

The RUG-4 rugged enclosure pairs with the IMX-6 tactical IMU to support four interchangeable GNSS receiver options. Each brings a different chipset, accuracy tier, and resilience profile — the right choice depends on whether the priority is cost, all-band mass-market performance, ultra-low SWaP, or mission-critical jamming/spoofing resilience.

Receiver Overview

Model	RUG-4-GPX	RUG-4-X20	RUG-4-G5P3	RUG-4-G5P8
GNSS Chipset	Sony CXD5610 (Inertial Sense GPX-1 module)	u-blox X20 platform (ZED-X20D)	Septentrio mosaic-G5 P3H	Septentrio mosaic-G5 P8
RTK / Compassing Engine	Inertial Sense RTKLib (open-source, host-side)	Onboard u-blox RTK / PPP-RTK / PPP	Onboard Septentrio GNSS+ RTK engine	Onboard Septentrio GNSS+ RTK engine
Antenna Configuration	Dual GNSS receivers (2 antennas), standard	Dual antenna, all-band on both antennas	Dual antenna, heading standard (P3H)	Single chip, switchable single- or dual-antenna mode

Signal & Constellation Support

Parameter	RUG-4-GPX	RUG-4-X20	RUG-4-G5P3	RUG-4-G5P8
Frequency Bands	Dual-band: L1 / L5	All-band: L1 / L2 / L5 / L6 + L-band (both antennas)	Triple-band (dual-antenna P3H)	Multi-band incl. E6 / E5 AltBoc; on-module L-band (single-antenna mode)
Constellations	GPS/QZSS, Galileo, GLONASS, BeiDou, NavIC, SBAS	GPS, GLONASS, Galileo, BeiDou, QZSS, NavIC, SBAS	GPS, GLONASS, BeiDou, Galileo, QZSS	GPS, GLONASS, BeiDou, Galileo, QZSS, NavIC, SBAS
Receiver Channels	62 physical acquisition/tracking channels	1,344-channel X20 engine	789 hardware channels	789 hardware channels

Positioning & Heading Performance

Parameter	RUG-4-GPX	RUG-4-X20	RUG-4-G5P3	RUG-4-G5P8
Standalone / SBAS Accuracy	1.0 m CEP (w/ SBAS)	1.2 m standalone; 0.6 m SBAS	1.2 m standalone; 0.4 m DGNSS	1.2 m standalone; 0.6 m SBAS; 0.1 m HAS
RTK Horizontal Accuracy	2 cm CEP*	0.6 cm + 1 ppm CEP	0.6 cm + 0.5 ppm RMS	0.6 cm + 0.5 ppm RMS
Heading / Compassing Accuracy	0.4° RMS @ 1 m baseline	0.1° RMS @ 1 m baseline	0.15° @ 1 m baseline; 0.03° @ 5 m	0.15° @ 1 m baseline; 0.03° @ 5 m
RTK Convergence Time	< 10 s	< 7 s (RTK); < 40 s (PPP-RTK)	< 7 s	< 7 s
Time to First Fix - 3D Position	~24 s (cold start)	~25 s (cold start)	< 35 s (cold start)	< 35 s (cold start)
Time to First Fix - RTK Position	~90+ s (cold start)*	See RTK Convergence Time above (once 3D fix & corrections are established)	See RTK Convergence Time above (once 3D fix & corrections are established)	See RTK Convergence Time above (once 3D fix & corrections are established)
Time to First Fix - Heading	~60 s (cold start)*	Not separately published	Not separately published	Not separately published
Max Output Data Rate	10 Hz position; 5 Hz heading	20 Hz position & heading	20 Hz	100 Hz position; 50 Hz w/ RTK + attitude

Security

Parameter	RUG-4-GPX	RUG-4-X20	RUG-4-G5P3	RUG-4-G5P8
Anti-Jam / Anti-Spoof	7-channel notch filter (per band)	Root of Trust, secure boot, Galileo OSNMA, jam/spoof detection	AIM+ Advanced (detection + automatic mitigation), RAIM+	AIM+ Ultimate (max threat protection), authenticated I/O (DTLS)

Which One?

RUG-4-GPX Best value entry point. Dual-frequency (L1/L5) GNSS compassing built on a widely available Sony chipset, driven by Inertial Sense's own open-source RTKLib stack for flexible tuning.	RUG-4-X20 Best all-around heading performance. All-band GNSS on both antennas, sub-0.1° heading, fastest RTK convergence, and strong built-in security — the mass-market high-precision choice.	RUG-4-G5P3 Smallest, lowest power. Ideal for SWaP-constrained platforms (drones, small robots) where centimeter RTK matters more than maximum update rate, with dual-antenna heading built in.	RUG-4-G5P8 Mission-critical resilience. Highest update rate (100 Hz), switchable single/dual-antenna heading in one chip, and Septentrio's toughest anti-jam/anti-spoof protection with authenticated I/O.
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* GPX-1 RTK accuracy is a fixed CEP spec with no published ppm/baseline-distance term, unlike the other three (fixed error + ppm-of-baseline). GPX-1 time-to-fix is vendor-published per fix type (3D, RTK, heading) from cold start; the other vendors publish 3D cold-start time separately from RTK convergence (measured once a 3D fix and corrections are already established) — the two are not directly comparable on a cold-start basis. Figures are typical/RMS values from each manufacturer's published datasheet, not independent testing.