Vaisala Weather Radar WRS400 is a dual-polarization X-band radar that uses solid-state transmitters.

**Solid-state transmitters**
Solid-state power amplifier (SSPA) transmitters provide increased observation accuracy, sensitivity, and tracking quality. The ultra-wideband performance virtually removes the risk of frequency interference.

The life-cycle costs of the SSPA transmitters are low because they do not require replacement of expensive consumable parts, in contrast to tube-based transmitters.

Thanks to continuous calibration, there is no calibration downtime.

**Improved coverage and data**
X-band frequency provides measurement data with high resolution and excellent precision for short-range meteorological surveillance.

By filling gaps in radar networks, the X-band weather radar improves radar network coverage, for example, in mountainous areas, rain catchment areas, and around wind parks.

**Compact design**
The compact weather radar is designed for fast installation and easy maintenance.

The transceiver is located at the back of the antenna, so only a short waveguide structure is needed. The simplified signal path provides improved sensitivity.

The simplified structure requires no RF rotary joints, waveguide switches, or site-specific parts. This enables increased data quality, reliability, and lower costs.

Because there is no need for a large equipment room, the site construction work is less extensive, and maintenance costs lower.

**Graceful degradation**
WRS400 has an independent SSPA transmitter for H channel and V channel. The radar design is based on reliable and redundant modules; even if one of the key components fails, the system will still maintain limited functionality. The failing component can be replaced fast and easily without an extensive break in operation.
Technical data

Operating environment for units in the radome

- **Operating temperature**: -40 ... +55 °C
- **Operating humidity**: 0 ... 100 %RH, condensing
- **Operating altitude/Ambient pressure**: Up to 3000 m, Up to 700 hPA
- **IP class for units in radome**: IP54

Antenna

- **Reflector diameter**: 1.4 m or 2.4 m
- **Type**: Center-fed parabolic reflector
- **Gain (minimum)**:
  - For 1.4 m antenna: >40 dBi
  - For 2.4 m antenna: 45 dBi
- **Beam width**:
  - For 1.4 m antenna: <1.8°
  - For 2.4 m antenna: <1°
- **Peak sidelobes at main polarization planes**: <25 dB
- **Cross-pol isolation at main polarization planes**: >30 dB
- **H/V alignment (squint angle)**: <0.1°

Pedestal

- **Type**: Semi-yoke elevation over azimuth
- **Acceleration**: 20°/s²
- **Position accuracy**: ±0.05° accuracy
- **Azimuth steering**: 360°
- **Vertical steering**: -2 ... +92° or better
- **Scanning rates**: Up to 6 rpm

Transmitter

- **Type**: Fully solid-state, SSPA-based transmitters. Transmitters for H and V channels are separate and independently-modulated.
- **Frequency range**: 9300 ... 9700 MHz
  - Selectable in 100 MHz bands and tunable within the range.
- **Peak power**:
  - SSPA 200 W (H) + 200 W (V)
  - SSPA 400 W (H) + 400 W (V)
- **Pulse width**: 1...90 μs
- **Duty cycle**: Max. 10%
- **Max pulse repetition frequency**: 3 kHz
- **Polarization**: Simultaneous Transmit and Receive (= STAR)
  - Horizontal-only
  - Vertical-only

Receiver

- **Type**: RF front-end, dual-channel digital receiver for horizontal and vertical polarization.
- **Noise figure**: <3 dB
- **Linear dynamic range**: 95 dB or better
- **Image rejection**: 80 dB or better (with WG filters)
- **Sensitivity**: -113 dBm

System specifications

- **Input power**: Voltage: 230 ±10 %, 50 ... 60 Hz ± 3 Hz (single-phase)
- **Power consumption**: Typical: 1200 W
- **Phase stability**: 0.5° or better
- **Total weight of radar (antenna, pedestal, transceiver)**:
  - With 1.4 m antenna: approx. 340 kg
  - With 2.4 m antenna: approx. 370 kg

Signal processing

- **Azimuth averaging**: 2 ... 1024 pulses
- **Clutter filters**: IIR, fixed, and adaptive width GMAP
- **Dual PRF velocity de-aliasing**: 2:3, 3:4, or 4:5 for 2X, 3X, or 4X de-aliasing
- **High sensitivity mode processing**: > 3 dB improvement detection gain
- **IF digitizing**: 16 bits, 100 MHz in 5 channels
- **Number of range bins**: Up to 8168 per channel
- **Optional data outputs**: I/Q
- **Processing modes**: PPP, FFT/DFT, Random Phase 2nd trip filtering/recovery
- **Range resolution**: N*15 m
- **Range de-aliasing by random phase**: 

Radome

- **Typical outside diameter**:
  - For 1.4 m antenna: 2400 mm
  - For 2.4 m antenna: 3700 mm
- **Type**: Quasi-random (dual-polarization)

Radar controller

- **Type**: Vaisala RCP8 with IRIS Radar
- **Scan modes**: PPI, RHI, Volume, Sector, Manual, Rapid Scan
- **Local display**: Real time, Ascope, BITE, products

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