L-Band Block Up- and Downconverter

Indoor / Outdoor

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

VSBU/ VSBD Type

VSBUL/ VSBDL Type

VSBUR/ VSBDR Type

IP67 Outdoor housing

WORK Microwave's 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 / 20 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.

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, 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

- Three indoor unit types are available:
  VSBU* Type – with front panel commands
  VSBUL* Type – attenuator selector on front panel
  VSBUR* Type – remote control operation only
  **VSBD, VSBDR, VSBDR also*
- Low phase noise
- Adjustable attenuator (typ. range: 0 … 20 dB or 0 … 30 dB, 0.1 dB step size)
- Gain slope Equalizer available
- Output power +10 dBm (1 dB compression point)
- Low spurious emissions
- Internal OCXO with long term stability 10^{-7} / year
- External reference input 5 or 10 MHz
- Local control through push buttons on front panel and display menu
- Stored alarms with time stamps
- Reference output 10 MHz
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces. Packet command syntax supports RS485 bus systems and allows addressed operation. TCP/IP over Ethernet, Web browser interface, SNMP with MIBs downloadable form the device
- Summary alarm output (DPDT)
- Low power consumption, typically less than 20 W
- CE compliant
- Up to 4 channels/frequency bands per unit are possible
- **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.

L-Band Block Upconverter

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.

Upconverter Type:		**VHBU- / VSBU- / VHBUR- / VSBUR- / VSBUL- / VHBUL-**				
		C	**C3**	**X**	**Ku1, Ku2, Ku3**	**K2**
RF-Output Frequency:		C-Band 5.85 … 6.45 GHz	C-Band 6.45 … 7.05 GHz	X-Band 7.90 … 8.40 GHz	Ku-Band Ku1: 13.75 … 14.50 GHz Ku2: 12.75 … 13.75 GHz Ku3: 12.75 … 13.50 GHz	K-Band 17.6…18.4 GHz
LO Frequency:		4.90 GHz	5.50 GHz	6.95 GHz	Ku1: 12.80 GHz Ku2: 11.80 GHz Ku3: 11.80 GHz	16.35 GHz
Phase Noise:	**10 Hz**	-70 / -60	-70 / -60	-68 / -58	-65 / -55[1)] -65 / -55[2)]	-60 / -50
	100 Hz	-90 / -80	-90 / -80	-88 / -78	-85 / -75[1)] -85 / -75[2)]	-80 / -70
	1 kHz	-100 / -90	-100 / -90	-98 / -88	-95 / -85[1)] -95 / -85[2)]	-90 / -80
	10 kHz	-105 / -95	-105 / -95	-103 / -93	-100 / -90[1)] -100 / -93[2)]	-97 / -87
	100 kHz	-110 / -100	-110 / -100	-106 / -96	-103 / -93[1)] -123 / -113[2)]	-117 / -107
	1 MHz	-133 / -123	-133 / -123	-130 / -120	-127 / -117[1)] -140 / -130[2)]	-135 / -125
		typ. / max. values in dBc/Hz [1)] standard values [2)] values with low phase noise option LPN				
IF-Input Frequency		950 …1550 MHz	950 …1550 MHz	950 …1450 MHz	Ku1: 950 …1700 MHz Ku2: 950 …1950 MHz Ku3: 950 …1700 MHz	1250 … 1750 MHz
Conversion Scheme:		Block up conversion, no frequency inversion				

Upconverter Type:		**VHBU- / VSBU- / VHBUR- / VSBUR- / VSBUL- / VHBUL-**				
		K3	**K4**	**Ka2**	**Ka6Ka7**	
RF-Output Frequency:		K-Band 17.3…18.1 GHz	K-Band 17.3…18.4 GHz	Ka-Band 27.5…28.6 GHz	Ka-Band 27.5…28.7 GHz 28.3…29.5 GHz (switchable)	
LO Frequency:		16.35 GHz	16.35 GHz	26.55 GHz	26.55 GHz 27.35 GHz	
Phase Noise:	**10 Hz**	-60 / -50	-60 / -50	-57 / -47	-57 / -47	
	100 Hz	-80 / -70	-80 / -70	-77 / -70	-77 / -70	
	1 kHz	-90 / -80	-90 / -80	-90 / -83	-90 / -83	
	10 kHz	-97 / -87	-97 / -87	-93 / -90	-93 / -90	
	100 kHz	-117 / -107	-117 / -107	-103 / -95	-103 / -95	
	1 MHz	-135 / -125	-135 / -125	-125 / -115	-125 / -115	
		typ. / max. values in dBc/Hz				
IF-Input Frequency		950 … 1750 MHz	950 … 2050 MHz	950 … 2050 MHz	950 … 2150 MHz	
Conversion Scheme:		Block up conversion, no frequency inversion				

Specifications continued next page

L-Band Block Upconverter

Indoor / Outdoor

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

IF-Input Characteristics:	Impedance: Return loss: Maximum aggregate input level: Connector:	50 Ω > 18 dB 0 dBm (damage Level) SMA female (standard) N female (standard with option OD)
IF/RF-Monitor (Option):	Signal level in ref. to in/output: Impedance: Connector:	-20 dB 50 Ω SMA female
RF-Output Characteristics:	Impedance: Return loss: 1 dB compression point: Output muting: Connectors:	50 Ω > 18 dB > 10 dBm[1)] > 75 dB (by command or sense input or by alarm condition) SMA female (standard) K female (2.92 mm) (-Ka standard) WR28 waveguide (-Ka with option WR28)
LO Test Output (Option):	Frequency: Signal level: Impedance: Connector:	LO Frequency standard (LO/2 Frequency on -Ka) -10 dBm ±3 dB 50 Ω SMA female
Transfer Characteristics (standard):	Max. conversion gain: Attenuation range: Gain variation over temp.: Gain flatness over freq.: Gain flatness over 40 MHz: Image rejection: Noise figure:	35 dB ±1 dB 0 … 20 dB, 0.1 dB steps 0 … 19 dB, 1 dB steps (Option VSBx**L**) ±0.5 dB max ±1.0 dB max. over band ±0.5 dB > 80 dB < 11 dB[1)] (on Ka < 15 dB[1)])
Transfer Characteristics with Gain Slope Equalizer: **(Option EQ,** **only for VHBU, VSBU, VHBUR, VSBUR)**	Max. conversion gain: Attenuation range: Gain variation over Temp.: Gain flatness over Freq.: Gain flatness over 40 MHz: Gain equalization: Image rejection: Noise figure:	35 dB ±1 dB 0 … 30 dB, 0.1 dB steps ±0.5 dB max ±1.0 dB max. over band ±0.5 dB +8.0 dB / GHz max., adjustable > 80 dB < 11 dB[1)] (on Ka < 15 dB[1)])
Group Delay:	Ripple, Slope:	< 1 ns peak-peak / 80 MHz
Spurious Outputs:	Signal related: Output harmonics: Signal independent:	< -65 dBc (< -60 dBc for Band Ka2 and Ka6Ka7)[1) 2)] < -40 dBc[1) 2)] < -85 dBm (< -75 dBm on -Ka)
Internal 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

L-Band 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:		**VHBD- / VSBD- / VHBDR- / VSBDR- / VHBDL- / VSBDL-**				
		C	**C-NI**	**X**	**Ku1, Ku2, Ku3**	**Ku2Ku3**
RF-Input Frequency:		C-Band 3.4 … 4.2 GHz	C-Band 3.4 … 4.2 GHz	X-Band 7.25 … 7.75 GHz	Ku-Band Ku1: 10.95 … 11.70 GHz Ku2: 10.70 … 11.70 GHz Ku3: 11.70 … 12.75 GHz	Ku2-Band: 10.70 … 11.70 GHz Ku3-Band: 11.70 … 12.75 GHz
LO Frequency:		5.15 GHz	LO1: 10.0 GHz LO2: 7.55 GHz	6.30 GHz	Ku1: 10.00 GHz Ku2: 9.75 GHz Ku3: 10.75 GHz	(switchable) Ku2: 9.75 GHz Ku3: 10.75 GHz
Phase Noise:	**10 Hz**	-70 / -60	-65 / -55	-68 / -58	-65 / -55[1)] -65 / -55[2)]	-65 / -55[1)]
	100 Hz	-90 / -80	-85 / -75	-88 / -78	-85 / -75[1)] -85 / -75[2)]	-85 / -75[1)]
	1 kHz	-100 / -90	-95 / -85	-98 / -88	-95 / -85[1)] -95 / -85[2)]	-95 / -85[1)]
	10 kHz	-105 / -95	-100 / -90	-103 / -93	-100 / -90[1)] 100 / -90[2)]	-100 / -90[1)]
	100 kHz	-110 / -100	-103 / -93	-106 / -96	-103 / -93[1)] -123 / -113[2)]	-103 / -93[1)]
	1 MHz	-133 / -123	-125 / -117	-130 / -120	-127 / -117[1)] -140 / -130[2)]	-127 / -117[1)]
		typ. / max. values in dBc/Hz		1) standard values	2) values with low phase noise option LPN	
IF-Output Frequency:		950 … 1750 MHz	950 …1750 MHz	950 … 1450 MHz	Ku1: 950 … 1700 MHz Ku2: 950 … 1950 MHz Ku3: 950 … 2000 MHz	(switchable) Ku2: 950 … 1950 MHz Ku3: 950 … 2000 MHz
Conversion Scheme:		frequency inversion	no frequency inversion			

Downconverter Type:		**VHBD- / VSBD- / VHBDR- / VSBDR- / VHBDL- / VSBDL-**				
		Ka3	**Ka5**	**Ka7**	**Ka9**	
RF-Input Frequency:		Ka-Band 18.2 … 19.3 GHz	Ka-Band 19.2 … 20.3 GHz	Ka-Band 20.2 … 21.3 GHz	Ka-Band 21.2 … 22.2 GHz	
LO Frequency:		17.25 GHz	18.25 GHz	19.25 GHz	20.25 GHz	
Phase Noise:	**10 Hz**	-60 / -50	-60 / -50	-60 / -50	-60 / -50	
	100 Hz	-80 / -72	-80 / -72	-80 / -72	-80 / -72	
	1 kHz	-93 / -85	-93 / -85	-93 / -85	-93 / -85	
	10 kHz	-97 / -93	-97 / -93	-97 / -93	-97 / -93	
	100 kHz	-107 / -100	-107 / -100	-107 / -100	-107 / -100	
	1 MHz	-127 / -120	-127 / -120	-127 / -120	-127 / -120	
		typ. / max. values in dBc/Hz	[1)] standard values		[2)] values with low phase noise option LPN	
IF-Output Frequency:		950 … 2050 MHz	950…2050 MHz	950…2050 MHz	950…1950 MHz	
Conversion Scheme:		no frequency inversion				

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L-Band Block Downconverter

Indoor / Outdoor

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

RF-Input Characteristics:	Impedance: Return loss: Maximum aggregate input level: LO leakage: RF-connector:	50 Ω > 18 dB 0 dBm (damage level) < -80 dBm SMA female (standard) K female (2.92 mm) (-Ka standard) WR28 waveguide (-Ka with option WR28)
IF/RF-Monitor (Option):	Signal level in reference to input: Impedance: Connector:	-20 dB 50 Ω SMA female
IF-Output Characteristics:	Impedance: Return Loss: 1 dB Compression Point: IF-Connectors:	50 Ω > 18 dB > 17 dBm[1)] SMA female (standard) N female (standard with option OD)
LO Test Output (Option):	Frequency: Signal level: Impedance: Connector:	LO Frequency standard (LO/2 Frequency on -Ka) -10 dBm ±3 dB 50 Ω SMA female
Transfer Characteristics (standard):	Max. conversion gain: Attenuation range: Gain Variation over Temp.: Gain Flatness over Freq.: Gain Flatness over 40 MHz: Image Rejection: Noise Figure:	35 dB ±1 dB 0 … 20 dB, 0.1 dB steps 0 … 19 dB, 1 dB steps (Option VSBD**L**) ±0.5 dB ±1.0 dB max. over band ±0.5 dB > 80 dB < 11 dB[1)] (-on Ka <15 dB[1)])
Transfer Characteristics with Gain Slope Equalizer: **(Option EQ,** **only for VHBD, VSBD, VHBDR, VSBDR)**	Max conversion gain: Attenuation range: Gain Variation over Temp.: Gain Flatness over Freq.: Gain Flatness over 40 MHz: Gain Equalization: Image Rejection: Noise Figure:	35 dB ±1 dB 0 … 30 dB, 0.1 dB steps ±0.5 dB ±1.0 dB max. over band ±0.5 dB +8.0 dB / GHz max, adjustable > 80 dB < 11 dB[1)] (-on Ka <15 dB[1)])
Group Delay:	Ripple, Slope:	< 1 ns peak-peak / 80 MHz
Spurious Outputs:	Signal related: Output harmonics: Signal independent:	< -65 dBc[1) 2)] < -40 dBc[1) 2)] < -75 dBm
Output Intercept Point 3rd Order:	OIP3:	> 30 dBm
Internal 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

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Single / Dual Channel
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Indoor Housing:

Reference Input:	Frequency: Level: Modes: Connector:	5 or 10 MHz sine wave 5 dBm ±5 dB auto / extern / intern BNC female
Reference Output:	Frequency: Level: Connector:	10 MHz 0 dBm ±3 dB BNC female
Monitoring and Control Interface (VHBU/VSBU only):	Protocol: Connection:	SNMP UDP over Ethernet (10/100 Mbps, auto sensing), connector RJ-45
	Protocol: Connection:	HTTP (web browser interface) TCP/IP over Ethernet (10/100 Mbps, auto sensing), connector RJ-45
	Protocol: Connection:	Multipoint packet format commands RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), connector RJ-45
Diagnostic Interface (VHBUL/VSBUL only):	RS232, connector DSUB09 female	
Alarm Interface:	Alarm: two potential free contacts (DPDT), 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 (VHBU/VSBU 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 (with option VFD)	
User Interface (VHBUL/VSBUL only):	Attenuator selector on front panel	
Mains Power Input:	100 … 240 V AC nominal, 90…264 V AC max., 50…60 Hz	
Mains Power Consumption:	Max.: 35 VA / 20 W	
Mains Power Input Connector:	IEC C14	
Mains Fuse:	2 x 2 A time-lag fuse	
Dimension and Weight:	483 x 44 x 270 mm^3 (WxHxD), 1 RU (19"), approx. 6 kg	

Outdoor Housing:

Reference Input (Option):	Frequency: Level: Modes: Connector:	5 or 10 MHz sine wave 5 dBm ±5 dB auto/extern/intern SMA female
Reference Output (Option):	Frequency: Level: Connector:	10 MHz 0 dBm ±3 dB SMA female
Combined Monitoring and Control Interface and Alarm Interface:	Protocol: Connection: Alarm output: Connection type: Mute Input:	Multipoint packet format commands RS232 or RS422/RS485 (configurable), connector MIL-C-26482: MS 3120 E 14-19-S Two potential free contacts (DPDT) 24 V DC output: max. 0.3 A 6.5 V DC output: max. 0.2 A MIL-C-26482: MS 3120 E 14-19-S TTL logic input with internal pull up
Monitoring and Control Interface:	Protocol: Connection:	SNMP UDP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
	Protocol: Connection:	HTTP (web browser interface) TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
	Protocol: Connection:	Multipoint packet format commands 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.: 35 VA / 20 W	
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 108 x 515 mm^3 (WxHxD) (XL housing)	
Degree of Protection:	IP 67 (acc. IEC 529)	

Specifications are subject to change