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Model Number:  
FN-U-K4L1-24403XX-XXXX

# Falcon Series

## Frequency Converter Module

### L-Band to Ka-Band Block Upconverter

#### Typical applications:

- Teleports & Earth Stations
- Satellite Operations
- Government & Defence applications
- Telemetry, Tracking & Command
- High Resilience applications

L-Band to Ka-Band block upconverter module with variable gain and slope.

The 1U chassis has the capacity for up to four hot-swap frequency converter modules. These can be all upconverters, all downconverters or a mix of both.

#### Frequency Converter Module



##### Frequency Converter Module

Compact form factor allowing multiple modules to be housed in the Genus chassis. Each module occupies 4 slots in the chassis.



##### Redundancy configurations

Field-replaceable 2+1 or 1+1 redundant configuration



##### Frequency Conversion Up

conversion from L-Band to Ka-Band.



##### Hot Swap & replaceable RF

Frequency Converter modules



##### Variable Gain & Slope

For balancing input signals.

#### Chassis Options



**Local control & monitoring** via HMI high resolution touchscreen



##### Resilience

from dual redundant hot-swap power supplies & field replaceable CPU & HMI



##### Compact indoor & outdoor

chassis options, which can be part populated



**Secure protocols** with SNMPv3 and HTTPS



##### Flexible Module Configurations

choose from a mixture of up and down converters with different operating frequencies.



##### Remote control & monitoring

via RJ45 Ethernet port with SNMP & web browser interface



##### Field replaceable Internal reference source

and external reference inject port with auto detection



Indoor Chassis



Outdoor Unit



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| Frequency Upconverter Module - RF Parameters                                  |                     |                                                                                                                                                                     | Redundancy - RF Parameters                                                    |                                                                               |
|-------------------------------------------------------------------------------|---------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------|
| Model Numbers                                                                 |                     | FN-U-K4L1-24403AA-XXK5                                                                                                                                              | SWF-G1S-QX-108A-xxxx                                                          | SWF-G1S-QX-116-xxxx                                                           |
| Size                                                                          |                     | 4 slots wide                                                                                                                                                        | 4 slots wide                                                                  | 4 slots wide                                                                  |
| Redundancy                                                                    |                     | Supported (based on chassis configuration)                                                                                                                          | 1+1 ( <b>Note:</b> This column denotes specs for 24403 in 1+1 configuration). | 2+1 ( <b>Note:</b> This column denotes specs for 24403 in 2+1 configuration). |
| Input Frequency Range                                                         |                     | 1150 - 2150 MHz                                                                                                                                                     |                                                                               |                                                                               |
| Output Frequency Range (User selectable frequency range via software command) |                     | Mode 1 : 27.0—28.00, Mode 2 : 27.50—28.50, Mode 3 : 28.00—29.00, Mode 4 : 28.50—29.50 GHz, Mode 5: 29.00—30.00 GHz, Mode 6: 29.50—30.50 GHz Mode 7: 30.00—31.00 GHz |                                                                               |                                                                               |
| Mean Conversion Gain                                                          |                     | Max. 22.0 ± 2.0 dB / Min. -3.0 ± 2.0 dB                                                                                                                             | Max. 18.0 ± 2.0 dB / Min -7.0 ± 2.0 dB                                        | Max. 14.8 ± 2.0 dB / Min -10.2 ± 2.0 dB                                       |
| Gain Step Size                                                                |                     | 0.25 ± 0.15 dB                                                                                                                                                      |                                                                               |                                                                               |
| Gain Flatness                                                                 |                     | Full IF band: ±1.5 dB Any 40MHz: ±0.3 dB                                                                                                                            |                                                                               |                                                                               |
| Input Return Loss (L-band)                                                    |                     | Typ. -20 dB / Min. -18 dB                                                                                                                                           | Typ. -13 dB / Min. -11 dB                                                     | Typ. -13 dB / Min. -11 dB                                                     |
| Output Return Loss (Ka-band)                                                  |                     | Typ. -18 dB / Min. -14 dB                                                                                                                                           | Typ. -9 dB / Min. -8 dB                                                       | Typ. -9 dB / Min. -8 dB                                                       |
| Noise Figure At max. gain                                                     |                     | Typ. 20 dB / Max 23 dB                                                                                                                                              | Typ. 21 dB / Max 24 dB                                                        | Typ. 22.7 dB / Max 25.8 dB                                                    |
| Input Power Range                                                             |                     | -75 to -30 dBm                                                                                                                                                      |                                                                               |                                                                               |
| OP1dB At max. gain                                                            |                     | Typ. +3 dBm / Min. 0 dBm                                                                                                                                            | Typ. 0 dBm / Min. -3.0 dBm                                                    | Typ. -1.5 dBm / Min. -4.5 dBm                                                 |
| OIP3 At max. gain                                                             |                     | Typ. +13 dBm / Min. +10 dBm                                                                                                                                         | Typ. +10.0 dBm / Min. +7.0 dBm                                                | Typ. +8.5 dBm / Min. +5.5 dBm                                                 |
| Slope Control Range                                                           |                     | 0-6 dB, pivot point at 2150 MHz                                                                                                                                     |                                                                               |                                                                               |
| Slope Control Steps                                                           |                     | 1 ± 0.5 dB                                                                                                                                                          |                                                                               |                                                                               |
| Internal Reference Stability                                                  |                     | ± 5 x 10 <sup>-8</sup> over 0 to 50°C                                                                                                                               |                                                                               |                                                                               |
| Phase Noise<br>(Typical values)                                               | @10Hz offset        | -70 dBc / Hz                                                                                                                                                        |                                                                               |                                                                               |
|                                                                               | @100Hz offset       | -80 dBc / Hz                                                                                                                                                        |                                                                               |                                                                               |
|                                                                               | @1KHz offset        | -90 dBc / Hz                                                                                                                                                        |                                                                               |                                                                               |
|                                                                               | @10KHz offset       | -98 dBc / Hz                                                                                                                                                        |                                                                               |                                                                               |
|                                                                               | @100KHz offset      | -101 dBc / Hz                                                                                                                                                       |                                                                               |                                                                               |
|                                                                               | @1MHz offset        | -107 dBc / Hz                                                                                                                                                       |                                                                               |                                                                               |
|                                                                               | @10MHz offset       | -130 dBc / Hz                                                                                                                                                       |                                                                               |                                                                               |
| Spurs In-band<br>(Measured at -15 dBm output and max gain)                    | Carrier related     | < -60 dBc                                                                                                                                                           |                                                                               |                                                                               |
|                                                                               | Non-carrier related | < -70 dBm                                                                                                                                                           |                                                                               |                                                                               |
| Spurs Out-of-band<br>(Measured at -15 dBm output and max gain)                | Carrier related     | < -60 dBc                                                                                                                                                           |                                                                               |                                                                               |
|                                                                               | Non-carrier related | < -70 dBm                                                                                                                                                           |                                                                               |                                                                               |
| LO Breakthrough                                                               |                     | < -70 dBm                                                                                                                                                           |                                                                               |                                                                               |
| Image Rejection                                                               |                     | > 60 dB typical                                                                                                                                                     |                                                                               |                                                                               |
| External Reference Input Frequency                                            |                     | 10MHz or 100MHz (auto detection)                                                                                                                                    |                                                                               |                                                                               |
| External Ref Input Level                                                      |                     | 0 dBm ± 10 dB                                                                                                                                                       |                                                                               |                                                                               |
| Mute                                                                          |                     | 60 dB                                                                                                                                                               |                                                                               |                                                                               |
| IF Monitor                                                                    |                     | Yes. Internal RF detector monitored.                                                                                                                                |                                                                               |                                                                               |
| Spectral Inversion                                                            |                     | Non-inverting                                                                                                                                                       |                                                                               |                                                                               |
| Number of conversion stages                                                   |                     | Dual                                                                                                                                                                |                                                                               |                                                                               |
| Spec version                                                                  |                     | 0.1                                                                                                                                                                 | 1.0                                                                           | 0.1                                                                           |

Note 1: The specification is subject to regular reviews and will be updated from time to time as part of our continuing product development and improved spec accuracy.

Note 2: Operation beyond the quoted limits stated above may cause instantaneous and permanent damage.

Note 3: All specs are for 50 Ohm connectors unless detailed otherwise.



| Frequency Upconverter Module - RF Parameters                                  |                                                                                                                                       |               |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Model Numbers                                                                 | FN-U-K4L1-24403AB-XXK5                                                                                                                |               |
| Size                                                                          | 4 slots wide                                                                                                                          |               |
| Redundancy                                                                    | Supported (based on chassis configuration)                                                                                            |               |
| Input Frequency Range                                                         | 1150 - 2150 MHz                                                                                                                       |               |
| Output Frequency Range (User selectable frequency range via software command) | <b>Mode 1</b> : 27.00—28.00 GHz, <b>Mode 2</b> : 28.00—29.00 GHz,<br><b>Mode 3</b> : 29.00—30.00 GHz, <b>Mode 4</b> : 30.00—31.00 GHz |               |
| Mean Conversion Gain                                                          | Max. 22.0 ± 2.0 dB / Min. -3.0 ± 2.0 dB                                                                                               |               |
| Gain Step Size                                                                | 0.25 ± 0.15 dB                                                                                                                        |               |
| Gain Flatness                                                                 | Full IF band: ±1.5 dB Any 40MHz: ±0.3 dB                                                                                              |               |
| Input Return Loss (L-band)                                                    | Typ. -20 dB / Min. -18 dB                                                                                                             |               |
| Output Return Loss (Ka-band)                                                  | Typ. -18 dB / Min. -14 dB                                                                                                             |               |
| Noise Figure At max. gain                                                     | Typ. 20 dB / Max 23 dB                                                                                                                |               |
| Input Power Range                                                             | -75 to -30 dBm                                                                                                                        |               |
| OP1dB At max. gain                                                            | Typ. +3 dBm / Min. 0 dBm                                                                                                              |               |
| OIP3 At max. gain                                                             | Typ. +13 dBm / Min. +10 dBm                                                                                                           |               |
| Slope Control Range                                                           | 0-6 dB, pivot point at 2150 MHz                                                                                                       |               |
| Slope Control Steps                                                           | 1 ± 0.5 dB                                                                                                                            |               |
| Internal Reference Stability                                                  | ± 5 x 10 <sup>-8</sup> over 0 to 50°C                                                                                                 |               |
| Phase Noise<br>(Typical values)                                               | @10Hz offset                                                                                                                          | -70 dBc / Hz  |
|                                                                               | @100Hz offset                                                                                                                         | -80 dBc / Hz  |
|                                                                               | @1KHz offset                                                                                                                          | -90 dBc / Hz  |
|                                                                               | @10KHz offset                                                                                                                         | -98 dBc / Hz  |
|                                                                               | @100KHz offset                                                                                                                        | -101 dBc / Hz |
|                                                                               | @1MHz offset                                                                                                                          | -107 dBc / Hz |
|                                                                               | @10MHz offset                                                                                                                         | -130 dBc / Hz |
| Spurs In-band<br>(Measured at -15 dBm output and max gain)                    | Carrier related                                                                                                                       | < -60 dBc     |
|                                                                               | Non-carrier related                                                                                                                   | < -70 dBm     |
| Spurs Out-of-band<br>(Measured at -15 dBm output and max gain)                | Carrier related                                                                                                                       | < -60 dBc     |
|                                                                               | Non-carrier related                                                                                                                   | < -70 dBm     |
| LO Breakthrough                                                               | < -70 dBm                                                                                                                             |               |
| Image Rejection                                                               | > 60 dB typical                                                                                                                       |               |
| External Reference Input Frequency                                            | 10MHz or 100MHz (auto detection)                                                                                                      |               |
| External Ref Input Level                                                      | 0 dBm ± 10 dB                                                                                                                         |               |
| Mute                                                                          | 60 dB                                                                                                                                 |               |
| IF Monitor                                                                    | Yes. Internal RF detector monitored.                                                                                                  |               |
| Spectral Inversion                                                            | Non-inverting                                                                                                                         |               |
| Number of conversion stages                                                   | Dual                                                                                                                                  |               |
| Spec version                                                                  | 0.1                                                                                                                                   |               |

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| Frequency Upconverter Module - RF Parameters                                  |                                                                                                                                                                        |               |
|-------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Model Numbers                                                                 | FN-U-K4L1-24403AC-XXK5                                                                                                                                                 |               |
| Size                                                                          | 4 slots wide                                                                                                                                                           |               |
| Redundancy                                                                    | Supported (based on chassis configuration)                                                                                                                             |               |
| Input Frequency Range                                                         | 950 - 2050 MHz                                                                                                                                                         |               |
| Output Frequency Range (User selectable frequency range via software command) | <b>Mode 1</b> : 27.50—28.60 GHz, <b>Mode 2</b> : 28.10—29.20 GHz,<br><b>Mode 3</b> : 28.70—29.80 GHz, <b>Mode 4</b> : 29.30—30.40 GHz, <b>Mode 5</b> : 29.90—31.00 GHz |               |
| Mean Conversion Gain                                                          | Max. 22.0 ± 2.0 dB / Min. -3.0 ± 2.0 dB                                                                                                                                |               |
| Gain Step Size                                                                | 0.25 ± 0.15 dB                                                                                                                                                         |               |
| Gain Flatness                                                                 | Full IF band: ±2.0 dB Any 40MHz: ±0.3 dB                                                                                                                               |               |
| Input Return Loss (L-band)                                                    | Typ. -20 dB / Min. -18 dB                                                                                                                                              |               |
| Output Return Loss (Ka-band)                                                  | Typ. -18 dB / Min. -14 dB                                                                                                                                              |               |
| Noise Figure At max. gain                                                     | Typ. 20 dB / Max 23 dB                                                                                                                                                 |               |
| Input Power Range                                                             | -75 to -30 dBm                                                                                                                                                         |               |
| OP1dB At max. gain                                                            | Typ. +3 dBm / Min. 0 dBm                                                                                                                                               |               |
| OIP3 At max. gain                                                             | Typ. +13 dBm / Min. +10 dBm                                                                                                                                            |               |
| Slope Control Range                                                           | 0-6 dB, pivot point at 2150 MHz                                                                                                                                        |               |
| Slope Control Steps                                                           | 1 ± 0.5 dB                                                                                                                                                             |               |
| Internal Reference Stability                                                  | ± 5 x 10 <sup>-8</sup> over 0 to 50°C                                                                                                                                  |               |
| Phase Noise<br>(Typical values)                                               | @10Hz offset                                                                                                                                                           | -70 dBc / Hz  |
|                                                                               | @100Hz offset                                                                                                                                                          | -80 dBc / Hz  |
|                                                                               | @1KHz offset                                                                                                                                                           | -90 dBc / Hz  |
|                                                                               | @10KHz offset                                                                                                                                                          | -98 dBc / Hz  |
|                                                                               | @100KHz offset                                                                                                                                                         | -101 dBc / Hz |
|                                                                               | @1MHz offset                                                                                                                                                           | -107 dBc / Hz |
|                                                                               | @10MHz offset                                                                                                                                                          | -130 dBc / Hz |
| Spurs In-band<br>(Measured at -15 dBm output and max gain)                    | Carrier related                                                                                                                                                        | < -60 dBc     |
|                                                                               | Non-carrier related                                                                                                                                                    | < -70 dBm     |
| Spurs Out-of-band<br>(Measured at -15 dBm output and max gain)                | Carrier related                                                                                                                                                        | < -60 dBc     |
|                                                                               | Non-carrier related                                                                                                                                                    | < -70 dBm     |
| LO Breakthrough                                                               | < -70 dBm                                                                                                                                                              |               |
| Image Rejection                                                               | > 60 dB typical                                                                                                                                                        |               |
| External Reference Input Frequency                                            | 10MHz or 100MHz (auto detection)                                                                                                                                       |               |
| External Ref Input Level                                                      | 0 dBm ± 10 dB                                                                                                                                                          |               |
| Mute                                                                          | 60 dB                                                                                                                                                                  |               |
| IF Monitor                                                                    | Yes. Internal RF detector monitored.                                                                                                                                   |               |
| Spectral Inversion                                                            | Non-inverting                                                                                                                                                          |               |
| Number of conversion stages                                                   | Dual                                                                                                                                                                   |               |
| Spec version                                                                  | 0.2                                                                                                                                                                    |               |

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Note 3: All specs are for 50 Ohm connectors unless detailed otherwise.



| Frequency Upconverter Module - RF Parameters                                  |                     | Redundancy - RF Parameters                    |                                                                       |
|-------------------------------------------------------------------------------|---------------------|-----------------------------------------------|-----------------------------------------------------------------------|
| Model Numbers                                                                 |                     | FN-U-K4L1-24403AD-XXK5                        | SWF-G1S-QX-108A-xxxx                                                  |
| Size                                                                          |                     | 4 slots wide                                  | 4 slots wide                                                          |
| Redundancy                                                                    |                     | Supported (based on chassis configuration)    | 1+1 (Note: This column denotes specs for 24403 in 1+1 configuration). |
| Input Frequency Range                                                         |                     | Mode 1 : 950—1950MHz, Mode 2 : 950—1450MHz,   |                                                                       |
| Output Frequency Range (User selectable frequency range via software command) |                     | Mode 1 : 27.5—28.5GHz, Mode 2 : 30.0—30.5GHz, |                                                                       |
| Mean Conversion Gain                                                          |                     | Max. 22.0 ± 2.0 dB / Min. -3.0 ± 2.0 dB       | Max. 18.0 ± 2.0 dB / Min -7.0 ± 2.0 dB                                |
| Gain Step Size                                                                |                     | 0.25 ± 0.15 dB                                |                                                                       |
| Gain Flatness                                                                 |                     | Full IF band: ±2 dB Any 40MHz: ±0.3 dB        |                                                                       |
| Input Return Loss (L-band)                                                    |                     | Typ. -20 dB / Min. -18 dB                     | Typ. -13 dB / Min. -11 dB                                             |
| Output Return Loss (Ka-band)                                                  |                     | Typ. -18 dB / Min. -14 dB                     | Typ. -9 dB / Min. -8 dB                                               |
| Noise Figure At max. gain                                                     |                     | Typ. 20 dB / Max 23 dB                        | Typ. 21 dB / Max 24 dB                                                |
| Input Power Range                                                             |                     | -75 to -30 dBm                                |                                                                       |
| OP1dB At max. gain                                                            |                     | Typ. +3 dBm / Min. 0 dBm                      | Typ. 0 dBm / Min. -3.0 dBm                                            |
| OIP3 At max. gain                                                             |                     | Typ. +13 dBm / Min. +10 dBm                   | Typ. +10.0 dBm / Min. +7.0 dBm                                        |
| Slope Control Range                                                           |                     | 0-6 dB, pivot point at 2150 MHz               |                                                                       |
| Slope Control Steps                                                           |                     | 1 ± 0.5 dB                                    |                                                                       |
| Internal Reference Stability                                                  |                     | ± 5 x 10 <sup>-8</sup> over 0 to 50°C         |                                                                       |
| Phase Noise<br>(Typical values)                                               | @10Hz offset        | -70 dBc / Hz                                  |                                                                       |
|                                                                               | @100Hz offset       | -80 dBc / Hz                                  |                                                                       |
|                                                                               | @1KHz offset        | -90 dBc / Hz                                  |                                                                       |
|                                                                               | @10KHz offset       | -98 dBc / Hz                                  |                                                                       |
|                                                                               | @100KHz offset      | -101 dBc / Hz                                 |                                                                       |
|                                                                               | @1MHz offset        | -107 dBc / Hz                                 |                                                                       |
|                                                                               | @10MHz offset       | -130 dBc / Hz                                 |                                                                       |
| Spurs In-band<br>(Measured at -15 dBm output and max gain)                    | Carrier related     | < -60 dBc                                     |                                                                       |
|                                                                               | Non-carrier related | < -70 dBm                                     |                                                                       |
| Spurs Out-of-band<br>(Measured at -15 dBm output and max gain)                | Carrier related     | < -60 dBc                                     |                                                                       |
|                                                                               | Non-carrier related | < -70 dBm                                     |                                                                       |
| LO Breakthrough                                                               |                     | < -70 dBm                                     |                                                                       |
| Image Rejection                                                               |                     | > 60 dB typical                               |                                                                       |
| External Reference Input Frequency                                            |                     | 10MHz or 100MHz (auto detection)              |                                                                       |
| External Ref Input Level                                                      |                     | 0 dBm ± 10 dB                                 |                                                                       |
| Mute                                                                          |                     | 60 dB                                         |                                                                       |
| IF Monitor                                                                    |                     | Yes. Internal RF detector monitored.          |                                                                       |
| Spectral Inversion                                                            |                     | Non-inverting                                 |                                                                       |
| Number of conversion stages                                                   |                     | Dual                                          |                                                                       |
| Spec version                                                                  |                     | 0.2                                           | 0.1                                                                   |

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