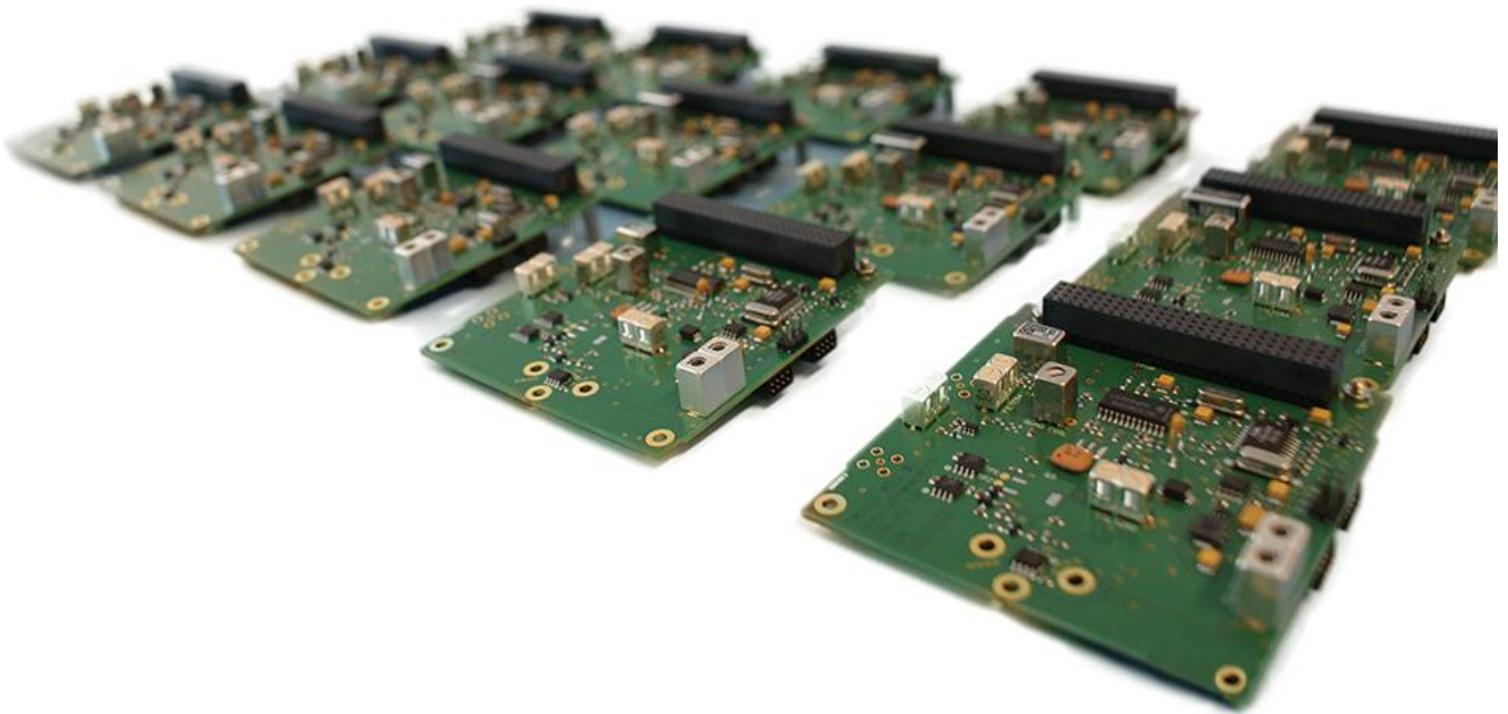


# Communication Systems



Flight heritage since 2012



VHF  
UHF

S-band

Custom  
solutions  
on request

[www.isispace.nl](http://www.isispace.nl)

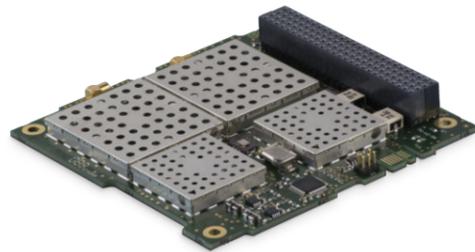
## UHF and VHF Band

### DESCRIPTION

The ISIS UHF/VHF transceivers are full duplex communication systems for CubeSat TT&C applications. The two variants of this product are TRXUV (UHF uplink/VHF downlink) and TRXVU (VHF uplink/UHF downlink). Both radios can operate in commercial and amateur bands of the VHF/UHF frequency spectrum and are low power, low mass, and highly configurable, offering the flexibility of changing data rates and frequencies in flight. These radios are tailored for CubeSat missions and cross compatible with other subsystems such as on-board computers and antenna systems. Both the TRXUV and the TRXVU are flight proven since 2012 and 2016 respectively, with over 75 units delivered.

### UHF uplink/VHF downlink

### VHF uplink/UHF downlink



### FEATURES

- Full duplex communication
- Data rate re-configurable in-flight
- Receiver loopback mode
- Safety watchdog
- Low power consumption
- Single PCB radio
- Single board Telemetry, Telecommand and Beacon capabilities

- Full duplex communication
- Data rate re-configurable in-flight
- Frequency re-configuration in-flight
- FM transponder mode available
- Safety watchdog
- Low power consumption
- Single PCB radio
- Single board Telemetry, Telecommand and Beacon capabilities

### PROPERTIES

<b>Dimensions:</b>	90 x 96 x 15 mm
<b>Mass:</b>	85g
<b>Supply voltage range:</b>	6.5 – 12.5 V DC
<b>Power consumption:</b>	0.2W (receiver only) 1.7 W (transmitter on)
<b>Operating temperature:</b>	-20 to +60 deg C
<b>RF interfaces:</b>	MMCX (50 ohm)
<b>Data interfaces:</b>	I <sup>2</sup> C

<b>Dimensions:</b>	90 x 96 x 15 mm
<b>Mass:</b>	75g
<b>Supply voltage range:</b>	6.5 – 20 V DC
<b>Power consumption:</b>	0.48W (receiver only) 4 W (transmitter on)
<b>Operating temperature:</b>	-20 to +60 deg C
<b>RF interfaces:</b>	MMCX (50 ohm)
<b>Data interfaces:</b>	I <sup>2</sup> C

## UHF uplink/VHF downlink

### PERFORMANCE

#### Transmitter

<b>Frequency range:</b>	145.8 – 146 MHz (amateur-satellite VHF allocation). Other ranges available on request
<b>Transmit power:</b>	23 dBm
<b>Modulation options:</b>	Binary Phase Shift Keying (BPSK)

<b>Data rate selectable:</b>	1200, 2400, 4800 and 9600 bps
<b>Data link layer protocol:</b>	AX.25

#### Receiver

<b>Frequency range:</b>	435 MHz – 438 MHz
<b>Modulation:</b>	Audio Frequency Shift Keying (AFSK)

<b>Data rate:</b>	1200 bps
<b>Sensitivity:</b>	-104 dBm Sensitivity for BER 1E-5
<b>Data link layer protocol:</b>	AX.25

### CONFIGURATION

- Receiver/Transmitter operating frequency
- Downlink data rate
- Custom beacon message (AX.25 or CW)
- CSKB connector type and location
- RF connector position and orientation
- I<sup>2</sup>C watchdog implementation

### FLIGHT HERITAGE

Since 2012

### QUALIFICATION TESTING

Test	QT	AT
Functional	✓	✓
Vibration	✓	-
Mechanical Shock	✓	-
Thermal Cycling	✓	✓
Thermal Vacuum	✓	-
Total Ionizing Dose	✓	-

## VHF uplink/UHF downlink

<b>Frequency range:</b>	435 – 438 MHz (amateur-satellite UHF allocation). Other ranges available on request
<b>Transmit power:</b>	27 dBm
<b>Modulation options:</b>	Binary Phase Shift Keying (BPSK) with G3RUH scrambling Gaussian Minimum Shift Keying (GMSK) with G3RUH scrambling 1200, 2400, 4800 and 9600 bps AX.25 or HDLC

<b>Frequency range:</b>	145.8 MHz – 146 MHz
<b>Modulation:</b>	Audio Frequency Shift Keying (AFSK) Gaussian Minimum Shift Keying (GMSK) with G3RUH scrambling Frequency Shift Keying (FSK) with G3RUH scrambling 1200, 9600 bps -104 dBm Sensitivity for BER 1E-5 AX.25

- Receiver/Transmitter operating frequency
- Downlink data rate
- Custom beacon message (AX.25)
- CSKB connector type and location
- RF connector position and orientation
- I<sup>2</sup>C watchdog implementation

Since 2016



# ISIS high data rate S-band transmitter

## DESCRIPTION

The ISIS High Data-rate S-band Transmitter is a CubeSat compatible Transmitter designed to meet the needs of high data-rate downlinks of up to 3.4 Mbps (information bit-rate at CCSDS transfer frame level).

The transmitter can be used for both TT&C or PDT downlinks. The S-band transmitter is as robust as it is flexible, implementing CCSDS as datalink layer protocol and allowing in-flight configuration of data-rate and RF output power.



## FEATURES

- Operates in EESS/SRS/SOS allocation band
- CCSDS compliant
- Data-rate and RF power re-configurable in-flight.
- RF power control loop to maintain constant RF power over the temperature range and Frequency band.
- SFCG Spectral mask compliant (Recommendation: SFCG-21-2R4)
- Safety watchdog.
- Adjustable RF output power from 27 to 33dBm (0.5dB steps)
- RF output tolerant to full mismatch

## PERFORMANCE

Frequency range:	2200-2290 MHz (EESS/SRS/SOS allocations)
Transmit power:	27 to 33 dBm
Modulation options:	Offset Quadrature Phase-shift Keying (OQPSK)
Pulse shaping:	Square Root Raised Cosine, Roll-off 0.5, 0.35 (other options on request)
Channel coding:	Concatenated Reed Solomon and Convolutional coding [C(7, 1/2) and RS (255, 223)]
Data rate selectable:	3.4 Mbps ( 1/2 , 1/4 and 1/8 )
Data link layer protocol:	CCSDS

## PROPERTIES

<b>Transmit power:</b>	27 to 33dBm
<b>Dimensions:</b>	90 x 96 x 33 mm
<b>Mass:</b>	<300g
<b>Supply voltage range:</b>	6,5 – 20 V DC
<b>Power consumption:</b>	9,2W
<b>Operating temperature:</b>	-40 to +60 deg C
<b>Interfaces:</b>	
Data:	o Housekeeping: I <sup>2</sup> C, CAN (optional) o Payload: SPI over LVDS (CCSDS transfer frames)
Power:	6-20V DC
RF output:	SMA (50 ohm)

## QUALIFICATION TESTING

Test	QT	AT
Functional	✓	✓
Vibration	✓	-
Mechanical Shock	✓	-
Thermal Cycling	✓	✓
Thermal Vacuum	✓	-
Total Ionizing Dose	✓	-

## CONFIGURATION

- Transmitter operating frequency
- Downlink data rate
- RF output power
- RF connector mounting position and orientation
- I<sup>2</sup>C and CAN watchdog implementation

Coming  
in  
2018

This document is subject to change without notice. Latest information is on [www.isispace.nl](http://www.isispace.nl)



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