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DATASHEET

WRS400

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VAISALA

Weather Radar WRS400



Features

- Fully solid-state transmitters
- Compact, modular design
- High resolution, accuracy, and sensitivity
- Fast installation and easy maintenance
- Low life-cycle costs
- Built-in automatic calibration
- Graceful degradation
- Light-weight pedestal
- Built around RVP10™ and IRIS™ software

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 tunable transmit frequency makes it easy to avoid 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 with high quality

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.

The transceiver has an internal heating/cooling system. The other units can be installed inside radar cabinet, or in other preferred location.

Pulse compression

Pulse compression is used in SSPA weather radars to achieve the required range resolution using long transmitted pulses. The pulse compression is implemented by non-linear frequency modulation (NLFM). The pulse compression also enhances the radar receiver's dynamic range (system dynamic range).

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 still maintains limited functionality.

Technical data

Operating environment of units in the radome

Operating environment	Indoor use
Operating temperature	-40 ... +55 °C
Operating humidity	0–100 %RH, condensing
Operating altitude/Ambient pressure	Up to 3000 m Down to 700 hPa
IP rating for pedestal and transceiver	IP54

Transmitter

Type	Fully solid-state, SSPA-based transmitters. Transmitters for H and V channels are separate and independently-modulated.
Peak power (H+V)	200 W + 200 W 400 W + 400 W
Pulse width	0.5–100 µs
Duty cycle	max. 10 %
Max. pulse repetition frequency	3 kHz
Cooling	Forced air
Polarization	Simultaneous Transmit and Receive (= STAR), H-only, V-only

Receiver

Type	RF front-end, dual-channel digital receiver for horizontal and vertical polarization
Noise figure	< 3 dB
Dynamic range	> 99 dB (4 µs pulse, 0.4 MHz NEBW)
Image rejection	> 80 dB (with WG filters)
Recovery time after Tx pulse	≤ 5 µs

Antenna

Type	Center-fed parabolic reflector
Reflector diameter	1.4 m or 2.4 m
Gain	1.4 m antenna: > 40 dBi 2.4 m antenna: > 45 dBi
Beam width	1.4 m antenna: < 1.8° 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
Scanning rates	Up to 40°/s (6.67 rpm)
Acceleration	20°/s^2
Position accuracy	Better than ±0.05°
Azimuth steering	360°
Vertical steering	-2 ... +92° or better

System

Typical operating range	100 km
Frequency range	9300–9700 MHz Selectable in 100 MHz bands and tunable within the range.
System dynamic range	113 dB (90 µs, 0.4 MHz NEBW)
Phase stability	< 0.5° rms
Input power	Voltage: 230 ±10 %, 50–60 Hz ±3 Hz (single-phase)
Power consumption	Typical: 1200 W
Total weight of radar (antenna, pedestal, transceiver)	Approximately 385 kg

Radar cabinet

Dimensions (w × h × d)	600 × 1300 × 1010 mm
Weight (without UPS, server)	100 kg
Weight (with UPS, server)	180 kg

Signal processing

Signal processor	Vaisala RVP10
Azimuth averaging	2–1024 pulses
IF digitizing	16 bits
Clutter filters	Fixed/Adaptive GMAP in frequency domain
Data outputs (8 and 16 bit)	`Ah/v`, `Azdr`, `CCOR`, `CSP`, `CSR`, `dBT`, `dBZ`, `dBZt`, `KDP`, `LDR`, `LOG`, `PHIH/V`, `PHIDP`, `PMI`, `R`, `RHOHV`, `SNR`, `SQI`, `T`, `V`, `VC`, `W`, `Z`, `ZC`, `ZDR`, `ZDRC`, `Zh`, `Zv`, `Zhv`
Optional data outputs	`HCLASS`, `I/Q`
Dual-polarization	Simultaneous (STAR), H only, V only
Dual PRF velocity de-aliasing	2:3, 3:4, or 4:5 for 2X, 3X, or 4X velocity unfolding
Enhanced reflectivity processing (Zhv)	> 3 dB improvement detection gain
Processing modes	PPP, FFT/DFT, Random phase coding / SZ 8/64 phase coding for 2nd trip filtering and recovery
Maximum number of range bins	15,000
Minimum range resolution	Down to 15 m (accuracy of ±1.0 m)
Maximum range	Up to 1024 km
Pulse compression	NLFM and LFM, compression ratio of up to 19.5 dB or better

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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