

# HC990EXF

Preliminary



## HC990EXF Extended-Filter Embedded Full GNSS Helical Antenna + L-Band

Frequency Coverage: GPS/QZSS-L1/L2/L5, QZSS-L6, GLONASS-G1/G2/G3, Galileo-E1/E5a/E5b/E6, BeiDou-B1/B2/B2a/B3, NavIC-L5 + L-Band correction services

The HC990EXF embedded helical antenna is designed for precision positioning, covering the GPS/QZSS-L1/L2/L5, QZSS-L6, GLONASS-G1/G2/G3, Galileo-E1/E5a/E5b/E6, BeiDou-B1/B2/B2a/B3, and NavIC-L5 frequency bands, including the satellite-based augmentation system (SBAS) available in the region of operation [WAAS (North America), EGNOS (Europe), MSAS (Japan), or GAGAN (India)], as well as L-band correction services.

The patent-pending HC990EXF utilizes Tallysman's latest wideband helical element design. The antenna element provides 67 MHz of signal bandwidth supporting the entire upper GNSS band and L-Band corrections (1539 - 1606 MHz) and 136 MHz of the lower band signal bandwidth (1164 - 1300 MHz). The other key component of the antenna is the axial ratio, which is a measure of how well the antenna captures the broadcast Right Hand Circular Polarized (RHCP) signal and mitigates the reflected LHCP signals. The Tallysman HC990EXF has a high peak gain of 3dBi, full bandwidth and 0.5 dB axial ratio at zenith, enabling excellent multipath mitigation and a very precise phase centre.

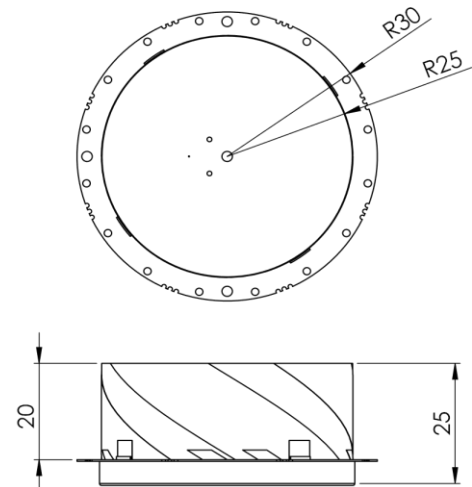
Weighing only 15 g, the light and compact HC990E features a precision-tuned helix element that provides excellent axial ratios and operates without the requirement of a ground plane, making it ideal for a wide variety of applications, including unmanned aerial vehicles (UAVs).

The HC990EXF features an industry-leading low current, low-noise amplifier (LNA) that includes an integrated low-loss pre-filter to prevent harmonic interference from high-amplitude signals, such as 700 MHz band LTE and other near-band cellular signals. As the radio frequency spectrum has become more congested, the signals or harmonic frequencies of new LTE bands [e.g. 800MHz x 2 = 1600MHz (GLONASS-G1)] can affect GNSS antennas and receivers. In North America, planned Ligado signals at 1525 - 1536 MHz can especially impact GNSS antennas that support space-based L-band correction services (1539 - 1559 MHz). New LTE signals in Europe [Band 32 (1452 - 1496 MHz)] and Japan [Bands 11 and 21 (1476 - 1511 MHz)] have also been observed to interfere with GNSS signals. In addition, Inmarsat satellite communication (uplink: 1626.5 - 1660.5 MHz) can also affect GNSS signals. The new Tallysman XF antennas have been designed to mitigate out-of-band signals and prevent GNSS antenna saturation. Tallysman's custom XF filtering mitigates all existing signals and new Ligado and LTE signals, enabling the antennas and attached GNSS receivers to perform optimally.

Care must be taken in installing the HC990EXF as ground planes below the antenna can affect its tuning. To facilitate a successful installation and optimum antenna performance, Tallysman also provides an Embedded Helical Antenna Installation Guide. For mounting instructions, visit: [https://www.tallysman.com/downloads/Helical\\_Mounting\\_Instruction.pdf](https://www.tallysman.com/downloads/Helical_Mounting_Instruction.pdf)



### Mechanical Drawing



### Applications

- Autonomous unmanned aerial vehicles (UAVs)
- Precision GNSS positioning
- Precision land survey positioning
- Mission-critical GNSS timing
- Network timing and synchronization
- Sea and land container tracking
- Fleet management and asset tracking
- Marine and avionics systems
- Law enforcement and public safety

### Features

- Very low noise preamp (2.2 dB typ.)
- Axial ratio ( $\leq 0.5$  dB at zenith)
- High LNA gain (35 dB typ.)
- Low current (35 mA typ.)
- ESD circuit protection (15 kV)
- Invariant performance from 2.2 to 16 VDC
- REACH, and RoHS compliant

### Benefits

- Extremely light (12 g)
- Excellent RH circular polarized signal reception
- Great multipath rejection
- Increased system accuracy
- Excellent signal-to-noise ratio
- Industrial temperature range

**About Tallysman:** With global headquarters and manufacturing in Ottawa, Canada, Tallysman is a leading manufacturer of high-precision antennas and components for Global Navigation Satellite System (GNSS) applications. Tallysman's mission is to support the needs of a new generation of positioning systems by delivering unprecedented antenna precision at competitive prices. Learn more at [www.tallysman.com](http://www.tallysman.com)

Revision: 1.0

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Frequency Coverage:

GPS/QZSS-L1/L2/L5, QZSS-L6, GLONASS-G1/G2/G3, Galileo-E1/E5a/E5b/E6, BeiDou-B1/B2/B2a/B3, NavIC-L5  
+ L-Band correction services

## Antenna

Technology Full-spectrum, RHCP quadrifilar helix

		Gain	Axial Ratio
		dBic typ. at Zenith	dB at Zenith
<b>GNSS</b>			
GPS / QZSS	L1	2.5	≤ 0.5
	L2	2.1	≤ 0.5
	L5	1.6	≤ 0.5
GLONASS	G1	2.3	≤ 0.5
	G2	2.0	≤ 0.5
	G3	2.4	≤ 0.5
Galileo	E1	2.5	≤ 0.5
	E5a	1.6	≤ 0.5
	E5b	2.4	≤ 0.5
	E6	2.0	≤ 0.5
BeiDou	B1	2.5	≤ 0.5
	B2	2.4	≤ 0.5
	B2a	1.6	≤ 0.5
	B3	2.2	≤ 0.5
IRNSS / NavIC	L5	1.6	≤ 0.5
QZSS	L6	2.0	≤ 0.5
L-band correction services		2.7	≤ 0.5
<b>Satellite Communications</b>			
Iridium		-	-
Globalstar		-	-
<b>Phase Centre</b>			
Phase Centre Variation (PCV)		TBD	
Phase Centre Offset (PCO)		TBD	

## Mechanicals

Mechanical Size	60.0 mm (dia.) x 26.0 mm (h.)
Weight	12 g
Available Connectors	Flying Lead (UFL)
Radome / Enclosure	-
Mount	Helical mounting ring P/N #

## Environmental

Operating Temperature	-45 °C to +85 °C
Storage Temperature	-55 °C to +95 °C
Random Vibration	-
Shock and Drop	-
Salt Fog	-
IP Rating (housing)	n/a
Compliance	IPC-A-610, FCC, RED / CE Mark, RoHS, REACH

## Warranty:

Parts and Labour	1-year standard warranty
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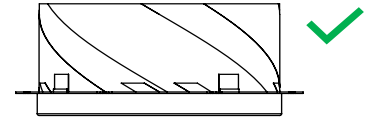
## Low Noise Amplifier (LNA) - Measured at 3.0 VDC and 25°C

Frequency Bandwidth	Out-of-Band Rejection
Lower Band	1164 - 1300 MHz ≥ 85 dB @ ≤ 0950 MHz ≥ 70 dB @ ≤ 1125 MHz ≥ 75 dB @ ≥ 1350 MHz
L-band corrections services	1539 - 1559 MHz ≥ 65 dB @ ≤ 1500 MHz ≥ 45 dB @ ≤ 1525 MHz ≥ 05 dB @ ≤ 1536 MHz ≥ 30 dB @ ≥ 1626 MHz ≥ 65 dB @ ≥ 1650 MHz
Upper Band	1559 - 1606 MHz

Architecture	Pre-filter → LNA
Gain	35 dB typ.
Noise Figure	2.0 dB typ.
VSWR	< 1.5:1 typ.   1.8:1 max.
Supply Voltage Range	2.2 to 16 VDC
Supply Current	36 mA typ.
ESD Circuit Protection	15 kV air discharge
P 1dB Output	TBD
Group Delay Variation	TBD

## Installation Instructions

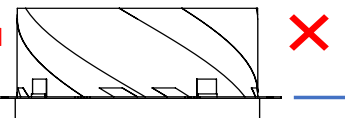
### PROPER INSTALLATION



No metallic ground plane or PCB

### IMPROPER INSTALLATION

(1) Antenna embedded in Metallic surface



or

(2) Antenna sitting on metallic ground plane or PCB

## Ordering Information

Part Number	<b>33-HC990EXF</b>
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Please refer to our **Ordering Guide** to review available radomes and connectors at:  
<https://www.tallysman.com/resource/tallysman-ordering-guide/>