

Instrument Specifications

RPG-HATPRO (tropospheric humidity / temperature profiler):

Parameter	Specification
Humidity profile performance	Vertical resolution: 200 m (range 0-2000 m) 400 m (range 2000-5000 m), 800 m (range 5000-10000 m) Accuracy: 0.4 g/m ³ RMS (absolute hum.) 5% RMS (rel. humidity)
Temperature profile performance	Vertical resolution: BL-Mode: 50 m (range 0-1200 m) Z-Mode: 200 m (range 1200-5000 m) 400 m (range 5000-10000 m) Accuracy: 0.25 K RMS (range 0-500 m) 0.50 K RMS (range 500-1200 m) 0.75 K RMS (range 1200-4000 m) 1.00 K RMS (range 4000-10000 m)
Liquid water profile performance (only with IR radiometer option)	Vertical resolution: 250 m (range 0-2000 m) 300 m (range 2000-5000 m), 500 m (range 5000-10000 m) Accuracy: cloud base height: 50 m (range 0-300 m) 100 m (range 300-1000 m) 200 m (range 1000-3000 m) 400 m (range 3000-5000 m) 600 m (range 5000-10000 m) density: 0.03 g/m ³ RMS Threshold: 50 g/m ² LWP Only single layer clouds are modelled
IR radiometer option	9.2-10.6 μm band, accuracy 1 K, noise: 0.2 K RMS
LWP	Accuracy: +/- 20 g/m ² Noise: 2 g/m ² RMS
IWV	Accuracy: +/-0.2 kg/m ² RMS Noise: 0.05 kg/m ² RMS
Full sky IWV and LWP maps (only with azimuth positioner option)	350 points in 6 minutes rapid scanning
Satellite tracking mode (only with azimuth positioner option)	Determines wet/dry delay and atmospheric attenuation along line of sight for all visible GPS / Galileo satellites in a single scan (2 minutes)
Channel center frequencies	K-Band: 22.24 GHz, 23.04 GHz, 23.84 GHz, 25.44 GHz, 26.24 GHz, 27.84 GHz, 31.4 GHz

	V-Band: 51.26 GHz, 52.28 GHz, 53.86 GHz, 54.94 GHz, 56.66 GHz, 57.3 GHz, 58.0 GHz
Channel bandwidth	2000 MHz @ 58.0 GHz, 1000 MHz @ 57.3 GHz, 600 MHz @ 56.66 GHz, 230 MHz @ all other frequencies
System noise temperatures	<400 K for 22-31 GHz profiler, <700 K for 51.4-58.0 GHz profiler
Radiometric resolution	K-Band: 0.10 K RMS, V-Band: 0.20 K RMS @ 1.0 sec integration time
Absolute brightness temperature accuracy	0.5 K
Radiometric range	0-800 K
Absolute calibration	with internal ambient & external cold load
Internal calibration	gain: with internal noise standard gain + system noise: amb. temp. target + noise standard abs. cal. of humidity profiler: sky tipping calibration
Receiver and antenna thermal stabilization	Stability better than 0.03 K over full operating temp. range
Gain nonlinearity error correction	Automatic, four point method
Brightness calculation	based on exact Planck radiation law
Integration time	>=0.4 seconds for each channel, user selectable
Sampling rate for profiles	> 1 sec, user selectable
Rain / fog mitigation system	High efficient blower system (130 Watts), hydrophobic coated microwave transparent window, 1.8 kW heater module preventing formation of dew under fog conditions
Data interface	RS-232, 115 kBaud
Data rate	10 kByte/sec., RS-232
Instrument control (external)	Host: Industrial PC, temp. range -10°C to +60°C, 4 x RS232, 2 x LAN, 2 x USB
Instrument control (internal)	Embedded PC, controls all internal calibrations, data acquisition, data file backup on 1 Gbyte flash memory, control of azimuth positioner, communication with host, can run measurements independently from host PC
Housekeeping	all system parameters, calibration history documentation
Retrieval algorithms	neural network, lin. / nonlin. regression algorithms
Optical resolution	HPBW: 3.5° for water vapour, 1.8° for temperature profiler
Sidelobe level	<-30dBc
Pointing speed (elevation)	45°/sec

Pointing speed (azimuth), optional	40°/sec
Operating temperature range	-40°C to 45°C
Power consumption	<120 Watts average, 350 Watts peak for warming-up (without dew blower heater), blower: 130 Watts max.
Lightning protection	Power line: circuit breakers Data line: Fiber optics data cable (max. length: 1400 m)
Input voltage	90-230 V AC, 50 to 60 Hz
Weight	60 kg (without dew blower)
Dimensions	63x36x90cm ³