H, ATSC, MediaFLO™, ISDB-T, AVSB, ISDBT<sub>B</sub>). LDMOS transistor-based amplifiers ensure high output power while requiring only minimum space.

All components are fully broadband from 470 MHz to 862 MHz (UHF bands IV/V) for both the analog and digital standards. The available output power ranges from 750 W to 2.8 kW for analog TV (combined), and from 300 W to 1.8 kW (DVB-T/-H, MediaFLO™, ISDB-T, ISDBT<sub>B</sub>) as well as 450 W to 1.8 kW (ATSC, AVSB) for digital TV.

## The transmitters include the following components:

- Exciter
- Power amplifier(s)
- Transmitter control unit
- Transmitter rack with cooling system

The new R&S®NH/NV8300 family of UHF transmitters is based on a design concept that is common to all Rohde&Schwarz sound and TV transmitters of the R&S®Nx8000 family. This means that the transmitter control unit and the bus system for internal and external communications are identical throughout.

## Key facts

- 750 W to 2.8 kW output power for analog TV
- 300 W to 1.8 kW output power for DVB-T/-H, MediaFLO™, ISDB-T, ISDBT<sub>B</sub>
- 450 W to 1.8 kW output power for ATSC, AVSB
- Frequency range 470 MHz to 862 MHz

# R&S®NH/NV8300

## Family of UHF Transmitters

### Benefits and key features

#### **R&S®Sx800 multistandard TV exciter for digital or analog signal processing**

- ▮ The exciter can be converted from analog to digital at any time
- ▮ Easy software upgrade to DVB-H
- ▮ Various standby configurations
- ▮ Easy servicing due to modular design and plug-ins
- ▮ For operation in single-frequency networks, a MIP decoder enables automatic delay compensation
- ▮ Digital signal processing provides maximum stability and easy precorrection

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#### **Air-cooled broadband R&S®VH8300A1 power amplifier**

- ▮ For analog and digital signals without requiring any adjustment
- ▮ With innovative amplifier controller, which is used for all sound and TV transmitters of the R&S®Nx8000 family
- ▮ Output power control makes for long life for the individual transistors
- ▮ Each amplifier module is self-monitoring and self-protecting
- ▮ Based on LDMOS technology
- ▮ All amplifier modules can easily be replaced during operation

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#### **Innovative R&S®NetCCU®800 transmitter control unit**

- ▮ The R&S®NetCCU®800 clearly shows the current status of the transmitter system on a color display
- ▮ Transmitter remote control and monitoring via SNMP and/or HTTP interface
- ▮ All parameters required for diagnostics can be retrieved locally as well as remotely
- ▮ In-depth diagnostics through new bus system
- ▮ Only two height units

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#### **Transmitter rack with integrated cooling**

- ▮ Same 19" rack (depth 800 mm) used for all power classes
- ▮ One rack accommodates up to six amplifier modules
- ▮ Contains two built-in fans that operate in active standby
- ▮ Various air ducting configurations
- ▮ Effective cooling only with small amounts of air; this considerably reduces the cooling system's power consumption and noise generation

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# R&S® Sx800 multi-standard TV exciter for digital or analog signal processing

Using state-of-the-art technology, the new R&S® Sx800 multistandard TV exciter can be accommodated in a housing of only one height unit. It performs full signal processing from the video/audio input signal (analog TV) or the transport stream (digital TV) to the standard-conforming RF output signal. Its flexible concept provides high safety of investment.

The new R&S® Sx800 TV exciter contains the following main modules:

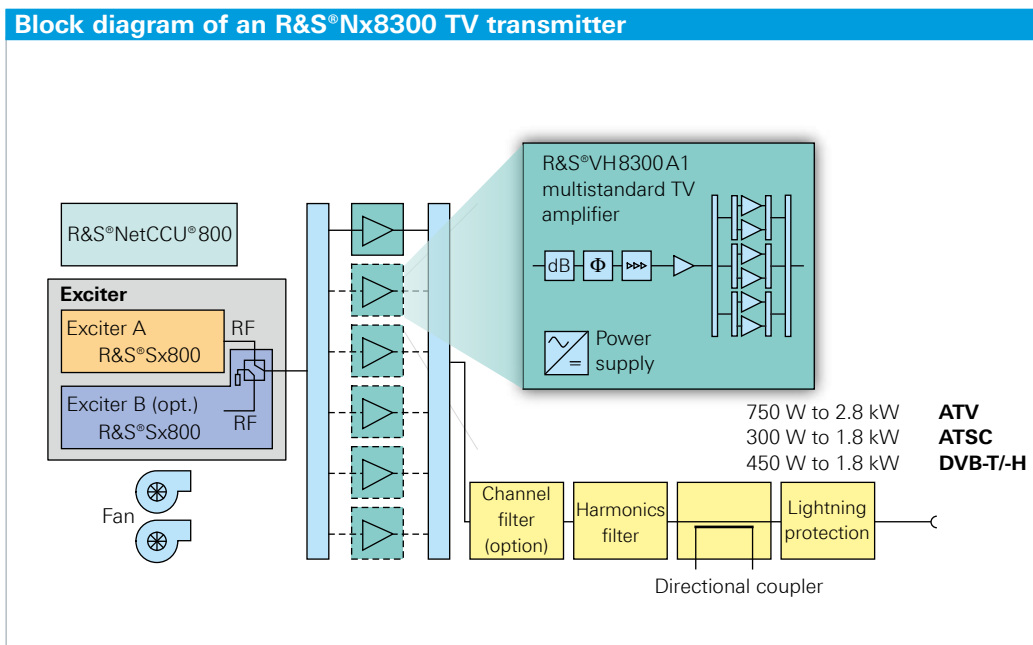
- Input interface
- Mainboard
- RF interface

## Input interface

For the analog TV standards, the input interface converts the analog video and audio input signals to digital signals for further processing. Optionally, the input interface encodes and modulates the NICAM subcarrier. NICAM signal processing supports the analog sound input, NICAM 728 data input and NICAM sound subcarrier operating modes. The input interface also monitors the input sync pulse. For the digital TV standards, the input interface is equipped with four ASI inputs (DVB-T/-H) or two SMPTE 310M and two ASI inputs (ATSC). This makes it a universal input stage – capable of handling all operating modes of the DVB-T/-H and ATSC standards.

For digital applications, the input interface monitors the packet synchronization and the data rate of the input signals. Input data buffers eliminate line-side jitter and wander effects.

Block diagram of an R&S® Nx8300 TV transmitter



For operation in single-frequency networks (SFN), a MIP decoder in line with TS 101191 is included in signal processing. The decoder enables automatic delay compensation and automatic operating mode detection. Seamless, automatic input signal switching ensures redundant signal feed.

The exciter can be converted from analog to digital at any time, involving only a minimum of effort.

### Mainboard

The mainboard digitally processes and modulates the signals from the input interface in line with the corresponding TV standard. Digital signal processing provides maximum stability and easy precorrection.

The signals are modulated by applying the appropriate algorithm for analog or digital TV. The resulting digital in-phase and quadrature (I and Q) signals are taken to a precorrector. Linear precorrection compensates for group delay and frequency response, which occur in power filters in the RF path, for example. Nonlinear precorrection corrects distortion products generated in the amplifiers. The digital precorrection implemented here makes for 100% reproducibility. For the digital standards, automatic/adaptive precorrection is available as an option.

### RF interface

The RF interface first converts the digital I and Q signals to analog baseband signals. These signals are double-converted in a subsequent modulator section to yield the final modulated signal.

A synthesizer supplies the frequencies required for upconversion. It can, of course, be locked to an external reference frequency. The high-quality reference oscillator ensures that the required frequency accuracy for SFNs is maintained even if the external reference fails.

The RF interface can optionally be equipped with a demodulator path that processes the amplified and/or filtered RF signal so that it can be analyzed for automatic/adaptive precorrection. For this purpose, the exciter is equipped with two inputs that allow the signal to be tapped ahead of and after the power filter without external switches being required.

### Overview of the special characteristics of the R&S®Sx800 TV exciter

#### General

- ▮ Integrated digital linear and nonlinear precorrection
- ▮ Digital signal processing for analog and digital TV

#### Digital TV

- ▮ DVB-T/-H, ATSC, MediaFLO™, ISDB-T, AVSB, ISDBT<sub>B</sub>
- ▮ ASI mode
- ▮ SMPTE 310M
- ▮ Suitable for single-frequency networks (SFN) and multifrequency networks (MFN)
- ▮ Hierarchical modulation (DVB-T/-H)
- ▮ Seamless input switching
- ▮ MIP monitoring
- ▮ Automatic/adaptive precorrection (optional)

#### Analog TV

- ▮ Standards B/G, K, M/N, I
- ▮ PAL, SECAM and NTSC
- ▮ FM mono, dual-sound/stereo IRT or, optionally, NICAM

# Air-cooled broadband R&S®VH8300A1 power amplifier

The air-cooled broadband R&S®VH8300A1 amplifier operates in the range from 470 MHz to 862 MHz (UHF bands IV/V). It can be used both for analog and digital signals without requiring any adjustments, which means a smaller inventory of spare parts for operators of mixed transmitter networks.

The output power of each amplifier plug-in depends on the modulation mode: 300 W for DVB-T/H, 450 W for ATSC and 750 W for analog TV (combined). Due to the use of advanced LDMOS technology, the power amplifiers offer very high linearity, excellent efficiency and compact design. Each amplifier plug-in contains a predriver and a driver stage, eight power transistors and a separate power supply.

The amplifier is available with either single- or three-phase mains. Correspondingly, the transmitters are available with either single- or three-phase mains distribution.

An innovative amplifier controller is used, which is identical for all sound and TV transmitters of the R&S®Nx8000 family from Rohde&Schwarz. This controller not only monitors and evaluates protective functions (e.g. overtemperature switchoff, VSWR reduction, transistor failure detection), but also provides phase correction and control of the RF output power. Output power control prevents, for example, the amplifier from being overdriven in the event a transistor fails, thus ensuring a long life of the individual transistors. Each amplifier module is, therefore, self-monitoring and self-protecting.

All relevant operating parameters and fault messages are transferred to the transmitter control unit via the CAN bus interface, which is likewise an innovative feature. The amplifier modules can easily be replaced during operation.



# Innovative R&S®NetCCU®800 transmitter control unit

The innovative R&S®NetCCU®800 transmitter control unit handles both internal and external communications and provides all control functions. Only two height units suffice to implement the functions of a transmitter control unit plus an IP interface. The R&S®NetCCU®800 clearly shows the current status of the transmitter system on a color display.

All transmitter and/or amplifier parameters required for diagnostics can be retrieved locally as well as remotely from anywhere in the world via a standard (IP) protocol and standard software (web browser, SNMP). This allows the transmitter status of unattended stations to be accurately evaluated, and any servicing that may be needed to be optimally prepared. Locally, this data can be retrieved via the IP interface of the R&S®NetCCU®800. All transmitter-specific settings can be easily downloaded in a file via PC.



The R&S®NetCCU®800  
transmitter control unit

# Transmitter rack with integrated cooling

A 19" rack (depth 800 mm) is used for all power classes. One rack accommodates up to six amplifier modules. The rack contains two built-in fans that operate in active standby.

Various air ducting configurations can be implemented, with cooling air intake from the top, bottom or rear of the transmitter rack, and exhaust air discharge toward the top or bottom. Each amplifier module contains an optimized, highly efficient heat sink. This feature plus the elaborate cooling concept ensure effective cooling with only small amounts of air. This in turn considerably reduces the cooling system's power consumption and noise generation.

An innovative, nearly wireless power distribution system eliminates wiring errors during assembly. The transmitters are available with single- and three-phase mains distribution.

A channel filter integrated in the transmitter (for analog operation), a frequency-response-compensated directional coupler and built-in lightning protection round out the R&S®NH/NV8300 family of transmitters.

## Cooling system

Possible configurations: all degrees of freedom



The inlet air can be taken from the bottom, the top or from the rear of the transmitter; the outlet air can be expelled at the bottom or at the top of the transmitter



# Specifications in brief

## Specifications common to the R&S®NH/NV8300

Frequency range	470 MHz to 862 MHz
Power supply	3 × 400 V AC ±15%; three-phase operation; 47 Hz to 63 Hz 230 V AC ±15%, 50/60 Hz, L1 – N; single-phase operation; 47 Hz to 63 Hz 240 V AC +10%/–15%, 50/60 Hz, L1 – L2; single-phase operation; 47 Hz to 63 Hz
Max. installation altitude	2000 m above sea level (>2000 m on request)
Operating temperature range	+1°C to +45°C
Permissible relative humidity	95%, without condensation
Dimensions (W × H × D)	600 mm × 2000 mm × 800 mm (23.6 in × 78.7 in × 31.5 in)
RF connector	1 <sup>5</sup> / <sub>8</sub> EIA
<b>Synchronization</b>	
Reference frequency	10 MHz, 0.1 V to 5 V (V <sub>pp</sub> ) or TTL, BNC
Reference pulse	1 Hz, TTL, BNC
<b>Local and remote control</b>	
Local control	
Color display and keys	front-panel operation via graphical user interface (GUI)
RJ-45	PC operation via standard web browser
Remote control	
RJ-45	IEC 864-2 via Ethernet, standard
RJ-45	network management interface (web server and/or SNMP agent), optional
Parallel interface	floating contacts for messages and commands, optional
Bit bus	bus interface, in line with IEC 864-2, optional

## Specifications of the R&S®NH8300 for analog TV

	R&S®NH8301	R&S®NH8302	R&S®NH8303	R&S®NH8304
Number of amplifiers	1	2	3	4
RF output power (dual sound)	750 W	1500 W	2250 W	2800 W
Rate of air flow	8.5 m <sup>3</sup> /min	11 m <sup>3</sup> /min	15 m <sup>3</sup> /min	17 m <sup>3</sup> /min
Reference frequency	10 MHz, 0.1 V to 5 V (V <sub>pp</sub> ) or TTL, BNC			
TV standards	B, G, K, M, N, I			
Color transmission	PAL, NTSC, SECAM			
Inputs (video)	2 × video			
Inputs (audio)	without NICAM: 2 × AF with NICAM: 2 × AF + 1 × AF for third language standard M/N: 1 × AF + 1 × BTSC (BNC)			
Sound transmission	dual-sound coding in line with IRT, FM single-sound and NICAM 728 (–13 dB/–20 dB) (optional); FM single-sound (–10 dB), BTSC input			

# Specifications in brief

Specifications of the R&S®NV8300 for DVB-T/-H (in line with EN 300744/EN 302304)						
	R&S®NV8301	R&S®NV8302	R&S®NV8303	R&S®NV8304	R&S®NV8305	R&S®NV8306
Number of amplifiers	1	2	3	4	5	6
RF output power <sup>1)</sup>	300 W	600 W	900 W	1200 W	1500 W	1800 W
Rate of air flow	8.5 m <sup>3</sup> /min	11 m <sup>3</sup> /min	15 m <sup>3</sup> /min	17 m <sup>3</sup> /min	17 m <sup>3</sup> /min	17 m <sup>3</sup> /min
Inputs (DVB-T/-H)	4 × ASI					
Coding and modulation	in line with EN 300744, EN 302304 (optional)					
Modulation	QPSK, 16QAM or 64QAM					
Guard interval	1/4, 1/8, 1/16 or 1/32 of useful symbol duration					
IFFT mode	2k and 8k, 4k (optional)					
Inner code rate	1/2, 2/3, 3/4, 5/6 or 7/8					
Useful symbol duration	224 μs (2k) or 896 μs (8k), 448 μs (4k, optional)					

Specifications of the R&S®NV8300 for ATSC (in line with Doc. 53/1995)				
	R&S®NV8301	R&S®NV8302	R&S®NV8303	R&S®NV8304
Number of amplifiers	1	2	3	4
RF output power <sup>2)</sup>	450 W	900 W	1350 W	1800 W
Rate of air flow	8.5 m <sup>3</sup> /min	11 m <sup>3</sup> /min	15 m <sup>3</sup> /min	17 m <sup>3</sup> /min
Inputs (ATSC)	2 × SMPTE + 2 × ASI			
Modulation	8VSB			
Symbol rate	10.76 MHz			
Data rate	19.39 Mbit/s			
Trellis coding	2/3			
Reed-Solomon encoding	207/187/10			

<sup>1)</sup> Average power specification: at <510 MHz approx. 10% lower power, at >662 MHz approx. 5% higher power.

<sup>2)</sup> Average power specification: at <510 MHz approx. 5% lower power, at >662 MHz approx. 6% higher power.

# Ordering information

Designation	Type	Order No.
300 W DVB-T/H UHF Transmitter 450 W ATSC UHF Transmitter	R&S®NV8301 (three-phase)	2098.0307.01 <sup>1)</sup>
600 W DVB-T/H UHF Transmitter 900 W ATSC UHF Transmitter	R&S®NV8302 (three-phase)	2098.0059.01 <sup>1)</sup>
900 W DVB-T/H UHF Transmitter 1350 W ATSC UHF Transmitter	R&S®NV8303 (three-phase)	2098.0107.01 <sup>1)</sup>
1200 W DVB-T/H UHF Transmitter 1800 W ATSC UHF Transmitter	R&S®NV8304 (three-phase)	2098.0159.01 <sup>1)</sup>
1500 W DVB-T/H UHF Transmitter	R&S®NV8305 (three-phase)	2098.0207.01 <sup>1)</sup>
1800 W DVB-T/H UHF Transmitter	R&S®NV8306 (three-phase)	2098.0259.01 <sup>1)</sup>
300 W DVB-T/H UHF Transmitter 450 W ATSC UHF Transmitter	R&S®NV8301 (single-phase)	2105.0054.01
600 W DVB-T/H UHF Transmitter 900 W ATSC UHF Transmitter	R&S®NV8302 (single-phase)	2105.0102.01
900 W DVB-T/H UHF Transmitter 1350 W ATSC UHF Transmitter	R&S®NV8303 (single-phase)	2105.0154.01
1200 W DVB-T/H UHF Transmitter 1800 W ATSC UHF Transmitter	R&S®NV8304 (single-phase)	2105.0202.01
1500 W DVB-T/H UHF Transmitter	R&S®NV8305 (single-phase)	2105.0254.01
1800 W DVB-T/H UHF Transmitter	R&S®NV8306 (single-phase)	2105.0302.01
750 W Analog UHF Transmitter	R&S®NH8301 (three-phase)	2098.1503.01 <sup>1)</sup>
1500 W Analog UHF Transmitter	R&S®NH8302 (three-phase)	2098.1555.01 <sup>1)</sup>
2250 W Analog UHF Transmitter	R&S®NH8303 (three-phase)	2098.1603.01 <sup>1)</sup>
2800 W Analog UHF Transmitter	R&S®NH8304 (three-phase)	2098.1655.01 <sup>1)</sup>
750 W Analog UHF Transmitter	R&S®NH8301 (single-phase)	2105.0554.01
1500 W Analog UHF Transmitter	R&S®NH8302 (single-phase)	2105.0602.01
2250 W Analog UHF Transmitter	R&S®NH8303 (single-phase)	2105.0654.01
2800 W Analog UHF Transmitter	R&S®NH8304 (single-phase)	2105.0702.01

<sup>1)</sup> The order numbers are for reference only. The actual order numbers of the system depend on the configuration.

Your local Rohde & Schwarz expert will help you to find the solution that is optimally suited to your requirements and will be glad to prepare a custom offer for you.

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(search term: NH8300, NV8300)

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