Data sheet


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# UHF Transmitter Family R&S®NH/NV 7000

## Liquid-cooled transmitters for analog and digital TV (DVB-T or ATSC)

- Frequency range 470 MHz to 860 MHz
- Advanced LDMOS[1)] technology for power amplifiers
- Digital precorrection
- Liquid-cooled
- High redundancy
- Highly compact for minimum space requirements
- Cost-effective installation
- All standby concepts possible (single transmitter, active or passive output-stage standby, exciter standby)

[1)] LDMOS = lateral diffused metal oxide silicon.



ROHDE&SCHWARZ

# A new generation of transmitters

## At a glance

The TV Transmitter Family R&S®NH/NV 7000 from Rohde & Schwarz is a new generation of liquid-cooled UHF transmitters for analog and digital TV (**DVB-T or ATSC**). They consist of the following main components:

- Exciter
- Power amplifiers incl. power supply
- Transmitter rack

The UHF transmitters are available for analog TV with powers of 3.5 kW to 40 kW and for DVB-T with powers of 800 W to 6.4 kW or ATSC with 1.3 kW to 10.4 kW (higher power ratings on request). Each amplifier has its own power supply that is integrated into the amplifier module and thus cooled by the liquid cooling system.

The amplifier module is self-engaging and can be exchanged during operation without any loss of liquid from the closed cooling system and without impairing the operation of the other modules.

The power supplies are fed with AC supply voltage, i.e. no auxiliary voltage supplies are required, which improves the availability of the transmitters. Parts exclusively made of stainless steel, aluminum or plastic are used for the cooling system in the transmitter rack.

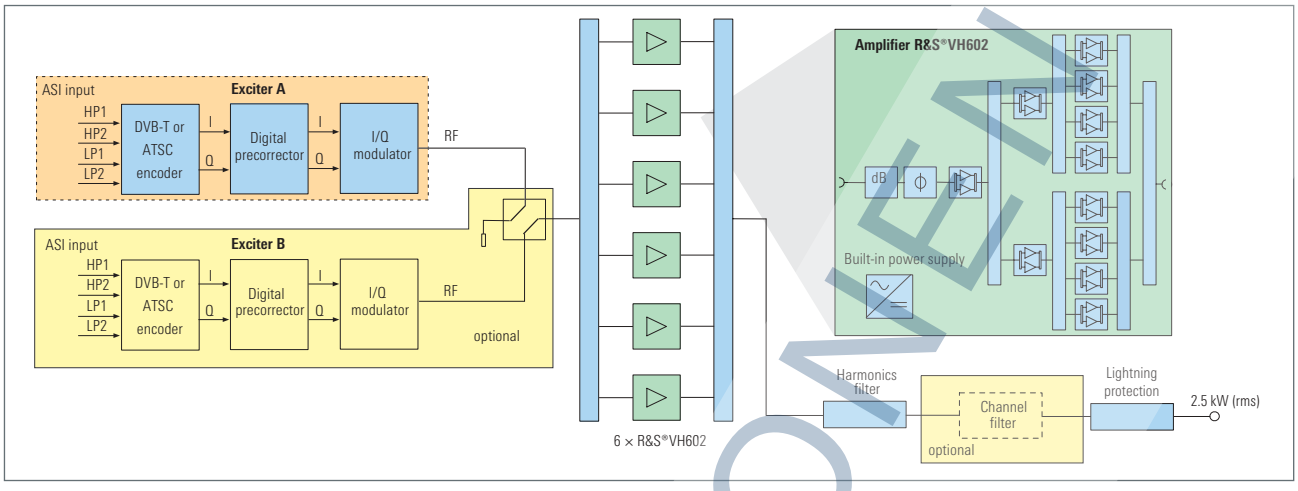
All transmitters can be equipped with a second exciter and the associated automatic switchover unit, the two units being integrated into the transmitter rack.

## Transmitter rack

The transmitters with a maximum output power of 10 kW for analog TV, 3.4 kW for DVB-T or 5.4 kW for ATSC are accommodated in a rack 630 mm in width. This means that space requirements are at a minimum since components such as the harmonics filter, the vision/sound diplexer and the color subcarrier trap for analog TV are also accommodated in the transmitter rack. The bandpass filter for DVB-T or ATSC is installed outside the transmitter rack. To obtain higher power, further racks fitted with the necessary amplifier plug-ins and couplers are required.

The connectors for modulation lines (VF, AF or TS), for example, as well as the remote control interface etc are located on the top of the transmitter rack.

The connectors for the cooling system can be either on the top or bottom of the rack. The tubing used throughout the cooling system is of uniform cross-section to avoid different flow rates and thus blocking.




***Block diagram of the 2.5 kW DVB-T transmitter or 4.1 kW ATSC transmitter***

## Power amplifiers

Owing to advanced LDMOS technology, the power amplifiers feature high linearity, excellent efficiency and compact design. The power supply is integrated into the amplifier module, which is an enclosed unit. There is practically no heat dissipated in the rack since the air circulates within the amplifier module by means of a radial fan and the residual heat is conveyed to the cooling system via a heat exchanger.

Protective circuits against reflection, overtemperature etc are provided. The junction temperature of the transistors is around 120 °C under normal operating conditions and at an ambient temperature of 25 °C.

## Exciter

The new exciter comprises the following modules:

- Encoder for analog TV, DVB-T or ATSC
- Digital precorrector
- Modulator
- Synthesizer
- Controller
- Control unit
- Motherboard
- Power supply

A NICAM module and a GPS module can be installed as options.

Since the modules are very compact, two complete exciters including the associated automatic switchover unit can be accommodated in a 19" mainframe of seven height units. Each exciter has its own power supply so that full redundancy is ensured. The fully digital precorrection can be reproduced to the full. No adjustments are required after module replacement.

The transmitter is operated with the aid of PC software under Windows or via a display integrated into the control unit.

**Analog mode**
The encoder for analog TV first digitizes the video and audio input signals. The processing of these signals in line with the associated TV or color coding standard is digital which provides high stability and easy correction.

The encoder uses digital filters to convert the processed video signal and the sound subcarriers separately for signal display with inphase and quadrature signal.

**DVB-T mode**
The encoder for DVB-T is integrated in a single module. It has four physical ASI interfaces that in pairs form a complete processing path (input interface, FEC and delay). The encoder is thus prepared for hierarchical modulation. For non-hierarchical coding, the two paths can be selected as a main and a standby path.

The encoder can be used both in multi-frequency networks and single-frequency networks. For single-frequency networks, a GPS receiver is integrated.

**ATSC mode**
The ATSC encoder module comprises data randomizer, Reed-Solomon encoder, data interleaver, Trellis encoder, MUX and pilot insertion. Channel coding and modulation are in line with Doc. ATSC-A53.

**Equalizer**
All versions of the encoder transfer the digital inphase and quadrature signals with a resolution of 12 bit to the digital precorrector. The precorrector is divided into two sections:

- The group-delay equalizer can compensate the group delay that occurs, for example, in power filters or vision/sound diplexers
- The linearity precorrector can precorrect the instantaneous signal amplitude and phase

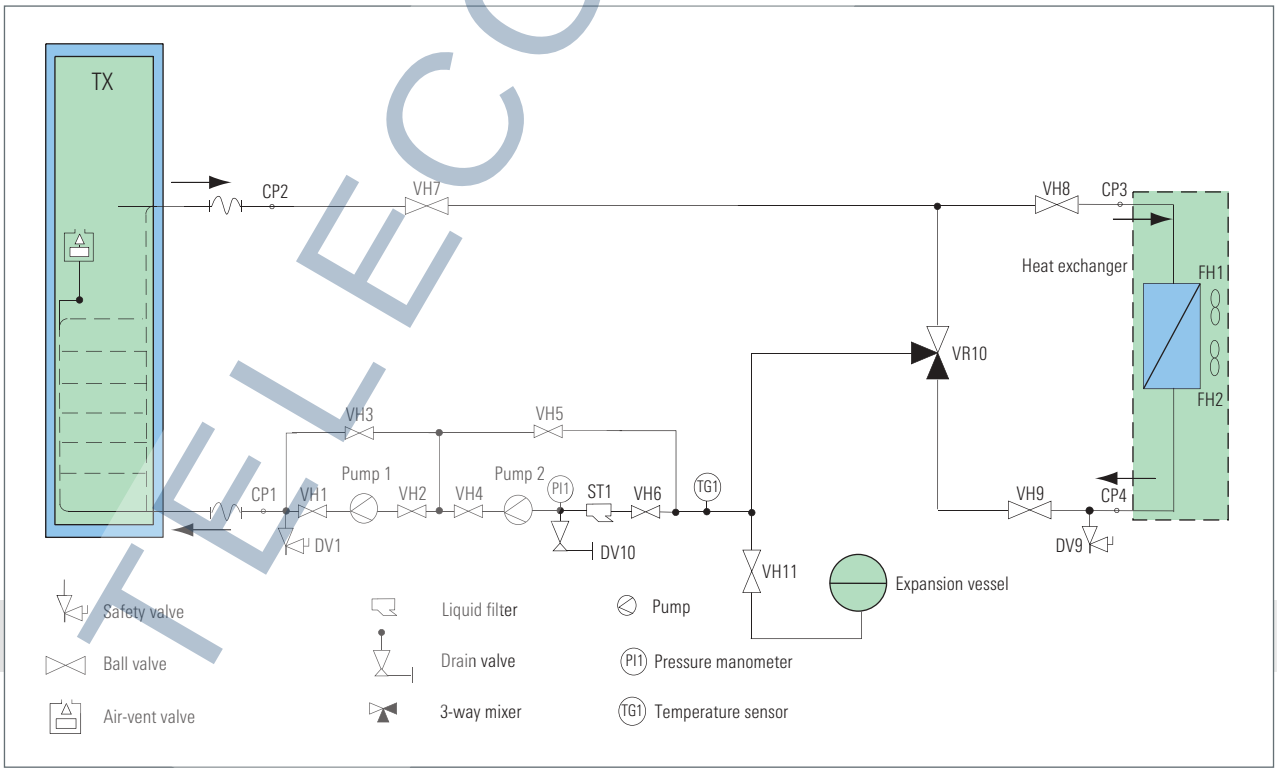
Since precorrection is digital, the reproducibility is 100 % even if modules are replaced.

**Central control unit**
The central control unit accommodated in the exciter rack controls and monitors the entire transmitter. This central control unit enables the user to access the parameters of the entire system, in particular those of the integrated encoders, via the control panel. In this way, only one remote control interface is required to monitor all functional units of the transmitter.

## Cooling system

The standard cooling system (as an external unit outside the transmitter rack) includes a pumping set for each transmitter rack. The pumping set consists of two pumps operating in series for full redundancy, a control unit and a mixer. A cooler is installed outside the transmitter room for each pumping set. The cooler is fitted with two fans operating in active standby for redundancy. The cooling agent used is AntifrogenN.

***Block diagram of the cooling system***



# Specifications

## Common data for R&S®NH/NV 7000

| | |
|---|---|
| **Frequency range** | 470 MHz to 860 MHz |
| Power supply | 230 V/400 V ±15 %, 50 (60) Hz ±2 % |
| Max. installation altitude | 2000 m above sea level (>2000 m on request) |
| Operating temperature range | +1 °C to +45 °C |
| Outside temperature range | –30 °C to +50 °C |
| Permissible relative air humidity | 95 % |
| **Inputs** | |
| Analog TV | 2 × video (BNC, 75 Ω), 2 × sound (XLR, 3-contact) |
| DVB-T | 2 × ASI (in pairs, prepared for hierarchical modulation) |
| ATSC | 2 × SMPTE-310 (BNC, 75 Ω) |
| **Interfaces** | |
| RS-232-C | at the front, operation of transmitter by means of graphical user interface (GUI) from PC, D-Sub, female, 9-contact |
| RS-485 | for remote control of transmitter, at transmitter top, D-Sub, female, 9-contact |
| RS-232-C | for remote control of transmitter, at transmitter top, D-Sub, female, 9-contact (connection of Hayes-compatible modem) |
| Optional | parallel remote control interface, floating, for messages and commands; SNMP interface and/or TCP/IP Web server |
| **Analog TV** | |
| TV standards | B, G, D, K, M, N, I |
| Color transmission | PAL, NTSC, SECAM |
| Sound transmission | dual-sound coding to IRT or FM single sound and NICAM 728 (–13 dB /–20 dB) or FM single sound (–10 dB) |
| **DVB-T** | coding and modulation in line with EN 300744 |
| IFFT mode | 2k and 8k |
| Useful symbol period | 224 µs (2k) or 896 µs (8k) |
| Modulation | QPSK, 16QAM or 64QAM |
| Guard interval | 1/4, 1/8, 1/16 or 1/32 of useful symbol period |
| Inner code rate | 1/2, 2/3, 3/4, 5/6 or 7/8 |
| Hierarchical coding | option on request |
| **ATSC** | in line with Doc. A53/1995 |
| Modulation | 8VSB |
| Symbol rate | 10.76 MHz |
| Data rate | 19.39 Mbit/s |
| Trellis coding | 2/3 |
| Reed-Solomon encoder | 207/187/10 |

## Specifications of R&S®NH 7000 (analog TV)

| | R&S®NH 7035 | R&S®NH 7050 | R&S®NH 7100 | R&S®NH 7200 | R&S®NH 7400 |
|---|---|---|---|---|---|
| RF output power [1] (analog TV) | 3.5 kW | 5 kW | 10 kW | 20 kW | 40 kW |
| Number of vision amplifiers | 2 | 3 | 6 | 12 | 24 |
| Number of sound amplifiers | 1 | 1 (2) | 2 | 2 | 4 |
| Cooling | liquid-cooled | | | | |
| Dimensions in mm (W × H × D) | 630 × 2167 × 1200 | | | 1260 × 2167 × 1200 | 2520 × 2167 × 1200 |
| RF connectors | EIA 1 5/8" | EIA 1 5/8" | EIA 3 1/8" | EIA 3 1/8" | EIA 4 1/2" |
| Reference frequency | 1 MHz, 5 MHz or 10 MHz, 0.1 V to 5 V ($V_{pp}$) or TTL, BNC | | | | |
| Bandwidth | 6 MHz, 7 MHz and 8 MHz | | | | |

## Specifications of R&S®NV 7000 (DVB-T/ATSC)

| | R&S®NV 7080 | R&S®NV 7130 | R&S®NV 7170 | R&S®NV 7250 | R&S®NV 7340 | R&S®NV 7500 | R&S®NV 7640 |
|---|---|---|---|---|---|---|---|
| RF output power [1] (DVB-T) | 800 W | 1.3 kW | 1.7 kW | 2.5 kW | 3.4 kW | 5 kW | 6.4 kW |
| RF output power [1] (ATSC) | 1.3 kW | 2.0 kW | 2.7 kW | 4.1 kW | 5.4 kW | 7.8 kW | 10.4 kW |
| Number of amplifiers | 2 | 3 | 4 | 6 | 8 | 12 | 16 |
| Cooling | liquid-cooled | | | | | | |
| Dimensions in mm (W × H × D) | 630 × 2167 × 1200 | | | | | 1260 × 2167 × 1200 | |
| RF connectors | EIA 1 5/8" | | | | EIA 3 1/8" | | |
| Reference frequency | 1 MHz, 5 MHz or 10 MHz, 0.1 V to 5 V ($V_{pp}$) or TTL, BNC | | | | | | |
| Bandwidth | 7 MHz and 8 MHz for DVB-T; 6 MHz for ATSC | | | | | | |
| Reference pulse | 1 Hz, TTL, BNC | | | | | | |

[1] Other power ratings on request.

More information at
www.rohde-schwarz.com
(search terms: NH7000, NV7000)

Certified Quality System
ISO 9001
DQS REG. NO 1954 QM

Certified Environmental System
ISO 14001
DQS REG. NO 1954 UM

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