



Synthesized Block Up- and Downconverter Indoor / Outdoor

Single / Dual / Triple Band
Single / Dual Channel
S-, C-, Ku-, K (DBS)-, Ka- and Q-band



WORK Microwave's synthesized block converters are designed to optimize the performance and bandwidth of satellite communications links, enabling operators to cost-effectively deliver a superior signal quality. Ideal use cases include fixed satellite ground stations as well as in satellite newsgathering (SNG) vehicles, fly-aways, and other mobile or portable applications.

The fifth-generation frequency converter series is built with the most advanced technologies available to ensure outstanding performance, high reliability, and a longer lifetime.

5th-generation enhancements

Reduced phase noise: Based on a powerful new synthesizer the frequency converters achieve a phase noise significantly beyond the recommended industry specification (Intelsat's IESS-308/309).

Optional slope compensation up to +8 dB / GHz over L-band: With slope compensation users can effectively balance the losses and negative slope of augmented cable runs to ensure that all signals entering the RF processing chain are at similar levels across all frequencies.

Improved flexibility and usability: Through a new USB port, operators can now access the converter via the back panel to make copies of parameter settings, replicate selected configurations on another device, or save configuration settings for future reference. In addition, a user-friendly, Web-based interface offers an intuitive user experience. When coupled with the enhanced USB port, the customizable GUI also simplifies the installation of firmware updates.

Higher reliability: An AC power consumption of typically 35 VA / 23 W maximizes the reliability and lifetime of the units.

High signal integrity

The very low phase noise of the oscillators guarantees an excellent signal quality. Low spurious emissions allow our customers to use the converters in the environments with demanding requirements, such as high power video uplinks. Sophisticated temperature compensation guarantees the stability over a wide temperature range.

Block converter with frequency synthesizer

In contrast to block converters with fixed or switchable LO these converters include a tunable LO with 100 Hz step size. The frequency bandwidth is selected to achieve low spurious emissions. These properties allow wideband frequency coverage with only one unit, where other concepts with fixed block converters require several different block converter modules.

Housing options

The converters normally are delivered without fans and can be operated in environments, where at minimum 1 RU space for natural ventilation is available above each unit. This eliminates the fan as a potential point of failure. For rack installations without any space in between the units, a fan within the converter unit is recommended. This forces airflow from the right side to left side of the units. Outdoor versions with IP67 degree of protection are also available.

The converters can be operated via the push buttons on the front panel using intuitive display menus or via remote control (RS232, RS422/485 and TCP/IP over Ethernet). Detailed monitoring of the system status and a summary alarm output (dual change over switch contacts) are provided. For the remote control either ASCII string-based commands as well as addressable, packet-based commands are provided.

Remote monitoring and control through SNMP and a Web browser interface is also available.

Customized products

In addition to standard products WORK Microwave offers custom tailored products and specialized products as follows:

- Modified or smaller housings to fit into your AC power switch on the front panel
- Existing design for mobile and portable applications.
- Different IF or RF frequency bands
- Customized M&C interface and control syntax.
- Extended storage or operating temperature range.
- Military versions for hostile environment (shock, vibration, humidity).

Key features

- Long-term stability 10^{-7} / year
- Output power +10 dBm (1 dB compression point)
- Automatic reference recognition (5 and 10 MHz)
- Digital gain compensation
- Operating temperature range either -30 °C to 60 °C (-22 °F to 140 °F) or 0 °C to 50 °C (32 °F to 122 °F)
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces. Packet command syntax supports RS485 bus systems and allows addressed operation.
- Remote control through Ethernet supporting a TCP/IP command interface, a Web browser interface and SNMP (MIBs are provided).
- RF test output on the front panel available
- AC power switch on the front panel
- Summary alarm output with dual change over switch contacts
- Transmit mute input
- Optional internal Fan (Option: FAN)
- CE compliant
- **3 years warranty**

Orders information

WORK Microwave offers two series of 19" rack satellite converters, Standard and High Performance. The specifications are the same for both types except the operating temperature range. The High Performance type operates between -30 °C to 60 °C (-22 °F to 140 °F) and the Standard type between 0 °C to 50 °C (32 °F to 122 °F). Therefore if you only need units for inside use, the standard unit is perfectly suited for this application.

Open questions, demo units

If you need more information about WORK Microwave's synthesized frequency block converters or if you would like to have demo unit, please contact us via e-mail: sales@work-microwave.de or call us. We are glad to assist you.

Synthesized Block Upconverter

Indoor / Outdoor

S-, C-, X-, Ku-, K- (DBS), Ka-band

Q-band available on request (contact factory)

Upconverter Type:	VHSBU-Ku-2 / VSSBU-Ku-2	VHSBU-Ka / VSSBU-Ka	VHSBU-Ka3 / VSSBU-Ka3	VHSBU-Ka1 / VSSBU-Ka1	
RF-Output Frequency:	Ku-Band 10.7 ... 12.75 GHz	Ka-Band 27.5 ... 31.0 GHz	Ka-Band 25.0 ... 28.0 GHz	Ka-Band 27.5 ... 28.6 GHz	
Intermediate Frequency:	-	8250 MHz	7.6 ... 8.2 GHz	-	
MW-LO-Frequency:	9.20 ... 11.10 GHz	36.1 ... 38.9 GHz	33.2 ... 35.6 GHz	26.05 ... 26.85 GHz	
Fixed-LO-Frequency:	-	9.55 GHz	9.1 GHz	-	
Phase Noise:	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	-70 / -67 -85 / -82 -96 / -93 -103 / -100 -107 / -104 -112 / -109	-50 / -47 -60 / -57 -85 / -82 -92 / -89 -95 / -92 -105 / -102	-50 / -47 -60 / -57 -85 / -82 -92 / -89 -95 / -92 -105 / -102	
typ. / max. values in dBc/ Hz ¹⁾ 0 °C ... 50 °C, outside this temperature range degraded by max 5 dB.					
Input Frequency:	1500 ... 1650 MHz	950 ... 1650 MHz	900 ... 1500 MHz	1450 ... 1750 MHz	
Conversion Scheme:	Single up conversion, no frequency inversion	Dual up conversion, no frequency inversion		Single up conversion, no frequency inversion	
Frequency Resolution:	100 Hz				

Common Parameters	
IF-Input Characteristics:	Impedance: 50 Ω Return loss: > 18 dB Operational input level: -40 dBm ¹⁾ Maximum aggregate input level: +10 dBm (damage level) Connector: SMA female (standard) N female (standard with option OD)
IF/RF-Monitor (Option):	Signal level in ref. to in/output: -20 dB Impedance: 50 Ω Connector: SMA female
RF-Output Characteristics:	Impedance: 50 Ω Return loss: > 18 dB, (> 15 dB with option WR28) 1 dB compression point: > 10 dBm ¹⁾ Output muting: > 60 dB (by command or sense input or by alarm condition) Connector: SMA female (standard) K female (-Ka standard) WR28 waveguide (-Ka with option WR28)
LO Test Output (Option):	Frequency: LO Frequency standard (LO>20 GHz = LO/2 on Test Output) Signal level: -10 dBm ±3 dB Impedance: 50 Ω Connector: SMA female
Transfer Characteristics:	Max. conversion Gain: 40 dB ±1 dB Attenuation range: 0 ... 30 dB, 0.1 dB steps Gain variation over temp.: ±0.5 dB max. Gain flatness over freq.: ±1.5 dB max. over band Gain flatness over 40 MHz: ±0.25 dB Image rejection: > 80 dB Noise figure: < 12 dB ¹⁾
Transfer Characteristics with Gain Slope Equalizer (Option):	Max. conversion gain: 40 dB ±1 dB Attenuation range: 0 ... 30 dB, 0.1 dB steps Gain variation over temp.: ±0.5 dB max. Gain flatness over freq.: ±1.5 dB max. over band Gain flatness over 40 MHz: ±0.25 dB Gain equalization: +8.0 dB / GHz max., adjustable Image rejection: > 80 dB Noise figure: < 12 dB ¹⁾
Intermodulation (3rd Order):	OIP3: > 18 dBm ¹⁾
AM / PM conversion:	0.1° / dB ¹⁾
Group Delay:	Ripple, slope: < 1 ns peak to peak / 80 MHz (single up-conversion) < 2 ns peak to peak / 80 MHz (dual up-conversion)
Spurious Outputs:	Signal related: < -60 dBc (Δf < 2 MHz), < -70 dBc (Δf ≥ 2 MHz) ¹⁾²⁾ Output harmonics: < -40 dBc ¹⁾²⁾ Signal independent: < -70 dBm
Frequency Stability:	±1 x 10 ⁻⁷ , -30 °C ... 60 °C ±1 x 10 ⁻⁸ , -30 °C ... 60 °C (after 30 min warm up) ±1 x 10 ⁻⁹ per day (fixed temperature after 24 h warm up)

¹⁾ at max. conversion gain

²⁾ Pout = 0 dBm

Specifications are subject to change

These converter types are only a small selection of what is available. Please contact us for further frequency bands and features.

Synthesized Block Downconverter

Indoor / Outdoor

S-, C-, X-, Ku-, K- (DBS), Ka-band
Q-band available on request (contact factory)

These converter types are only a small selection of what is available. Please contact us for further frequency bands and features.

Downconverter Type:	VHSBD-X VSSBD-X	VHSBD-Ku VSSBD-Ku	VHSBD-K VSSBD-K	VHSBD-Ka VSSBD-Ka	
RF-Input Frequency:	X-Band 7.25 ... 8.4 GHz	Ku-Band 10.70 ... 12.75 GHz	K-Band 17.3 ... 18.4 GHz	Ka-Band 18.1 ... 21.2 GHz	
LO-Frequency:	6.3 ... 6.9 GHz	9.75 ... 11.25 GHz	16.35 ... 16.90 GHz	17.15 ... 19.45 GHz	
Phase Noise:	10 Hz -70 / -67 100 Hz -84 / -81 1 kHz -98 / -95 10 kHz -104 / -101 100 kHz -107 / -104 ¹⁾ 1 MHz -112 / -109 ¹⁾	-70 / -67 -85 / -82 -96 / -93 -103 / -100 -107 / -104 ¹⁾ -112 / -109 ¹⁾	-63 / -60 -83 / -80 -93 / -90 -98 / -95 -100 / -97 ¹⁾ -110 / -107 ¹⁾	-61 / -58 -81 / -78 -91 / -88 -96 / -93 -98 / -95 ¹⁾ -108 / -105 ¹⁾	
typ. / max. values in dBc/ Hz ¹⁾ 0 °C ... 50 °C, outside this temperature range degraded by max 5 dB.					
IF-Output Frequency:	950 ... 1500 MHz	950 ... 1500 MHz	950 ... 1500 MHz	950 ... 1750 MHz	
Conversion Scheme:	Single down conversion, no frequency inversion				
Frequency Resolution:	100 Hz				

Common Parameters	
RF-Input Characteristics:	Impedance: 50 Ω Return loss: > 18 dB Operational input level: -40 dBm ¹⁾ Maximum aggregate input level: +5 dBm (damage level) LO leakage: < -80 dBm Connector: SMA female (standard) K female (-Ka standard) WR28 waveguide (-Ka with option WR28)
IF/RF-Monitor (Option):	Signal level in ref. to in/output: -20 dB Impedance: 50 Ω Connector: SMA female
IF-Output Characteristics:	Impedance: 50 Ω Return loss: > 18 dB 1 dB compression point: > 17 dBm ¹⁾ Output muting: > 60 dB (by command or sense input or by alarm condition) Connector: SMA female (standard) N female (standard with option OD)
LO Test Output (Option):	Frequency: LO Frequency standard (LO>20 GHz = LO/2 on Test Output) Signal level: -10 dBm ±3 dB Impedance: 50 Ω Connector: SMA female
Transfer Characteristics:	Max. conversion gain: 40 dB ±1 dB Attenuation range: 0 ... 30 dB, 0.1 dB steps Gain variation over temp.: ±0.5 dB max. Gain flatness over freq.: ±1.5 dB max. over band Gain flatness over 40 MHz: ±0.25 dB Image rejection: > 80 dB Noise figure: < 12 dB ¹⁾
Transfer Characteristics with Gain Slope Equalizer (Option):	Max. conversion gain: 40 dB ±1 dB Attenuation range: 0 ... 30 dB, 0.1 dB steps Gain variation over temp.: ±0.5 dB max. Gain flatness over freq.: ±1.5 dB max. over band Gain flatness over 40 MHz: ±0.25 dB Gain equalization: +8.0 dB / GHz max., adjustable Image rejection: > 80 dB Noise figure: < 12 dB ¹⁾
Group Delay:	Ripple, Slope: < 1 ns peak to peak / 80 MHz (single down conversion) < 2 ns peak to peak / 80 MHz (dual down conversion)
Intermodulation (3rd Order):	OIP3: > 30 dBm ¹⁾
AM / PM conversion:	0.1° / dB ¹⁾
Spurious Outputs:	Signal related: < -60 dBc (Δf < 2 MHz), < -70 dBc (Δf ≥ 2 MHz) ^{1) 2)} Output harmonics: < -40 dBc ^{1) 2)} Signal independent: < -75 dBm
Frequency Stability:	±1 x 10 ⁻⁷ , -30 °C ... 60 °C ±1 x 10 ⁻⁸ , -30 °C ... 60 °C (after 30 min warm up) ±1 x 10 ⁻⁹ per day (fixed temperature after 24 h warm up)

¹⁾ at max. conversion gain

²⁾ Pout = 0 dBm

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Synthesized Block Up- and Downconverter

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Q-band available on request (contact factory)

Indoor Housing:

Reference Input	Frequency: 5 or 10 MHz sine wave Level: 5 dBm ±5 dB Modes: auto/extern/intern Connector: BNC female
Reference Output	Frequency: 10 MHz Level: 0 dBm ±3 dB Connector: BNC female
Monitoring and Control Interface:	Protocol: SNMP Connection: UDP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
	Protocol: HTTP (web browser interface) Connection: TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
	Protocol: Multipoint Connection: RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
Alarm Interface: Mute Input:	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09 female
Temperature Range:	Standard performance: 0 °C ... 50 °C operating, - 30 °C ... 80 °C storage High performance: -30 °C ... 60 °C operating (10 minutes warm up at -30 °C)
Relative Humidity:	< 95 % non condensing
User Interface: (Indoor only)	LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys (option VFD)
Mains Power Input:	100 ... 240 V AC nominal, 90 ... 264 V AC max., 50 ... 60 Hz
Mains Power Consumption:	Max.: 45 VA / 30 W (single converters) Typ.: 35 VA / 23 W (single converters)
Mains Power Input Connector:	Indoor: IEC C14
Mains Fuse:	2 x 2.0 A, time-lag fuse
Dimension and Weight:	Indoor: 483 x 44 x 505 mm ³ (WxHxD), 1 RU (19") approx. 8.4 kg

Outdoor Housing:

Reference Input (Option):	Frequency: 5 or 10 MHz sine wave Level: 5 dBm ± 5dB Modes: auto/extern/intern Connector: SMA female
Reference Output (Option):	Frequency: 10 MHz Level: 0 dBm ±3 dB Connector: SMA female
Combined Monitoring and Control Interface and Alarm Interface:	Protocol: Multipoint packet format commands Connection: RS232 or RS422/RS485 (configurable), connector MIL-C-26482: MS 3120 E 14-19-S Alarm output: Two potential free contacts (DPDT) 24 V DC output: max. 0.3 A 6.5 V DC output: max. 0.2 A Connection type: MIL-C-26482: MS 3120 E 14-19-S Mute Input: TTL logic input with internal pull up
	Protocol: SNMP Connection: UDP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
	Protocol: HTTP (web browser interface) Connection: TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
Monitoring and Control Interface:	Protocol: Multipoint packet format commands Connection: TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
Temperature Range:	-30 °C ... 60 °C operating (10 minutes warmup at -30 °C)
Relative Humidity:	< 100 %
Mains Power Input:	100 ... 240 V AC nominal, 90 ... 264 V AC max., 50 ... 60 Hz
Mains Power Consumption:	Max.: 45 VA / 30 W (single converters) Typ.: 35 VA / 23 W (single converters)
Mains Power Input Connector:	Amphenol C16-1 (3+PE) male
Mains Fuse:	2 x 2 A time-lag fuse
Dimensions:	322 x 108 x 391 mm ³ (WxHxD) (small housing) (standard) 402 x 111 x 391 mm ³ (WxHxD) (large housing) 412 x 74 x 515 mm ³ (WxHxD) (XL housing)
Degree of Protection:	IP 67 (acc. IEC 529)

Specifications are subject to change