

we are the wave – excellence in high frequency

# Product Catalogue February 2017

Satellite Frequency Converters Test Loop Translators Redundancy Systems 1:1 / N:1

DVB-S / S2 / S2X Modulators Modems Demodulators



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# Analog Products

Satellite IF Converters Dual Channel Shared Oscillator Downconverters Test Loop Translators Synthesized Block Converters Fixed Frequency Block Converters Remote Control Units ALC Redundancy Systems 1:1/N:1

### Satellite Up- and Downconverter

Indoor / Outdoor



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





WORK Microwave's satellite up-and downconverters are designed to support the demanding requirements of analog and digital satellite transmissions, such as TV uplinks and high-speed data networks. 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).

**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 45 VA / 30 W maximizes the reliability and lifetime of the units.

**Enhanced scalability:** A completely modular-based design provides users with a cost-effective solution that can be tailored according to specific needs, including frequency range, output power and conversion gain.

### S-, C-, X-, Ku-, K-, Ka-, and Q-band coverage

The following satellite frequency bands are covered: S, C, X, Ku, K, Ka, and Q-band. The converters support the standard IF-frequency bands 70  $\pm$ 20 MHz and/or 140  $\pm$ 40 MHz. The conversion is performed without spectral inversion. The upconverters offer an increased power output (P1dB  $\geq$  +10 dBm) in all versions. The units are available as single band, dual band or as triple band converters. For more bands or channels please contact factory.

### High signal integrity

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

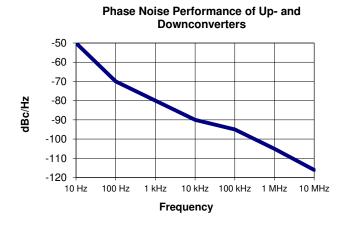
### **Housing options**

The converters normally are delivered without fans and can be operated in environments, where at minimum one RU space for natural ventilation is available above each unit. This eliminates the fan as potential point of failure. For rack installations without any space in between the units, a fan within the converter unit is recommended. This forces an airflow from the right side to left side of the units. Outdoor versions with IP 67 degree of protection are also available.

## Operating and control – easy integration into your system

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 as follows:

- Modified or smaller housings to fit into your existing design for mobile and portable applications.
- Extended storage or operating temperature range.
- Military versions for hostile environment (shock, vibration, humidity).
- For down converters: Application specific output filtering and automatic level control. The output level is kept constant independent of the strength of the input signal with adjustable control.
- Additional PLO output.

### **Key features**

- 70 MHz or 140 MHz IF bands available
- Optional switchable IF 70 MHz and 140 MHz (IF 70/140)
- Very low phase noise (< -50 dBc/Hz @ 10 Hz)
- Long-term stability 10<sup>-7</sup> / year
- Output power +10 dBm (1 dB compression point)
- Automatic reference recognition (5 and 10 MHz)
- Adjustable gain equalizer
- Digital gain compensation
- Operating temperature range either -30 °C to 60 °C (-22 °F to 140 °F), -40 °C to 60 °C (-40 °F to 140 °F) (VECD units) or 0 °C to 50 °C (32 °F to 122 °F)

- Remote control through RS232, RS422/485 (2wire 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).
- Test output on the front panel: RF-Test at up converter, IF-Test at down converter.
- Optional IF-Test output for up converters (Option: IFT)
- Optional RF-Test output for down converters (Option: RFT)
- AC power switch on the front panel
- Summary alarm output (dual change over switch contacts)
- Transmit mute input
- Optional internal Fan (Option: FAN)
- CE compliant
- 3 years warranty

#### **Order information**

WORK Microwave offers three series of 19" rack satellite converters:

Standard-, High- and Extra High Performance. The specifications are the same for all types except the operating temperature range. The High Performance type operates between -30 °C to 60 °C (-22 °F to 140 °F), the Extra High Performance type between -40 °C to 60 °C (-40 °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 fifth-generation frequency converters or if you would like to have a demo unit, please contact us via e-mail: sales@work-microwave.com or call us. We are glad to assist you.

### Satellite Upconverter L-, S-, C-, X-, Ku-, K- (DBS), Ka-band

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

Upconverter Type:	VHCU-L-2 / VSCU-L-2	VHCU-S / VSCU-S	VHCU-S4 / VSCU-S4	VHCU-C / VSCU-C
RF-Output Frequency:	L-Band	S-Band	S-Band	C-Band
	0.95 2.15 GHz	2.025 2.290 GHz	2.0 2.6 GHz	5.85 6.65 GHz
Intermediate Frequency:	5170 MHz	2450 MHz	3050 MHz	2450 MHz
	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input
	5100 MHz	2440 MHz	3060 MHz	2440 MHz
	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input
Phase Noise: 10 Hz	-70 / -67	-70 / -67	-70 / -67	-63 / -60
100 Hz	-84 / -81	-84 / -81	-84 / -81	-83 / -80
1 kHz	-98 / -95	-98 / -95	-98 / -95	-93 / -90
10 kHz	-104 / -101	-104 / -101	-104 / -101	-98 / -95
100 kHz	-107 /-104 <sup>1)</sup>	-107 /-104 <sup>1)</sup>	-107 /-104 <sup>1)</sup>	-100 / -97
1 MHz	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>	-110 / -107 <sup>1)</sup>
	typ. / max. values in dBc	/Hz <sup>1)</sup> 0 °C 50 °C, out	side this temperature range d	egraded by max. 5 dB
Fixed Oscillator with Test Output	5240 MHz (70 MHz IF)	2520 MHz (70 MHz IF)	3120 MHz (70 MHz IF)	2520 MHz (70 MHz IF)
(indoor only, optional for outdoor):	5240 MHz (140 MHz IF)	2580 MHz (140 MHz IF)	3200 MHz (140 MHz IF)	2580 MHz (140 MHz IF)
	-6 ±3 dBm	-6 ±3 dBm	-6 ±3 dBm	-6 ±3 dBm
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	6.12 7.32 GHz	4.475 4.740 GHz	5.05 5.65 GHz	8.30 9.10 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	6.05 7.25 GHz	4.465 4.730 GHz	5.06 5.66 GHz	8.29 9.09 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Upconverter Type:	VHCU-C1 / VSCU-C1	VHCU-X / VSCU-X	VHCU-X4 / VSCU-X4	VHCU-X6 / VSCU-X6
RF-Output Frequency:	C-Band	X-Band	X-Band	X-Band
	5.85 7.03 GHz	7.90 8.40 GHz	7.80 8.60 GHz	8.00 8.50 GHz
Intermediate Frequency:	2610 MHz	2450 MHz	2450 MHz	2450 MHz
	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input
	2600 MHz	2440 MHz	2440 MHz	2440 MHz
	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input
Phase Noise: 10 Hz	-63 / -60	-63 / -60	-63 / -60	-63 / -60
100 Hz	-83 / -80	-83 / -80	-83 / -80	-83 / -80
1 kHz	-93 / -90	-93 / -90	-93 / -90	-93 / -90
10 kHz	-98 / -95	-98 / -95	-98 / -95	-98 / -95
100 kHz	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>
1 MHz	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>
	typ. / max. values in dBc	/Hz <sup>1)</sup> 0 °C 50 °C, out	side this temperature range d	egraded by max. 5 dB
Fixed Oscillator with Test Output	2680 MHz (70 MHz IF)	2520 MHz (70 MHz IF)	2520 MHz (70 MHz IF)	2520 MHz (70 MHz IF)
(indoor only, optional for outdoor):	2740 MHz (140 MHz IF)	2580 MHz (140 MHz IF)	2580 MHz (140 MHz IF)	2580 MHz (140 MHz IF)
	-6 ±3 dBm	-6 ±3 dBm	-6 3 dBm	-6 ±3 dBm
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	8.46 9.64 GHz	10.35 10.85 GHz	10.25 11.05 GHz	10.45 10.95 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	8.45 9.63 GHz	10.34 10.84 GHz	10.24 11.04 GHz	10.44 10.94 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Upconverter Type:	VHCU-Ku / VSCU-Ku	VHCU-Ku1 / VSCU-Ku1	VHCU-K / VSCU-K	VHCU-Ka / VSCU-Ka
RF-Output Frequency:	Ku-Band	Ku-Band	K-Band	Ka-Band
	12.75 14.50 GHz	10.70 12.75 GHz	17.3 18.4 GHz	27.5 31.0 GHz
Intermediate Frequency:	2450 MHz	3050 MHz	2450 MHz	5170 MHz
	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input
	2440 MHz	3060 MHz	2440 MHz	5100 MHz
	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input
Phase Noise: 10 Hz	-63 / -60	-63 / -60	-63 / -60	-56 / -53
100 Hz	-83 / -80	-83 / -80	-83 / -80	-73 / -70
1 kHz	-93 / -90	-93 / -90	-93 / -90	-84 / -81
10 kHz	-98 / -95	-98 / -95	-98 / -95	-90 / -87
100 kHz	-100 / -971)	-100 / -971)	-100 / -971)	-93 / -90 <sup>1)</sup>
1 MHz	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-103 / -100 <sup>1)</sup>
	typ. / max. values in dBc	/Hz <sup>1)</sup> 0 °C 50 °C, out	side this temperature range de	egraded by max. 5 dB
Fixed Oscillator with Test Output	2520 MHz (70 MHz IF)	3120 MHz (70 MHz IF)	2380 MHz (70 MHz IF)	5240 MHz (70 MHz IF)
(indoor only, optional for outdoor):	2580 MHz (140 MHz IF)	3200 MHz (140 MHz IF)	2300 MHz (140 MHz IF)	5240 MHz (140 MHz IF)
	-6 ±3 dBm	-6 ±3 dBm	-6 ±3 dBm	-6 ±3 dBm
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	15.20 16.95 GHz	13.75 15.80 GHz	14.85 15.95 GHz	32.67 36.17 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	15.19 16.94 GHz	13.76 15.81 GHz	14.86 15.96 GHz	32.60 36.10 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Specifications continued next page

### Satellite Upconverter L-, S-, C-, X-, Ku-, K- (DBS), Ka-band

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

Upconverter Type:	VHCU-Ka1 / VSCU-Ka1	VHCU-Ka2 / VSCU-Ka2	VHCU-Ka3 / VSCU-Ka3	VHCU-Ka5 / VSCU-Ka5
RF-Output Frequency:	Ka-Band	Ka-Band	Ka-Band	Ka-Band
	19.2 20.2 GHz	17.7 19.5 GHz	19.4 21.2 GHz	29.0 32.0 GHz
Intermediate Frequency:	2450 MHz	2450 MHz	2450 MHz	5170 MHz
	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input	for 70 MHz IF Input
	2440 MHz	2440 MHz	2440 MHz	5100 MHz
	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input	for 140 MHz IF Input
Phase Noise: 10 Hz	-61 / -58	-61 / -58	-61 / -58	-56 / -53
100 Hz	-81 / -78	-81 / -78	-81 / -78	-73 / -70
1 kHz	-91 / -88	-91 / -88	-91 / -88	-84 / -81
10 kHz	-96 / -93	-96 / -93	-96 / -93	-90 / -87
100 kHz	-98 / -95 <sup>1)</sup>	-98 / -95 <sup>1)</sup>	-98 / -951)	-93 / -90 <sup>1)</sup>
1 MHz	-108 / -105 <sup>1)</sup>	-108 / -105 <sup>1)</sup>	-108 / -105 <sup>1)</sup>	-103 / -100 <sup>1)</sup>
	typ. / max. values in dB	c/Hz <sup>1)</sup> 0 °C 50 °C, ou	Itside this temperature range	degraded by max 5 dB.
Fixed Oscillator with Test Output	2380 MHz (70 MHz IF)	2380 MHz (70 MHz IF)	2380 MHz (70 MHz IF)	5240 MHz (70 MHz IF)
(indoor only, optional for outdoor):	2300 MHz (140 MHz IF)	2300 MHz (140 MHz IF)	2300 MHz (140 MHz IF)	5240 MHz (140 MHz IF)
	-6 ±3 dBm	-6 ±3 dBm	-6 ±3 dBm	-6 ±3 dBm
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	16.75 17.75 GHz	15.25 17.05 GHz	16.95 18.75 GHz	34.17 37.17 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	16.76 17.76 GHz	15.26 17.06 GHz	16.96 18.76 GHz	34.10 37.10 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Common Parameters
n, no frequency inversion
50 Ω > 20 dB point: > 10 dBm > 60 dB (by command or sense input or by alarm condition) : -20 dB of RF-output (approx.) (indoor only, optional for outdoor) SMA female (standard) K female (-Ka standard) WR28 waveguide (-Ka with option WR28)
jain:       40 dB ±1.0 dB         :       0 30 dB, Step 0.1 dB         ± 0.25 dB/day at constant temperature         ± 0.25 dB/day at constant temperature         ± 0.25 dB max., ±0.2 dB typ. over temperature range         ± 0.25 dB over ±20 MHz (IF 70 MHz), ±0.40 dB over ±40 MHz (IF 140 MHz)         > 80 dB         < 12 dB <sup>1</sup>
/ MHz (IF 70 MHz), adjustable IHz (IF 140 MHz), adjustable
0.03 ns / MHz max. 0.01 ns / MHz² max. 1 ns peak to peak max.
0.015 ns / MHz max. 0.005 ns / MHz² max. 2 ns peak to peak max.
>18 dBm <sup>1)</sup>
<pre>&lt; -60 dBc (<math>\Delta f &lt; 2 \text{ MHz}</math>), &lt; -70 dBc (<math>\Delta f \ge 2 \text{ MHz}</math>)<sup>1) 2)</sup> </pre> : < -40 dBc <sup>1) 2)</sup> nt:  < -70 dBm
60 °C 60 °C (after 30 min warm up) (fixed temperature after 24 h warm up)
1

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

### Satellite Downconverter

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

Downconverter Type:	VHCD-L-2 / VSCD-L-2	VHCD-S / VSCD-S	VHCD-S4 / VSCD-S4	VHCD-C / VSCD-C
RF-Input Frequency:	L-Band	S-Band	S-Band	C-Band
	0.95 2.15 GHz	2.025 2.290 GHz	2.0 2.6 GHz	3.4 4.2 GHz
Intermediate Frequency:	5170 MHz	2450 MHz	3050 MHz	2150 MHz
	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output
	5100 MHz	2440 MHz	3040 MHz	2140 MHz
	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output
Phase Noise: 10 Hz	-70 / -67	-70 / -67	-70 / -67	-70 / -67
100 Hz	-84 / -81	-84 / -81	-84 / -81	-84 / -81
1 kHz	-98 / -95	-98 / -95	-98 / -95	-98 / -95
10 kHz	-104 / -101	-104 / -101	-104 / -101	-104 / -101
100 kHz	-107 /-104 <sup>1)</sup>	-107 /-104 <sup>1)</sup>	-107 /-104 <sup>1)</sup>	-107 /-104 <sup>1)</sup>
1 MHz	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>
	typ. / max. values in dE	<sup>1)</sup> 0 °C 50 °C, oι	utside this temperature range	degraded by max. 5 dB
Fixed Oscillator with Test Output	5240 MHz (70 MHz IF)	2520 MHz (70 MHz IF)	3120 MHz (70 MHz IF)	2220 MHz (70 MHz IF)
(indoor only, optional for outdoor):	5240 MHz (140 MHz IF)	2580 MHz (140 MHz IF)	3180 MHz (140 MHz IF)	2280 MHz (140 MHz IF)
	-6 ±3 dBm, Connector	-6 ±3 dBm, Connector	-6 ±3 dBm	-6 ±3 dBm, Connector
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	6.12 7.32 GHz	4.475 4.740 GHz	5.05 5.65 GHz	5.55 6.35 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	6.05 7.25 GHz	4.465 4.730 GHz	5.04 5.64 GHz	5.54 6.34 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Downconverter Type:	VHCD-C1 / VSCD-C1	VHCD-X / VSCD-X	VHCD-Ku / VSCD-Ku	VHCD-Ka / VSCD-Ka
RF-Input Frequency:	C-Band	X-Band	Ku-Band	Ka-Band
	3.4 4.8 GHz	7.25 7.75 GHz	10.70 12.75 GHz	18.1 21.2 GHz
Intermediate Frequency:	5170 MHz	2150 MHz	2150 MHz	2450 MHz
	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output
	5100 MHz	2140 MHz	2140 MHz	2440 MHz
	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output
Phase Noise: 10 Hz	-63 / -60	-63 / -60	-63 / -60	-61 / -58
100 Hz	-83 / -80	-83 / -80	-83 / -80	-81 / -78
1 kHz	-93 / -90	-93 / -90	-93 / -90	-91 / -88
10 kHz	-98 / -95	-98 / -95	-98 / -95	-96 / -93
100 kHz	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-98 / -95 <sup>1)</sup>
1 MHz	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-108 / -105 <sup>1)</sup>
	typ. / max. values in dBc/Hz <sup>1)</sup> 0 °C 50 °C, outside this temperature range degraded by max. 5 (		degraded by max. 5 dB	
Fixed Oscillator with Test Output	5240 MHz (70 MHz IF)	2220 MHz (70 MHz IF)	2220 MHz (70 MHz IF)	2380 MHz (70 MHz IF)
(indoor only, optional for outdoor):	5240 MHz (140 MHz IF)	2280 MHz (140 MHz IF)	2280 MHz (140 MHz IF)	2300 MHz (140 MHz IF)
	-6 ±3 dBm, Connector	-6 ±3 dBm, Connector	-6 ±3 dBm, Connector	-6 ±3 dBm, Connector
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	8.57 9.97 GHz	9.40 9.90 GHz	12.85 14.90 GHz	15.65 18.75 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	8.50 9.90 GHz	9.39 9.89 GHz	12.84 14.89 GHz	15.66 18.76 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Downconverter Type:	VHCD-Ka2 / VSCD-Ka2	VHCD-Ka3 / VSCD-Ka3	VHCD-Ka4 / VSCD-Ka4	VHCD-Ka7 / VSCD-Ka7
RF-Input Frequency:	Ka-Band	Ka-Band	Ka-Band	Ka-Band
	17.7 19.5 GHz	19.4 21.2 GHz	27.5 31 GHz	25.5 27.5 GHz
Intermediate Frequency:	2450 MHz	2450 MHz	5170 MHz	2450 MHz
	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output
	2440 MHz	2440 MHz	5100 MHz	2440 MHz
	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output
Phase Noise: 10 Hz	-61 / -58	-61 / -58	-56 / -53	-57 / -54
100 Hz	-81 / -78	-81 / -78	-73 / -70	-77 / -74
1 kHz	-91 / -88	-91 / -88	-84 / -81	-87 / -84
10 kHz	-96 / -93	-96 / -93	-90 / -87	-92 / -89
100 kHz	-98 / -95 <sup>1)</sup>	-98 / -95 <sup>1)</sup>	-93 / -90 <sup>1)</sup>	-94 / -91 <sup>1)</sup>
1 MHz	-108 / -105 <sup>1)</sup>	-108 / -105 <sup>1)</sup>	-103 / -100 <sup>1)</sup>	-104 / -101 <sup>1)</sup>
	typ. / max. values in dl	Bc/Hz <sup>1)</sup> 0°C 50°C, ou	tside this temperature range c	legraded by max. 5 dB
Fixed Oscillator with Test Output	2380 MHz (70 MHz IF)	2380 MHz (70 MHz IF)	5240 MHz (70 MHz IF)	2380 MHz (70 MHz IF)
(indoor only, optional for outdoor):	2300 MHz (140 MHz IF)	2300 MHz (140 MHz IF)	5240 MHz (140 MHz IF)	2300 MHz (140MHz IF)
	-6 ±3 dBm, Connector	-6 ±3 dBm	-6 ±3 dBm, Connector	-6 ±3 dBm
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	15.25 17.05 GHz	16.95 18.75 GHz	32.67 36.17 GHz	23.05 25.05 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	15.26 17.06 GHz	16.96 18.76 GHz	32.60 36.10 GHz	23.06 25.06 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Specifications continued next page

### Satellite Downconverter

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

	Commo	n Parameters
Conversion Scheme:	Dual down conversion, no freque	ency inversion
Frequency Resolution:	100 Hz	•
RF-Input Characteristics:	Impedance: Return loss: Operational input level: Maximum aggregate input level: LO leakage: RF-connector:	50 Ω > 20 dB -45 dBm <sup>1)</sup> +5 dBm (damage level) < -80 dBm SMA female (standard) K female (-Ka standard) WR28 waveguide (-Ka with option WR28)
IF-Output Characteristics:	Frequency: Impedance: Return loss: 1 dB compression point: Output muting: IF-signal monitor: IF-connectors:	70 ±20 MHz or 140 ±40 MHz (optional: both → [IF-Band] = 70/140) 50 or 75 Ω > 20 dB > 10 dBm, 13 dBm typical > 60 dB (by command or sense input or by alarm condition) -20 dB of IF-output (approx.) BNC female N female (standard with option OD)
Transfer Characteristics:	Max. conversion gain: Attenuation range: Level stability: Gain flatness: Image rejection: Noise figure:	45 dB ±1.0 dB 0 30 dB, Step 0.1 dB ±0.25 dB/day at constant temperature ±0.25 dB max., ±0.2 dB typ. over temperature range ±0.25 dB over ±20 MHz (IF 70 MHz), ±0.40 dB over ±40 MHz (IF 140 MHz) > 80 dB < 12 dB <sup>1</sup>
Equalizer (Gain slope):	Max. ±0.0625 dB / MHz (IF 70 M Max. ±0.05 dB / MHz (IF 140 MH	Hz), z) (programmable)
Group Delay (±18 MHz):	Linear: Parabolic: Ripple:	0.03 ns / MHz max. 0.01 ns / MHz² max. 1 ns peak to peak max.
Group Delay (±36 MHz):	Linear: Parabolic: Ripple:	0.015 ns / MHz max. 0.005 ns / MHz <sup>2</sup> max. 2 ns peak to peak max.
Intermodulation (3 <sup>rd</sup> Order):	OIP3:	> 20 dBm <sup>1)</sup>
AM / PM conversion:	0.1° / dB <sup>1)</sup>	
Spurious Outputs:	Signal related: Output harmonics: Signal independent:	< -60 dBc ( $\Delta f$ < 2 MHz), < -70 dBc ( $\Delta f \ge$ 2 MHz) <sup>1) 2)</sup> < -40 dBc <sup>1) 2)</sup> < -75 dBm
Frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C 60 °C ±1 x 10 <sup>-8</sup> , -30 °C 60 °C (after ±1 x 10 <sup>-9</sup> per day (fixed temperati	30 min warm up)

<sup>1)</sup> at max. conversion gain

<sup>2)</sup> 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.

## Satellite Up- and Downconverter

### L-, S-, C-, X-, Ku-, K- (DBS), Ka-band Q/V-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:	Alarm: Two potential free contacts (D	OPDT)	
Mute Input:	Mute Input: TTL logic input with inter	nal pull up	
	Connector DSUB09 female		
Temperature Range:	Standard performance: 0 °C 50 °C	C operating, -30 °C 80 °C storage	
	High performance: -30 °C 60 °C o	perating (10 minutes warm up at -30 °C)	
Relative Humidity:	< 95 % non condensing		
User Interface: (Indoor only)	LCD-Display 2 x 40 characters, 4 cu	rsor keys, 4 function keys	
	VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys (with option VFD)		
Mains Power Input:	100 240 V AC nominal, 90 264 V AC max., 50 60 Hz		
Mains Power Consumption:	Max.: 45 VA / 35 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 <sup>3</sup> (WxHxE	D), 1 RU (19") approx. 8.4 kg	

### **Outdoor Housing:**

Reference Input (Option):	Frequency:	5 or 10 MHz sine wave		
	Level:	5 dBm +5 dB		
	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	Protocol:	Multipoint packet format commands		
Interface and Alarm Interface:	Connection:	RS232 or RS422/RS485 (configurable),		
		connector MIL-C-26482: MS 3120 E 14-19-S		
	Alarm output:	Two potential free contacts (DPDT)		
	, iaini oaipati	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		
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 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 minu	utes warm up at -30 °C)		
Relative Humidity:	< 100 %			
Mains Power Input:	100 240 V AC nominal, 90 20	64 V AC max., 50 … 60 Hz		
Mains Power Consumption:	Max.: 45 VA / 35 W (single conver	ters)		
Mains Power Input Connector:	Amphenol C16-1 (3+PE) male	Amphenol C16-1 (3+PE) male		
Mains Fuse:	2 x 2 A time-lag fuse			
Dimensions:		(small housing) (standard)		
		(large housing)		
	412 x 74 x 515 mm <sup>3</sup> (WxHxD)	(XL housing)		
Degree of Protection:	IP 67 (acc. IEC 529)			

Compact Satellite Up- and Downconverter



Single / Dual Channel L-Band



WORK Microwave's integrated, compact frequency converter is a new cost-effective option for satellite operators, integrators, and teleports made possible by the latest advancements in RF chipsets.

### Enhancements

**Compact Design:** Designed specifically for operators using classic IF frequency bands, the compact version enables operators to support multiple simultaneous channels in one unit, saving significant rack space and costs.

**Input and Output Adjustable Attenuator:** With two software adjustable attenuators the operator can now optimize the system performance regarding noise figure and intermodulation.

**RF-RMS Detector:** Through a new RMS Detector the user can perform a real time monitoring of RF-power, giving the opportunity to initialize a switch over to spare units in case of RF power loss or simply to monitor the system.

### Scalability

Together with WORK Microwave's new compact N:1 Redundancy Switch (RSCC-N) very compact and flexibly redundancy solutions up to 8:1 can be designed, giving the user the possibility to start with a small group of converters and expand it later to 8 operational units and one spare unit.

## Operating and control – easy integration into your system

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.

### **Key features**

- 70 MHz or 140 MHz IF bands available
- Optional switchable IF 70 MHz and 140 MHz (IF 70/140)
- Variable attenuator on input and output
- Digital gain compensation
- RF RMS detector (UPC)
- Very low phase noise (< -67 dBc/Hz @ 10 Hz)
- Long-term stability 10<sup>-7</sup> / year
- Automatic reference recognition (5 and 10 MHz)
- Adjustable gain equalizer
- 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).
- Test output on the front panel: RF-Test at upconverter, IF-Test at downconverter.
- AC power switch on the front panel
- Summary alarm output (dual change over switch contacts)
- Transmit mute input
- Optional internal Fan (Option: FAN)
- CE compliant
- 3 years warranty

## Compact Satellite Up- and Downconverter L-Band

Upconverter Type:		VSCU-L
RF-Output Frequency:		L-Band
		0.95 2.15 GHz
Intermediate Frequency:	5170 MHz	
		for 70 MHz IF Input
		5100 MHz
		for 140 MHz IF Input
Phase Noise:	10 Hz	-70 / -67
	100 Hz	-84 / -81
	1 kHz	-93 / -90
	10 kHz	-100 / -95
	100 kHz	-103 /-100
	1 MHz	-130 / -125
		typ. / max. values in dBc/Hz
Fixed Oscillator with Test	5240 MHz (70 MHz IF)	
		5240 MHz (140 MHz IF)
		-6 ±3 dBm
		SMA female
Microwave Oscillator with	Test Output	6.12 7.32 GHz
		(70 MHz IF)
		6.05 7.25 GHz
		(140 MHz IF)
		-7 ±3 dBm
		SMA female

Downconverter Type:	VSCD-L
RF-Input Frequency:	L-Band
	0.95 2.15 GHz
Intermediate Frequency:	5170 MHz
	for 70 MHz IF Output
	5100 MHz
	for 140 MHz IF Output
Phase Noise: 10 Hz	-70 / -67
100 Hz	-84 / -81
1 kHz	-93 / -90
10 kHz	-100 / -95
100 kHz	-103 /-100
1 MHz	-130 / -125
	typ. / max. values in dBc/Hz
Fixed Oscillator with Test Output:	5240 MHz (70 MHz IF)
-	5240 MHz (140 MHz IF)
	-6 ±3 dBm, Connector SMA
	female
Microwave Oscillator with Test Output	6.12 7.32 GHz
	(70 MHz IF)
	6.05 7.25 GHz
	(140 MHz IF)
	-7 ±3 dBm
	SMA female

	Commo	n Parameters
Conversion Scheme:	Dual conversion, no frequency inve	ersion
Frequency Resolution:	100 Hz	
IF Characteristics:	Frequency:	70 ±20 MHz or 140 ±40 MHz (optional: both $\rightarrow$ [IF-Band] = 70/140)
	Impedance:	50 or 75 Ω
	Return loss:	> 20 dB
	IF-Connectors:	BNC female
RF Characteristics:	Impedance:	50 Ω
	Return loss:	> 20 dB
	1 dB compression point:	> 10 dBm
	Output muting:	> 60 dB (by command or sense input or by alarm condition)
	RF-signal monitor:	-20 dB of RF-output (approx.)
	RF-connectors:	SMA female (standard)
Transfer Characteristics:	Max. conversion gain:	40 dB ±1.0 dB for upconverter
	······ •••••••••••••••••••••••••••••••	45 dB ±1.0 dB for downconverter
	Attenuation range IF:	0 30 dB, Step 0.1 dB
	Attenuation range RF:	0 20 dB, Step 0.1 dB
	Level stability:	$\pm 0.25  dB/day$ at constant temperature
		± 0.5 dB max., ±0.2 dB typ. over temperature range
	Gain flatness:	± 0.25 dB over ±20 MHz (IF 70 MHz), ±0.40 dB over ±40 MHz (IF 140 MHz)
	Image rejection:	> 80 dB
	Noise figure:	$< 12 \text{ dB}^{1}$
Equalizer (Gain Slope):	Max. ±0.0625 dB / MHz (IF 70 MHz	z), adjustable
	Max. ±0.05 dB / MHz (IF 140 MHz), adjustable	
Group Delay (±18 MHz):	Linear:	0.03 ns / MHz max.
, , , , , , , , , , , , , , , , , , , ,	Parabolic:	0.01 ns / MHz <sup>2</sup> max.
	Ripple:	1 ns peak to peak max.
Group Delay (±36 MHz):	Linear:	0.015 ns / MHz max.
, , , , , , , , , ,	Parabolic:	0.005 ns / MHz <sup>2</sup> max.
	Ripple:	2 ns peak to peak max.
Intermodulation (3 <sup>rd</sup> Order):	OIP3:	>20 dBm <sup>1)</sup>
AM / PM conversion:	0.1° / dB <sup>1)</sup>	
Spurious Outputs:	Signal related:	< -60 dBc <sup>1) 2)</sup>
	Output harmonics (DNC only):	< -40 dBc <sup>1) 2)</sup>
	Signal independent:	< -70 dBm
Frequency Stability:	+1 x 10 <sup>-7</sup> -30 °C 60 °C	
	±1 x 10 <sup>-8</sup> , -30 °C 60 °C (after 30	) min warm up)
	$\pm 1 \times 10^{-8}$ , -30 °C 60 °C (after 30 $\pm 1 \times 10^{-9}$ per day (fixed temperatur	e after 24 h warm up)
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:	$0 \text{ dBm} \pm 3 \text{ dB}$
	Connector:	BNC female
	Connoctor.	Specifications continued next page

Specifications continued next page

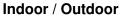
Monitoring and Control Interface:	Protocol:	SNMP		
-	Connection:	UDP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45		
	Protocol:	HTTP (web browser interface)		
	Connection: TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connecto			
	Protocol:	Multipoint		
	Connection:	RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45		
Alarm Interface:	Alarm: Two potential free contacts (	DPDT)		
Mute Input:	Mute Input: TTL logic input with inte	rnal pull up		
	Connector DSUB09 female			
Temperature Range:	Standard performance: 0 °C 50 °C operating, -30 °C 80 °C storage			
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 (with option VFD)			
Mains Power Input:	100 240 V AC nominal, 90 264	4 V AC max., 50 60 Hz		
Mains Power Consumption:	Max.: 40 VA / 25 W (single converte	ers)		
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 <sup>3</sup> (WxHxD), 1 RU (19") approx. 8.4 kg			
) at max. conversion gain		All specifications are preliminary and subject to change		

<sup>2)</sup> Pout = 0 dBm

### Open questions, demo units

For detailed order options or if you need more information about WORK Microwave's new compact IF/L-Band frequency converters, please contact us via e-mail: sales@work-microwave.com or call us. We are glad to assist you.

### Dual Channel, Shared Oscillator Downconverter





S-, C-, X-, Ku-, K (DBS)-, Ka-, and Q-band Triple-channel converters also available



All of WORK Microwave's satellite down converters meet the demanding requirements of modern satellite transmission applications. Customers worldwide appreciate their reliability and high level of quality. The dual-channel, shared oscillator converters can be used in systems where an accurate phase relationship is required between two converter channels, as is the case for monopulse tracking system down conversion.

### **Operating and control**

The converters can be operated via the push buttons on the front panel using self-explanatory 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 ASCII string-based commands as well as addressable, packet-based commands are provided.

### **Housing options**

The converters normally are delivered without fans and can be operated in environments, where at minimum one 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 IP 67 degree of protection are also available.



### **Key features**

- Shared oscillator to guarantee excellent phase tracking in between channels
- 70 MHz or 140 MHz IF bands available
- Low power consumption
- Extreme low phase noise (< -60 dBc/Hz @ 10 Hz)
- Long- term stability 10<sup>-7</sup> / year
- Output power +10 dBm (1 dB compression point)
- Automatic reference recognition (5 and 10 MHz)
- 0 °C to 50 °C (32 °F to 122 °F) (VSCD units)
   -30 °C to 60 °C (-22 °F to 140 °F) (VHCD units)
   -40 °C to 60 °C (-40 °F to 140 °F) (VECD units)
- 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 (Indoor Version only)
- IF test outputs (standard on indoor units, on outdoor units with Option IFT)
- Summary alarm output with dual change over switch contacts
- Internal Fan as option for indoor units (Option FAN)
- CE compliant
- 3 years warranty

# Dual Channel, Shared Oscillator Downconverter S-, C-, X-, Ku-, K (DBS)-, and Ka- band

Q-band on request (contact factory)

Downconverter Type:	VHCD-S1S1T /	VHCD-S4S4T /	VHCD-CCT /	VHCD-XXT /
21	VSCD-S1S1T	VSCD-S4S4T	VSCD-CCT	VSCD-XXT
RF-Input Frequency:	S-Band	S-Band	C-Band	X-Band
	2.2 2.3 GHz	2.00 2.60 GHz	3.4 4.2 GHz	7.25 7.75 GHz
Intermediate Frequency:	2450 MHz	3050 MHz	2150 MHz	2150 MHz
	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output
	2440 MHz	3060 MHz	2140 MHz	2140 MHz
	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output
Phase Noise: 10 Hz	-70 / -67	-70 / -67	-70 / -67	-63 / -60
100 Hz	-84 / -81	-84 / -81	-84 / -81	-83 / -80
1 kHz	-98 / -95	-98 / -95	-98 / -95	-93 / -90
10 kHz	-104 / -101	-104 / -101	-104 / -101	-98 / -95
100 kHz	-107 /-1041)	-107 /-104 <sup>1)</sup>	-107 /-104 <sup>1)</sup>	-100 / -97 <sup>1)</sup>
1 MHz	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>	-112 / -109 <sup>1)</sup>	-110 / -107 <sup>1)</sup>
	typ. / max. values in dBc/Hz <sup>1)</sup> 0 °C 50 °C, ou		utside this temperature range	degraded by max. 5 dB
Fixed Oscillator with Test Output	2520 MHz (70 MHz IF)	3120 MHz (70 MHz IF)	2220 MHz (70 MHz IF)	2220 MHz (70 MHz IF)
(indoor only, optional for outdoor):	2580 MHz (140 MHz IF)	3200 MHz (140 MHz IF)	2280 MHz (140 MHz IF)	2280 MHz (140 MHz IF)
	-6 ±3 dBm,	-6 ±3 dBm,	-6 ± 3 dBm,	-6 ± 3 dBm,
	SMA female	SMA female	SMA female	SMA female
Microwave Oscillator with Test Output	4.65 4.75 GHz	5.05 5.65 GHz	5.55 6.35 GHz	9.40 9.90 GHz
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)
(LO > 20 GHz = LO/2 on Test Output)	4.64 4.74 GHz	5.06 5.66 GHz	5.54 6.34 GHz	9.39 9.89 GHz
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm
	SMA female	SMA female	SMA female	SMA female

Downconverter Type:	VHCD-X3X3T /	VHCD-KuKuT /	VHCD-KaKaT /	VHCD-Ka1Ka1T /	
	VSCD-X3X3T	VSCD-KuKuT	VSCD-KaKaT	VSCD-Ka1Ka1T	
RF-Input Frequency:	X-Band	Ku-Band	Ka-Band	Ka-Band	
	7.0 9.0 GHz	10.70 12.75 GHz	18.10 21.20 GHz	19.70 20.10 GHz	
Intermediate Frequency:	2150 MHz	2150 MHz	2450 MHz	2150 MHz	
	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output	for 70 MHz IF Output	
	2140 MHz	2140 MHz	2440 MHz	2140 MHz	
	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output	for 140 MHz IF Output	
Phase Noise: 10 Hz	-63 / -60	-63 / -60	-61 / -58	-61 / -58	
100 Hz	-83 / -80	-83 / -80	-81 / -78	-81 / -78	
1 kHz	-93 / -90	-93 / -90	-91 / -88	-91 / -88	
10 kHz	-98 / -95	-98 / -95	-96 / -93	-96 / -93	
100 kHz	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-98 / -95 <sup>1)</sup>	-98 / -95 <sup>1)</sup>	
1 MHz	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-108 / -105 <sup>1)</sup>	-108 / -105 <sup>1)</sup>	
	typ. / max. values in dE	typ. / max. values in dBc/Hz <sup>1)</sup> 0 °C 50 °C, outside		degraded by max 5 dB.	
Fixed Oscillator with Test Output	2220 MHz (70 MHz IF)	2220 MHz (70 MHz IF)	2380 MHz (70 MHz IF)	2080 MHz (70 MHz IF)	
(indoor only, optional for outdoor):	2280 MHz (140 MHz IF)	2280 MHz (140 MHz IF)	2300 MHz (140 MHz IF)	2000 MHz (140 MHz IF)	
	-6 ± 3 dBm,	-6 ±3 dBm,	-6 ±3 dBm,	-6 ±3 dBm,	
	SMA female	SMA female	SMA female	SMA female	
Microwave Oscillator with Test Output	9.15 11.15 GHz	12.85 14.90 GHz	15.65 18.75 GHz	17.55 17.95 GHz	
(indoor only, optional for outdoor):	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	(70 MHz IF)	
(LO > 20 GHz = LO/2 on Test Output)	9.14 11.14 GHz	12.84 14.89 GHz	15.66 18.76 GHz	17.56 17.96 GHz	
	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	(140 MHz IF)	
	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	-7 ±3 dBm	
	SMA female	SMA female	SMA female	SMA female	

## Dual Channel, Shared Oscillator Downconverter S-, C-, X-, Ku-, K (DBS)-, and Ka- band

Q-band on request (contact factory)

	Common	Parameters			
Conversion Scheme:	Dual down conversion, no frequency inversion.				
	All channels with shared oscillator.				
	Same conversion frequency for all channels.				
	Gain setting individual for each cha				
Phase Tracking between channels:	< 10 deg rms after 1 hour warm up, constant gain setting, constant frequency setting, signal frequency cor				
	within 10 kHz. Initial phase difference to be compensated externally.				
Frequency Resolution:	100 Hz				
RF-Input Characteristics:	Impedance:	50 Ω			
	Return loss:	> 20 dB			
	Operational input level:	-45 dBm <sup>1)</sup>			
	Maximum aggregate input level:	+5 dBm (damage level)			
	LO leakage:	< -80 dBm			
	RF-connector:				
	RF-connector:	SMA female (standard)			
		K female (-Ka standard)			
	_	WR28 waveguide (-Ka with option WR28)			
IF-Output Characteristics:	Frequency:	70 ±20 MHz or 140 ±40 MHz (optional: both $\rightarrow$ [IF-Band] = 70/140)			
	Impedance:	50 or 75 Ω			
	Return Loss:	> 20 dB			
	1 dB compression point:	> 10 dBm, 13 dBm typical			
	Output muting:	> 60 dB (by command or sense input or by alarm condition)			
	IF-signal monitor:	-20 dB of IF-output (approx.)			
	IF-Connectors:	BNC female			
		N female (standard with option OD)			
Transfer Characteristics:	Max. conversion gain:	45 dB ±1.0 dB			
	Attenuation range:	0 30 dB, Step 0.1 dB			
	Level stability:	±0.25 dB/day at constant temperature			
		±0.5 dB max., ±0.2 dB typ. over temperature range			
	Gain flatness:	±0.25 dB over ±20 MHz (IF 70 MHz), ±0.40 dB over ±40 MHz (IF 140 MHz)			
	Image rejection:	> 80 dB			
	Noise figure:	< 12 dB <sup>1)</sup>			
	Isolation between channels:	> 60 dB			
Equalizer (Gain slope):	Max. ±0.0625 dB / MHz (IF 70 MHz	z),			
	Max. ±0.05 dB / MHz (IF 140 MHz)	(programmable)			
Group Delay (± 18 MHz):	Linear:	0.03 ns / MHz max.			
, , , , , , , , , , , , , , , , , , , ,	Parabolic:	0.01 ns / MHz <sup>2</sup> max.			
	Ripple:	1 ns peak to peak max.			
Group Delay (± 36 MHz):	Linear:	0.015 ns / MHz max.			
	Parabolic:	$0.005 \text{ ns} / \text{MHz}^2 \text{ max}.$			
	Ripple:	2 ns peak to peak max.			
Intermodulation (3 <sup>rd</sup> Order):	OIP3:	$> 20 \text{ dBm}^{1/2}$			
AM / PM conversion:	0.1° / dB <sup>1)</sup>				
Spurious Outputs:	Signal related:	< -60 dBc ( $\Delta f$ < 2 MHz), < -70 dBc ( $\Delta f \ge$ 2 MHz) <sup>1) 2)</sup>			
Spurious Outputs.		< -60 dBc ( $\Delta t$ < 2 MHz), < -70 dBc ( $\Delta t$ ≥ 2 MHz) / / / / / / / / / / / / / / / / / / /			
	Output harmonics:				
	Signal independent:	< -75 dBm			
Frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C 60 °C				
	$\pm 1 \times 10^8$ , $-30^\circ$ C (after 30 min warm up) $\pm 1 \times 10^{-9}$ per day (fixed temperature after 24 h warm up)				
	±1 x 10 <sup>-9</sup> per day (fixed temperatur	e after 24 h warm up) Specifications are subject to change			

<sup>1)</sup> at max. conversion gain <sup>2)</sup> 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.

### **Dual Channel, Shared Oscillator Downconverter**

S-, C-, Ku-band

K- and Q-band 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:	Alarm: two potential free contacts (I	OPDT),		
Mute Input:	Mute Input: TTL logic input with inte	rnal 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 ct	irsor keys, 4 function keys		
	VFD-Display 2 x 40 characters, 4 cu	irsor keys, 4 function keys (with option VFD)		
Mains Power Input:	100 240 V AC nominal, 90 26	4 V AC max., 50 60 Hz		
Mains Power Consumption:	Max.: 45 VA / 35 W			
-	Typ.: 40 VA / 28 W			
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 <sup>3</sup> (WxHxD), 1 RU (19") approx. 8.4 kg			

### **Outdoor Housing:**

Reference Input (Option):	Frequency:	5 or 10 MHz sine wave		
nororonoe input (option):	Level:	5 dBm +5 dB		
	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	Protocol:	Multipoint packet format commands		
Interface and Alarm Interface:	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		
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 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 minu	ites warm up at -30 °C)		
Relative Humidity:	< 100 %			
Mains Power Input:	100 240 V AC nominal, 90 26	64 V AC max., 50 60 Hz		
Mains Power Consumption:	Max.: 45 VA / 35 W			
Mains Power Input Connector:	Amphenol C16-1 (3+PE) male			
Mains Fuse:	2 x 2 A time-lag fuse			
Dimensions:		(standard)		
	412 x 74 x 515 mm <sup>3</sup> (WxHxD) (XL housing)			
Degree of Protection:	IP 67 (acc. IEC 529)			

### **Test Loop Translator**

Indoor / Outdoor

Single / Dual / Triple Band Single / Dual Channel C-, X-, Ku-, K-, Ka- and Q-Band Output



The RF test loop translator can be used to convert signals from one RF band to another for test and system evaluation purposes.

### **Operating and control**

The converters can be operated via the push buttons on the front panel using self-explanatory display menus or via remote control (RS232, RS422/485, TCP/IP over Ethernet).

Detailed monitoring of the system status and a summary alarm output with dual change over switch contacts are provided. For the remote control ASCII string-based commands as well as addressable, packet-based commands are provided. Remote monitoring and control through a Web browser interface is also integrated.



#### **Key features**

- RF Filter on input and output
- Variable attenuator 0 ... 30 dB, 0.1 dB step size
- Signal mute function
- Integrated local oscillator with 100 Hz step size available
- Internal OCXO
- External reference input with automatic reference recognition (5 and 10 MHz)
- 10 MHz reference output
- Low power consumption
- Local control through front panel
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface.
- AC power switch on the front panel
- Summary alarm output with dual change over switch contacts
- CE compliant
- 3 years warranty

## Test Loop Translator Indoor / Outdoor

### C-, X-, Ku-, K-, Ka- and Q-Band Output Q-band available on request (contact factory)

Converter Type:		VSTLT-C / VHTLT-C	VSTLT-X / VHTLT-X	VSTLT-Ku / VHTLT-Ku	VSTLT-K / VHTLT-K	VSTLT-Ka1 / VHTLT-Ka1
RF-Input Frequency:		C-Band 5.85 6.65 GHz	X-Band 7.90 8.40 GHz	Ku-Band 13.0 14.5 GHz	K-Band 17.3 18.4 GHz	Ka-Band 27.5 27.7 GHz
RF-Output Frequency:		C-Band 3.4 4.2 GHz	X-Band 7.25 7.75 GHz	Ku-Band 10.95 12.45 GHz	Ku-Band 11.7 12.5 GHz	K-Band 17.7 17.9 GHz
Intermediate Frequency:		-	950 1450 MHz	-	-	-
LO1 Frequency:		2.45 GHz	6.95 GHz	2.05 GHz	4.8 6.7 GHz	9.8 GHz
LO2 Frequency:		-	6.30 GHz	-	-	-
Conversion Scheme:		Single conversion, no frequency inversion	Dual conversion, no frequency inversion	Single conversion, no frequency inversion	Single conversion, no frequency inversion	Single conversion, no frequency inversion
LO-Frequency Resolution:		fix frequency	fix frequency	fix frequency	100 Hz	fix frequency
Phase Noise:	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	-76 / -66 -93 / -83 -105 / -95 -111 / -101 -111 /-101 -128 / -118	-65 / -55 -85 / -75 -95 / -85 -100 / -90 -103 / -93 -127 / -117	-76 / -66 -93 / -83 -105 / -95 -111 / -101 -111 / -101 -128 / -118	-66 / -56 -83 / -73 -95 / -85 -101 / -91 -101 / -91 -118 / -108	-66 / -56 -83 / -73 -95 / -85 -101 / -91 -101 / -91 -118 / -108
typ. / max. values in dBc/Hz						

Converter Type:		VSTLT-Ka / VHTLT-Ka				
RF-Input Frequency:		Ka-Band				
		27.5 31.0 GHz				
RF-Output Frequency:		Ka-Band				
		17.7 21.2 GHz				
Intermediate Frequency:		10.70 12.70 GHz				
LO1 Frequency:		16.80 18.30 GHz				
LO2 Frequency:		7.00 8.50 GHz				
Conversion Scheme:		Dual conversion,				
		no freq. inversion				
LO-Frequency Resolution:		100 Hz				
Phase Noise:	10 Hz	-62 / -59				
	100 Hz	-82 / -79				
	1 kHz	-90 / -87				
	10 kHz	-96 / -93				
	100 kHz	-98 / -95				
	1 MHz	-109 / -105				
		typ / max values in dBc/Hz				

## Test Loop Translator Indoor / Outdoor

### C-, X-, Ku-, K-, Ka- and Q-Band Output Q-band available on request (contact factory)

	Con	nmon Parameters
RF-Input Characteristics:	Impedance:	50 Ω
	Return Loss:	> 18 dB
	Max. aggregate input level:	+8 dBm (standard) (damage level)
	LO Leakage:	< -80 dBm
	Connector:	SMA female (standard)
		K female (2.92 mm) (-Ka standard)
		WR28 waveguide (-Ka with option WR28)
Input- / Output-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
	1 dB compression point:	$> 5  dBm^{1)}$
	LO leakage:	< -80 dBm
	Output muting:	> 60 dB (by command or sense input or by alarm condition)
	Connector:	SMA female (standard)
		K female (2.92 mm) (-Ka standard)
		WR28 waveguide (-Ka with option WR28)
LO Test Output (Option):	Frequency:	LO Frequency standard (LO/2 Frequency on -Ka)
	Signal level:	-10 dBm ±3 dB
	Impedance:	50 Ω
	Connector:	SMA female
Transfer Characteristics:	Max. conversion gain:	0 dB ±1 dB
		-10 dB ±1 dB for VSTLT-Ku / VHTLT-Ka
	Attenuation Range:	0 30 dB, Step 0.1 dB
	Gain variation over temp .:	±1.0 dB
	Gain flatness over freq .:	±1.0 dB max. over band
	Gain flatness over 40 MHz:	±0.5 dB
Group Delay Variation:	Ripple:	< 1 ns peak to peak / 80 MHz (single conversion)
		< 2 ns peak to peak / 80 MHz (dual conversion)
Spurious Outputs:	Signal related:	< -50 dBc (within RF-Output band) <sup>1) 2)</sup> ,
		except < -30 dBc for VSTLT-Ka / VHTLT-Ka and VSTLT-Ku / VHTLT-Ka
Intermodulation (3 <sup>rd</sup> order):	OIP3:	> 15 dBm
		except > 5 dBm at VSTLT-Ka / VHTLT-Ka
Frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C 60 °C	
	±1 x 10 <sup>-8</sup> , -30 °C 60 °C (after	r 30 min warm up)
	±1 x 10 <sup>-8</sup> , -30 °C 60 °C (after ±1 x 10 <sup>-9</sup> per day (fixed tempera	ture after 24 h warm up)
<sup>1)</sup> at max. conversion gain		Specifications are subject to change

<sup>2)</sup> Pout = -10 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.

## Test Loop Translator Indoor / Outdoor

### S-, C-, Ku-, K-, Ka- and Q-band

### 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:	Alarm: two potential free contacts (DF	PDT),				
Mute Input:	Mute Input: TTL logic input with interr	nal 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 o	perating (10 minutes warm up at -30 °C)				
Relative Humidity:	< 95 % non condensing					
User Interface: (Indoor only)	LCD-Display 2 x 40 characters, 4 cur	sor keys, 4 function keys				
	VFD-Display 2 x 40 characters, 4 cur	sor 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 conversio	n)				
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 mm3 (WxHxD	), 1 RU (19") approx. 8.4 kg or				
-	483 x 44 x 270 mm <sup>3</sup> (WxHxD	), 1 RU (19") approx. 6 kg				
	(depends on converter type)	··· -				

### **Outdoor Housing:**

Reference Input (Option):	Frequency:	5 or 10 MHz sine wave
1 (1 )	Level:	5 dBm ±5 dB
	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	Protocol:	Multipoint packet format commands
Interface and Alarm Interface:	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
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 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 minu	tes warm up at -30 °C)
Relative Humidity:	< 100 %	
Mains Power Input:	100 240 V AC nominal, 90 26	
Mains Power Consumption:	Max.: 45 VA / 30 W (single convers	sion)
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 <sup>3</sup> (WxHxD) (	small housing) (standard)
		large housing)
		XL housing)
Degree of Protection:	IP 67 (acc. IEC 529)	

### Synthesized Block Up- and Downconverter

Indoor / Outdoor

Single / Dual / Triple Band Single / Dual Channel S-, C-, Ku-, K (DBS)-, Ka- and Q-band Wideband to L-Band BDC (1 ... 40 GHz)





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.

### 5<sup>th</sup>-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 45 VA / 35 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 one 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 IP 67 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<sup>-7</sup> / 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), -40 °C to 60 °C (-40 °F to 140 °F) (VECD units) 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 three series of 19" rack satellite converters:

Standard-, High- and Extra High Performance. The specifications are the same for all types except the operating temperature range. The High Performance type operates between -30 °C to 60 °C (-22 °F to 140 °F), the Extra High Performance type between -40 °C to 60 °C (-40 °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.com 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	Ka-Band	Ka-Band	Ka-Band	
		10.70 12.75 GHz	27.5 31.0 GHz	25.0 28.0 GHz	27.5 28.6 GHz	
Intermediate Frequency:		-	7.9 8.6 GHz	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	-63 / -60	-50 / -47	-50 / -47	-50 / -47	
	100 Hz	-83 / -80	-60 / -57	-60 / -57	-60 / -57	
	1 kHz	-93 / -90	-85 / -82	-85 / -82	-85 / -82	
	10 kHz	-98 / -95	-92 / -89	-92 / -89	-92 / -89	
	100 kHz	-100 / -97 <sup>1)</sup>	-95 / -92	-95 / -92	-95 / -92	
	1 MHz	-110 / -107 <sup>1)</sup>	-105 / -102	-105 / -102	-105 / -102	
		typ. / max. values	in dBc/Hz <sup>1)</sup> 0 °C	50 °C, outside this te	emperature range degra	ided 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	no treduency inversion no treduency inv			
Frequency Resolution:		100 Hz				

	Common Pa	arameters
IF-Input Characteristics:	Impedance: Return loss: Operational input level: Maximum aggregate input level: Connector:	50 Ω > 18 dB -40 dBm <sup>1)</sup> +10 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 $\Omega$ SMA female
RF-Output Characteristics:	Impedance: Return loss: 1 dB compression point: Output muting: Connector:	50 Ω > 18 dB, (> 15 dB with option WR28) > 10 dBm <sup>1)</sup> > 60 dB (by command or sense input or by alarm condition) SMA female (standard) K female (-Ka standard) WR28 waveguide (-Ka with option WR28)
LO Test Output (Option):	Frequency: Signal level (MW-LO): Signal level (Fixed-LO): Impedance: Connector:	LO Frequency standard (LO > 20 GHz = LO/2 on Test Output) -7 dBm ±3 dB -10 dBm ±3 dB 50 Ω SMA female
Transfer Characteristics:	Max. conversion Gain: Attenuation range: Gain variation over temp.: Gain flatness over freq.: Gain flatness over 40 MHz: Image rejection: Noise figure:	40 dB ±1 dB 0 30 dB, 0.1 dB steps ±0.5 dB max. ±1.5 dB max. over band ±0.25 dB > 80 dB < 12 dB <sup>1)</sup>
Transfer Characteristics with Gain Slope Equalizer (Option):	Max. conversion gain: Attenuation range: Gain variation over temp.: Gain flatness over freq.: Gain flatness over 40 MHz: Gain equalization: Image rejection: Noise figure:	40 dB ±1 dB 0 30 dB, 0.1 dB steps ±0.5 dB max. ±1.5 dB max. over band ±0.25 dB +8.0 dB / GHz max., adjustable > 80 dB < 12 dB <sup>1)</sup>
Intermodulation (3rd Order):	OIP3:	> 18 dBm <sup>1)</sup>
AM / PM conversion:	0.1° / dB <sup>1)</sup>	
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: Output harmonics: Signal independent:	< -60 dBc ( $\Delta f < 2 \text{ MHz}$ ), < -70 dBc ( $\Delta f \ge 2 \text{ MHz}$ ) <sup>1) 2)</sup> < -40 dBc <sup>1) 2)</sup> < -70 dBm
Frequency Stability:	$\pm 1 \times 10^{-7}$ , -30 °C 60 °C $\pm 1 \times 10^{-8}$ , -30 °C 60 °C (after 30 $\pm 1 \times 10^{-9}$ per day (fixed temperature	min warm up) after 24 h warm up)
<sup>1)</sup> at max. conversion gain		Specifications are subject to change

<sup>1)</sup> at max. conversion gain <sup>2)</sup> 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	Ku-Band	K-Band	Ka-Band	
	7.25 8.4 GHz	10.70 12.75 GHz	17.3 18.4 GHz	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: 1	) Hz -70 / -67	-63 / -60	-63 / -60	-61 / -58	
10	) Hz -84 / -81	-83 / -80	-83 / -80	-81 / -78	
1	kHz -98 / -95	-93 / -90	-93 / -90	-91 / -88	
10	kHz -104 / -101	-98 / -95	-98 / -95	-96 / -93	
100	<b>kHz</b> -107 /-104 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-100 / -97 <sup>1)</sup>	-98 / -95 <sup>1)</sup>	
1	MHz -112 / -109 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-110 / -107 <sup>1)</sup>	-108 / -105 <sup>1)</sup>	
	typ. / max. value	typ. / max. values in dBc/Hz <sup>1)</sup> 0 °C 50 °C, outside this temperature range degraded by max.			
IF-Output Frequency:	950 1500 MHz	950 1500 MHz	950 1500 MHz	950 1750 MHz	
Conversion Scheme:	Single down conversion	Single down conversion, no frequency inversion			
Frequency Resolution:	100 Hz	100 Hz			

Common Parameters           RF-Input Characteristics:         Impedance:         50 Ω					
Impedance: Return loss: Operational input level: Maximum aggregate input level: LO leakage: Connector:	50 Ω > 18 dB -40 dBm <sup>1)</sup> +5 dBm (damage level) < -80 dBm SMA female (standard) K female (-Ka standard)				
Signal level in ref. to in/output: Impedance: Connector:	WR28 waveguide (-Ka with option WR28) -20 dB 50 Ω SMA female				
Impedance: Return loss: 1 dB compression point: Output muting: Connector:	50 Ω > 18 dB > 17 dBm <sup>1)</sup> , > 10 dBm <sup>1)</sup> at Ka-Band > 60 dB (by command or sense input or by alarm condition) SMA female (standard) N female (standard with option OD)				
Frequency: Signal level (MW-LO): Signal level (Fixed-LO): Impedance: Connector:	LO Frequency standard (LO > 20 GHz = LO/2 on Test Output) -7 dBm $\pm$ 3 dB -10 dBm $\pm$ 3 dB 50 $\Omega$ SMA female				
Max. conversion gain: Attenuation range: Gain variation over temp.: Gain flatness over freq.: Gain flatness over 40 MHz: Image rejection: Noise figure:	40 dB ±1 dB 0 30 dB, 0.1 dB steps ±0.5 dB max. ±1.5 dB max. over band ±0.25 dB > 80 dB < 12 dB <sup>1)</sup>				
Max. conversion gain: Attenuation range: Gain variation over temp.: Gain flatness over freq.: Gain flatness over 40 MHz: Gain equalization: Image rejection: Noise figure:	40 dB ±1 dB 0 30 dB, 0.1 dB steps ±0.5 dB max. ±1.5 dB max. over band ±0.25 dB +8.0 dB / GHz max., adjustable > 80 dB < 12 dB <sup>1)</sup>				
Ripple, Slope:	< 1 ns peak to peak / 80 MHz (single down conversion) < 2 ns peak to peak / 80 MHz (dual down conversion)				
OIP3:	> 30 dBm <sup>1)</sup> > 20 dBm <sup>1)</sup> at Ka-Band				
0.1° / dB <sup>1)</sup>					
Signal related: Output harmonics: Signal independent:	< -60 dBc (Δf < 2 MHz), < -70 dBc (Δf ≥ 2 MHz) <sup>1) 2)</sup> < -40 dBc <sup>1) 2)</sup> < -75 dBm				
+1 x 10 <sup>-7</sup> -30 °C 60 °C					
	Impedance:         Return loss:         Operational input level:         Maximum aggregate input level:         LO leakage:         Connector:         Signal level in ref. to in/output:         Impedance:         Connector:         Impedance:         Return loss:         1 dB compression point:         Output muting:         Connector:         Frequency:         Signal level (MW-LO):         Signal level (Fixed-LO):         Impedance:         Connector:         Max. conversion gain:         Attenuation range:         Gain flatness over freq.:         Gain flatness over freq.:      <				

<sup>1)</sup> at max. conversion gain <sup>2)</sup> Pout = 0 dBm

## Synthesized Block Up- and Downconverter Indoor / Outdoor

### S-, C-, X-, Ku-, K- (DBS), Ka-band 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:	Alarm: two potential free contact			
Mute Input:	Mute Input: TTL logic input with i			
mate input.	Connector DSUB09 female			
Temperature Range:	Standard performance: 0 °C 5	i0 °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	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 conve	erters)		
•	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 <sup>3</sup> (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	Protocol:	Multipoint packet format commands
Interface and Alarm Interface:	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
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 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 minu	tes warm up at -30 °C)
Relative Humidity:	< 100 %	
Mains Power Input:	100 240 V AC nominal, 90 26	4 V AC max., 50 60 Hz
Mains Power Consumption:	Max.: 45 VA / 30 W (single converte	ers)
-	Typ.: 35 VA / 23 W (single converte	
Mains Power Input Connector:	Amphenol C16-1 (3+PE) male	
Mains Fuse:	2 x 2 A time-lag fuse	
Dimensions:		small housing) (standard)
		large housing)
	412 x 74 x 515 mm <sup>3</sup> (WxHxD) (	XL housing)
Degree of Protection:	IP 67 (acc. IEC 529)	

## Synthesized Block Downconverter

### Wideband to L-Band Block-Downconverter (1 ... 40 GHz)

Downconverter Type:	VSSBD-WB-FAN-S0121 + VSBD-W	/B-FAN-S0122
RF-Input Frequency:	1 40 GHz	
IF-Output	1200 ±250 MHz	
Frequency:	(3 dB Bandwidth: ±250 MHz)	
Phase Noise: 10 Hz		-50
100 Hz		-70
1 kHz		-85
10 kHz		-90
100 kHz		-100
1 MHz		-105
3 MHz		-115
	max. values in dBc/Hz	
Conversion Scheme:	Block down conversion, no frequence	cy inversion
Frequency Resolution:	100 Hz	
RF-Input Characteristics:	Impedance:	50 Ω
	Return loss:	Typ: > 10 dB; max. 8 dB
	Maximum Aggregate Input Level:	10 dBm (damage Level)
	LO leakage:	< -60 dBm
	Connector:	K (female)
IF-Output Characteristics:	Impedance:	50 Ω
	Return loss:	> 18 dB
	1 dB compression point:	> 10 dBm <sup>1)</sup>
	Output muting:	> 75 dB (by command or sense input or by alarm condition)
	Connector:	SMA (female)
Transfer Characteristics:	Max. Conversion Gain:	35 dB ±1 dB
	Attenuation range:	0 30 dB, 0.1 dB steps
Importend: applies to the entire device	Gain Variation over Temp.:	±1.0 dB
combination of preconverter and	Gain Flatness over 500 MHz:	Typ ±2.0 dB; max: ± 2.5 dB)
synthesized converter	Gain Flatness over 125 MHz:	Typ ±1.0 dB; max: ±1.75 dB)
	Gain Flatness over 40 MHz:	± 1 dB
	Image Rejection:	> 70 dB
	Noise Figure:	< 18 dB <sup>1)</sup>
Group Delay:	Ripple, Slope:	1 ns peak to peak / 40 MHz
		2 ns peak to peak / 250 MHz
Spurious Outputs:	Signal related:	< -50 dBc <sup>1</sup> <sup>(2)</sup>
	LO-Leakage:	< -75 dBm
Output Intercept Point 3rd Order:	OIP3:	> 20 dBm <sup>1)</sup>
Internal Frequency Stability:		±1 x 10 <sup>-7</sup> , -30 °C 60 °C
		$\pm 1 \times 10^{-8}$ , -30 °C 60 °C (after 30 min warm up)
Defense as leavet		$\pm 1 \times 10^{-9}$ per day (fixed temperature after 24 h warm up)
Reference Input:	Frequency:	5 or 10 MHz sine wave
	Level: Modes:	5 dBm ±5 dB
		auto/extern/intern
Deference Output	Connector:	BNC (female) 10 MHz
Reference Output:	Frequency: Level:	0 dBm ±3 dB
	Connector:	BNC (female)
Monitoring and Control Interface:	Protocol:	SNMP
Monitoring and control interface.	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 packet format commands
	Connection:	RS232 or RS422/RS485 (configurable), connector DSUB09 female or
	Connection.	TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45
Alarm Interface:	Two potential free contacts (DPDT),	
Temperature Range:	0 °C 50 °C operating, -30 °C 8	
Relative Humidity:	< 95 % non condensing	
User Interface:	LCD-Display 2 x 40 characters, 4 cu	irsor keys 4 function keys
Mains Power Input:	100 240 V AC nominal, 90 264	
Mains Power Consumption:	75 W 120VA	
Mains Power Consumption: Mains Power Input Connector:	IEC C14	
Dimension and Weight:	483 x 88 x 508 mm <sup>3</sup> (WxHxD), 2 RL	(10") approx 12 kg th d
<sup>1)</sup> at max, conversion gain		ν (19 /, αρριόλ. 12 kg l.b.u.

<sup>1)</sup> at max. conversion gain <sup>2)</sup> Pout = 0 dBm

### L-Band Block Up- and Downconverter

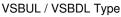
Indoor / Outdoor



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



VSBUR / VSBDR Type





IP 67 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.

### 5<sup>th</sup>-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 one 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 IP 67 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<sup>-7</sup> / 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.com or call us. We are glad to assist you.

## L-Band Block Upconverter Indoor / Outdoor

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

Q/V-band available on request (contact factory)

Upconverter Type:			VHBU- / VSBU- /	VHBUR- / VSBU	UR- / VSBUL- / V	HBUL-	
		C, C2, C3	Х	Ku1, K	u2, Ku3	Ku4, K	u5, Ku6
RF-Output Frequency:		C-Band	X-Band	Ku-E	Band	Ku-E	Band
		C: 5.85 6.45 GHz	7.90 8.40 GHz	Ku1: 13.75 .	14.50 GHz	Ku4: 12.90 .	13.50 GHz
		C2: 5.78 6.52 GHz		Ku2: 12.75 .	13.75 GHz	Ku5: 10.70.	11.75 GHz
		C3: 6.45 7.05 GHz		Ku3: 12.75 .	13.50 GHz	Ku6: 11.70 .	12.75 GHz
LO Frequency:		C: 4.90 GHz	6.95 GHz	Ku1: 12	80 GHz	Ku4: 11	.95 GHz
		C2: 4.83 GHz		Ku2: 11.80 GHz		Ku5: 9	.75 GHz
		C3: 5.50 GHz		Ku3: 11	.80 GHz	Ku6: 10	.75 GHz
Phase Noise:	10 Hz	-70 / -60	-68 / -58	-65 / -55 <sup>1)</sup>	-65 / -55 <sup>2)</sup>	-65 / -55 <sup>1)</sup>	-65 / -55 <sup>2)</sup>
	100 Hz	-90 / -80	-88 / -78	-85 / -75 <sup>1)</sup>	-85 / -75 <sup>2)</sup>	-85 / -75 <sup>1)</sup>	-85 / -75 <sup>2)</sup>
	1 kHz	-100 / -90	-98 / -88	-95 / -85 <sup>1)</sup>	-95 / -85 <sup>2)</sup>	-95 / -85 <sup>1)</sup>	-95 / -85 <sup>2)</sup>
	10 kHz	-105 / -95	-103 / -93	-100 / -90 <sup>1)</sup>	-100 / -93 <sup>2)</sup>	-100 / -90 <sup>1)</sup>	-100 / -93 <sup>2)</sup>
	100 kHz	-110 / -100	-106 / -96	-103 / -93 <sup>1)</sup>	-123 / -113 <sup>2)</sup>	-103 / -93 <sup>1)</sup>	-123 / -113 <sup>2)</sup>
	1 MHz	-133 / -123	-130 / -120	-127 / -117 <sup>1)</sup>	-140 / -130 <sup>2)</sup>	-127 / -117 <sup>1)</sup>	-140 / -130 <sup>2)</sup>
		typ. / max. values in dE	3c/Hz <sup>1)</sup> standa	rd values	<sup>2)</sup> values	with low phase no	ise option LPN
IF-Input Frequency:		C: 950 1550 MHz	9501450 MHz	Ku1: 950	1700 MHz	Ku4: 9501550 MHz	
		C2: 9501690 MHz		Ku2: 950	1950 MHz	Ku5: 950	.2000 MHz
		C3: 9501550 MHz		Ku3: 950	1700 MHz	Ku6: 950	.2000 MHz
Conversion Scheme:			Block up o	o conversion, no frequency inversion			

Upconverter Type:			VHBU- / VSBU- / VHBUR	- / VSBUR- / VSBUL- / VI	IBUL-	
		Ku7	K1, K2, K3	K4	Ka1, Ka2, Ka4	
RF-Output Frequency:		Ku-Band	K-Band	K-Band	Ka-Band	
		14.50 14.80 GHz	K1: 17.30 18.10 GHz	17.3018.40 GHz	Ka1: 29.00 30.00 GHz	
			K2: 17.6018.40 GHz		Ka2: 27.50 28.60 GHz	
			K3: 17.30 18.10 GHz		Ka4: 28.50 29.10 GHz	
LO Frequency:		13.40 GHz	K1: 16.05 GHz	16.35 GHz	Ka1: 28.05 GHz	
			K2: 16.35 GHz		Ka2: 26.55 GHz	
			K3: 16.35 GHz		Ka4: 27.55 GHz	
Phase Noise:	10 Hz	-65 / -55	-60 / -50	-60 / -50	-57 / -47	
	100 Hz	-85 / -75	-80 / -70	-80 / -70	-77 / -70	
	1 kHz	-95 / -85	-90 / -80	-90 / -80	-90 / -83	
	10 kHz	-100 / -90	-97 / -87	-97 / -87	-93 / -90	
	100 kHz	-103 / -93	-117 / -107	-117 / -107	-103 / -95	
	1 MHz	-127 / -117	-135 / -125	-135 / -125	-125 / -115	
			typ. / max.	values in dBc/Hz		
IF-Input Frequency:		1100 1400 MHz	K1: 1250 1750 MHz	950 2050 MHz	Ka1: 950 1950 MHz	
			K2: 1250 1750 MHz		Ka2: 950 2050 MHz	
			K3: 950 1750 MHz		Ka4: 950 1550 MHz	
Conversion Scheme:			Block up conversio	n, no frequency inversion		

Upconverter Type:		VH	BU- / VSBU- / VHBUR- / VSB	UR- / VSBUL- / VHBUL-	
		Ka6, Ka7	Ka8, Ka9	Ka10, Ka11	
RF-Output Frequency:		Ka-Band	Ka-Band	Ka-Band	
		Ka6: 27.50 28.70 GHz	Ka8: 30.00 31.00 GHz	Ka10: 28.00 29.00 GHz	
		Ka7: 28.30 29.50 GHz	Ka9: 27.00 28.00 GHz	Ka11: 29.50 30.00 GHz	
LO Frequency:		Ka6: 26.55 GHz	Ka8: 29.05 GHz	Ka10: 27.05 GHz	
		Ka7: 27.35 GHz	Ka9: 26.05 GHz	Ka11: 28.55 GHz	
Phase Noise:	10 Hz	-57 / -47	-57 / -47	-57 / -47	
	100 Hz	-77 / -70	-77 / -70	-77 / -70	
	1 kHz	-90 / -83	-90 / -83	-90 / -83	
	10 kHz	-93 / -90	-93 / -90	-93 / -90	
	100 kHz	-103 / -95	-103 / -95	-103 / -95	
	1 MHz	-125 / -115	-125 / -115	-125 / -115	
typ. / max. v				in dBc/Hz	
IF-Input Frequency:		Ka6: 950 2150 MHz	Ka8: 950 1950 MHz	Ka10: 950 1950 MHz	
		Ka7: 950 2150 MHz	Ka9: 950 1950 MHz	Ka11: 950 1450 MHz	
Conversion Scheme:			Block up conversion, no fr	equency inversion	

Specifications continued next page

## L-Band Block Upconverter Indoor / Outdoor

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

Q/V-band available on request (contact factory)

Common Parameters		
IF-Input Characteristics:	Impedance:	50 Ω
	Return loss:	> 18 dB
	Maximum aggregate input level:	0 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
	1 dB compression point:	$> 10 \text{ dBm}^{1}$
	Output muting:	> 75 dB (by command or sense input or by alarm condition)
	Connectors:	SMA female (standard)
		K female (2.92 mm) (-Ka standard)
		WR28 waveguide (-Ka with option WR28)
LO Test Output (Option):	Frequency:	LO Frequency standard (LO/2 Frequency on -Ka)
	Signal level:	-10 dBm +3 dB
	Impedance:	50 Ω
	Connector:	SMA female
Transfer Characteristics (standard):	Max. conversion gain:	35 dB ±1 dB
	Attenuation range:	0 20 dB, 0.1 dB steps
	, alonaalon rango.	0 19 dB, 1 dB steps (Option VSBxL)
	Gain variation over temp .:	$\pm 0.5 \text{ dB max}$
	Gain flatness over freg.:	±1.0 dB max, over band
	Gain flatness over 40 MHz:	±0.5 dB
	Image rejection:	> 80 dB
	Noise figure:	$< 11 \text{ dB}^{11}$ (on Ka < 15 dB <sup>11</sup> )
Transfer Characteristics with Gain Slope	Max. conversion gain:	35 dB ±1 dB
Equalizer:	Attenuation range:	0 30 dB, 0.1 dB steps
(Option EQ,	Gain variation over Temp.:	±0.5 dB max
only for VHBU, VSBU, VHBUR, VSBUR)	Gain flatness over Freg.:	±1.0 dB max. over band
···· <b>,</b> ·······, ······, ······,	Gain flatness over 40 MHz:	+0.5 dB
	Gain equalization:	+8.0 dB / GHz max., adjustable
	Image rejection:	> 80 dB
	Noise figure:	$< 11 \text{ dB}^{11}$ (on Ka $< 15 \text{ dB}^{11}$ )
Group Delay:	Ripple, Slope:	< 1 ns peak-peak / 80 MHz
Spurious Outputs:	Signal related:	< -65 dBc (< -60 dBc for Ka-Band and BW > 800 MHz) <sup><math>1)</math> <sup>2)</sup></sup>
-F	Output harmonics:	$< -40 \text{ dBc}^{(1)}$
	Signal independent:	< -85 dBm (< -75 dBm on -Ka)
Output Intercept Point 3 <sup>rd</sup> Order:	OIP3:	$> 20 \text{ dBm}^{1}$
Internal Frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C 60 °C	
	$\pm 1 \times 10^{\circ}$ , -30 °C 60 °C (after 30 min warm up)	
	$\pm 1 \times 10^{-9}$ per day (fixed temperatur	e after 24 h warm un)

<sup>1)</sup> at max. conversion gain <sup>2)</sup> 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.

# **L-Band Block Downconverter**

Indoor / Outdoor

### S-, C-, X-, Ku-, K- (DBS), Ka-band Q/V-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-					
		С	C3	C-NI	Х	Ku1, Ku2, Ku3, Ku4, Ku5	
RF-Input Frequency:		C-Band	C-Band	C-Band	X-Band	Ku-Band	
		3.40 4.20 GHz	5.85 6.45 GHz	3.40 4.20 GHz	7.25 7.75 GHz	Ku1: 10.95 11.70 GHz	
						Ku2: 10.70 11.70 GHz	
						Ku3: 11.70 12.75 GHz	
						Ku4: 11.55 12.75 GHz	
						Ku5: 12.25 12.75 GHz	
LO Frequency:		5.15 GHz	4.90 GHz	LO1: 10.0 GHz	6.30 GHz	Ku1: 10.00 GHz	
				LO2: 7.55 GHz		Ku2: 9.75 GHz	
						Ku3: 10.75 GHz	
						Ku4: 10.60 GHz	
						Ku5: 11.30 GHz	
Phase Noise:	10 Hz	-70 / -60	-70 / -60	-65 / -55	-68 / -58	-65 / -55 <sup>1)</sup> -65 / -55 <sup>2)</sup>	
	100 Hz	-90 / -80	-90 / -80	-85 / -75	-88 / -78	-85 / -75 <sup>1)</sup> -85 / -75 <sup>2)</sup>	
	1 kHz	-100 / -90	-100 / -90	-95 / -85	-98 / -88	-95 / -85 <sup>1)</sup> -95 / -85 <sup>2)</sup>	
	10 kHz	-105 / -95	-105 / -95	-100 / -90	-103 / -93	-100 / -90 <sup>1)</sup> 100 / -90 <sup>2)</sup>	
	100 kHz	-110 / -100	-110 / -100	-103 / -93	-106 / -96	-103 / -93 <sup>1)</sup> -123 / -113 <sup>2)</sup>	
	1 MHz	-133 / -123	-133 / -123	-125 / -117	-130 / -120	-127 / -117 <sup>1)</sup> -140 / -130 <sup>2)</sup>	
		typ. / max. va	alues in dBc/Hz	" standard values	<sup>2)</sup> values with low	phase noise option LPN	
IF-Output Frequency:		950 1750 MHz	9501550 MHz	9501750 MHz	950 1450 MHz	Ku1: 950 1700 MHz	
						Ku2: 950 1950 MHz	
						Ku3: 950 2000 MHz	
						Ku4: 950 2150 MHz	
						Ku5: 950 1450 MHz	
Conversion Scheme:		frequency inversion		no fr	equency inversion		

Downconverter Type:			VHBD- / VSBD- / VHBDR- /	VSBDR- / VHBDL- / VSBDL-	
		Ku2Ku3	Ka2, Ka3, Ka5, Ka7	Ka8, Ka9, Ka10, Ka11	Ka4
RF-Input Frequency:		Ku-Band	Ka-Band	Ka-Band	Ka-Band
		Ku2: 10.70 11.70 GHz	Ka2: 18.30 19.30 GHz	Ka8: 18.60 19.70 GHz	28.50 29.10 GHz
		Ku3: 11.70 12.75 GHz	Ka3: 18.20 19.30 GHz	Ka9: 21.20 22.20 GHz	
		(switchable)	Ka5: 19.20 20.30 GHz	Ka10: 18.25 19.45 GHz	
			Ka7: 20.20 21.30 GHz	Ka11: 17.20 18.30 GHz	
LO Frequency:			Ka2: 17.35 GHz	Ka8: 17.65 GHz	
		Ku2: 9.75 GHz	Ka3: 17.25 GHz	Ka9: 20.25 GHz	27.55 GHz
		Ku3: 10.75 GHz	Ka5: 18.25 GHz	Ka10: 17.30 GHz	27.55 GHZ
			Ka7: 19.25 GHz	Ka11: 16.25 GHz	
Phase Noise:	10 Hz	-60 / -50	-60 / -50	-60 / -50	-57 / -47
	100 Hz	-80 / -72	-80 / -72	-80 / -72	-77 / -70
	1 kHz	-93 / -85	-93 / -85	-93 / -85	-90 / -83
	10 kHz	-97 / -93	-97 / -93	-97 / -93	-93 / -90
	100 kHz	-107 / -100	-107 / -100	-107 / -100	-103 / -95
	1 MHz	-127 / -120	-127 / -120	-127 / -120	-125 / -115
		typ. / max. values in dBc/	Hz <sup>1)</sup> standard values	<sup>2)</sup> values with low p	phase noise option LPN
IF-Output Frequency:			Ka2: 950 1950 MHz	Ka8: 950 2050 MHz	
		Ku2: 950 1950 MHz	Ka3: 950 2050 MHz	Ka9: 950 1950 MHz	9501550 MHz
		Ku3: 950 2000 MHz	Ka5: 950 2050 MHz	Ka10: 950 2150 MHz	9301330 MHZ
			Ka7: 950 2050 MHz	Ka11: 950 2050 MHz	
Conversion Scheme:			no frequenc	cy inversion	

Specifications continued next page

# **L-Band Block Downconverter**

Indoor / Outdoor

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

Q/V-band available on request (contact factory)

	Common Parameters						
RF-Input Characteristics:	Impedance:	50 Q					
·····	Return loss:	> 18 dB					
	Maximum aggregate input level:	0 dBm (damage level)					
	LO leakage:	< -80 dBm					
	RF-connector:	SMA female (standard)					
		K female (2.92 mm) (-Ka standard)					
		WR28 waveguide (-Ka with option WR28)					
IF/RF-Monitor (Option):	Cignal laval in reference to input	-20 dB					
	Signal level in reference to input:						
	Impedance:	50 Ω					
	Connector:	SMA female					
IF-Output Characteristics:	Impedance:	50 Ω					
	Return Loss:	> 18 dB					
	1 dB Compression Point:	> 17 dBm <sup>1)</sup>					
	IF-Connectors:	SMA female (standard)					
		N female (standard with option OD)					
LO Test Output (Option):	Frequency:	LO Frequency standard (LO/2 Frequency on -Ka)					
	Signal level:	-10 dBm ±3 dB					
	Impedance:	50 Ω					
	Connector:	SMA female					
Transfer Characteristics (standard):	Max. conversion gain:	35 dB ±1 dB					
, , , , , , , , , , , , , , , , , , ,	Attenuation range:	0 20 dB, 0.1 dB steps					
	· ····································	0 19 dB, 1 dB steps (Option VSBDL)					
	Gain Variation over Temp .:	+0.5 dB					
	Gain Flatness over Freg.:	±1.0 dB max. over band					
	Gain Flatness over 40 MHz:	±0.5 dB					
	Image Rejection:	> 80 dB					
	Noise Figure:	$< 11 \text{ dB}^{1}$ (-on Ka <15 dB <sup>1</sup> )					
Transfer Characteristics with Gain Slope	Max conversion gain:	35 dB +1 dB					
Equalizer:	Attenuation range:	0 30 dB, 0.1 dB steps					
(Option EQ,	Gain Variation over Temp.:	±0.5 dB					
only for VHBD, VSBD, VHBDR, VSBDR)	Gain Flatness over Freg.:	±1.0 dB max. over band					
	Gain Flatness over 40 MHz:	±0.5 dB					
	Gain Equalization:	+8.0 dB / GHz max. adjustable					
	Image Rejection:	> 80  dB					
	Noise Figure:	$< 11 \text{ dB}^{1}$ (-on Ka <15 dB <sup>1</sup> )					
Group Dolovy	Ripple, Slope:	< 1 ns peak-peak / 80 MHz					
Group Delay: Spurious Outputs:	Signal related:	< 1 hs peak-peak / 80 MHz < -65 dBc <sup>1/2)</sup>					
opunious outputs:	Signal related: Output harmonics:	< -65 dBC <sup>1/2</sup>					
	Signal independent:	< -75 dBm					
Output Intercept Point 3 <sup>rd</sup> Order:	OIP3:	> 30 dBm <sup>1)</sup>					
Internal frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C 60 °C						
	±1 x 10 <sup>-8</sup> , -30 °C 60 °C (after 30	min warm up)					
	±1 x 10 <sup>-9</sup> per day (fixed temperature after 24 h warm up)						

<sup>1)</sup> at max. conversion gain <sup>2)</sup> 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.

# L-Band Block Up- and Downconverter Indoor / Outdoor

### Single / Dual / Triple Band Single / Dual Channel Q/V-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				
(VHBU/VSBU only):	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 packet format commands				
	Connection:	RS232 or RS422/RS485 (configurable), connector DSUB09 female or				
		TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45				
Diagnostic Interface	RS232, connector DSUB09 female					
(VHBUL/VSBUL only):						
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 cu					
		rsor 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 <sup>3</sup> (WxHxD), 1 RU	(19"), approx. 6 kg				

### **Outdoor Housing:**

Reference Input (Option):	Frequency:	5 or 10 MHz sine wave
···· · · · · · · · · · · · · · · · · ·	Level:	5 dBm ±5 dB
	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	Protocol:	Multipoint packet format commands
Interface and Alarm Interface:	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
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 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 warm up 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 <sup>3</sup> (WxHxE	D) (small housing) (standard)
	402 x 111 x 391 mm <sup>3</sup> (WxHxE	) (large housing)
	412 x 74 x 515 mm <sup>3</sup> (WxHxD)	(XL housing)
Degree of Protection:	IP 67 (acc. IEC 529)	

Specifications are subject to change

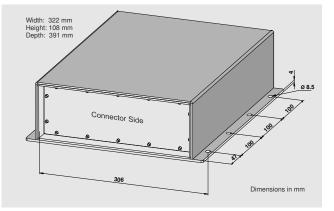
### Outdoor Housings Frequency Converter



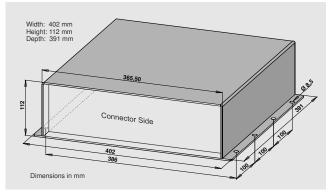


WORK Microwave offers its satellite proven communication equipment in different outdoor housings, which can be used under all weather conditions. The units can be operated over a temperature range of -40 °C to 60 °C (-40 °F to 140 °F). In the non-operating modus they survive temperatures of -50 °C to 80 °C (-58 °F to 176 °F) without any damage. Same as the 19" rack mount units, they meet the demanding requirements of modern satellite transmission applications, such as for TV uplinks and high-speed data network installations. Because of their rugged construction and low power consumption, they are perfect for fixed satellite earth stations, satellite newsgathering (SNG) vehicles and fly-aways.

WORK Microwave outdoor units are ideally meant to be mounted directly to the antenna. They do not require additional protection against water. The housing provides environmental protection according to IP67 (temporary flooding) when all cables are connected and sealed appropriately. Special environmental protection sleeves for the coaxial connectors allow optimal sealing from the housing to the cable. The housing should be mounted with the connector side down. Alternatively, the connector panel can be in a vertical position.



Dimensions of small Outdoor Housing



Dimensions of large Outdoor Housing



Width: 412 mm, Height: 74 mm, Depth: 505 mm

### Dimensions of XL Outdoor Housing

Monitoring and Control Interface:	RS232 or RS422/RS485 Alarm output: Two potential free contacts (DPDT) 24 V DC output: max. 0.3 A 6.5 V DC output: max. 0.2 A						
	Mute Input: TTL logic input with internal pull up (Connector type: MIL-C-26482: MS 3120 E 14-19 S)						
Temperature Range:	-40 °C 60 °C operating						
Relative Humidity:	< 100 %						
Mains Power Input:	100 240 V AC nominal, 90 264 V AC max, 50 60 Hz						
Mains Power Input Connector:	Amphenol C16-1 (3+PE) male						
Dimensions:	322 x 108 x 391 mm <sup>3</sup> (WxHxD) (small housing)						
	402 x 112 x 391 mm <sup>3</sup> (WxHxD) (large housing)						
	412 x 74 x 505 mm <sup>3</sup> (WxHxD) (XL housing)						
Degree of Protection:	IP 67 (acc. IEC 529)						

# Outdoor Housings Redundancy Switches

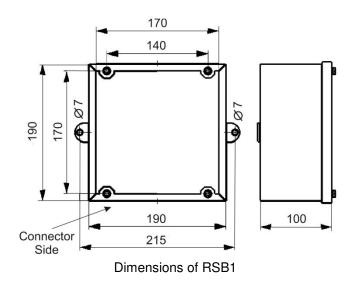


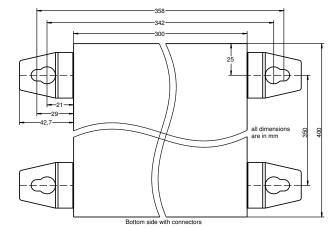


OSB-2

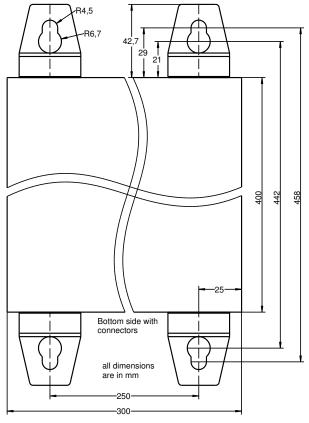








OSB-2 with horizontally mounted brackets



OSB-2 with vertically mounted brackets Dimensions of OSB-2

Temperature Range:	-40 °C 60 °C operating
Relative Humidity:	< 100 %
Degree of Protection:	IP 67 (acc. IEC 529)

# Redundant L-Band Block Converter

Indoor



S-, C-, X-, Ku-, K- (DBS)-Band



1+1 Redundant Block Converter System (cover not shown)

WORK Microwave's 1+1 redundant block converter system combines a redundancy switching system and two block converters in one unit, increasing operators efficiencies and cost savings. By consolidating previously separate capabilities into a single, compact, 19" housing, the WORK Microwave system dramatically reduces power consumption, providing operators with an innovative approach to redundant block converter systems. The hot plugging capability of the slide-in converters allows changing the spare unit without any downtime. 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.

### 5<sup>th</sup>-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).

**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 45 VA / 30 W maximizes the reliability and lifetime of the system.

### 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

The redundant block converters normally are delivered without fans and can be operated in environments, where at minimum one 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.

Each part of the systems can be operated separately via remote control by using TCP/IP over Ethernet. By using the serial interface (RS485) for remote control, all parts can be controlled via one interface. Detailed monitoring of the system status and a summary alarm output (dual change over switch contacts) are provided. For the remote control either ASCII stringbased commands as well as addressable, packetbased commands are provided. Remote monitoring and control through SNMP and a Web browser interface is also available.

### **Redundancy Switch System**

The redundancy switch system includes a coaxial signal splitter for the input signal and a coaxial signal switch for the output signal. The system can operate in automatic mode, whereby an automatic switchover unit is performed upon detection of an alarm generated by the active unit. In addition, a manual switchover of the standby unit can be initiated.

### **Redundant Power Supply**

Each slide-in converter comes with a separate power supply, capable to supply the redundancy controller and the second converter to guarantee highest possible availability.

### **Key features**

- Previously three devices in one 19" housing
- Hot pluggable slide-in converters
- Redundant power supplies
- Low phase noise
- Adjustable attenuator (range: 0 ... 20 dB, 0.1 dB step size)
- Output power +10 dBm (1 dB compression point)
- Low spurious emissions
- Internal OCXO with long term stability 10<sup>-7</sup> / year
- External reference input 5 or 10 MHz
- Reference output 10 MHz

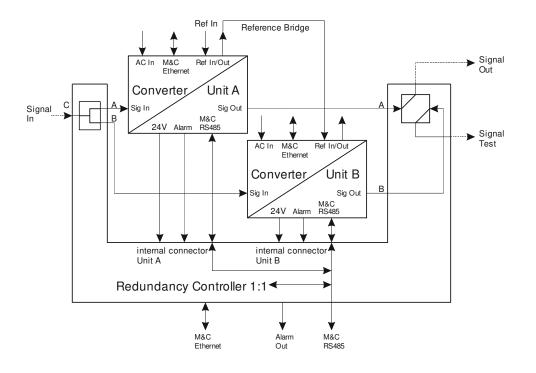
- Local control through push buttons on front panel
- Stored alarms with time stamps
- Remote controls through RS485 interface. Packet command syntax supports RS485 bus systems and allows addressed operation. TCP/IP over Ethernet, Web browser interface, SNMP with MIBs downloadable form the device
- Summary alarm output (DPDT)
- Low power consumption, typically 30 W
- 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.com or call us. We are glad to assist you.



Functional Block Diagram 1+1 Redundant Block Converter System

# Redundant L-Band Block Upconverter

### S-, C-, X-, Ku-, K- (DBS)-Band

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

Upconverter Type:			VHBU- / VS	BU-			
	C	C3	Х	Ku1, Ku2, Ku3, Ku7	K2, K3, K4		
RF-Output Frequency:	C-Band	C-Band	X-Band	Ku-Band	K-Band		
	5.85 6.45 GHz	6.45 7.05 GHz	7.90 8.40 GHz	Ku1: 13.75 14.50 GHz	K2: 17.6 18.4 GHz		
				Ku2: 12.75 13.75 GHz	K3: 17.3 18.1 GHz		
				Ku3: 12.75 13.50 GHz	K4: 17.3 18.4 GHz		
				Ku7: 14.50 14.80 GHz			
LO Frequency:	4.90 GHz	5.50 GHz	6.95 GHz	Ku1: 12.80 GHz	K2: 16.35 GHz		
				Ku2: 11.80 GHz	K3: 16.35 GHz		
				Ku3: 11.80 GHz	K4: 16.35 GHz		
Phase No. 10	70 / 00	70 / 00	00 / 50	Ku7: 13.40 GHz	00 / 50		
Phase Noise: 10		-70 / -60	-68 / -58	$-65 / -55^{1}$ $-65 / -55^{2}$	-60 / -50		
100		-90 / -80	-88 / -78	-85 / -75 <sup>1)</sup> -85 / -75 <sup>2)</sup> -95 / -85 <sup>1)</sup> -95 / -85 <sup>2)</sup>	-80 / -70		
1 k		-100 / -90	-98 / -88	-95 / -85 <sup>1)</sup> -95 / -85 <sup>2)</sup> -100 / -90 <sup>1)</sup> -100 / -93 <sup>2)</sup>	-90 / -80		
10 k		-105 / -95	-103 / -93	-100 / -90 / -100 / -93 / -103 / -93 <sup>1)</sup> -123 / -113 <sup>2)</sup>	-97 / -87		
100 k 1 M		-110 / -100	-106 / -96 -130 / -120	-123 / -113 / -127 / -117 <sup>1)</sup> -140 / -130 <sup>2)</sup>	-117 / -107		
	nz -133/-123	-133 / -123	-130/-120	-127/-117/ -140/-130/	-135 / -125		
	typ. / max. values	in dBc/Hz <sup>1)</sup> st	andard values	<sup>2)</sup> values with low pl	hase noise option LPN		
IF-Input Frequency:	9501550 MHz	9501550 MHz	9501450 MHz	Ku1: 950 1700 MHz	K2: 1250 1750 MHz		
				Ku2: 950 1950 MHz	K3: 950 1750 MHz		
				Ku3: 9501700 MHz	K4: 950 2050 MHz		
				Ku7: 1100 1400 MHz			
Conversion Scheme:		Bloc	k up conversion, no fr	equency inversion			
IF-Input Characteristics:		Impedance: 50 $\Omega$					
	Return loss:	> `	8 dB				
	Maximum aggregate		Bm (damage Level)				
	Connector:		A female (standard)				
RF-Output Characteristics:	Impedance:		Ω				
	Return loss:		8 dB				
	1 dB compression p		0 dBm <sup>1)</sup>				
	Output muting: Connectors:			r sense input or by alarm con	idition)		
	Connectors.		A female (standard)	18 CU-)			
Transfer Characteristics:	May conversion sei		emale (2.92 mm) (f > dB ±1 dB	18 GHZ)			
Transier Gharacteristics.	Max. conversion gai Attenuation range:		20 dB, 0.1 dB steps				
	Gain variation over t		20 ub, 0.1 ub step: .5 dB max.	5			
	Gain flatness over fr		.0 dB max. over band				
	Gain flatness over 4		.5 dB				
	Image rejection:		30 dB				
	Noise figure:		1 dB <sup>1)</sup>				
Group Delay:	Ripple, Slope:	< `	ns peak to peak / 80	) MHz			
Spurious Outputs:	Signal related:	< -	65 dBc <sup>1) 2)</sup>				
	Output harmonics:		40 dBc <sup>1) 2)</sup>				
	Signal independent:		85 dBm				
Output Intercept Point 3 <sup>rd</sup> Order:	OIP3:		20 dBm <sup>1)</sup>				
Internal Frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C						
	±1 x 10 <sup>-8</sup> , -30 °C ±1 x 10 <sup>-9</sup> per day (fix	bu C (after 30 min	warm up)				
1) at many conversion acin	±1 x 10 per day (fix	ed temperature afte	r 24 n warm up)				

 $^{1)}$  at max. conversion gain  $^{2)}$  Pout = 0 dBm

Specifications are subject to change

# Redundant L-Band Block Downconverter

Indoor

### S-, C-, X-, Ku-, K- (DBS)-Band

Downconverter Type:		VHBD- / VSBD-				
	С	X	Ku1, Ku2, Ku3			
RF-Input Frequency:	C-Band	X-Band	Ku-Band			
	3.4 4.2 GHz	7.25 7.75 GHz	Ku1: 10.95 11.70 GHz			
			Ku2: 10.70 11.70 GHz			
			Ku3: 11.70 12.75 GHz			
LO Frequency:	5.15 GHz	6.30 GHz	Ku1: 10.00 GHz			
			Ku2: 9.75 GHz			
			Ku3: 10.75 GHz			
Phase Noise: 10 H		-68 / -58	-65 / -55 <sup>1)</sup> -65 / -55 <sup>2)</sup>			
100 H		-88 / -78	-85 / -75 <sup>1)</sup> -85 / -75 <sup>2)</sup>			
1 kH		-98 / -88	-95 / -85 <sup>1)</sup> -95 / -85 <sup>2)</sup>			
10 kH		-103 / -93	-100 / -90 <sup>1)</sup> -100 / -93 <sup>2)</sup>			
100 kH		-106 / -96	-103 / -93 <sup>1)</sup> -123 / -113 <sup>2)</sup>			
1 MH		-130 / -120	-127 / -117 <sup>1)</sup> -140 / -130 <sup>2)</sup>			
		. values in dBc/Hz		alues with low phase no	ise option LPN	
IF-Output Frequency:	950 1750 MHz	950 1450 MHz	Ku1: 950 1700 MHz			
			Ku2: 950 1950 MHz			
			Ku3: 950 2000 MHz			
Conversion Scheme:	frequency	no free	quency inversion			
	inversion					
RF-Input Characteristics:	Impedance:		Ω			
		Return loss: > 18 dB				
		Maximum aggregate input level: 0 dBm (damage level)				
		LO leakage: < -80 dBm				
	RF-connector:		MA female (standard)			
			female (2.92 mm) (f > 18 GH	z)		
IF-Output Characteristics:	Impedance:		ΩΩ			
	Return Loss:		18 dB			
	1 dB Compression		17 dBm <sup>1)</sup>			
	IF-Connectors:		MA female			
Transfer Characteristics:	Max. conversion ga		5 dB ±1 dB			
	Attenuation range:		20 dB, 0.1 dB steps			
	Gain Variation ove		±0.5 dB			
	Gain Flatness over		1.0 dB max. over band			
	Gain Flatness over		0.5 dB			
	Image Rejection:		80 dB			
	Noise Figure:		11 dB <sup>1)</sup>			
Group Delay:	Ripple, Slope:	<	1 ns peak to peak / 80 MHz			
Spurious Outputs:	Signal related:		-65 dBc <sup>1) 2)</sup>			
	Output harmonics:		-40 dBc <sup>1) 2)</sup>			
	Signal independent:		< -75 dBm			
Output Intercept Point 3rd Order:	OIP3:		30 dBm <sup>1)</sup>			
Internal frequency Stability:	±1 x 10 <sup>-7</sup> , -30 °C					
		. 60 °C (after 30 min				
	±1 x 10 <sup>-9</sup> per day (fixed temperature after 24 h warm up)					

<sup>1)</sup> at max. conversion gain <sup>2)</sup> 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.

# **Redundant L-Band Block Converter**

Indoor

### S-, C-, X-, Ku-, K- (DBS)-Band

### **General Information:**

Slide-in Block Converters					
Reference Input:	Frequency:	5 or 10 MHz sine wave			
-	Level:	5 dBm ±5 dB			
	Modes:	auto/extern/intern			
	Connector:	SMA female			
Reference Output:	Frequency:	10 MHz			
	Level:	0 dBm ±3 dB			
	Connector:	SMA 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 packet format commands			
	Connection:	TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45			
Mains Power Input:	100 240 V AC nominal	, 90 264 V AC max., 50 60 Hz			
Mains Power Consumption:	Max.: 30 VA / 20 W, Typ.:	: 25 VA / 15 W			
Mains Power Input Connector:	IEC C14				
Mains Fuse:	2 x 2 A time-lag fuse				
Dimension and Weight:	134 x 36 x 416 mm <sup>3</sup> (WxH	HxD), approx. 1.8 kg			

	Redundancy Controller						
Switching:	Manual or Automatic						
Switching Time:	< 100 ms						
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 packet format commands					
	Connection:	RS422/RS485, connector DSUB09 female or					
		TCP/IP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45					
Summary Alarm Interface:	Two potential free contacts	(DPDT), connector DSUB09 female					
Configuration:	16 DIP switches on rear side	e					
Signal Splitter:	Frequency range:	1 18 GHz					
	Connectors:	SMA female					
	Return loss:	> 14 dB					
	Attenuation:	1.2 dB max. above 3 dB					
Signal Switch:		Transfer Relay					
	Frequency Range:	0 18 GHz					
	Connectors:	SMA female					
	Return loss:	> 15 dB					
	Attenuation:	0.5 dB max.					

Housing				
User Interface:	10 LEDs, 4 Function Keys			
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			
Dimension and Weight:	483 x 44 x 460 mm <sup>3</sup> (WxHxD), 1 RU (19"), approx. 8.0 kg with two slide in converters			

## Order Information Frequency Converter



### IF Converter ([typ]=C)

-1st item-	-2nd item-	-3rd item-	-4th item-	-5th item-	-6th item-	-7th item-	-8th item-	-9th item-
[generation]	[temp.range]	[typ]	[direction]	-[RF-band(s)]-	-[IF-band]-	-[IF-imp.]-	-[options]-	-[s-number]-
V	S=Standard Performance	С	U=Upconv.	S	70 MHz ±20 MHz	50 Ω	see description below	for special devices
	H=High Performance		D=Downconv.	С	140 MHz ±40 MHz	75 Ω		
	E=Extra High Performance (-40°C 60°C)			х	70_140 MHz			
				Ku	720 MHz ±200 MHz			
				К				
				Ка				
				Q				

### Synthesized Blockconverter ([typ]=SB), L-Band Blockconverter ([typ]=B), Test Loop Translator ([typ]=TLT)

-1st item-	-2nd item-	-3rd item-	-4th item-	-optional item- (only for L-Band Blockconverter)	-5th item-	-6th item-	-7th item-	-8th item-	-9th item-
[generation]	[temp.range]	[typ]	[direction]	[frontpanel]	[switcha ble]	-[RF- band(s)]-	-[IF-band]-	-[options]-	-[s-number]-
V	S=Standard Performance	SB	U=Upconv.	-	-	S	-	see description below	for special devices
	H=High Performance	В	D=Downconv.	R=Remote	2	С	1200 MHz ±300 MHz		
	E=Extra High Performance (-40°C 60°C)	TLT		L=Local control	3	X			
				see description below		Ku			
						К			
						Ка			
						Q			

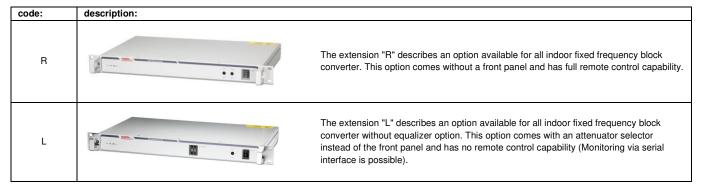
### Redundant L-Band Blockconverter ([typ]=B)

-1st item-	-2nd item-	-3rd item-	-4th item-	-5th item-	-6th item-	-7th item-	-8th item-
[generation]	[temp.range]	[typ]	[direction]	-[RF-band(s)]-	-[switch/splitter]-	-[options]-	-[s-number]-
V	S=Standard Performance	В	U=Upconv.	S	Red1=50 $\Omega$ Input Splitter, 50 $\Omega$ Output Transfer Switch Red2=50 $\Omega$ Input Switch, 50 $\Omega$ Output Transfer Switch	FAN	for special devices
	H=High Performance		D=Downconv.	С		LPN	
	E=Extra High Performance (-40°C 60°C)			Х		No additional options available	
				Ku			
				К			
Additional Slid	le-in Converter (e	.g. as Spare L	Init):	•		•	•
[generation]	[temp.range]	[typ]	[direction]	-[RF-band(s)]-	-SLOT-	-[options]-	-[s-number]-
V	S=Standard Performance	В	U=Upconv.	S		LPN	for special devices
	H=High Performance		D=Downconv.	С		No additional options available	
	E=Extra High Performance (-40°C 60°C)			Х			
				Ku			
				К			

## Order Information Frequency Converter



### description [frontpanel]:



### description [options]:

code:	description:
WR28	WR28 Waveguide Output, Ka-Band only (f > 26.5 GHz)
OD	Outdoor housing
VFD	VFD display for indoor units
FAN	Fan for indoor units
EQ	Equalizer, standard on IF-Converters
LPN	Low phase noise
RIN	external reference Input, outdoor unit only
ROUT	10 MHz reference Output, outdoor unit only
IFT	IF test output, standard on IF Down converters
RFT	RF test output, standard on IF Up converters
LOT	LO test output, standard on IF Converters
LSS	Low Step Size (10 Hz frequency resolution)

### **Examples:**

Order Code:	Order code description:
VSCU-Ku-70-50	Ku Band IF up converter, standard performance, IF 70 MHz, impedance 50 $\Omega$
VHCD-X-140-75	X Band IF down converter, high performance, IF 140 MHz, impedance 75 $\Omega$
VSSBU-Ka	Ka Band Synthesized Block up converter
VSBD-K-OD	K Band Block down converter, Outdoor housing
VSBD-Ku2Ku3-IFT-RFT-LOT-LPN	Ku Band dual channel Block down converter, IF-, RF- and LO- test output, low phase noise
VSBU2-Ku1Ku3-VFD	Ku Band dual band Block Up converter (switchable), VFD Display
VHTLT-S-FAN	S Band Test Loop Translator, high performance, internal Fan
VSCD-KuKuT-70-50	Ku Band Tracking Downconverter, standard performance, IF 70 MHz, impedance 50 $\Omega$
VSBUL-Ku1	Ku1-Band Block up converter, local control (without display, only attenuation switch, no remote control)
VSBDR-K	K-Band Block down converter, Remote (without display, configurable only via remote control)
VSBD-C-Red1	C-Band Block Downconverter with Input Splitter and Output Transfer Switch
VSBU-Ku1-Red2-FAN	Ku1-Band Block Upconverter with Input Switch and Output Transfer Switch
VSBU-Ku1-SLOT	Spare Unit for VSBU-Ku1-Red2-FAN

### Redundancy Switch Controller 1:1 RSCM1





The WORK Microwave redundancy switch 1:1 is used for 1:1 redundancy configurations for Upconverters, Downconverters, Modulator-Upconverters, Transport Stream Modulators, Demodulators, and Modems. It comes standard with a coaxial signal splitter for the input signal and a coaxial signal switch for the output signal. An input signal switch instead of the signal splitter is available as an option. For IP modem applications a similar device, RSCI1 is available.

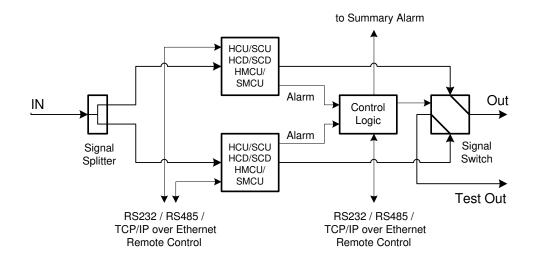
LNAs or even HPAs can be included within the system, as the switch is capable to control external waveguide transfer switches as option. DC power to LNAs can also be provided as option. The switch accepts alarm signals from two types of equipment, so that it can be used for redundancy configurations with e.g. a video encoder and a modulator within one chain.

The unit can be controlled from the front panel or remotely via RS 232, RS422/485, or IP over Ethernet.

The unit can operate in automatic mode, whereby an automatic switchover to the standby unit is performed upon detection of an alarm generated by the active unit. In addition, a manual switchover to the standby unit can be initiated.

Two power supplies and two AC input connectors guarantee high availability of the unit.

The 1:1 redundancy is also available in an outdoor version, where the signal splitter and the signal transfer relay is mounted within an outdoor switch box. The control unit is similar to the indoor redundancy controller, but does not include any signal splitters or signal switches. The outdoor switch box also includes interfaces for alarms and M&C of outdoor units. A control cable runs from the outdoor switch box to the indoor redundancy controller.



1:1 Redundancy with Signal Splitter

# Redundancy Switch Controller 1:1 RSCM1

Model		RSCM1-xx-xx	RSCM1-OD
	Redu	ndancy Switch 1:1	Redundancy Controller 1:1 for outdoor switch box RSB1-xx-xx
Control Interface to Outdoor Switch Box RSB1-xx-xx:			Alarm inputs, control outputs (Connector Type:
Switch Box RSB1-XX-XX:			MIL-C-26482: MS 3120 E 16-26 P)
Signal Input Splitter	Connector Type:	3 x SMA female	
	Impedance:	50 Ω	
	Power Handling:	3 W	
	Frequency Range:	6 18 GHz	
	Total Insertion Loss:	≤ 4.4 dB	
	Return Loss: Amplitude Balance:	≥ 13 dB 0.4 dB	
	Connector Type:	3 x SMA female	
	Impedance:	50 Ω	
	Power Handling:	3 W	
	Frequency Range:	4 8 GHz	
	Total Insertion Loss:	≤ 4.2 dB	
	Return Loss:	≥ 15 dB	
	Amplitude Balance:	0.4 dB	
	Connector Type:	3 x SMA female	
	Impedance:	50 Ω	
	Power Handling:	3 W	
	Frequency Range: Total Insertion Loss:	800 … 2500 MHz ≤ 4.0 dB	
	Return Loss:	≥ 17 dB	
	Amplitude Balance:	0.3 dB	
Signal Input Splitter	Connector Type:	3 x BNC female	
	Impedance:	50 Ω	
	Power Handling:	1 W	
	Frequency Range:	5 300 MHz	
	Total Insertion Loss:	≤ 4.0 dB	
	Return Loss:	≥ 15 dB	
	Amplitude Balance: Connector Type:	0.4 dB 3 x BNC female	
	Impedance:	$75 \Omega$	
	Power Handling:	1 W	
	Frequency Range:	5 300 MHz	
	Total Insertion Loss:	≤ 4.0 dB	
	Return loss:	≥ 15 dB	
	Amplitude Balance:	0.4 dB	
	Connector Type:	4 x SMA female	
RSCM1-50KT-xx, RSCM1-xx-50K:	Impedance:	50 Ω	
	Power Handling:	1 W (switching)	
	Frequency Range: Insertion Loss (max.):	0 … 18 GHz 0.2 dB (0 … 1 GHz)	
	Insertion Loss (max.).	0.3 dB (1 4 GHz)	
		0.3 dB (4 8 GHz)	
		0.4 dB (8 12 GHz)	
		0.6 dB (12 18 GHz)	
	Isolation (min.):	85 dB (0 1 GHz)	
		80 dB (1 4 GHz)	
		70 dB (4 8 GHz)	
		65 dB (8 12 GHz)	
	Return Loss (min.):	60 dB (12 18 GHz) 26 dB (0 1 GHz)	
	netuin 2055 (mmi.).	20 dB (0 1 GHZ) 20 dB (1 4 GHZ)	
		17 dB (4 8 GHz)	
		15 dB (8 12 GHz)	
		14 dB (12 18 GHz)	
	Connector Type:	4 x 1.6/5.6 female (Adapters to external	
RSCM1-75LT-xx, RSCM1-xx-75L:		BNC female connectors are provided)	
	Impedance:	$75 \Omega$	
	Power Handling:	1 W (switching)	
	Frequency Range: Insertion Loss (max.)	0 … 2.5 GHz 0.2 dB (0 … 1 GHz)	
	moordon 2000 (max.)	0.2 dB (0 1 GHz) 0.3 dB (1 2.5 GHz)	
	Isolation (min.)	80 dB (0 1 GHz)	
		70 dB (1 2.5 GHz)	
	Return Loss (min.):	20 dB (0 1 GHz)	
	, , ,	17 dB (1 2.5 GHz)	
Ovvite him av	Manual or Automatic		
	Typical 8 ms, max. 20 ms		

Specifications continued next page

# Redundancy Switch Controller 1:1 RSCM1

Remote M&C Interface:	Protocol:	SNMP				
	Connection:	onnection: UDP over Ethernet (10 or 100 Mbps, auto sensing), connector RJ-45				
	Protocol:	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), conr	nector DSUB09 female or			
		TCP/IP over Ethernet (10 or 100 Mbps, auto	sensing), connector RJ-45			
Summary Alarm Interface:	Two potential free conta	acts (DPDT, Connector DSUB09 female)				
Internal M&C Interface:	RS485 (Connector DSUB09 male)		RS485 (Connector Type:			
	R3483 (Connector D30	JD09 IIIale)	MIL-C-26482: MS 3120 E 16-26 P)			
Configuration:	16 DIP switches on rear side for serial interfaces					
Temperature Range:	-30 °C 60 °C operati	ng				
	-30 °C 80 °C storage	9				
Relative Humidity:	< 95 % non condensing					
User Interface:	10 LEDs, 4 Function Ke	eys				
DC Output (Option DC):	2x 23.5 V / 0.7 A max.					
Mains Power Input:	2 x 100 240 V AC no	ominal, 90264 V AC max, 5060 Hz, Redundant F	ower Supply, Hot swap			
Mains Power Consumption:	Max: 16 VA / 8 W					
	Typ.: 10 VA / 5 W					
Mains Power Input Connector:	2 x IEC C14					
Mains Fuse:	2 x 2 x 2.0 A time-lag fuse					
Dimension and Weight:	483 x 44 x 270 mm <sup>3</sup> or with option L 483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19")					
	approx. 3 kg					

Specifications are subject to change

### Order Information:

RSCM1-[Input Splitter or Switch Type]-[Output Switch Type]-[Options] Redundancy Switch with splitter, switches included RSCM1-[Input Splitter or Switch Type]-[Output Switch Type]-OD-[Options] Redundancy Controller with Outdoor Switch Box RSCM1-OD-[Options] Redundancy Controller for Outdoor Switch Box

#### Possible Options are:

- L housing depth 470 mm
- DC redundant 24V DC output

### Examples:

RSCM1-75VHF-50K	75 Ω Input Splitter VHF band, 50 Ω Output Transfer Switch 18 GHz
RSCM1-0-50K	without Input Splitter, 50 $\Omega$ Output Transfer Switch 18 GHz
RSCM1-50KT-50K-L	50 Ω Input Transfer Switch 18 GHz, 50 Ω Output Transfer Switch 18 GHz, housing depth 470 mm
RSCM1-OD	Controller without Splitter and Switch for Outdoor Switch Box RSB1

# **Outdoor Redundancy Switch Box 1:1**



Outdoor Redundancy Switch Box 1:1 RSB1

	RSB1-xx-xx	
	Outdoor Switch Box 1:1	
Connector Type:	3 x SMA female	
Impedance:	50 Ω	
	3 W	
	18 26.5 GHz	
	≤ 6.0 dB	
Return Loss:	≥ 10.8 dB	
Amplitude Balance:	0.4 dB	
Connector Type:	3 x N female	
	50 Ω	
	3 W	
	6 18 GHz	
Total Insertion Loss:		
Return Loss:	≥ 13 dB	
	3 x N female	
21	50 0	
	4 8 GHz	
Total Insertion Loss:	≤ 5.0 dB	
Return Loss:	≥ 14 dB	
Amplitude Balance:	0.4 dB	
Connector Type:	3 x N female	
	50 Ω	
	3 W	
	800 2500 MHz	
Total Insertion Loss:	≤ 5.0 dB	
Return Loss:	≥ 16 dB	
Amplitude Balance:	0.3 dB	
	3 x N female	
	75 Ω	
	1 W	
	5 300 MHz	
Total Insertion Loss:	≤4.5 dB	
Return Loss:	≥ 14 dB	
	0.4 dB	
	Impedance: Power Handling: Frequency Range: Total Insertion Loss: Return Loss: Amplitude Balance: Connector Type: Impedance: Power Handling: Frequency Range: Total Insertion Loss: Amplitude Balance: Connector Type: Impedance: Power Handling: Frequency Range: Total Insertion Loss: Amplitude Balance: Connector Type: Impedance: Power Handling: Frequency Range: Total Insertion Loss:	Outdoor Switch Box 1:1Connector Type: $3 \times$ SMA femaleImpedance: $50 \Omega$ Power Handling: $3 W$ Frequency Range: $18 \dots 26.5 \text{ GHz}$ Total Insertion Loss: $\leq 6.0 \text{ dB}$ Return Loss: $\geq 10.8 \text{ dB}$ Amplitude Balance: $0.4 \text{ dB}$ Connector Type: $3 \times N$ femaleImpedance: $50 \Omega$ Power Handling: $3 W$ Frequency Range: $6 \dots 18 \text{ GHz}$ Total Insertion Loss: $\leq 5.0 \text{ dB}$ Return Loss: $\geq 13 \text{ dB}$ Amplitude Balance: $0.4 \text{ dB}$ Connector Type: $3 \times N$ femaleImpedance: $50 \Omega$ Power Handling: $3 W$ Frequency Range: $6 \dots 18 \text{ GHz}$ Total Insertion Loss: $\leq 5.0 \text{ dB}$ Return Loss: $\leq 5.0 \Omega$ Power Handling: $3 W$ Frequency Range: $4 \dots 8 \text{ GHz}$ Total Insertion Loss: $\leq 5.0 \text{ dB}$ Return Loss: $\geq 14 \text{ dB}$ Amplitude Balance: $0.4 \text{ dB}$ Connector Type: $3 \times N$ femaleImpedance: $50 \Omega$ Power Handling: $3 W$ Frequency Range: $80 \dots .2500 \text{ MHz}$ Total Insertion Loss: $\leq 5.0 \text{ dB}$ Return Loss: $\geq 16 \text{ dB}$ Amplitude Balance: $0.3 \text{ dB}$ Connector Type: $3 \times N$ femaleImpedance: $75 \Omega$ Power Handling: $1 W$ Frequency Range: $5 \dots 300 \text{ MHz}$ Total Insertion Loss: $\leq 4.5  d$

# **Outdoor Redundancy Switch Box 1:1**

Circul Innut or Output Transfer Outland	O and a star Transa	4 0144	ferral a
Signal Input or Output Transfer Switch	Connector Type:	4 x SMA	temale
RSB1-50KT-xx, RSB1-xx-50K	Impedance:	50 Ω	
(without internal cabling):	Power Handling:	1 W (swi	
	Frequency Range:	0 18 0	
	Insertion Loss (max.):	0.2 dB	(0 1 GHz)
		0.3 dB	(1 4 GHz)
		0.3 dB	(4 8 GHz)
		0.4 dB	(8 12 GHz)
		0.6 dB	(12 18 GHz)
	Isolation (min.):	85 dB	(0 1 GHz)
		80 dB	(1 4 GHz)
		70 dB	(4 8 GHz)
		65 dB	(8 12 GHz)
		60 dB	(12 18 GHz)
	Return Loss (min.):	26 dB	(0 1 GHz)
	,	20 dB	(1 4 GHz)
		17 dB	(4 8 GHz)
		15 dB	(8 12 GHz)
		14 dB	(12 18 GHz)
Signal Input or Output Transfer Switch	Connector Type:		nale (2.9 mm, SMK)
RSB1-50KaT-xx, RSB1-xx-50Ka26,	Impedance:	50 Ω	
RSB1-xx-50Ka40:	Power Handling:	1 W (swi	tching)
	Frequency Range:	0 40 0	
	Insertion Loss (max.)	0.3 dB	(0 6 GHz)
		0.4 dB	(6 12.4 GHz)
		0.4 dB 0.5 dB	(12.4 18 GHz)
		0.5 dB 0.7 dB	(12.4 10 GHz) (18 26.5 GHz)
		0.7 dB 0.8 dB	(26.5 40 GHz)
	Isolation (min.)	70 dB	(0 6 GHz)
	Isolation (min.)	60 dB	(6 12.4 GHz)
		60 dB 60 dB	(12.4 18 GHz)
		55 dB	(12.4 16 GHz) (18 26.5 GHz)
		50 dB	(26.5 40 GHz)
	Deturn Less (min ):	17 dB	(0 6 GHz)
	Return Loss (min.):	-	
		15 dB	(6 12.4 GHz)
		14 dB	(12.4 18 GHz)
		11 dB	(18 26.5 GHz)
Circulation Option Transfer C. 11.1		10 dB	(26.5 40 GHz)
Signal Input or Output Transfer Switch	Attenuation (max.)	1.6 dB	(0.5 GHz)
Additional Attenuation by internal		1.7 dB	(1 GHz)
cabling:		2.8 dB	(10 GHz)
		3.4 dB	(18 GHz)
0.1111.0		3.9 dB	(27 GHz)
Switching:	Controlled by RSCM1-OD		
Control Interface to Indoor Control Unit	Alarms, control signals, internal		
RSCM1-OD:	(Connector Type: MIL-C-26482:		
Interface to Converter Units:			s at alarm outputs of converter units, internal M&C (RS485)
	(Connector Type: MIL-C-26482:	MS 3120 E	: 14-19 P)
Temperature Range:	-30 °C 60 °C operating		
	-30 °C 80 °C storage		
Relative Humidity:	< 100 %		
Dimension and Weight:	190 x 100 x 190 mm <sup>3</sup> (WxHxD)		
	approx. 2 kg		
Degree of Protection:	IP 67 (acc. IEC 529)		

Specifications are subject to change

### Order Information:

RSB1-[Input Splitter or Switch Type]-[Output Switch Type]

### Example:

**RSB1-50L-50Ka** 50 Ω Input Splitter L band, 50 Ω Output Transfer Switch 40 GHz

Redundancy Switch 1:1 for IP Modems RSCI1





This version of WORK Microwave's 1:1 redundancy switch is specifically designed for IP modems and IP demodulators. In addition to this version, a standard 1:1 redundancy switch RSCM1 is available, which can be used for modulators, demodulators, and modems with ASI transport stream inputs and outputs.

For Gigabit Ethernet traffic interfaces, the 1:1 redundancy switch RSCI1 includes a special type of form C (SPDT) Ethernet switch compatible with RJ45 interfaces to allow switchover from one IP modem or IP demodulator to the redundant one. This operates together with MAC address announcing methods, initiated automatically by the Gigabit Ethernet traffic interfaces. The IP modulator that detects a port is active (after switchover) sends a broadcast message to signal that the MAC address has changed. Equipment receiving this message, typically the next router, needs to react to this message and update its ARP resolution table. The details of this are defined in IPv4, an extension to RFC 826, called Gratuitous ARP. For IPv6, it is defined by RFC 4861, clause Unsolicited called 7.2.6 and is Neighbor Advertisement. The downtime after switchover is approximately less than 5 seconds, typically only 2 to 3 seconds and depends mainly on the Ethernet auto negotiation time.

IP modems and demodulators need to be configured in the same way and have different MAC addresses, but the same IP address.

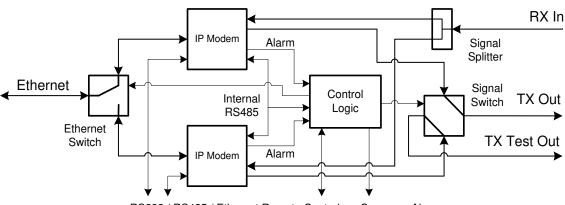
For the RF transmit signal, a transfer relay is included. For the RF receive signal, a transfer relay or signal splitter is available, which can be mounted externally to the unit. For L-band receive signals, a special signal splitter with an integrated switch is available, which allows operators to always provide DC and a 22 kHz tone signal from the active unit to the LNB.

The 1:1 redundancy switch accepts alarm signals from the two IP devices. The unit can operate in automatic mode, whereby an automatic switchover to the standby unit is performed upon detection of an alarm generated by the active unit.

For configurations including a splitter on the receive signal side, where both IP devices can receive the RF signal, monitoring of the receive conditions of both units is implemented.

In addition, a manual switchover to the standby unit can be initiated.

The units can be controlled from the front panel or remotely via RS232, RS422/485, or Ethernet. Two power supplies and two AC input connectors guarantee high availability of the unit.



RS232 / RS485 / Ethernet Remote Control Summary Alarm

# Redundancy Switch 1:1 for IP Modems RSCI1

Model	Item		
RSCI1-0-xx:	-	no internal signal splitter or	switch is included
RSCI1-50K-xx	Internal Signal Transfer Switch	Connector Type:	4 x SMA female
or		Impedance:	50 Ω
RSCI1-50K:		Power Handling:	1 W (switching)
		Frequency Range:	0 18 GHz
		Insertion Loss (max.):	0.2 dB (0 1 GHz)
			0.3 dB (1 4 GHz)
			0.3 dB (4 8 GHz)
			0.4 dB (8 12 GHz)
			0.6 dB (12 18 GHz)
		Isolation (min.):	85 dB (0 1 GHz)
			80 dB (1 4 GHz)
			70 dB (4 8 GHz)
			65 dB (8 12 GHz)
			60 dB (12 18 GHz)
		Return Loss (min.):	26 dB (0 1 GHz)
			20 dB (1 4 GHz)
			17 dB (4 8 GHz)
			15 dB (8 12 GHz)
Book			14 dB (12 18 GHz)
RSCI1-xx:	-	no external signal splitter or	
RSCI1-xx-75LD:	External Signal Splitter	Connector Type:	3 x F female
	(including diodes for DC)	Impedance:	75 Ω
		Power Handling:	100 mW
		Frequency Range:	500 2400 MHz
		Total Insertion Loss:	≤ 6.2 dB
		Return Loss:	> 15 dB
		DC Path:	max 30 V, 1 A,
		bor am.	diode decoupling
RSCI1-xx-75LR:	External Signal Splitter	Connector Type:	3 x F female
noon-xx-roen.	(including DC relay switch)	Impedance:	75 Ω
	(including DC relay switch)		100 mW
		Power Handling:	
		Frequency Range:	500 2400 MHz
		Total Insertion Loss:	≤ 6.2 dB
		Return Loss:	> 15 dB
		DC Path:	max 30 V, 500 mA
			Form C (SPDT) relay
RSCI1-xx-50V:	External Signal Splitter	Connector Type:	3 x BNC female
		Impedance:	50 Ω
		Power Handling:	1 W
		Frequency Range:	5 300 MHz
		Total Insertion Loss:	≤ 4.0 dB
		Return Loss:	> 15 dB
		Amplitude Balance:	0.4 dB
RSCI1-xx-75V:	External Signal Splitter	Connector Type:	3 x BNC female
		Impedance:	75 Ω
		Power Handling:	1 W
		Frequency Range:	5 300 MHz
		Total Insertion Loss:	
			≤ 4.0 dB
		Return Loss:	> 15 dB
D0014 501/T	Enternal Ginnal Torra (	Amplitude Balance:	0.4 dB
RSCI1-xx-50KT:	External Signal Transfer Switch	Connector Type:	4 x SMA female
		Impedance:	50 Ω
		Power Handling:	1 W (switching)
		Frequency Range:	0 18 GHz
		Insertion Loss (max.):	0.2 dB (0 1 GHz)
			0.3 dB (1 4 GHz)
			0.3 dB (4 8 GHz)
			0.4 dB (8 12 GHz)
			0.6 dB (12 18 GHz)
		Isolation (min.):	85 dB (0 1 GHz)
			80 dB (1 4 GHz)
			70 dB (4 8 GHz)
			65 dB (8 12 GHz)
			60 dB (12 12 GHz)
		Poturn Loss (min.):	· · · · · · · · · · · · · · · · · · ·
		Return Loss (min.):	26 dB (0 1 GHz)
			20 dB (1 4 GHz)
			17 dB (4 8 GHz)

Specifications continued next page

# Redundancy Switch 1:1 for IP Modems RSCI1

Ethernet Hardware Switch:	Connector:	3 x RJ45
	Type:	10/100/1000 Mbps
	MAC Address announcing	IPv4: according to extension of RFC 826, Gratuitous ARP
	scheme, initiated by IP traffic	IPv6: according to RFC 4861, clause 7.2.6, Unsolicited Neighbor Advertisement
	ports of IP devices after	
	switchover:	
Switching:	Manual or Automatic	
Delay from unit alarm occurrence until IF/RF relay switching:	Typical 8 ms, max. 20 ms	
Remote M&C Interface:	Protocol:	SNMP
	Connection:	UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, connector RJ-45
	Protocol:	HTTP (web browser interface)
	Connection:	TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, connector RJ-45
	Protocol:	Multipoint
	Connection:	RS232 or RS422/RS485 (configurable), connector DSUB09 female or
		TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, connector RJ-45
Summary Alarm Interface:		PDT, Connector DSUB09 female)
Internal M&C Interface:	RS485 (Connector DSUB09 m	
Configuration:	16 DIP switches on rear side /	serial interface
Temperature Range:	-30 °C 60 °C operating	
	-30 °C 80 °C storage	
Relative Humidity:	< 95 % non condensing	
User Interface:	10 LEDs, 4 Function Keys	
Mains Power Input:		90 264 V AC max, 50 60 Hz, Redundant Power Supply, Hot swap
Mains Power Consumption:	Max: 16 VA / 8 W	
	Typ.: 10 VA / 5 W	
Mains Power Input Connector:	2 x IEC C14	
Mains Fuse:	2 x 2 x 2.0 A time-lag fuse	
Dimension and Weight:		tion L 483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19")
	approx. 3 kg	

Specifications are subject to change

#### Order Information:

RSCI1-[internal RF Switch Type] -[external RF Splitter or Switch Type ]-[Options]

### Possible Options are:

L housing depth 470 mm

#### Examples:

RSCI1-50K-75LD	External Signal Splitter with diodes
RSCI1-50K-75LR	External Signal Splitter with DC relay switch
RSCI1-50K-50KT	External Signal Transfer Switch 18 GHz

### Compact Redundancy Switch 2:1 RSCC-2





The WORK Microwave Redundancy Switch RSCC-2 is a compact solution for a 2:1 redundancy system. It can be used for Upconverters and Downconverters. The system includes four coaxial transfer switches, which are integrated into the housing.

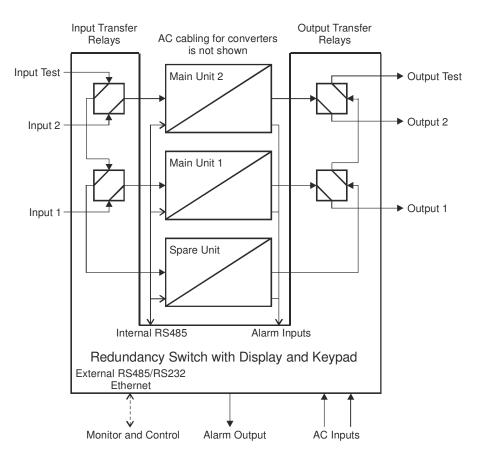
The system can be configured from the front panel or remotely via RS232, RS422/485, or TCP/IP over Ethernet.

The switching system can be set in automatic mode, whereby an automatic switchover to the spare unit is

performed upon detection of an alarm generated by the main unit. In addition, a manual switchover to the spare unit and back can be initiated.

Two power supplies and two AC input connectors within the unit guarantee high availability.

The Redundancy Switch RSCC-2 is also available with integrated uplink power control (Option UPC). For functional details see separate datasheet for Remote Control Unit / Satellite Uplink Power Control Unit.



2:1 Redundancy Switch System with RSCC-2

### Compact Redundancy Switch 8:1 RSCC-8 with Switch Matrix ISM-8





The WORK Microwave Redundancy Switch RSCC-8 is a compact solution for an 8:1 redundancy system. It can be used for Upconverters and Downconverters. The system consists of the controller and an indoor switch matrix integrated in separate 19" 1 RU housing.

The system can be configured from the front panel or remotely via RS232, RS422/485, or TCP/IP over Ethernet.

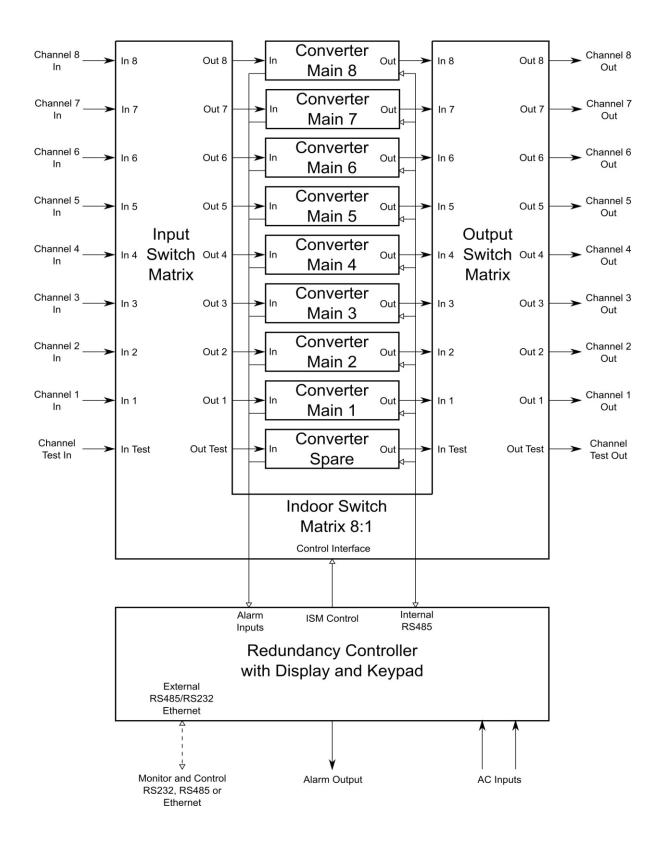
The switching system can be set in automatic mode, whereby an automatic switchover to the spare unit is

performed upon detection of an alarm generated by the main unit. In addition, a manual switchover to the spare unit and back can be initiated.

Two power supplies and two AC input connectors within the unit guarantee high availability.

The Redundancy Switch RSCC-8 is also available with integrated uplink power control (Option UPC). For functional details see separate datasheet for Remote Control Unit / Satellite Uplink Power Control Unit.

# Compact Redundancy Switch 8:1 RSCC-8 with Switch Matrix ISM-8



### Modular Redundancy Switch N:1 RSCM





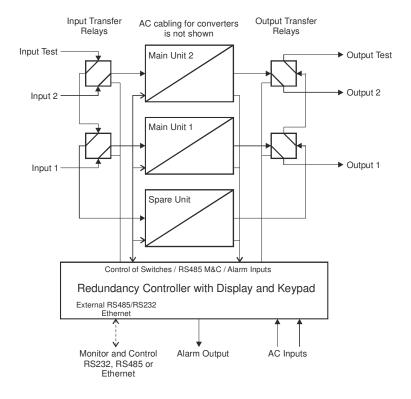
The WORK Microwave Redundancy Switch System N:1 can be configured for redundancy configurations with a maximum of eight main units and one spare unit. The redundancy system can be used for Upconverters and Downconverters.

The core of the solution is based on a highly flexible control unit. The required coaxial transfer switches, waveguide transfer switches, and signal splitters are mounted on separate panels or within an outdoor housing. When used in a rack mount installation, redundant switching panels can be added to the system in a modular way if the number of required channels increases over time. The system can be configured from the front panel of the controller or remotely via RS232, RS422/485, or TCP/IP over Ethernet.

The switching system can be set in automatic mode, whereby an automatic switchover to the spare unit is performed upon detection of an alarm generated by the main unit. In addition, a manual switchover to the spare unit and back can be initiated.

Two power supplies and two AC input connectors within the controller unit guarantee high availability.

The Redundancy Switch System is also available with integrated uplink power control (Option UPC). For functional details see separate datasheet for Remote Control Unit / Satellite Uplink Power Control Unit.



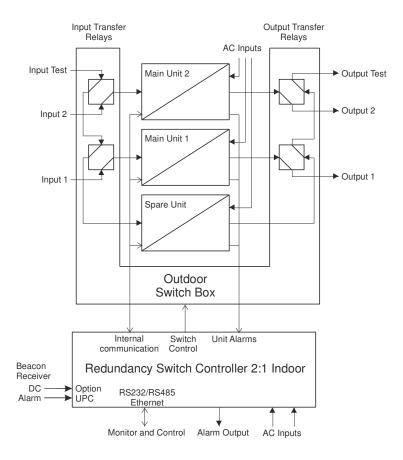
2:1 Modular Redundancy Switch System with RSCM-2

### Outdoor Redundancy Switch 2:1 RSCM-2-OD



This picture shows an Outdoor Switch Box of a 2:1 redundant switching system. The Switch Box is connected to the control unit, which is installed indoors. The Outdoor Switch Box includes alarm and status indication via LEDs, manual switchover and easy access to the serial control interfaces of the converter units. The picture below shows a typical 2:1 configuration with converters, built as an outdoor solution.





2:1 Redundancy Switch System with Outdoor Switch Unit

# **Redundancy Switch System N:1**

Remote M&C Interface:	Bratacal	SNMD
Remote Mac Interface:	Protocol: Connection:	SNMP 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
User Interface:	LCD (VFD as option), 2 x 4	40 characters, 4 cursor keys, 2 function keys, Status LED's s (DPDT, connector DSUB09 female)
Alarm Interface:	Two potential free contacts	ion and equalization offsets can be set to compensate for influences of cable and relay
Insertion loss compensation:	differences in case of a rep	
Delay from unit alarm occurrence		
until IF/RF relay switching:		ms (depending on connected spare unit)
Uplink Power Control Algorithm:	Configurable parameters	<ul> <li>Uplink power control on/off</li> <li>Maximum gain increase in reference to clear sky gain</li> </ul>
(only with Option UPC)		<ul> <li>Sampling and update period in 0.1 seconds</li> </ul>
		<ul> <li>Ratio between decrease of beacon signal and increase of transmission signal</li> </ul>
		<ul> <li>Clear sky value of DC beacon receiver signal</li> <li>Sustain period in seconds (up 3600 s) for which the uplink power control keeps the last</li> </ul>
		gain increase value (in case of deep fade conditions where the beacon receiver can
	Manita na fan	lose lock for some period of time)
	Monitors for	<ul> <li>DC signal from beacon receiver</li> <li>Calculated attenuation of beacon signal</li> </ul>
		Current gain increase of transmission signal
Beacon Receiver Interface:		n Y-cable connected to spare unit interface),
(only with Option UPC)		voltage 0 12 V and Beacon receiver alarm relay
Maximum number of switches per each switch panel:	4 (Indoor switch panel)	
Signal Transfer Switches:	Connector Type:	4 x SMA female (Indoor switch panel)
(Input and/or Output)	Connector Type.	(N female on IF interfaces, SMA female on RF interfaces of outdoor switch unit)
	Impedance:	50 Ω
RSCC-2-50K-xx	Power Handling:	1 W (switching)
RSCM-n-50K-xx	Frequency Range:	0 18 GHz
RSCC-2-xx-50K RSCM-n-xx-50K	Insertion Loss (max.):	0.2 dB (0 1 GHz) 0.3 dB (1 4 GHz)
		0.3 dB (4 8 GHz)
		0.4 dB (8 12 GHz)
		0.6 dB (12 18 GHz)
	Isolation (min.):	85 dB (0 1 GHz)
		80 dB (1 4 GHz) 70 dB (4 8 GHz)
		70 dB (4 8 GHz) 65 dB (8 12 GHz)
		60 dB (12 18 GHz)
	Return Loss (min.):	26 dB (0 1 GHz)
		20 dB (1 4 GHz)
		17 dB (4 8 GHz)
		15 dB (8 12 GHz) 14 dB (12 18 GHz)
	(waveguide switches and	other transfer switches on request)
Signal Transfer Switches:	Connector Type:	4 x 1.6/5.6 female (Indoor switch panel)
(Input and/or Output)		(Adapters to external BNC female connectors are provided)
DCCC 0.751	Impedance:	75 Ω
RSCC-2-75L-xx RSCM-n-75L-xx	Power Handling:	1 W (switching) 0 … 2.5 GHz
RSCC-2-xx-75L	Frequency Range: Insertion Loss (max.):	0 2.5 GHz 0.2 dB (0 1 GHz)
RSCM-n-xx-75L		0.3 dB (1 2.5 GHz)
	Isolation (min.):	80 dB (0 1 GHz)
		70 dB (1 2.5 GHz)
	Return Loss (min.):	20 dB (0 1 GHz)
Temperature Range:	-30 °C 60 °C operating	18 dB (1 2.5 GHz)
i sinperatare mange.	-25 °C 60 °C operating	(for RSCM-n-75L)
	(the LCD display is operati	
	-30 °C 80 °C storage	
Relative Humidity:	<95% non condensing	
Mains Power Input:		nal, 90264 V AC max, 5060 Hz, Redundant Power Supply, Hot swap
Mains Power Consumption:	Max: 16 VA / 8 W Typ: 10 VA / 5 W	
Mains Power Input Connector:	2 x IEC C14	
Mains Fower input connector.	2 x 2 x 2.0 A time-lag fuse	
Dimension and Weight of		n option L 483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19")
Redundancy Controller:	approx. 4 kg (with option L	approx. 5.5 kg)
Dimension and Weight of Outdoor	300 x 150 x 400 mm <sup>3</sup> (Wx	HxD)
Switch Box:	approx. 7 kg	
		Specifications are subject to change

Specifications are subject to change

0	utdoor Switch Box RSP-2-50K-50K-OI	D, RSP-2-50K-	50Ka-OD, RSP	P-2-50Ka-50K	-OD		
Interface to Indoor Controller:	Connector MIL-C-26482: MS 3120 E 16-26 S, unit alarms, RS485 communication interface to units, IF/RF-relay- control, 24V supply						
Interface to Outdoor Converters:	3 connectors MIL-C-26482: MS 312	0 E 14-19 P, u	nit alarm, RS4	85 communica	ation interface	, 24V supply	
IF Connectors:	Impedance: $50 \Omega$ Connectors:N fema	Impedance: 50 Ω					
RF Connectors:	Impedance:     50 Ω       Connectors:     SMA female (standard)       K female (2.92 mm) (-Ka40)						
IF/RF Relays 0 18 GHz (K),	Power handling max.: 1 W (s	witching)					
RF Relays 0 26.5 GHz (Ka26)	Frequency (GHz):	01	1 4	4 8	8 12.4	12.4 18	18 26.5
(without cabling):	V.S.W.R. (max.):	1.1	1.15	1.25	1.35	1.5	1.7
	Insertion loss (dB max.):	0.2	0.2	0.3	0.4	0.5	0.8
	Isolation (dB min.):	85	80	70	65	60	55
RF Relays 0 40 GHz (Ka40)	Power handling max.: 1 W (s	witching)					
(without cabling):	Frequency (GHz):	0 6	6 12.4	12.4 18	18 26.5	26.5 40	
	V.S.W.R. (max.):	1.3	1.4	1.5	1.7	1.9	
	Insertion loss (dB max.):	0.3	0.4	0.5	0.7	0.8	
	Isolation (dB min.):	70	60	60	55	50	
Insertion Loss Compensation:	For each channel attenuation and equalization offsets can be set on the controller to compensate for influences of cable and relay differences in case of a replacement.						
Local Control Possibilities: Only with disconnected indoor controller:							
	- RS232 M&C interface to converter units with RS232 to RS485 converter						
	- IF- and RF-relay switching to replace main unit 1, main unit 2 or none						
Temperature Range:	-30°C 60°C operating						
Relative Humidity:	< 100 %						
Dimension and Weight:	300 x 150 x 400 mm <sup>3</sup> (WxHxD)						
	approx. 7 kg						

Specifications are subject to change

	Indoor Swite	h Matrix ISM-8				
Interface to Indoor Controller:	connector DSUB15 male	connector DSUB15 male				
IF Connectors:	Impedance: 75 Ω Connector: BNC female					
RF Connectors:	Impedance: $50 \Omega$ Connector:SMA female					
Monitor Connectors IF and RF:	Impedance: $50 \Omega$ Connector:BNC female					
IF Switches 40 240 MHz:	Power handling max.: 15 dBm Path: Insertion loss (dB typ.): Isolation (dB typ.): Return Loss on Inputs (dB typ.): Return Loss on Outputs (dB typ.):	normal 2.0 80 19.1 17.8	replaced 2.4 90 21.9 16.5			
RF Switches 1.8 2.2 GHz:	Power handling max.: 15 dBm Path: Insertion loss (dB typ.): Isolation (dB typ.): Input Return Loss (dB typ.): Output Return Loss (dB typ.):	normal 2.7 68 11.0 14.9	replaced 3.3 75 14.9 17.0			
Insertion Loss Compensation:	For each channel attenuation and equalization offsets can be set on the controller to compensate for influences of cable and relay differences in case of a replacement.					
Temperature Range:	-30°C 60°C operating - 30°C 80°C storage					
Relative Humidity:	< 95 % non condensing					
Dimension and Weight:	483 x 44 x 470 mm <sup>s</sup> (WxHxD), 1 RU (19") approx. 5 kg					

Specifications are subject to change

# **Redundancy Switch System N:1**

#### Order Information:

RSCC-2-[Input Switch Type]-[Output Switch Type]-[Options] Compact Redundancy Switch

**RSCC-[Number of signal channels]-[Input Switch Type]-[Output Switch Type]-[Options]** Compact Redundancy Switch with Indoor Switch Matrix

### RSCM-[Number of signal channels]-[Input Switch Type]-[Output Switch Type]-[Options]

Modular Redundancy System

#### Possible Options are:

- OD with outdoor switch unit, available only for two channels on RSCM
- UPC Uplink Power control included

VFD VF Display

L Controller housing depth 470 mm

### Examples:

RSCC-2-50K-50K-L	Compact Switch with 50 $\Omega$ 18 GHz Input and Output Transfer Switches, housing depth 470 mm
RSCM-2-50K50K-50K	Modular 2:1 System with two 50 $\Omega$ 18 GHz Input Transfer Switches and one 50 $\Omega$ 18 GHz Output Transfer
	Switch per channel for converters with two inputs
RSCM-2-50K-50K-OD	2:1 Outdoor system with 50 $\Omega$ 18 GHz Input and Output Transfer Switches
RSCC-8-75VHF-50L-VFD	Compact 8:1 Switch with VF Display and 75 $\Omega$ input switch matrix for VHF band and 50 $\Omega$ output switch matrix
	for L band

## Remote Control Unit Satellite Uplink Power Control Unit





WORK Microwave's remote control unit is perfect for use with outdoor converter units. Via the front panel, operators can manually control the configuration of an outdoor converter similar way to what is possible for indoor converter units.

Versions that enable the operator to control more than one converter from the same unit are available (Options Dual and Multi).

Remote control of the complete setup via RS232, RS485, or IP over Ethernet is possible utilizing this control unit. In addition, alarm relay outputs are provided. For connection to the outdoor unit or to the remote controlled unit in general, an RS485 connection is used.

### Uplink power control

Uplink power control is a hardware and software option for the Remote Control Unit.

This feature senses a DC signal from a beacon receiver. If due to additional atmospheric attenuation caused by rain, snow, clouds, fog, or an antenna misalignment the beacon signal is attenuated, the transmitted signal is increased proportionally until a configurable maximum additional gain is reached or the maximum gain of the Upconverter is reached.

The uplink power control uses a DC signal from a beacon receiver and also provides an input for a lock signal or alarm signal from a beacon receiver.

The following parameters can be configured:

- Uplink power control on/off
- Maximum gain increase in reference to clear sky gain

- Sampling and update period in seconds
- Ratio between decrease of beacon signal and increase of transmission signal (due to difference of rain attenuation effect for different frequencies)
- Clear sky value of DC beacon receiver signal
- Sustain period in seconds (up to 3600 seconds) for which the uplink power control keeps the last gain increase value (in case of deep fade conditions where the beacon receiver can lose lock for some period of time).

The following specifications can be monitored:

- DC signal from beacon receiver
- Calculated attenuation of beacon signal
- Current gain increase of transmission signal

As LNAs or LNBs may show gain variation over temperature, which would mislead the uplink power control algorithm, there is an optional input for a temperature sensor. A temperature sensor can be mounted close to these LNAs or LNBs. The characteristic for the temperature compensation can be configured (only on Standard Remote Controller).

# Remote Control Unit Satellite Uplink Power Control Unit

Model	RC-CO Remote Control for Outdoor Units
Monitoring and Control Interface:	RS232 or RS422/RS485 (Connectors DSUB09 female) (selectable by customer), IP over Ethernet
Internal Monitor and Control Interface	Standard:
to controlled unit(s):	RS422/RS485
	Alarm Signal
	DC Supply from ODU 1224 V
	Connector: DSUB25 male
	Option PS:
	RS422/RS485
	Alarm Signal
	DC Supply to ODU 24 V
	Connector: DSUB25 female
	Option Dual/Multi:
	RS422/RS485
	Connector: DSUB09 male
Beacon Receiver Interface:	Differential DC Input:
(Option UPC or UPC/TS)	Voltage Range for DC-In+ and DC-In-: -12 +12 V related to GND
	DC-In+ - DC-In-: max. 12 V
	DC-ln+ ≥ DC-ln-
	Input Impedance: approx 10 kΩ
	Beacon Receiver Alarm Input:
	TTL Input, Pull-Up to 5 V with 1 k $\Omega$ , suitable for external relay closure to GND
	Connector: DSUB09 male
Temperature Sensor Interface:	Output Current: 1 mA, DC Voltage Sensing
(Option UPC/TS)	Suitable for Temperature Sensor: KTY19-6M (2 k $\Omega$ @ 25 °C)
	Connector: DSUB09 female
Temperature Range:	-30 °C 60 °C operating (the LCD display is operational: -20 °C 60 °C)
remperature nunge.	-30 °C 80 °C storage
Relative Humidity:	< 95% non condensing
User Interface:	LCD, 2 x 40 characters, 4 cursor keys, 2 function keys, Status LEDs
Mains Power Input:	Option PS, Dual, Multi:
-	100 240 V AC nominal, 90 264 V AC max
	50 60 Hz
	Option PS can supply DC power from remote control to converter unit
Mains Power Consumption:	Option PS, Dual, Multi:
	Typ: 10 VA / 6 W, Max: 55 W
Mains Power Input Connector:	IEC C14
Mains Fuse:	2.0 A time-lag fuse
Dimension and Weight:	483 x 44 x 270 mm³ (WxHxD), 1 RU (19")
	approx. 4 kg

Specifications are subject to change

### Order Information: RC-CO-[Options]

### Possible Options are:

UPC	Uplink power control
UPC/TS	Uplink power control with temperature sensor
PS	Power supply on RC-CO
DUAL	Remote Control for two frequency converters
MULTI	Remote Control for up to 8 frequency converters
Т	Remote Control for dual channel tracking converters

Examples:

RC-CO RC-CO-UPC RC-CO-PS RC-CO-Dual

#### Cannot be combined with:

T DUAL, MULTI, T DUAL, MULTI UPC/TS, PS UPC/TS, PS UPC, UPC/TS

## Automatic Level Control (ALC) Filter Amplifier





WORK Microwave now offers ALC filter amplifiers as a stand-alone unit or as an application-specific option within its downconverters. The picture above shows the stand-alone unit.

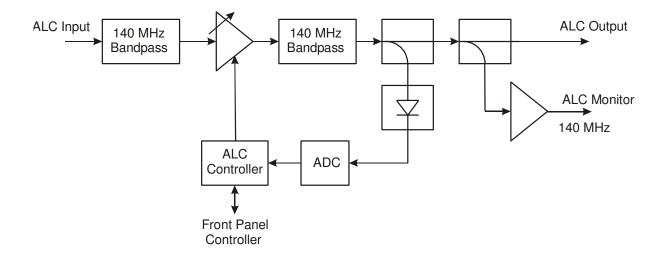
The input of this unit can be connected to the IF output of the downconverter.

The picture below shows a block diagram of the application-specific ALC filter amplifier. The signal is bandpass filtered on the input as well as on the output. Both bandpass filters are identical.

The pictures on the next page show typical amplitude frequency responses of such filters. The overall filter characteristic of the complete unit results from a series connection of the two identical filters, doubling all attenuation values in dB, which means that e.g. a stop-band suppression of 50 dB for one filter results in a overall stop-band suppression for the complete unit of about 100 dB (for the same frequency point).

In between these filters a variable gain stage allows adjustment of the signal level. A small portion of the output signal level is coupled to an RMS detector.

A digitally implemented control algorithm using a microprocessor allows operators to select a specified output level and keeps the output level constant, even if the input signal varies within the allowed level range. The operational parameters of the ALC amplifier can be configured from the front panel processor as well as remotely. Monitoring of the ALC amplifier is also possible from the front panel processor as well as remotely. Besides the main ALC output, an ALC monitor output is available on the rear panel.



# Automatic Level Control (ALC) Filter Amplifier

IF Input:	Center Frequency:	140 MHz			
n mpat.	Frequency Range:	80 200 MHz			
	Signal Level:	-5020 dBm			
	Return Loss:	> 18 dB (within filter passband bandwidth)			
	Connector:	SMA female			
	Impedance:	50 Ω			
IF Output:	Center Frequency:	140 MHz			
in output.	Bandwidth:	34 MHz or 41 MHz or 54 MHz or 75 MHz or 110 MHz			
	Signal Level:	-5 dBm10 dBm (adjustable, 0.1 dB step size)			
	Return Loss:	> 18 dB (within filter passband bandwidth)			
	Connector:	SMA female			
	Impedance:	50 Ω			
IF Monitor Output:	Signal similar to IF Output	0011			
	Signal Level:	20 dB lower than IF Output			
	Return Loss:	> 20 dB			
	Connector:	SMA female			
	Impedance:	50 Ω			
Transfer Characteristics:	Gain:	15 60 dB (automatically or manual adjustable, 0.1 dB step size)			
	Group delay:	< 0.5 ns / 25 kHz within 54 MHz bandwidth			
	Bandwidth:	54 MHz (3 dB)			
	Frequency Range:	113 167 MHz (3 dB)			
Interrmodulation (3 <sup>rd</sup> Order):	< -55 dBc, (Pout: 2 x +4 dE	Sm )			
ALC Control:	Fast attack for required ga	n adjustment > configurable value (0.1 5 dB)			
	with configurable time cons	stant up to 1000 s.			
	Gradual adjustment for required gain adjustment < configurable value (0.1 5 dB) with configurable time constant up to 1000 s				
	Control cycle approx. 100 ms.				
	No interruption of the signa	I during adjustment.			
Monitoring and Control Interfaces:	Ethernet/IP (10 or 100 Mbps, auto sensing)				
	RS232 or RS422/RS485 (Connectors DSUB09 female) (configurable)				
Alarm Interface:	Two potential free contacts (DPDT, Connector DSUB09 female)				
Temperature Range:	-25 °C 60 °C operating				
	the LCD display is operation	nal: -20 °C 60 °C			
	-30 °C 80 °C storage				
Relative Humidity:	< 95 % non condensing				
User Interface:	LCD, 2 x 40 characters, 4 cursor keys, 4 function keys				
Mains Power Input:	100 240 V AC nominal, 90264 V AC max, 5060 Hz				
Mains Power Consumption:	Max: 16 VA / 8 W				
-	Typ.: 12 VA / 5 W				
Mains Power Input Connector:	IEC C14				
Mains Fuse:		2.0 A time-lag fuse			
Manis i use.	2.0 A time-lag fuse				
Dimension and Weight:	2.0 A time-lag fuse 483 x 44 x 270 mm <sup>3</sup> (WxH	xD), 1 RU (19")			

Specifications are subject to change

Order Information:

### ALC-[IF Frequency in MHz]-[Filter BW in MHz]

Examples: ALC-140-34 ALC-140-41 ALC-140-54 ALC-140-75 ALC-140-110

## Handheld Satcom Test Source







The Handheld Test Source is an easy to use all-in-one test instrument that eliminates the need for several independent test sources. It is the ideal solution for the following applications:

- Signal source for measurement of different parameters of satellite upconverters, including intermodulation, 1 dB compression point, and conversion gain
- Ordinary low phase noise dual carrier signal generator
- Combined source for block upconverters (L-band, 10 MHz and 24 V DC)

### **Key Features**

- Single and two tone output
- 50 MHz to 180 MHz and 950 MHz to 2150 MHz output frequency
- Step size 0.5 MHz
- -45 dBm to -5 dBm output power / 0.5 dB step size
- Both synthesizers independently adjustable in frequency and power
- Low system intermodulation
- 10 MHz reference output with adjustable power
- Remote control via USB using PC software (GUI) supplied together with the device
- Power supply options: internal battery, USB or external SMPS

### **Product Design**

The Test Source consists of a single main module, which contains the RF section, the reference section

and the power supply. The internal lithium ion battery is directly connected to the main module.

### RF and reference section

The main parts of the RF section are the two low spurious PLL synthesizers. The synthesizers use a high stable internal reference of 10 MHz to generate a frequency from 50 MHz to 180 MHz and from 950 MHz to 2150 MHz with a step size of 0.5 MHz. Each signal is filtered by a frequency depended low pass filter before it is amplified and attenuated by a high dynamic attenuator to reach the desired output level in the range of -45 dBm to -5 dBm (step size: 0.5 dB).

To create a two tone signal at the RF output, the two single tone signals are combined by a wideband power combiner. The output signal can be muted as well as each synthesizer. In addition to a two tone signal, a 10 MHz reference, adjustable in power (-10 dBm to 10 dBm, 0.5 dB steps) and a 24 V DC signal can be switched to the RF out port.

### Open questions, demo units

If you need more information about the Handheld Satcom Test from WORK Microwave or if you would like to have demo unit, please contact us via e-mail: sales@work-microwave.com or call us on +49 8024 6408 0. We are glad to assist you.

# Handheld Satcom Test Source

Instruction         Image: Control to Control	Frequency Range:	50 MHz to 180 MHz and 950 MHz to 2150 MHz				
Output level:         -45 dBm to -5 dBm           Output level resolution:         0.5 dB           Output lingedance:         11 dB           Output lingedance:         50 MHz         50 Ohm           Output numbe:         < 60 dBc						
Output level resolution:         0.5 dB           Level tolerance:         ±1 dB           Output impedance:         50 Ohm           Output impedance:         50 Ohm           Output impedance:         50 Ohm           Output impedance:         <-60 dBc           Phase Noise:         50 Ohmz         180 MHz         950 MHz         2150 MHz           Phase Noise:         50 Ohmz         180 MHz         950 MHz         <-73 dBc/Hz         <-80 dBc/Hz         <-135 dBc/Hz         <-135 dBc/Hz         <-135 dBc/Hz         <-135 dBc/Hz         <-135 dBc/Hz         <-136 dBc/Hz         <-136 dBc/Hz         <-136 dBc         <-70 dBc </th <th></th> <th></th> <th></th> <th></th> <th></th>						
Level tolerance:         11 dB           Output limpedance:         50 Ohm           Output limpedance:         50 MHz           Output nute:         <60 dBc           Phase Noise:         50 MHz         2150 MHz           1 kHz         <-103 dBc/Hz         <-93 dBc/Hz         <-80 dBc/Hz         <-73 dBc/Hz           100 Hz         <-110 dBc/Hz         <-100 dBc/Hz         <-80 dBc/Hz         <-80 dBc/Hz           100 kHz         <-110 dBc/Hz         <-100 dBc/Hz         <-90 dBc/Hz         <-80 dBc/Hz           100 kHz         <-113 dBc/Hz         <-100 dBc/Hz         <-90 dBc/Hz         <-80 dBc/Hz           100 kHz         <-137 dBc/Hz         <-100 dBc/Hz         <-100 dBc/Hz         <-100 dBc/Hz         <-100 dBc/Hz           100 kHz         <-137 dBc/Hz         <-135 dBc/Hz         <-135 dBc/Hz         <-135 dBc/Hz         <-128 dBc/Hz           Spurious (single tone):          <-75 dBc         <<-70 dBc            Arrononic (single tone):          <-75 dBc         <-70 dBc            Brown <-56 dBm         <-65 dBc         <-65 dBc         <-65 dBc         <-70 dBc           Pout <-5 dBm         <-65 dBc         <-80 dBc         <-80 dBc         <-70 dBc <th></th> <th></th> <th></th> <th></th> <th></th>						
Output Impedance:         50 MHz         50 Ohm           Output mute:         < -60 dBc           Phase Noise:         50 MHz         < -60 dBc           100 Hz         < -103 dBc/Hz         < -93 dBc/Hz         < -80 dBc/Hz         < -73 dBc/Hz           1 kHz         < -110 dBc/Hz         < -100 dBc/Hz         < -80 dBc/Hz         < -100 dBc/Hz         < -80 dBc         < -75 dBc         < -70 dBc         < -80 dBc         < -70 dBc         < -70 dBc           < -70 dBc                <-70 d						
Output mute:         <				-		
Phase Noise:         50 MHz         180 MHz         950 MHz         2150 MHz           100 Hz         < -103 dBc/Hz         < -93 dBc/Hz         < -80 dBc/Hz         < -73 dBc/Hz           10 kHz         < -110 dBc/Hz         < -100 dBc/Hz         < -80 dBc/Hz         < -73 dBc/Hz         < -73 dBc/Hz           10 kHz         < -113 dBc/Hz         < -103 dBc/Hz         < -103 dBc/Hz         < -80 dBc/Hz         < -70 dBc          < -100 dBc/Hz         < -70 dBc         < -70 dBc            < -70 dBc          < -70 dBc <th></th> <th></th> <th></th> <th></th> <th></th>						
100 Hz         <-103 dBc/Hz         <-93 dBc/Hz         <-80 dBc/Hz         <-80 dBc/Hz           1 KHz         <-110 dBc/Hz         <-100 dBc/Hz         <-80 dBc/Hz         <-80 dBc/Hz           100 KHz         <-113 dBc/Hz         <-100 dBc/Hz         <-83 dBc/Hz         <-83 dBc/Hz           100 KHz         <-113 dBc/Hz         <-100 dBc/Hz         <-83 dBc/Hz         <-83 dBc/Hz           100 KHz         <-130 dBc/Hz         <-120 dBc/Hz         <-107 dBc/Hz         <-100 dBc/Hz           1 MHz         <-137 dBc/Hz         <-135 dBc/Hz         <-107 dBc/Hz         <-128 dBc/Hz           spurious (single tone):         50 MHz to 180 MHz         <-135 dBc/Hz         <-130 dBc/Hz         <-128 dBc/Hz           <<1 dbs://subsection         50 MHz         180 MHz         <-130 dBc/Hz         <-130 dBc/Hz         <-128 dBc/Hz           <<1 dbs://subsection          50 MHz         180 MHz         <-130 dBc/Hz         <-128 dBc/Hz         <-128 dBc/Hz           <<1 dbs://subsection           <-75 dBc         <-70 dBc         <-70 dBc              <-65 dBc         <-65 dBc         <-65 dBc         <-70 dBc         <-70 dBc              <0 dBc         <-90 d		50 MH-			2150 MH-	
1 kHz         < 10 dBc/Hz         < 100 dBc/Hz         < 87 dBc/Hz         < 80 dBc/Hz           10 kHz         < 113 dBc/Hz         < 110 dBc/Hz         < 90 dBc/Hz         < 83 dBc/Hz         < 83 dBc/Hz         < 83 dBc/Hz         < 100 dBc/Hz         < 83 dBc/Hz         < 100 dBc/Hz         < 83 dBc/Hz         < 100 dBc/Hz <th>Flidse Noise.</th> <th>50 MHZ</th> <th></th> <th>950 MHZ</th> <th>2150 MHZ</th>	Flidse Noise.	50 MHZ		950 MHZ	2150 MHZ	
1 kHz         < 10 dBc/Hz         < 100 dBc/Hz         < 87 dBc/Hz         < 80 dBc/Hz           10 kHz         < 113 dBc/Hz         < 110 dBc/Hz         < 90 dBc/Hz         < 83 dBc/Hz         < 83 dBc/Hz         < 83 dBc/Hz         < 100 dBc/Hz         < 83 dBc/Hz         < 100 dBc/Hz         < 83 dBc/Hz         < 100 dBc/Hz <th>100 Hz</th> <th>&lt; -103 dBc/Hz</th> <th>&lt; -93 dBc/Hz</th> <th>&lt; -80 dBc/Hz</th> <th>&lt; -73 dBc/Hz</th>	100 Hz	< -103 dBc/Hz	< -93 dBc/Hz	< -80 dBc/Hz	< -73 dBc/Hz	
10 kHz 100 kHz         < -113 dBc/Hz						
100 kHz 1 MHz         < -130 dBc/Hz						
1 MHz         < -137 dBc/Hz						
Spurious (single tone):       50 MHz to 180 MHz       950 MHz to 2150 MHz         elsewhere       <-75 dBc          Harmonics (single tone):       <-75 dBc          System Intermodulation:       50 MHz       180 MHz       950 MHz       2150 MHz         Pout <-5 dBm       <-75 dBc             Pout <-5 dBm       <-65 dBc       <-65 dBc       <-65 dBc            Pout <-18 dBm       <-80 dBc       <-80 dBc       <-80 dBc       <              Pout <-25 dBm       <-90 dBc       <-90 dBc       <-80 dBc       <-70 dBc			• • •			
< 1 MHz offset elsewhere     < -75 dBc     < -70 dBc       Harmonics (single tone):     < -70 dBc     < -70 dBc       System Intermodulation:     50 MHz     180 MHz     950 MHz     2150 MHz       Pout < -5 dBm Pout < -18 dBm Pout < -25 dBm     < -65 dBc     < -65 dBc     < -65 dBc       Pout < -25 dBm     < -65 dBc     < -65 dBc     < -65 dBc       Pout < -25 dBm     < -80 dBc     < -80 dBc     < -70 dBc       Pout < -25 dBm     < -90 dBc     < -80 dBc     < -70 dBc       Pout < -25 dBm     < -65 oBc     < -65 dBc     < -65 dBc       Pout < -25 dBm     < -90 dBc     < -80 dBc     < -70 dBc       Pout < -25 dBm     < -90 dBc     < -80 dBc     < -70 dBc       Pout < -25 dBm     < -90 dBc     < -80 dBc     < -70 dBc       Pout < -25 dBm     < 0 dBm, 0.5 dB steps         Reference Frequency stability:     ± 1 x 10 <sup>7</sup> , 0 °C to 50 °C         ± 2 x 10 <sup>9</sup> per day           Temperature range:     0 °C to +40 °C          0 °C to 50 °C           ± 2 x 10 <sup>9</sup> per day           Power consumption:     ext 24 V DC SMPS, USB, internal Li-Poly-Battery						
Harmonics (single tone):         System Intermodulation:     50 MHz     180 MHz     950 MHz     2150 MHz       Pout < -5 dBm Pout < -18 dBm Pout < -18 dBm Pout < 25 dBm		< -75	dBc	< -70	dBc	
System Intermodulation:         50 MHz         180 MHz         950 MHz         2150 MHz           Pout < -5 dBm Pout < -18 dBm Pout < -25 dBm         < -65 dBc         < -65 dBc         < -65 dBc         < -65 dBc         < -70 dBc           Pout < -25 dBm Pout < -25 dBm         < -80 dBc         < -80 dBc         < -80 dBc         < -70 dBc	elsewhere	<- 75	dBc	< -70	dBc	
System Intermodulation:         50 MHz         180 MHz         950 MHz         2150 MHz           Pout < -5 dBm Pout < -18 dBm Pout < -25 dBm         < -65 dBc         < -65 dBc         < -65 dBc         < -65 dBc         < -70 dBc           Pout < -25 dBm Pout < -25 dBm         < -80 dBc         < -80 dBc         < -80 dBc         < -70 dBc	Harmonics (single tone):		< -30	0 dBc		
Pout < -18 dBm Pout < -25 dBm		50 MHz	180 MHz	950 MHz	2150 MHz	
Pout < -18 dBm Pout < -25 dBm						
Pout < -25 dBm				< -65 dBc	< -65 dBc	
Reference Output:       10 MHz, -10 dBm to +10 dBm, 0.5 dB steps         Reference Frequency stability:       ± 1 x 10 <sup>-7</sup> , 0 °C to 50 °C         ± 2 x 10 <sup>-9</sup> per day         Temperature range:       0 °C to +40 °C         operating       0 °C to +50 °C         storage       -20 °C to 50 °C         Interface:       USB 2.0         Power supply:       ext. 24 V DC SMPS, USB, internal Li-Poly-Battery         Power consumption:       max. 12 W         else       max. 6 W         Connectors:       Frout:         S0 Ohm SMA female						
Reference Frequency stability:       ± 1 x 10 <sup>7</sup> , 0 °C to 50 °C         ± 2 x 10 <sup>9</sup> per day         Temperature range:       0 °C to +40 °C         operating       0 °C to +50 °C         storage       -20 °C to 50 °C         Interface:       USB 2.0         Power supply:       ext. 24 V DC SMPS, USB, internal Li-Poly-Battery         Power consumption:       max. 12 W         else       max. 6 W         Connectors:       Frout:         S0 Ohm SMA female				< -80 dBc	< -70 dBc	
± 2 x 10° per day         Temperature range:       0°C to +40°C         charging battery       0°C to +50°C         storage       -20°C to 50°C         Interface:       USB 2.0         Power supply:       ext. 24 V DC SMPS, USB, internal Li-Poly-Battery         Power consumption:       max. 12 W         charging battery       max. 6 W         Connectors:       FR Fout:         50 Ohm SMA female		10 MHz, -10 dBm to +10 dBm, 0.5 dB steps				
Temperature range:       charging battery operating of °C to +40 °C (0 °C to +50 °C)         o°C to +50 °C       0 °C to +50 °C         storage       -20 °C to 50 °C         Interface:       USB 2.0         Power supply:       ext. 24 V DC SMPS, USB, internal Li-Poly-Battery         Power consumption:       max. 12 W         else       max. 6 W         Connectors:       FR Fout:         50 Ohm SMA female	Reference Frequency stability:	± 1 x 10 <sup>-7</sup> , 0 °C to 50 °C				
charging battery operating storage     0 °C to +40 °C 0 °C to +50 °C -20 °C to 50 °C       Interface:     USB 2.0       Power supply:     ext. 24 V DC SMPS, USB, internal Li-Poly-Battery       Power consumption: charging battery else     max. 12 W max. 6 W       Connectors:     Frout:       50 Ohm SMA female		± 2 x 10 <sup>-9</sup> per day				
operating storage     0 °C to +50 °C       -20 °C to 50 °C     -20 °C to 50 °C       Interface:     USB 2.0       Power supply:     ext. 24 V DC SMPS, USB, internal Li-Poly-Battery       Power consumption:     max. 12 W       charging battery else     max. 6 W       Connectors:     50 Ohm SMA female						
storage     -20 °C to 50 °C       Interface:     USB 2.0       Power supply:     ext. 24 V DC SMPS, USB, internal Li-Poly-Battery       Power consumption:     max. 12 W       charging battery     max. 6 W       Connectors:     50 Ohm SMA female						
Interface:     USB 2.0       Power supply:     ext. 24 V DC SMPS, USB, internal Li-Poly-Battery       Power consumption:     max. 12 W       else     max. 6 W       Connectors:     50 Ohm SMA female						
Power supply:     ext. 24 V DC SMPS, USB, internal Li-Poly-Battery       Power consumption:     max. 12 W       else     max. 6 W       Connectors:     Frout:       S0 Ohm SMA female						
Power consumption:     max. 12 W       else     max. 6 W       Connectors:     Fout:       50 Ohm SMA female						
charging battery else     max. 12 W max. 6 W       Connectors:     Fout:       RF out:     50 Ohm SMA female		ext. 24 V DC SMPS, USB, internal Li-Poly-Battery				
else max. 6 W Connectors: RF out: 50 Ohm SMA female						
Connectors: RF out: 50 Ohm SMA female						
RF out: 50 Ohm SMA female		max. 6 W				
<b>KEF out:</b> 50 Ohm BNC female						
		USB Standard type B				
	- 3 -	approx. 1.5 kg				
Dimensions (L x W x H):         250 x 125 x 74 mm	Dimensions (L x W x H):	250 x 125 x 74 mm				

Specifications are subject to change

Order Information:

HTS-VL

# **Digital Products**

DVB-S / S2 / S2X Modulators Modems Demodulators



## 



The A-Series is a next generation FPGA-based family of satellite modem, modulator and demodulator platforms. The AX-60 product line is based on a powerful architecture that supports the new DVB-S2X standard, providing users with a future-proof solution. Advanced features and benefits include higher modulation schemes up to 256APSK, a finer granularity of ModCods and advanced filtering.

Beyond DVB-S2X, the AX-60 platform can be extended to customized waveforms and user-defined data processing. Through an all-IP structure, the platform supports both native network operation as well as data streaming over IP. Built-in encapsulators

#### **Key features**

- DVB-S2X ETSI EN 302 307-2
- DVB-S2 ETSI EN 302 307-1
- DVB-S2X modulations: QPSK to 256APSK; normal, short, linear
- DVB-S2 modulations: QPSK to 32APSK; normal, short
- Symbol rates from 100 ksps to 75 Msps
- Data rate up to 360 Mbit/s integrated
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Low spurious output

and decapsulators provide support for the standard formats, such as GSE and MPE plus specialized streaming like transparent baseband data, raw IQ information, space data formats and more.

A-Series devices are based on a new processing architecture that offers signal based advancements, a flexible software platform and improved access from monitoring and control to the transmission parameters. This allows direct real-time monitoring and quick adaptation to specific customer requirements. Scalable hardware ensures that operators can serve all applications from very low up to extremely high throughput.

- Operates as Layer 3 Bridge or Layer 3 Router
- Predistortion ready for automatic group delay and nonlinearity compensation
- OptiACM controller (open for other ACM systems)
- Real-time M&C capabilities
- IP and baseband traffic shaping
- Generic Stream Encapsulation (GSE)
- Multiprotocol Encapsulation (MPE)
- CE compliant
- 3 years warranty

Modulator Parameters:	AX-60 / AT-60					
Signal Outputs:		1x L-band output	950 2150 M			
3		1x IF output	50 180 MHz			
			IF Output	<u> </u>		L-band Output
IF-Output Frequency:		50 180 MHz				950 2150 MHz
Frequency Resolution:			1 Hz			1 Hz
Phase Noise:	10 Hz		-45			-45
	100 Hz		-80			-75
	1 kHz		-88			-88
	10 kHz	-90			-90	
	100 kHz		-100			-100
	1 MHz		-115			-115
				max. va	alues in dBc/Hz	
IF-Output Characteristics:		Impedance:	50 Ω or 75 Ω		Impedance:	50 Ω
·		Return Loss:	> 18 dB		Return Loss:	> 18 dB
		Output Power:	-25 dBm 5 dBm	l.	Output Power:	-30 dBm 0 dBm,
			0.1 dB steps, ±0.5			0.1 dB steps, ±0.5 dBm accuracy
		Output Power	• /	,	Output Power	
		muted:	< -85 dBm		muted:	< -85 dBm
		Connector:	BNC female		Connector:	N female 50 $\Omega$
					10 MHz reference	
					output:	1.5 ±1.5 dBm (can be switched on/off)
Spurious Outputs:		Signal related:	< -70 dBc, unmodu	ulated carrier,	Signal related:	< -70 dBc, unmodulated carrier,
			50 90 MHz or			950 1900 MHz
			100 180 MHz < -45 dBc, unmodu	lated corrier		< -55 dBc, unmodulated carrier, 1900 2150 MHz
			< -45 dBC, unified harmonics, out of l			< -45 dBc, unmodulated carrier
			narmonics, out of i	band		harmonics, out of band
Frequency and Clock Stability		Standard:	+0 × 10 <sup>-7</sup> /0°C	EOOC offer w	orm up) oging: ±0 v	$10^{-8}$ per day, ±1 x $10^{-6}$ per year
Frequency and Clock Stability	y.	Option EXT:	$\pm 2 \times 10^{-8}$ (0 C	50 C, allel W	$am up), aging. \pm 2 x$	$\times 10^{-9}$ per day, ±1 x 10 <sup>-7</sup> per year
Symbol Rate:		Max. Range:	±2 × 10 (=30			ing on firmware option)
eyinber nate.		Step size:		1 sps		
DVB-S2X Modulation / Coding	1:	ModCods:		QSPK	13/45, 9/20,	11/20
	<b>-</b>	(normal FEC fram	le)	8PSK	23/36, 25/36,	
		(	,	16APSK	26/45, 3/5, 28	8/45, 23/36, 25/36, 13/18, 7/9, 77/90
				32APSK	32/45, 11/15,	
				64APSK	11/15, 7/9, 4/	
				128APSK		
				256APSK		
		ModCods:		QPSK	11/45, 4/15,	14/45, 7/15, 8/15, 32/45
		(short FEC frame)	)	8PSK	7/15, 8/15, 20	
				16APSK		6/45, 3/5, 32/45
				32APSK	2/3, 32/45	
		ModCods linear:		8PSK	5/9-L, 26/45-	
		(normal FEC fram	ie)	16APSK		, 5/9-L, 3/5-L, 2/3-L
				32APSK	25/36-L	
				64APSK	32/45-L	
				256APSK		L, 31/45-L, 11/15-L
		M 10 1			ing to ETSI EN 3023	
DVB-S2 Modulation / Coding:		ModCods:		QPSK		1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		(normal and short		8PSK		5/6, 8/9, 9/10
		except 9/10 short	FEG frame only)	16APSK		5/6, 8/9, 9/10
		Dilata Incertion:		32APSK	3/4, 4/5, 5/6,	8/9, 9/10
		Pilots Insertion:	rambling:	on / off N = 0 2	062141	
		Physical Layer Sc	ambing.			07.1
Carrier ID:			a to ETOL TO 1001		ing to ETSI EN 3023	07-1
Signal Spectrum Mask:			ng to ETSI TS 1031			
Signal Spectrum Mask:		$\alpha = 0.35, 0.25, 0.2$	20, 0.15, 0.10, 0.05	according ETSI	EN 302307	

Demodulator Parameters:		AX-60 / AR-60				
Signal Inputs:		1x L-band input 950 2150 MHz				
	1x IF input 50 180 MHz (option IF)					
	IF Input	L-band Input				
IF-Input Frequency:	50 180 MHz	950 2150 MHz				
IF-Input Characteristics:	Impedance:       50 Ω / 75 Ω switchab         Return Loss:       >18 dB         Input Power:       -60 dBm15 dBm         (total aggregate pow         IF-Connector:       BNC female 50 Ω	Return Loss: >13 dB Input Power: -70 dBm20 dBm				
Symbol Rate:	Max. Range: Step size:	100 ksps 75 Msps 1 sps				
DVB-S2X Demodulation / Decoding:	ModCods non-linear: (normal FEC frame)	QSPK         13/45, 9/20, 11/20           8PSK         23/36, 25/36, 13/18           16APSK         26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90           32APSK         32/45, 11/15, 7/9           64APSK         11/15, 7/9, 4/5, 5/6           128APSK         32/45, 3/4				
	ModCods non-linear: (short FEC frame) ModCods linear: (normal FEC frame)	QPSK         11/45, 4/15, 14/45, 7/15, 8/15, 32/45           8PSK         7/15, 8/15, 26/45, 32/45           16APSK         7/15, 8/15, 26/45, 3/5, 32/45           32APSK         2/3, 32/45           8PSK         5/9-L, 26/45-L           16APSK         1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L           32APSK         25/36-L           64APSK         29/45-L           256APSK         29/45, 2/3, 31/45, 11/15           all according to ETSI EN 302307-2				
DVB-S2 Demodulation / Decoding:	ModCods:	QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10				
	Inormal and short FEC frame;         8PSK         3/5, 2/3, 3/4, 5/6, 8/9, 9/10           except 9/10 short FEC frame only)         16APSK         2/3, 3/4, 4/5, 5/6, 8/9, 9/10           Demodulator auto detection:         Modulation- and FEC-type, pilots on/off are automatically					
	Physical Layer Scrambling:	Physical Layer Scrambling: N = 0 262141 all according to ETSI EN 302307-1				
Signal Spectrum Mask:	α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05 a					
Common Parameters:		AX-60 / AT-60 / AR-60				
Data Interfaces:	2x Ethernet RJ-45, 10/100/1000 Mbps	auto sensing				
	arbitrarily assignable for M&C and/or tra	affic operation				
Network Operation:	Layer 3 Bridge or Router for IPv4 and I 256 IP/subnet routes towards satellite	Pv6 packet transmission nt DVB-S2X and encapsulation settings				
Data Encapsulation:	Generic Stream Encapsulation (GSE) a Multiprotocol Encapsulation (MPE) acc	according ETSI TS 102606 ording to ETSI EN 301192				
IP Data Rate:	data rates/packet rates can vary in com	cessing, subject to prevailing modem limits bination with complex internal processing (i.e. traffic shaping)				
Traffic Shaper/QoS on BB level:	configurable baseband channel limits b guaranteed and limited bandwidth indiv					
Traffic Shaper/QoS on IP level:	(contact factory for options)					
Transport Stream Output:	1x RTP/UDP IP over Ethernet accordin					
OptiACM:	1x ISI selectable from multistream carri CCM / VCM / ACM functionality for poin 64 ACM channels with separate MODC	nt-to-point and point-to-multipoint links				
Predistortion:	(contact factory for options)	<b>y</b>				
Monitoring and Control:	Protocol: SNMP Connection: UDP/IP ove Protocol: HTTP (web	er Ethernet/RJ-45 or in-band via satellite link browser interface) r Ethernet/RJ-45 or in-band via satellite link				
Internal Fan	FAN included					
Temperature Range:	0°C 50°C operating or -30°C 60 -30°C 80°C storage	°C operating (option EXT)				
Relative Humidity:	< 95% non condensing					
User Interface:	LCD-Display 2 x 40 characters, 4 curso VFD-Display 2 x 40 characters, 4 curso	or keys, 2/4 function keys (option EXT)				
Mains Power Input:	100 240 V AC nominal, 90 264 V	AC max, 50 60 Hz				
Mains Power Consumption:	Typ.: 65 VA / 45 W					
Mains Power Input Connector:	IEC C14					
Mains Fuse: Dimension and Weight:	2 x 3.15 A time-lag fuse 483 x 44 x 505 mm <sup>3</sup> (WxHxD), 1 RU (1	Q")				

Specifications are subject to change

#### **Order Information:**

AX-60	IP Modem
AT-60	IP Modulator
AR-60	IP Demodulator

#### Hardware options:

IF50	additional 50 $\Omega$ IF output and 50 $\Omega/75$ $\Omega$ switchable IF input
IF75	additional 75 $\Omega$ IF output and 50 $\Omega/75$ $\Omega$ switchable IF input
RT	support for external 10 MHz reference and time stamp synchronization for output data
EXT	extended operating temperature range of -30°C +60°C

Hardware options may only be available for certain device types and are not field-upgradable. Please contact factory with specific requests.

#### License based options:

License based options are field-upgradable by a license file.

TXDxxx	transmis	sion data rate limit / applicable to AX-60 and AT-60 devices
TXE	D10	max 10 Mbps throughput towards satellite
TXE	030	max 30 Mbps throughput towards satellite
TXE	D100	max 100 Mbps throughput towards satellite
TXE	D160	max 160 Mbps throughput towards satellite
TXE	Omax	max throughput according to specification
TXSxxx	transmis	sion symbol rate limit / applicable to AX-60 and AT-60 devices
TXS	S15	max 15 Msps Tx carrier
TXS	S30	max 30 Msps Tx carrier
TXS	645	max 45 Msps Tx carrier
TXS	60	max 60 Msps Tx carrier
TXS	Smax	max Tx carrier according to specification
Either a syn	nbol rate or a	a data rate based license has to be selected. License model can be changed in field.

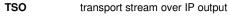
RXDxxx reception data rate limit / applicable to AX-60 and AR-60 devices

	RXD10	max 10 Mbps throughput from satellite
	RXD30	max 30 Mbps throughput from satellite
	RXD100	max 100 Mbps throughput from satellite
	RXD160	max 160 Mbps throughput from satellite
	RXDmax	max throughput according to specification
RXSxxx	reception	symbol rate limit / applicable to AX-60 and AR-60 devices
	RXS15	max 15 Msps Rx carrier
	RXS30	max 30 Msps Rx carrier
	RXS45	max 45 Msps Rx carrier

- RXS60 max 60 Msps Rx carrier
- RXSmax max Rx carrier according to specification

Either a symbol rate or a data rate based license has to be selected. License model can be changed in field.

BBO	baseband frame output interface over IP
BBI	baseband frame input interface over IP
TCO	transport stream sucr ID sutput







70/140 MHz IF Output L-band Output



Fully compliant with DVB standards, the DVB Satellite Broadcast Modulator supports a wide range of DTH broadcast, video contribution, and distribution applications over satellite.

Through an advanced feature set, the broadcast modulator helps operators get the most out of expensive satellite bandwidth, optimize data transport, and considerably improve satellite signal quality.

Innovative features include Carrier ID, DVB-S2 multistream, TSoIP, and wideband (up to 80 Mbaud). In addition, the DVB Satellite Broadcast Modulator platform supports next-generation DVB-S2X, providing operators with a future-proof solution.

# MPEG transport stream input – L-band or IF output

The modulator accepts MPEG transport streams on ASI, SPI, or TS over IP inputs from a video encoder or MPEG multiplexer and provides a DVB-S, DVB-S2 or DVB-S2X modulated carrier output between 50 to 180 MHz or L-band. Additionally a baseband frame input is available for VCM and ACM modes in combination with external multiplexers and encapsulators.

#### **High signal integrity**

Low spurious emissions make the modulator perfect for use in environments with demanding requirements, like high-power video uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

#### VideoACM

An integrated VideoACM controller provides adaptive or variable FEC and modulation setting for point-to-

point or point-to-multipoint Transport Stream transmissions.

#### Predistortion

Broadcast Predistortion and Extended Predistortion – operating in the background during regular transmission – mitigates the negative effects in the filters and amplifiers of satellites by automatically compensating for linear and non linear distortions. Subsequently the satellite link can be operated with less back off/higher power and a higher signal-tonoise ratio increases beam coverage ensuring higher throughput and availability for the satellite operator.

#### Flexibility, backward compatibility

Mode adaptation, FEC encoding, and modulation is compliant with the DVB-S2/S2X standard ETSI EN 302307. QPSK, 8PSK, 16APSK, 32APSK and 64APSK modulation is available. For backward compatibility, the modulator also supports BPSK, QPSK, 8PSK, 16QAM modulation according to the DVB-S standards ETSI EN 300421 and 301210. Using the modulator, carriers with very low symbol rates (e.g. 8 ksps) up to 80 Msps can be transmitted.

# Operating and control – easy integration into your system

The modulator can be operated via 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 addressable, packet-based commands are used. Remote monitoring and control through SNMP, and a Web browser interface is available.

#### **Specials and OEM Products**

WORK Microwave can customize any product to meet an operator's exact specifications.

#### **Key features**

- DVB-S2X ETSI EN 302 307-2 DVB-S2 - ETSI EN 302 307-1 DVB-DSNG - ETSI EN 301 210 DVB-S - ETSI EN 300 421
- DVB-S2X modulations: QPSK / 8PSK / 16APSK / 32APSK / 64APSK / 128 APSK / 256APSK normal, short and linear
- DVB-S2 modulations: QPSK / 8PSK / 16APSK / 32APSK normal, short
- DVB-S and DVB-DSNG: QPSK / 8PSK / 16QAM modulation
- DVB Carrier ID ETSI TS 103 129
- Broadcast Predistortion including automatic group delay and dynamic constellation predistortion for QPSK and 8PSK (option XB)
- Extended Predistortion including automatic group delay and static constellation predistortion up to 32APSK (option XE)
- Optional BISS-E encryption, supports multi program transport stream
- Physical layer framing with scrambling codes 0 to 262141 according to DVB-S2 standard
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Adjustable digital slope equalizer
- Low spurious output
- An output signal multiplexer integrated within the L-band version allows to combine the modulated signal, the 10 MHz reference signal and DC power (option DC24 or DC48) to drive an external power block upconverter
- Dual ASI interfaces with automatic cable equalizer and auto-switchover
- DVB-S2 Multistream support with capacity management with two input streams supported. Optional a hex ASI interface is available, including 3x2 auto redundancy switchover (option MT6)

- Transport Stream over IP inputs (option TI1, TI2)
- VideoACM support
- Baseband frame input for VCM operation and connection to external encapsulators etc.
- Null packet insertion and deletion with PCR correction
- Still picture playout; customized picture content can be loaded to the modulator unit
- Symbol rates from 8 ksps to 80 Msps
- Data rate max 213 Mbps per ASI Interface
- Data rate max 356 Mbps with SPI Interface
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP with MIBs downloadable from the device
- Summary alarm output with dual change over switch contacts
- Transmit mute input
- 10 MHz Reference OCXO included
- L-band Monitor Output
- Extended operating temperature range option -30 °C to 60 °C (-22 °F to 140 °F)
- CE compliant
- 3 years warranty

#### Open questions, demo units

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

Indoor Unit

Modulator Type:	HDM2-Vx / SDM2-Vx	HDM2-Lx / SDM2-Lx	HDM2-Vx/Lx / SDM2-Vx/Lx
IF-Output Frequency:	50 180 MHz	950 2150 MHz	50 180 MHz and 950 2150 MHz
			(2 outputs, can be alternatively enabled
Frequency Resolution:		1 Hz	
Phase Noise: 10 Hz	-70	-65	
100 Hz	-80	-75	see HDM2-Vx and HDM2-Lx
1 kHz	-88	-88	
10 kHz	-90	-90	
100 kHz	-100	-100	
1 MHz	-115	-115	
1 101112	-115	max. values in dBc/Hz	-
F-Output Characteristics:	Impedance:	$50 \Omega \text{ or } 75 \Omega \text{ (VHF-band out}$	
-output onaracteristics.	impedance.	$50 \Omega$ or $75 \Omega$ (L-band output	
	Return Loss:		)
		>20 dB typ > 18 dB min	
	Output Power:	-25 dBm 5 dBm, 0.1 dB st	
		-30 dBm 0 dBm, 0.1 dB st	eps (L-band output)
	Accuracy:	± 0.5 dB	
	Stability:	± 0.5 dB	
	Output Power muted:	<-85 dBm	
	Connector:	BNC female (V-Band output)	
		N female (L-band output 50	
	DC supply over L-band output:	F female (L-band output 75 9	
	10 MHz reference over L-band output:		A, switchable (option DC24 or DC48)
		1.5 ±1.5 dBm, switchable	
Monitoring Output	Output Power:	-20 dB of IF Output	on SDM2-Vx / HDM2-Vx and
(on front panel):			HDM2-Vx-Lx / SDM2-Vx-Lx
		-20 dB of L-band Output	on SDM2-Lx / HDM2-Lx and
	Impedance:	50 Ω	
	Return Loss:	>20 dB	
	Connector:	SMA female	
L-band Monitoring:	Output Frequency:	1.4 GHz	available only on HDM2-Vx / SDM2-Vx
(on rear panel):	Output Power:	-45 dBm approx	and
	Impedance:	75 Ω	HDM2-Vx-Lx / SDM2-Vx-Lx
	Return Loss:	>15 dB	
	Connector:	BNC female	
Spurious Outputs:	Signal related:	<-67 dBc (unmodulated ca	rrier, in band)
		<-45 dBc (unmodulated ca	rrier harmonics, out of band)
Frequency Stability:	±2 x 10 <sup>-8</sup> (-30°C 60°C, after warm up	), aging: ±1 x 10 <sup>-9</sup> per day, ±1 x	10 <sup>-7</sup> per year
Symbol Rate:	Max Range:	8 ksps 80 Msps	
-	Step size:	1 sps	
Clock Stability:	±2 x 10 <sup>-8</sup> (-30°C 60°C, after warm up	), aging: ±1 x 10 <sup>-9</sup> per day, ±1 x	10 <sup>-7</sup> per year
Data Rate:	3 kbps 356 Mbps (SPI interface) *)		
	3 kbps 213 Mbps (ASI interface) *)		
			*) max 170 Mbps, when BISS-1/E active
		ace)*)	
Modulation / Encoding	10 kbps 213 Mbps (TS over IP interfa		
	10 kbps 213 Mbps (TS over IP interfa ModCods:	QSPK 13/45, 9/2	20, 11/20
	10 kbps 213 Mbps (TS over IP interfa	QSPK 13/45, 9/2 8PSK 23/36, 25/	20, 11/20 /36, 13/18
	10 kbps 213 Mbps (TS over IP interfa ModCods:	QSPK 13/45, 9/2 8PSK 23/36, 25/ 16APSK 26/45, 3/5	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90
	10 kbps 213 Mbps (TS over IP interfa ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25/           16APSK         26/45, 3/5           32APSK         32/45, 11/	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9
	10 kbps 213 Mbps (TS over IP interfa ModCods:	QSPK 13/45, 9/2 8PSK 23/36, 25. 16APSK 26/45, 3/5 32APSK 32/45, 11, 64APSK 11/15, 7/9	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9
	10 kbps 213 Mbps (TS over IP interfa ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame)	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4	20, 11/20 /36, 13/18 , 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25/           16APSK         26/45, 3/5           32APSK         32/45, 11/           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame)	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 0, 4/5, 5/6 L 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 4, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           36APSK         2/45, 3/4           QPSK         7/15, 8/15           32APSK         2/3, 32/45	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         7/15, 8/15           32APSK         2/4, 3/4	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 9, 4/5, 5/6 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame)	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         2/3, 32/45           8PSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear:	QSPK         13/45, 9/2           8PSK         23/36, 25           16APSK         26/45, 3/5           32APSK         32/45, 11           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         3/245, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/3, 32/45	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 9, 4/5, 5/6 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear:	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 4, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/2, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         32/45-L	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L
	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           64APSK         32/45-L           32APSK         29/45-L, 2/           all according to ETSI EN 3/3	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (normal FEC frame)	QSPK         13/45, 9/2           8PSK         23/36, 25           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         3/4, 7/9           328PSK         7/15, 8/15           16APSK         7/15, 8/15           32APSK         2/45, 3/4           0PSK         11/45, 4/1           32APSK         2/9, 3/2/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           31 according to ETSI EN 33           (devices with option MT6 limite	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 1/15, 7/9 9, 4/5, 5/6 4 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 3/5, 32/45 6 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK)
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (normal FEC frame) ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11.           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         1/15, 8/15           16APSK         21/45, 3/4           QPSK         1/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limite           QPSK         1/4, 1/3, 2	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 4, 1/45, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 3/5, 32/45 5, 26/45, 3/5, 3/5, 3/45 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (normal FEC frame) ModCods: (normal and short FEC frame;	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/9, 2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 3(           (devices with option MT6 limitle           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) (25, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 6/4, 5/6, 8/9, 9/10
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (normal FEC frame) ModCods:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/9, 2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 3(           (devices with option MT6 limitle           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 4, 15, 7/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 3/5, 3/45 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 dto 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (normal FEC frame) ModCods: (normal and short FEC frame;	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         22/36-L           64APSK         32/45-L           256APSK         29/45-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 3/6           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3/4, 4	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) (25, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 6/4, 5/6, 8/9, 9/10
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfa ModCods: (normal FEC frame) ModCods: (short FEC frame) ModCods linear: (normal FEC frame) ModCods: (normal and short FEC frame;	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         22/36-L           64APSK         32/45-L           256APSK         29/45-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 3/6           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3/4, 4	20, 11/20 /36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 //5, 5/6, 8/9, 9/10
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfate         ModCods:         (normal FEC frame)         ModCods linear:         (normal FEC frame)         ModCods linear:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal and short FEC frame;         except 9/10 short FEC frame only)         Pilots Insertion:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         2/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         2/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/2, 2/3, 3/4, 4           32APSK         2/3, 3/4, 4	20, 11/20 /36, 13/18 ;, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 /15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 //4, 5/6, 8/9, 9/10 //5, 5/6, 8/9, 9/10
DVB-S2X:	10 kbps 213 Mbps (TS over IP interfation         ModCods:         (normal FEC frame)         ModCods:         (short FEC frame)         ModCods linear:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal FEC frame)	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         21/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/12, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         29/45-L, 2           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32APSK         3/4, 4/5, 5           on / off         N = 0 262141	20, 11/20 (36, 13/18 (5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 ), 4/5, 5/6 (15, 14/45, 7/15, 8/15, 32/45 ), 26/45, 32/45 ), 26/45, 3/5, 32/45 ), 26/45, 3/5, 32/45 ), 26/45, 3/5, 3/2, 4/5 ), 26/45, 3/5, 1/2, 3/5, 1/2, 3/5 (45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 3/4, 5/6, 8/9, 9/10 3/5, 5/6, 8/9, 9/10 3/6, 8/9, 9/10
DVB-S2X: Modulation / Encoding DVB-S2:	10 kbps 213 Mbps (TS over IP interfate         ModCods:         (normal FEC frame)         ModCods linear:         (normal FEC frame)         ModCods linear:         (normal FEC frame)         ModCods:         (short FEC frame)         ModCods:         (normal FEC frame)         Pilots Insertion:         Physical Layer Scrambling:         :	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 3(           (devices with option MT6 limitle           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32APSK         3/4, 4/5, 5           on / off         N = 0 262141	20, 11/20 (36, 13/18 (5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 ), 4/5, 5/6 (15, 14/45, 7/15, 8/15, 32/45 ), 26/45, 32/45 ), 26/45, 3/5, 32/45 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 1/2, 3/5, 1/2, 3/245 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 3/2, 3/245 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 ), 4, 5/6, 8/9, 9/10 )/5, 5/6, 8/9, 9/10 )/6, 8/9, 9/10
Modulation / Encoding DVB-S2X: Modulation / Encoding DVB-S2: Modulation / Encoding	10 kbps 213 Mbps (TS over IP interfate         ModCods: (normal FEC frame)         ModCods: (short FEC frame)         ModCods linear: (normal FEC frame)         ModCods: (normal And short FEC frame; except 9/10 short FEC frame; except 9/10 short FEC frame only)         Pilots Insertion: Physical Layer Scrambling: :         Outer Reed Solomon Coding:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/3/45-L           256APSK         29/45-L, 26/           16APSK         1/2-L, 8/1           32APSK         32/45-L           256APSK         29/45-L, 26/           all according to ETSI EN 3(           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           3PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32APSK         3/4, 4/5, 5           on / off         N = 0 262141           all according to ETSI EN 3(	20, 11/20 (36, 13/18 (5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 ), 4/5, 5/6 (15, 14/45, 7/15, 8/15, 32/45 ), 26/45, 32/45 ), 26/45, 3/5, 32/45 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 1/2, 3/5, 1/2, 3/245 ), 26/45, 3/5, 3/245 ), 26/45, 3/5, 3/2, 3/4, 5/6, 8/9, 9/10 ), 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 )/4, 5/6, 8/9, 9/10 )/5, 5/6, 8/9, 9/10 )/6, 8/9, 9/10
DVB-S2X: Modulation / Encoding DVB-S2:	10 kbps 213 Mbps (TS over IP interfate         ModCods:         (normal FEC frame)         ModCods:         (short FEC frame)         ModCods linear:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal FEC frame)         Pilots Insertion:         Physical Layer Scrambling:         :         Outer Reed Solomon Coding:         Convolutional Interleaving:	QSPK         13/45, 9/2           8PSK         23/36, 25,           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         3/245, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           16APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         2/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           8PSK         3/245-L           26APSK         29/45-L, 5           all according to ETSI EN 30           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32APSK         3/4, 4/5, 5           on / off         N = 0 262141           all according to ETSI EN 30           188/204, T=8           Depth I = 12	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 15, 7/9 9, 4/5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 3/2, 4/5 5, 26/45, 3/5, 3/2, 4/5 5, 26/45, 3/5, 3/2, 3/4 45-L 5-L, 5/9-L, 3/5-L, 2/3-L 2/3-L, 31/45-L, 11/15-L 02307-2 d to 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 1/5, 5/6, 8/9, 9/10 1/5, 5/6, 8/9, 9/10 02307-1
DVB-S2X: Modulation / Encoding DVB-S2: Modulation / Encoding	10 kbps 213 Mbps (TS over IP interfate         ModCods: (normal FEC frame)         ModCods: (short FEC frame)         ModCods linear: (normal FEC frame)         ModCods: (normal And short FEC frame; except 9/10 short FEC frame; except 9/10 short FEC frame only)         Pilots Insertion: Physical Layer Scrambling: :         Outer Reed Solomon Coding:	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11.           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         25/36-L           64APSK         32/45-L           256APSK         29/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/4, 4/5, 5           on / off         3/4, 4/5, 5           N = 0 262141         all according to ETSI EN 30           188/204, T=8         Depth 1 = 12           BPSK or QPSK 1/2, 2/3, 3	20, 11/20 (36, 13/18 5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 4, 5, 5/6 4 5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 3/2, 3/2, 4/5 5, 26/45, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 2/3-L, 31/45-L, 11/15-L 0/2307-2 d to 32APSK) 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 3/4, 5/6, 8/9, 9/10 3/6, 8/9, 9/10 0/2307-1 4, 5/6, 6/7, 7/8 (Convolutional K=7)
Modulation / Encoding DVB-S2: Modulation / Encoding	10 kbps 213 Mbps (TS over IP interfate         ModCods:         (normal FEC frame)         ModCods:         (short FEC frame)         ModCods linear:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal FEC frame)         Pilots Insertion:         Physical Layer Scrambling:         :         Outer Reed Solomon Coding:         Convolutional Interleaving:	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 7/9           256APSK         32/45, 3/4           QPSK         11/15, 8/15           16APSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         5/9-L, 26/           16APSK         1/2-L, 8/1           32APSK         29/45-L, 26           16APSK         1/2-L, 8/1           32APSK         29/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limite           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32APSK         3/4, 4/5, 5           on / off         N = 0 262141           all according to ETSI EN 30           188/204, T=8           Depth I =12           BPSK or QPSK 1/2, 2/3, 3/3<	20, 11/20 (36, 13/18 (5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 ), 4/5, 5/6 (5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 1/2, 3/5, 1/2, 3/245 5, 2/3, 1/45-L, 11/15-L 02307-2 4/5, 5/6, 8/9, 9/10 (75, 5/6, 8/9, 9/10) (75, 5/6, 8/9, 9/10 (75, 5/6, 8/9, 9/10) (75, 5
Modulation / Encoding DVB-S2: Modulation / Encoding DVB-S / DVB-DSNG:	10 kbps 213 Mbps (TS over IP interfate         ModCods: (normal FEC frame)         ModCods: (short FEC frame)         ModCods linear: (normal FEC frame)         ModCods: (normal and short FEC frame; except 9/10 short FEC frame; except 9/10 short FEC frame only)         Pilots Insertion: Physical Layer Scrambling: :         Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/2, 3/45           8PSK         2/3, 32/45           8PSK         2/3, 32/45           8PSK         2/3, 32/45           8PSK         3/2, 32/45           256APSK         2/45-L, 26           16APSK         2/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limitle           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32	20, 11/20 (36, 13/18 (5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 ), 4/5, 5/6 (5, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 3/245 5, 26/45, 3/5, 1/2, 3/5, 1/2, 3/245 5, 2/3, 1/45-L, 11/15-L 02307-2 4/5, 5/6, 8/9, 9/10 (75, 5/6, 8/9, 9/10) (75, 5/6, 8/9, 9/10 (75, 5/6, 8/9, 9/10) (75, 5
Modulation / Encoding DVB-S2: Modulation / Encoding	10 kbps 213 Mbps (TS over IP interfate         ModCods:         (normal FEC frame)         ModCods:         (short FEC frame)         ModCods linear:         (normal FEC frame)         ModCods:         (normal FEC frame)         ModCods:         (normal FEC frame)         Pilots Insertion:         Physical Layer Scrambling:         :         Outer Reed Solomon Coding:         Convolutional Interleaving:	QSPK         13/45, 9/2           8PSK         23/36, 25.           16APSK         26/45, 3/5           32APSK         32/45, 11,           64APSK         11/15, 7/9           128APSK         3/4, 7/9           256APSK         32/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/45, 3/4           QPSK         11/45, 4/1           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/15, 8/15           32APSK         2/3, 32/45           8PSK         7/2, 3/45           8PSK         2/3, 32/45           8PSK         2/3, 32/45           8PSK         2/3, 32/45           8PSK         3/2, 32/45           256APSK         2/45-L, 26           16APSK         2/45-L, 2           all according to ETSI EN 30           (devices with option MT6 limitle           QPSK         1/4, 1/3, 2           8PSK         3/5, 2/3, 3           16APSK         2/3, 3/4, 4           32	20, 11/20 (36, 13/18 (5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 (15, 7/9 ), 4/5, 5/6 (15, 14/45, 7/15, 8/15, 32/45 5, 26/45, 32/45 5, 26/45, 3/5, 32/45 5, 26/45, 3/5, 3/2, 3/2, 4/5 5, 26/45, 3/5, 3/2, 3/2, 4/5 5, 26/45, 3/5, 3/2, 3/2, 4/5 5, 26/45, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (7, 5, 5/6, 8/9, 9/10 (7, 7/8 (Convolutional K=7) atic Trellis)

Indoor Unit

Transport Stream Inputs:         DVB-SPI (DSUB25 female) and Dual DVP-ASI electrical (2 x Connector BNC female, impedance 75 0, cable EQ) and be witching selectrical electrical internation (2.1) and be accessed and be witching selectrical electrical elec	Signal Spectrum Mask:	<i>α</i> = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05
support of Z TS multiple input strains (except with option B)         Aperately with option ME & DMS electrical infracts (is X connector RNC female, Impediance 75.0, cable EQ)           3 pairs of auto and/ching inputs or 6 individual inputs for multiple transport Streams, paper         Approximation of X Connector RNC female, Impediance 75.0, cable EQ)           3 pairs of auto and/ching inputs or 6 individual inputs for multiple transport Streams, paper         Approximation of X Connector RNC female, Impediance 75.0, cable EQ)           Multiple Transport Streams:         Comparity Connector RNC female with option MTE, external bridging for all other versions.           Baseband Frame Input:         Through DVB ASI inputs or DVB-SPI input afternally bridged with option MTE, external bridging for all other versions.           Transport Stream Security         Through DVB ASI inputs or DVB-SPI input afternal version per TS INN 302307-1, Annex L2 input security and ISIS MS Connector on RSCE Stand MCM in and ESIM MACM in and ESIM MCM in and	Transport Stream Inputs:	DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 Ω, cable EQ)
Alternatively with option NTC, 6: DVB ASI electrical interfaces (a x Connector ENC Const, Impedance 75.0; cable EQ).           Spars of alux auching inputs of individual and interfaces (a x Connector ENC Inset).           Multiple Transport Streams.           Individual modulation and FEC (MoDCOD) configuration per TS input Capacity auclutator/immainton per TS input can be activated other versions.           Baseband Frame Input:           Transport Streams.           Individual modulation and FEC (MoDCOD) configuration per TS input Capacity auclutator/immainton per TS input can be activated other versions.           Baseband Frame Input:           Transport Stream Security           Option of VCMACM in transport streams in SIGS Mode 0, 1 and E BisS Mode 0:           Support aligned available as U. TSO Support stream is accombined using 12 Annex L2           Dimong TUPS ACC Sciences           View Control signal available as U. TSO Support stream is accombined using 12 Annex Capacity accurate the transport stream is accombined using 12 Annex Capacity accurate the transport and transport stream is accombined using 12 Annex Capacity accurate the transport accurate t		
3 pairs of auto switching impute or 6 individual imputs for multiple transport stream support.         Additionally with option T1 of 712 by to be individual imputs for multiple Connector RJ-45, 1001 7001 Rpgs, auto sensing). Pk4, UDP rapport. PEC according SMPT Exact Connector RJ-45, 1001 7001 Rpgs, auto sensing). They apport. PEC according SMPT Exact Connector RJ-45, 1001 7001 Rpgs, auto sensing). They apport. PEC according SMPT Exact Connector RJ-45, 1001 7001 Rpgs, auto sensing). Connector RJ-45, 1001 7001 Rpgs, auto sensing). Connector RJ-45, 1001 7001 Rpgs, auto sensing. They are according SMPT Exact Connector RJ-45, 1001 7001 Rpgs, auto sensing). Connector RJ-45, 1001 7001 Rpgs, auto sensing. They are according SMPT Exact Connector RJ-45, 1001 7001 Rpgs, and sensing according to FISI EXA 92207. J. Annex 12           Baseband Frame Input:         Support of VCMAC Mi hard alignating according to FISI EXA 92207. J. Annex 12           Flow control signal available as LVDS. Output signal on DVB-SPI connector or RS222 Signal on DVB-SPI connector (Digtan BRF).           Biss Mode 1:         MPEC transport stream is combined using a sensition word which indiver form a 16 hexadecimal-character Core Proceed untouched Biss Mode 1:           Biss Mode 1:         MPEC transport stream is combined using a sensition word which indiver form a 16 hexadecimal-character Ingeled Max input for Color Session Word and 14-hexadecimal-character Ingeled Max in the form for Color Session Word and 14-hexadecimal-character Ingeled Max: input for Color Session Word and Encrypted Session Word: 100 FPR AME insertion (WPS S2 or Dummy PLFRAME insertion (WPS S2 or Dummy PL		
Additionally with option T1 io T12 up to two individual Transport Steam over IP Inputs (Connector R1-45, 1001000 Mkp, auto estaing), IVA-UDP and TPL support, FEG according SMPTE 2022 (z.g. atter toterance 1500 ms. Conversion T5 over IP to ASI, Internally bridged with option MTE, external bridging for all Individual motion and FEG (MDCODD) configuration per T5 input Capacity calculator/imitation per T5 input cancer and build Packet defined naccording to T51 EN 302307-1, Annex D.2, D.3.           Baseband Frame Input:         Through DVB ASI inputs or DVB-SPI input afternatively to Transport Stream input, configurable Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support of VCAACM in tand segminal according to T51 EN 302307-1, Annex L2 Support Stream Frames Steac           Transport Stream Frame Steac         Through T2 Annoxida according to T51 EN 302307-1, Annex L2 Support and the Calcer Steam Steam in tansfer duralization for the activation for the activation for the activation for the activation for the actin termane tacording to T2 Annex Annex Annex Annex Annex Annex A		
100/1000 Mbps, auto sensing). IP-4, UDP and RTP support, FEC according SMPT 2023 12, differ tolerance 1S00 ms, Conversion T3 over 1P to SAD, internal bridging dwth option MTE, external bridging for all other versions.           Multiple Transport Streams:         Company Construction and FEC (MODCOD) configuration per TS input Company Links and the sensitivity of transport streams imput. Configuration and Mul. Packet deletion according to ETSI EN 302307-1, Annex J. 2, 0.3. Through DVB AS Inputs and VDMAP by Transport Stream Imput. Configurable Support of VCMAPCM in hard signaling according to ETSI EN 302307-1, Annex J. 2, 0.3. (Volta Stream Stream Security Control Model on multip cognitivity of transport streams in Input. Configurable Support of VCMAPCM in hard signaling taccording to ETSI EN 302307-1, Annex J. 2, 0.3. (Volta Stream Stream Security Coption B):           Biss Mode 0:         Into agent DVB AS Promotecom Configurable Support and the security of the security stream is Institement unitod. The security of the security stream is institement unitod. The security of the security stream is the security of the security stream is the security of the security stream is a transmitter increated in the security of the security of the security stream is the security of the security of the security of the security stream is a transmitter increated in the security of t		
childiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/imitation per TS input can be activated introduced modulation and FEC (MODCOD) configuration per TS input Capacity calculator/imitation per TS input can be activated introduced modulation and signaling according to FTS EI 80 302307-1, Amery D.2, D.3.           Baseband Frame Input:         Through DVCMACM in band signaling according to FTS EI 80 302307-1, Amery D.2, D.3.           Transport Stream Security (Option BB):         BISS E Scambler, compilant to EBU Tech 322 rev. 2 BISS E Scambler, compilant to EBU Tech 322 rev. 2 BISS E Scambler, compilant to EBU Tech 322 rev. 2 BISS E Scambler, compilant to EBU Tech 322 rev. 2 BISS E Scambler, compilant to EBU Tech 322 rev. 2 BISS Mode 0:           Transport Stream Security (Option B):         BISS Mode 0:         MPEC transport stream is carabided using a session word witch is derived from a to E-boxadeomic haracter Encrypted Session Word and the Howadeomic-tharacter Clear Session Word BISS Mode 1:         MPEC transport stream is scrambide using a session word witch is derived from a to E-boxadeomic haracter Encrypted Session Word and to Howadeomic haracter injected BISS Mode 1:           Transport Stream Frames Size:         TS Mul packet or SA Mi Zero packet insertion (DVS-S, DVE-DSND, DVE-S2) or Dummy PLFRAME insertion (DVS-S2 DVD-DSND, VDE-S2) or Dummy PLFRAME insertion (DVS-S2 DVD-DSND, DVE-S2) or Dummy PLFRAME insertion (DVS-S2 DVD-S2) DVD-S2) DVD-S2 DVD-		
Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS Input           Baseband Frame Input:         Capacity calculation/initiation per SI input and backity by Tarinagout stream input, configurable           Frame Input:         Through DVSS PRI Input alternatively to Tarinagout stream input, configurable           Frame Input:         Through DVSS PRI Input alternatively to Tarinagout stream input, configurable           Frame Input:         Through DVSS PRI Input alternatively to Tarinagout stream input, configurable           Frame Input:         BISS SEes Cambler, compliant to EBU Eooh 329; rev. 2           Supports single or multi program transport streams in BISS Mode 0, 1 and E         BISS Mode 1:           BISS Mode 1:         Matter and transport streams is assession word which is deviced from a 16 hexadeoimal-character Encrypted Session Word and 14-hexadeoimal-character Injected I tearing           Matter Input alter for Clear Session Word and Encrypted Session Word and 14-hexadeoimal-character Injected I tearing:         The program to the Option BI Option BIC SIM Bole		
Capacity calculation/initiation per 15 input can be activated input stream synchronization and Will-Packet deliden according to ETSI ER 302207-1, Annex D.2, D.3.           Baseband Frame Input:         Through DVB-ASI inputs or DVB-SPI input atternatively to Transport stream in spice on offigurable or DVB SPI connector in DSize Signal on DVB-SPI connector or DSize Signal on DVB-SPI connector (Option BB):           Transport Stream Security (Option BI):         BISS E Generality and the DBU Tesh 222 rev 2 Supports single or null program transport stream is accumbed using a second which is defined from a BISS Mode 1:         MPEC transport stream is cannot be accumbed using a second which is defined from the BISS Mode 2:         MPEC transport stream is cannot be accumbed using a second which is defined from the BISS Mode 2:         MPEC transport stream is cannot be accumbed using a second which is defined from the BISS Mode 2:         MPEC transport stream is cannot be accumbed using a second which is defined from the BISS Mode 2:         MPEC transport stream is cannot be accumbed using a second which is defined from the Internation of the DC Cean Session Word and 1-throated connaction. Devices with option BI do not contain the otherwise included support for 2 input streams.           Transport Stream Frame Size:         186 or 204 bytes         To Null packet defined or SAIZ Second Se		
Input erisem synchronization and Null-Reacket dieletion according to ETSILEN 302207.1, Amer. D.2, D.3.           Baseband Frame Input:         Through TVS-RSI Inputs of TVS-PSI Plut alternatively to Transport Stream Input, configurable Support of VCMACM in band signaling according to ETSILEN 302207.1, Amer. D.2, D.3.           Transport Stream Security (Option Bi):         EDS Streambler, compliant to EBU Tech 322 rev. 2           Support signal or multip cognition transport stream is ISIS Mode 0, 1 and E BISS Mode 0:         Inscrement of the Stream Stream Stream Stream StreamBer during the Stream of which is derived from a the machine transport stream is crantber using a session word which is derived from a the machine transport Stream Stream Stream Stream Stream Stream Stream Stream Stream Character Theoretical Stream (Control BISS Mode 0:         Inscreamber Character Stream Stream Stream Stream Stream Stream Stream Stream Stream Character Stream Character Theoret Stream Transport Stream Str	Multiple Transport Streams:	
Baseband Frame Input:         Through DVB-ASI inputs or DVB-SPI input atternatively to Transport stream input, configurable Support of VCMACM in head Signaling according to ETSI ESI 823203(-1, Annes 12 Prove control signal available as LVDS Chupt signal on DVB-SPI connector of R5232 Signal on DVB-SPI connector (Option BI):           Transport Stream Security (Option BI):         Exist Mode 0.1 and E           Bits Mode 0.1 and E         Bits Mode 0.1 and E           Bits Mode 0.1 and E         Bits Mode 0.1 and E           Bits Mode 0.1 and E         Bits Mode 0.1 and E           Bits Mode 1.1         MPEG transport stream is scrambde using a session word with evel from a 16-headdomat-character Encrypted Session Word and 1-headdomat-character Injected           Max. Input rate for Clasr Session Word and 1-headdomat-character Injected         Thin per 5 minutes - 1 time per 1 soconds           Transport Stream Frame Size:         TS Nul packet or TS All Zen packet insertion CVB-S, DVB-SDNG, DVB-S2) or Durmy PLFRAME insertion (DVB-S2 orby), when the data rate to transmit is higher than the data rate at the data input. Null packet to TS All Zen packet insertion CVB-S2, DVB-DSNG, DVB-S2) or Durmy PLFRAME insertion (DVB-S2 orby), when the data rate to transmit is higher than the data rate at the data input.           Still Picture Playout:         TS standards calculate or TA All Zen packet insertion CVB-S2. DVB-DSNG, DVB-S2) or Durmy PLFRAME insertion (DVB-S2 orby), when the data rate to transmit is higher than the data rate at the data input.           Still Picture Playout:         TS Null packet to TS All Zen DE         TS Null packet to TS All Zen DE </td <td></td> <td></td>		
Support of VCM/ACM in bard signaling according to ETS IN 352007-1, Answ 12           Free control signal availables a UVDS Output Signal on DVB-SPI connector or R5232 Signal on DVB-SPI connector (Option BB):           BISS E Scambler, compliant to EBU Tech 3322 rev. 2           BISS Mode D:         BISS Mode D:           BISS Bio D:         BISS Mode D:           BISS Mode D:         MPEG transport stream is transferred nucleuched           BISS Mode D:         MPEG transport stream is scambled using a session word which is derived from a 16-braxdecimal-character Encypted Session Word and 14-braxadecimal-character Injected identifier.           Max. Input rate for Class Station Word and Encrypted Session Word and 14-braxadecimal-character Injected identifier.           Transport Stream Frames Size:         188 or 204 bytes           Packet Stuffing:         188 or 204 bytes           Statu pact or to Sati Zaro packet insertion (DVB-S2 DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 DVB), which defend on a the enablet or smore incoming nucl packet.           Still Picture Playout:         As standard a color bus pattern is transmitted with main profile at main teads (MMMI), MPEG-2 encoding, 4:3 aspect rate, 2:5 Histor and the color bus pattern is transmitted with main profile at main teads.           Still Picture Playout:         As standard a color DVB-S2 multiple input stream operation.           As standard a color bus pattern is transmitted with main profile at main teads.           Broadcast Predistortion (Option XE):           <	Baseband Frame Input:	
Icplina BBR)         Ich         Ich<		
Transport Stream Security (Option B):         BisSE E Scrambler, compliant to EBU Tech 3292 rev. 2           Supports single or mult program transport streams in BISS Mode 0, 1 and E BISS Mode 0:         mo scrambling, MPEG transport stream is carabled using a session word which is derived from a list Mode 0:           BISS Mode 0:         MPEG transport stream is scrambled using a session word which is derived from a list market fragment Session Word and Encrypted Session Word and 14 hexadecimal-character lingeted BISS Mode 0:           Transport Stream Frames Size:         10 times per 5 minutes - 1 time per 10 seconds           Transport Stream Frames Size:         To Null packet or TS All Zero packet insertion (DVB-S, DVB-SQ) or Dummy PLFRAME insertion (DVB-S2 only, When the data rate to transmit is higher than the data rate at the data input. Null packet deletion can be enabled to remove incoming null packets. PCR (program clock reference) correction (WHN Null packet insertion (DVB-S2 or Dummy PLFRAME insertion (DVB-S2 only, When the data rate to transmit is higher intol word and an annull single transmit shigher intol included.           Still Picture Playout:         To Null packet or TS All Zero packet insertion (DVB-S2 OVB-DSMG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 only, When the data rate to can be enabled to remove incoming null packets. PCR (program clock reference) correction (WHN Null packet insertion/deletion) for max 250 PID streams with PCRs included.           Still Picture Playout:         That can be inserted		
(Option BI):         Supports single or multi program transport streams in BISS Mode 0, 1 and E           BISS Mode 0:         ms carambling, MPC transport stream is stransferred uniouched           BISS Mode 0:         ms carambling, MPC transport stream is stransferred uniouched           BISS Mode 0:         ms carambling, MPC transport stream is stransferred uniouched           BISS Mode 0:         ms carambling, MPC transport stream is a stransferred uniouched           BISS Mode 0:         ms carambling, MPC transport stream is a stransferred uniouched           BISS Mode 0:         ms carambling, MPC transport stream is carambled using 12-hexadecimal-character injected           How 11 and for Class Session Word and 14-hexadecimal-character injected         -10 times per 5 minutes           -11 times per 5 minutes         -10 times per 5 minutes           -188 or 200 bytes         Transport Stream Frames Size:         Tota stream prate included support for 2 input streams!           Packet Sturfing:         Doily when the data rate to transport stream operation.         Devices stream with PCRs           Not supported in case of DVB-S2 nulliple input stream operation.         Not supported in case of DVB-S2 nulliple input stream operation.           Still Picture Playout:         As standard a color bar partial is transport stream rate.         Tota stream rate.           Still Picture Playout:         As standard a color bar partial is transport stream rate.         Tota stream rate.		
BISS Mode 0:         no scrambing, MPEG transport stream is strambled using 12-hoxadecimal-character Clave Session Word BISS Mode 1::         MPEG transport stream is scrambled using a session word which is derived from a 10-hoxadecimal-character Clavepted Session Word and 14-hoxadecimal-character Clave Identifier           Max. Hop that for Clave Tession Word and Encrypted Session Word: 1 - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 time per 10 seconds         - 1 time per 10 seconds           - 1 Stull packet or TS All Zaro packet insertion (DVB-S, DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 only), when the data rate to transmitted vith main polite at main twell with Nuk packet insertion (DVB-S2 or DVB-S2 multiple into stream peraterion.           Still Picture Playout:         As standard a color bar pattern is transmitted with main polite at main twell with with setandards           Still		
BISS Mode 1:         MPEG transport stream is scambled using 12-beakedmell-character Clear Session Word BISS Mode 2:           MPEG transport stream is scambled using 12-beakedmell-character Injected lidentifier         Max. Input rate for Clear Session Word and 14-beakedmell-character Injected lidentifier           Max. Input rate for Clear Session Word and Encrypted Session Word:         - 10 time per to seconds           Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not contain the otherwise included support for 2 input streams!           Transport Stream Frames Size:         T8 Null packet or TS All Zaro packet insertion (DVB-S; DVB-DSNG, DVB-S2) or Dummy PLFRAME Insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at the data input. Null packet deletion can be enabled to remove incoming null packets.           PCR (program clock reference) correction (WH Null packet insertion (DVB-S2 included.           Null packet deletion can be enabled to remove incoming null packets.           PCR (program clock reference) correction (WH Null packet insertion (DVB-S2 included.           Not supported in case of DVB-S2 multiple input stream operation.           Compliant with Standards:         Externed rate. Indicade (support rates).           Extended Predistortion (Option XE):         As standard a color bar pattern is transmitted with main profile at main relevel (MPML) MPEG-2 encoding. 4:3 aspect rate, 2:4 frame rate, included.           Monitoring:         Faults, stored faults with line stamps.           Compliant with Standards:	(Орион в):	
BISS Mode E:         MPEG transport stream is scrambled using a session word which is derived from a 16-hexadedimic-haracter Encrypted Session Word and 14-hexadecimal-character injected Identifier           Max. Input rate for Clear Session Word and Encrypted Session Word:         - 10 times per 5 minutes           - 10 times per 5 minutes         - 10 times per 5 minutes           - 10 times per 5 minutes         - 10 times per 5 minutes           - 10 times per 5 minutes         - 10 times per 5 minutes           - 10 times per 5 minutes         - 10 times per 5 minutes           - 10 times per 5 minutes         - 10 times per 5 minutes           Packet Stuffing:         15 Null apacket or TS AII Zero packet insertion (DVB-S, DVB-DSNC, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 moly), when the data rate to transmit is higher than the data rate at the data linput. Null packet detelon can be enabled to remove incoming null packets. PCR (program clock reference) correction (with Null packet) insertion/detelon) for max 250 PID streams with PCRs included           Still Picture Playout:         - No 19 S2-27 multiple mult stream operation.           Not support and support processing can be enabled to remove incoming null packets.         - PCR (program clock reference) correction (with Null packet) insertion demodel submited remove incoming null procession.           Still Picture Playout:         - No 19 S2-27 multiple multi stream operation.           Notic stard a support processing can be enabled through outsomer field selectable firmware options.           An external windows PC is		
16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Udentifier         Max. input rate for Clear Session Word and Encrypted Session Word: - 10 times per 5 minutes - 11 times per 5		
Max. Input rate for Clear Session Word and Encrypted Session Word: - 10 times per 5 minutes - 10 times per 5 minutes - 10 times per 5 minutes - 11 times per 10 seconds Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not contain the otherwise included support for 2 input streams! Transport Stream Frames Size: To Skulf packt or TS AII Zero packet insertion (DVB-S); DVB-S); DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at the data input. Null packt deletion can be enabled to romove incoming null packets. PCR (program clock reference) correction (with Null packet insertion/eldetion) for max 250 PID streams with PCRs included a color bar pattern is transmitted with main prolife at main level (MPML) MPEG-2 encoding. 4.3 aspect ratid, 25 Hz farme rate, interfaced (suitable for FAL or SECAM). PCR (biotech films application program, which optimizes the prodision an alternative, customized still picture can traid, 25 Hz farme rate, interfaced (suitable for FAL or SECAM). PCR (biotech films application program, which optimizes the predision parameters in the background of live transmissions (if advised), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator. For all commection: UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45 Protocol: COPIP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45 Protocol: Connection: UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45 Protocol: Connection: UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45 Pro		
• 10 times per 5 minutes         • 1 time per 10 seconds         Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not contain the otherwise included support for 2 input streams!         Transport Stream Frames Size:         Packet Stuffing:         113 to 72 do bytes         114 to 74 do bytes         115 to		
- 1 time per 10 seconds     important note: Option BI operate exclusively with single stream operation. Devices with option BI do not contain the     otherwise included support for 2 input streams!     Transport Stream Frames Size:     188 or 204 bytes     Packet Stuffing:         T5 Null packet or T5 Nil Zero packet insertion (DVB-S, DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2         only), when the data rate to transmit is higher than the data rate at the data input.         Null packet deletion can be enabled to remove incoming null packets.         PCR (program clock reference) correction (with Null packet insertion (DVB-S2         only), when the data rate to transmit is higher than the data rate at the data input.         Null supported in case of DVB-S2 multiple input stream operation.         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect         ratio, 25 Hz frame rate, interfaced (suitable for PAL or SECAM), As option an atternative, customized still picture can         biology of ASI identification content, different streams the pattern is transmitted with main profile at main tere]         Moltary and content, different at the tage ratio, different frame rate).         Fordetast Predistortion (Option XE)         Borodcast Predistortion (Option XE)         biology of ASI identification program and the modulator. For all         communication between the reference demoduator, for and z-2 FITS TS 10312         EVENDES         Monitoring:         Fortocol:              SNMP         Connection:              UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:              SNMP         Connection:              UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:              UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:              CPIP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connecto		
Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not contain the otherwise included support for 2 input streams!           Transport Stream Frames Size:         188 of 264 bytes           Packet Stuffing:         75 Null packet or TS AII Zero packet insertion (DVB-S, DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 only, when the data rate to transmit in higher than the data rate at the data input.           Null packet of torgram clock reference) correction (with Null packets.         PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCBs included.           Still Picture Playout:         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect rate, 0.5 E H ratem rate, interfaced (sublable for PAL or SECAM). As option an alternative, customized still picture can be loaded different content, different aspect ratib, different frame rate).           Compliant with Standards:         ETSI IS N300421, ETSI EN 3032010, ETSI EN 3023010, ETSI EN 302301, ETSI EN 3023010,		
otherwise included support for 2 input streamsi           Transport Stream Frames Size:         188 or 204 bytes           Packet Stuffing:         TS Null packet or TS All Zero packet insertion (DVB-S; DVB-DSNC, DVB-S2) or Durmy PLFRAME Insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at that input. Null packet deletion can be enabled to remove incoming null packets. PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included.           Still Picture Playout:         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, 25 Hz frame rate, interfaced (subable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).           Compliant with Standards:         ETS IEN 300421; ETS IEN 303021; ETS IEN 30302; ETS IEN 30302; ETS IEN 30302; E		- Time per to seconds
otherwise included support for 2 input streamsi           Transport Stream Frames Size:         188 or 204 bytes           Packet Stuffing:         TS Null packet or TS All Zero packet insertion (DVB-S; DVB-DSNC, DVB-S2) or Durmy PLFRAME Insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at that input. Null packet deletion can be enabled to remove incoming null packets. PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included.           Still Picture Playout:         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, 25 Hz frame rate, interfaced (subable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).           Compliant with Standards:         ETS IEN 300421; ETS IEN 303021; ETS IEN 30302; ETS IEN 30302; ETS IEN 30302; E		Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not contain the
Packet Stuffing:         TS Null packet or TS AII Zero packet insertion (DVB-S). DVB-DSD, DVB-S2) or Dummy PLERAME Insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at the data input.           Stuff Packet Stuffing:         TS Null packet or telemenc) correction (with Null packet).           PCR (program clock reference) correction (with Null packet).         PCR (program clock reference) correction (with Null packet).           Stuff Picture Playout:         As standard a color bar pattern is transmitted with main profile and an anin level (MPML).           Compliant with Standards:         ETS IEN 300421. ETS IEN 303207.1 ard -2, ETS ITS 303207.1 and -2, ETS ITS 303207.1 ard -2, ETS ITS 303200.1 ard ard the modulator IP connectivity is used.           Monitoring and Control Interface:         Note insertion and transtres interpace and the		
only, when the data rate to transmit is higher than the data input.         Null packet deletion can be enabled to remove incoming null packets.           PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included.           Not supported in case of DVB-S2 multiple input stream operation.           Still Picture Playout:         As standard a color bar prattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, different frame rate).           Compliant with Standards:         ETS EN 300421, ETS EN 30210, ETS EN 302307-1 and -2, ETS ITS 103129           Extended Predistortion (Option XB)         Entraware and signal processing can be enabled through customer field selectable firmware options. An external windows PC is required to run the application program. Wich Optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. The application program and the modulator IP connectivity is used.           Monitoring:         Faults, storef datus with time stamps           Monitoring and Control Interface:         Onnection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint         Connection:         Multipoint           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint         Connector CPUP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45		
Null packet deletion can be enabled to remove incoming null packets.         PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included.           Not supported in case of DVB-S2 multiple input stream operation.         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding. 4:3 aspect ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).           Compliant with Standards:         ETSI EN 300421, ETSI EN 301210, ETSI EN 302307-1 and -2, ETSI TS 103129           Broadcast Predistortion (Option XE):         As standards:         ETSI EN 300421, ETSI EN 301210, ETSI EN 302307-1 and -2, ETSI TS 103129           Broadcast Predistortion (Option XE):         A external windows PC is required to run the application program, which optimizes the predistoriton parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.           Monitoring:         Faults, stored faults with time stamps           Monitoring and Control Interface:         NMIP           Alarm Interface:         Alarm: two potential free contacts (DPDT), Multipoint Connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Alarm	Packet Stuffing:	
PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included.           Not supported in case of DVB-S2 multiple input stream operation.           Still Picture Playout:           As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, 25 Hz frame rate, interfaced (suitable for PAL or SEC/AM). As option an alternative, customized still picture can be loaded (different aspect ratio).           Compliant with Standards:         ETSI EN 300421, ETSI EN 301210, ETSI EN 302307-1 and -2, ETSI TS 103122 EN 50083-9 (ASI electrical, SPI Interface)           Broadcast Predistortion (Option XE):         Hardware and signal processing can be enabled through customer field selectable firmware options. An external windows PC is required to run the application program. which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.           Monitoring:         Foltocci:         SNMP           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing). IPv4, IPv6, connector RJ-45 Protocci:           Protocci:         Multipoint           Connection:         TCPIP over Ethernet (10/100 Mbps, auto sensing). IPv4, IPv6, connector RJ-45           Protocci:         Multipoint           Connection:         TCPIP over Ethernet (10/100 Mbps, auto sensing). IPv4, IPv6, connector RJ-45		
Included.         Not supported in case of DVB-S2 multiple input stream operation.           Still Picture Playout:         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, different pAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).           Compliant with Standards:         ETSI EN 300421, ETSI EN 301210, ETSI EN 302207-1 and -2, ETSI TS 103129           Broadcast Predistortion (Option XB)         Hardware and signal processing can be enabled through non-which optimizes the predistoriton parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.           Monitoring:         Faults, stored faults with time stamps           Monitoring and Control Interface:         Fotocol:         NMP           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol: </td <td></td> <td></td>		
Not supported in case of DVB-S2 multiple input stream operation.           Still Picture Playout:         As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4/3 aspect ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).           Compliant with Standards:         ETSI EN 30042/1, ETSI EN 300210, ETSI EN 302307-1 and -2, ETSI TS 107129           Broadcast Predistortion (Option XB)         Etsi Bardware and Signal processing can be enabled through customer field selectable firmware options. An external windows PC is required to run the application program, which optimizes the predistortion parameters in the Ackground of live transmissions (fl activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program.           Monitoring:         Faults. stored faults with time stamps           Monitoring:         Faults. stored faults with time stamps           Monitoring:         Faults. stored faults with time stamps           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), I		
Still Picture Playout:       As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different taspect ratio, different frame rate).         Compliant with Standards:       ETSI EN 300421, ETSI EN 301210, ETSI EN 30207-1 and -2, ETSI TS 103129         Broadcast Predistortion (Option XB)       Hardware and signal processing can be enabled through customer field selectable firmware options.         Ar external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.         Monitoring:       Faults, stored faults with time stamps         Monitoring and Control Interface:       Fortocol:       SNMP         Connection:       UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       Multipoint       Connector RJ-45         Protocol:       Multipoint       Connector CDPUP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm Interface:       Alarm: two potential free contacts (DPDT),       Multipoint         Multe Input:       Connector DSUB09 female or       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45		
be loaded (different content, different aspect ratio, different frame rate).           Compliant with Standards:         ETSI EN 300241, ETSI EN 300210, TSI EN 302307-1 and -2, ETSI TS 103129           Broadcast Predistortion (Option XB):         Hardware and signal processing can be enabled through customer field selectable firmware options.           An external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.           Monitoring:         Faults, stored faults with time stamps           Monitoring and Control Interface:         Protocol:         SNMP           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         HTTP (web browser interface)         Connector RJ-45           Protocol:         Multipoint         Connector SUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint         Connector SUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Connector SUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Connector SUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45	Still Picture Playout:	
Compliant with Standards:         ETSI EN 300421, ETSI EN 302307-1 and -2, ETSI TS 103129           Broadcast Predistortion (Option XB)         Hardware and signal processing can be enabled through customer field selectable firmware options. An external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connector RJ-45           Monitoring:         Faults, stored faults with time stamps           Monitoring and Control Interface:         Protocci           Protocci:         SNMP           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocci:         Multipoint           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Alarm: Interface:         Alarm: two potential free contacts (DPT),           Mute Input:         Mult pot: 1TL Ligic input with internal pull up           Connector DSUB09 female         Connector DSUB09 female           Temperature Range:         HDM2: -30 °C 60 °C operating (10 minutes warm up at -30 °C)           SDM2: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys           Mains Power Input:         100 240 V AC nominal, 90 264 V AC max, 50 60 Hz (with option 2PSU)           Mains Power Inpu		
EN SO083-9 (ASI electrical. SPI Interface)           Broadcast Predistortion (Option XB)           Extended Predistortion (Option XB)           Extended Predistortion (Option XB)           Extended Predistortion (Option XE)           An external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.           Monitoring:         Faults, stored faults with time stamps           Monitoring and Control Interface:         Protocol:           Monitoring         UDP over Ethermet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         HTTP (web browser interface)           Connection:         TCP/IP over Ethermet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint           Connection:         RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethermet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Mute Input:         Voconector DSUB09 female           Connector:         CDPOTD,           Mute Input:         S0 °C 60 °C operating (10 minutes warm up at -30°C)           SDM2: CO-C		
Broadcast Predistortion (Option XB)       Hardware and signal processing can be enabled through customer field selectable firmware options. An external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communication between the reference demodulator, the application program and the modulator. For all communications between the reference demodulator, the application program and the modulator. For all communications between the reference demodulator.         Monitoring       Frotocol:       Multipoint         Connection:       TCP/IP over Ethernet (10/100	Compliant with Standards:	
Extended Predistortion (Öption XE):         An external wind/ows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.           Monitoring:         Faults, stored faults with time stamps           Monitoring and Control Interface:         Protocol:         SMMP           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Alarm Interface:         Multi Input:           Multe Input:         Multe Input:           Multe Input:         Multe Input:           Connector DSUB09 female         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           SDM2:         0.°C60 °C operating           Connector DSUB09 female         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           SDM2:         0.°C50 °C operating           -30 °C50 °C operating         -30 °C50 °C operating	Broadcast Predistortion (Option XB)	
Monitoring:       Faults, stored faults with time stamps         Monitoring and Control Interface:       Protocol:       SNMP         Connection:       UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       Multipoint         Connection:       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       Multipoint         Connection:       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm: two potential free contacts (DPDT),       Multi Input:         Mute Input:       Alarm: two potential free contacts (DPDT),         Mute Input:       Mute Input: TTL logic input with internal pull up         Connector DSUB09 female       Connector RJ-45         Temperature Range:       HDM2: -30 °C 60 °C operating (10 minutes warm up at -30°C)         SDM2:       O°C 50 °C operating         -30 °C 60 °C operating       -30 °C C 60 °C apprating         -30 °C 60 °C operating       -240 V AC nominal, 90 264 V AC max, 50 60 Hz         Wains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         <		
Monitoring:         Faults, stored faults with time stamps         Interface:           Monitoring and Control Interface:         Protocol:         SNMP           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         HTTP (web browser interface)           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint           Connection:         RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Alarm: Interface:         Alarm: two potential free contacts (DPDT), Mute Input:           Mute Input:         Mute input: TL logic input with internal pull up Connector DSUB09 female           Temperature Range:         HDM2: -30 °C 60 °C operating -30 °C 80 °C storage           Relative Humidity:         c95% non condensing           User Interface:         SDM2: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys           Mains Power Input:         100 240 V AC nominal, 90 264 V AC max, 50 60 Hz           Max 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         with option DC24, DC power on)           Max 170 W (with option DC24, DC power on)         Max 170 W (with option DC24, DC power on)           Max 170 W (with option DC24, DC power on)         Max 280 W (with o		
Monitoring and Control Interface:       Protocol:       SIMP         Connection:       UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       HTTP (web browser interface)         Connection:       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       Multipoint         Connection:       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm Interface:       Alarm: two potential free contacts (DPDT),         Mute Input:       Mute Input: TL logic input with internal pull up         Connector DSUB09 female       Connector SUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating         -30 °C 80 °C storage       -30 °C 60 °C operating         -30 °C 80 °C storage       -30 °C 80 °C storage         Relative Humidity:       >95% non condensing         User Interface:       SDM2: UCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys         Mains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz (with option 2PSU)         Max 170 W (with option DC24, DC power on)       Max 170 W (with option DC24, DC power on)         Max 80 W (with option DC24, DC power on)       Max 170 W (with option DC24 or DC 48)         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse		
Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         HTTP (web browser interface)           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint           Connection:         RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Alarm Interface:         Alarm: two potential free contacts (DPDT), Mute Input:           Mute Input:         Mute Input: TL logic input with internal pull up Connector DSUB09 female           Temperature Range:         HDM2: 30 °C 60 °C operating (10 minutes warm up at -30°C) SDM2: 0 °C 80 °C coperating -30 °C 80 °C corrage           Relative Humidity:         <95% non condensing		
Protocol:       HTTP (web browser interface)         Connection:       TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Protocol:       Multipoint         Connection:       RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm Interface:       Alarm: two potential free contacts (DPDT), Mute Input:         Connector DSUB09 female       Connector DSUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating -30 °C 80 °C operating -30 °C 80 °C operating -30 °C 80 °C operating -30 °C 80 °C operating         Veser Interface:       SDM2:       0 °C c storage         Relative Humidity:       <95% non condensing	Monitoring and Control Interface:	
Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Protocol:         Multipoint           Connection:         RS232 or RS42/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45           Alarm Interface:         Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09 female           Temperature Range:         HDM2: -30 °C 60 °C operating (10 minutes warm up at -30°C) SDM2: 0 °C 50 °C operating		
Protocol:       Multipoint         Connection:       R5232 or R5422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm Interface:       Alarm: two potential free contacts (DPDT), Mute Input:         Mute Input:       Connector DSUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating (10 minutes warm up at -30°C) SDM2: 0 °C 50 °C operating 80 °C storage         Relative Humidity:       <95% non condensing 80 °C storage		
Connection:       RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm Interface:       Alarm: two potential free contacts (DPDT), Mute Input:       Mute Input: TTL logic input with internal pull up Connector DSUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating -30 °C 80 °C operating -30 °C 80 °C operating -30 °C 80 °C storage         Relative Humidity:       <95% non condensing		
TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45         Alarm Interface:       Alarm: two potential free contacts (DPDT), Mute Input:         Mute Input:       Connector DSUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating SDM2: 0 °C 50 °C operating -30 °C 50 °C operating         Vest       v95% non condensing         User Interface:       SDM2: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys HDM2: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys         Mains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         Mains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         Mains Power Input Connector:       IEC C14         Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm³ (WxHx		
Mute Input:       Mute Input: TTL logic input with internal pull up Connector DSUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating (10 minutes warm up at -30°C) SDM2: 0 °C 50 °C operating -30 °C 80 °C storage         Relative Humidity:       <95% non condensing         User Interface:       SDM2: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys HDM2: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys         Mains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz (with option 2PSU)         Mains Power Consumption:       Typ.: 38 VA / 25 W without BUC Power and TSOIP modules Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on) Max 280 W (with option DC48, DC power on)         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg		TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45
Connector DSUB09 female         Temperature Range:       HDM2: -30 °C 60 °C operating (10 minutes warm up at -30°C) SDM2: 0 °C 50 °C operating -30 °C 80 °C storage         Relative Humidity:       <95% non condensing	Alarm Interface:	
Temperature Range:       HDM2: -30 °C 60 °C operating (10 minutes warm up at -30°C) SDM2: 0 °C 50 °C operating -30 °C 80 °C storage         Relative Humidity:       <95% non condensing	Mute Input:	
SDM2:       0 °C 50 °C operating -30 °C 80 °C storage         Relative Humidity:       <95% non condensing	Temperature Bango:	
-30 °C 80 °C storage         Relative Humidity:         <95% non condensing	remperature nange.	
Relative Humidity:       <95% non condensing		
User Interface:       SDM2: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys HDM2: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys         Mains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz 2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         Mains Power Consumption:       Typ.: 38 VA / 25 W without BUC Power and TSOIP modules Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on)         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg	Relative Humidity:	
Mains Power Input:       100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz         Mains Power Consumption:       Typ.: 38 VA / 25 W without BUC Power and TSOIP modules Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on)         Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg	User Interface:	
2x 100 240 V AC nominal, 90 264 V AC max, 50 60 Hz (with option 2PSU)         Mains Power Consumption:       Typ.: 38 VA / 25 W without BUC Power and TSOIP modules Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on)         Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg		
Mains Power Consumption:       Typ.: 38 VA / 25 W without BUC Power and TSOIP modules Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on)         Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg	Mains Power Input:	
Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on)         Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg	Maine Dewey Constructions	
Max 280 W (with option DC48, DC power on)         Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg	mains Power Consumption:	
Mains Power Input Connector:       IEC C14         Mains Fuse:       2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg		
Mains Fuse:     2 x 2 A (or 2.5 A) time-lag fuse       2 x 5 A time lag fuse (with option DC24 or DC 48)       Dimension and Weight:     483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19")       approx. 8 kg	Mains Power Input Connector:	
2 x 5 A time lag fuse (with option DC24 or DC 48)         Dimension and Weight:       483 x 44 x 470 mm³ (WxHxD), 1 RU (19") approx. 8 kg	•	
Dimension and Weight: 483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg	Mains Fuse:	
approx. 8 kg	Dimonoion and Wainht	
	Dimension and weight:	
		approx. 0 kg (with option DC24 or DC 48)

Specifications are subject to change

Indoor Unit

#### Order Information:

HDM2-[Output Band and Impedance]-[Options] or SDM2-[Output Band and Impedance]-[Options] Modulator with VHF-band or L-band output

HDM2-V[Impedance]/L[Impedance]-[Options] or SDM2-V[Impedance]/L[Impedance]-[Options] Modulator with VHF-band and L-band output

Possible Options are:		Cannot be combined with:	Requires:
FAN	internal Fan	-	-
BBR	Baseband Frame flow control as RS232 signal	MT6	-
BI	BISS scrambling	MT6	-
DC24	24 V DC power on L-band output	DC48	FAN
DC48	48 V DC power on L-band output	DC24	FAN
TI1	one TS over IP input interface	TI2	-
TI2	two TS over IP input interfaces	TI1	-
MT6	Support of 6 Multiple ASI Input streams	BI, BBR	-
ХВ	Broadcast Predistortion	-	-
XE	Extended Predistortion	-	-
2PSU	Dual Power Supply	DC24, DC48	-

#### Examples:

SDM2-V75	Modulator with VHF-band Output 75 $\Omega$
HDM2-L50	Modulator with L-band Output 50 $\Omega$ ,
HDM2-V75-FAN	Modulator with VHF-band Output 75 $\Omega$ with Fan
HDM2-V75/L50-TI2-MT6-FAN	Modulator with VHF-band and L-band output with
	2 TS over IP inputs, support of 6 multiple input streams, Fan



Wide C-, X-, Ku-, K-, Ka-band





Our high-speed DVB Modulator-Upconverter series combines WORK Microwave's fifth-generation upconverters with a DVB modulator in a single housing, providing operators with significant cost and space savings. No extra modulator is required. Ideal use cases include fixed satellite ground stations as well as in satellite newsgathering (SNG) vehicles, flyaways, and other mobile or portable applications.

#### New approach – better solution

Traditionally, two separate units are in use for highpower TV uplinks that require low spurious emissions: a modulator plus a conventional upconverter. WORK Microwave's combined modulator and converter concept allows both units to exist in one housing. This approach provides a very low spurious signal over the whole frequency band and reduced group delay characteristics. This is a significant advantage compared with combined L-band modulator/block converters. For each frequency band the entire bandwidth range is covered e.g. for Ku-band, 12.75-14.50GHz is supported.

#### MPEG transport stream input-RF output

The unit accepts MPEG transport streams on ASI, SPI, or TS over IP inputs from a video encoder or MPEG multiplexer and provides a DVB-S/S2/S2X modulated carrier in the C-, X-, Ku-, K- or Ka-band which can be directly connected to a high-power amplifier.

Additionally a baseband frame input is available for VCM and ACM operation in combination with external multiplexers or encapsulators.

#### High signal integrity

Low spurious emissions make the modulatorupconverters perfect for use in environments with demanding requirements, like high-power video uplinks. Sophisticated temperature compensation guarantees gain stability over a very wide temperature range.

#### Predistortion

Broadcast Predistortion and Extended Predistortion – operating in the background during regular transmission – mitigates the negative effects in the filters and amplifiers of satellites by automatically compensating for linear and non linear distortions. Subsequently the satellite link can be operated with less back off/higher power and a higher signal-tonoise ratio increases beam coverage ensuring higher throughput and availability for the satellite operator.

#### Flexibility, backward compatibility

Mode adaptation, FEC encoding, and modulation is compliant with the DVB-S2/S2X standard ETSI EN 302307. QPSK, 8PSK, 16APSK, 32APSK, 64APSK modulation is available. For backward compatibility, the modulator also supports BPSK, QPSK, 8PSK, 16QAM modulation according to the DVB-S standards ETSI EN 300421 and 301210. Using the modulator, carriers with very low symbol rates (e.g., 8 ksps) up to 80 Msps can be transmitted.

## Operating and control – easy integration into your system

The converters can be operated via 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 remote control, addressable, packet-based commands are used. Remote monitoring and control through SNMP and a Web browser interface is available.

#### **Specials and OEM products**

WORK Microwave can customize any product to meet an operator's exact specifications.

We offer specials as follows:

- Dual- or Tri-Band versions
- Customized M&C interface and control syntax
- Extended storage or operating temperature range.
- Military versions for hostile environment (shock, vibration, humidity)
- Outdoor units

#### **Key Features**

- DVB-S2X ETSI EN 302 307-2 DVB-S2 - ETSI EN 302 307-1 DVB-DSNG - ETSI EN 301 210 DVB-S - ETSI EN 300 421
- DVB-S2X modulations: QPSK / 8PSK / 16APSK / 32APSK / 64APSK / 128APSK / 256APSK normal, short and linear
- DVB-S2 modulations: QPSK / 8PSK / 16APSK / 32APSK normal, short
- DVB-S and DVB-DSNG: QPSK / 8PSK / 16QAM modulation
- DVB Carrier ID ETSI TS 103 129
- Broadcast Predistortion including automatic group delay and dynamic constellation predistortion for QPSK and 8PSK (option XB)
- Extended Predistortion including automatic group delay and static constellation predistortion up to 32APSK (option XE)
- Optional BISS-E encryption, supports multi program transport stream
- Physical layer framing with scrambling codes 0 to 262141 according to DVB-S2 standard
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Adjustable digital slope equalizer
- Low spurious output
- Dual ASI interfaces with automatic cable equalizer and auto-switchover

- DVB-S2 Multistream support with capacity management with two input streams supported. Optional hex ASI interface available, including 3x2 auto redundancy switchover (option MT6)
- Transport Stream over IP inputs (option TI1, TI2)
- VideoACM support
- Baseband Frame Input for VCM operation and connection to external encapsulators, etc
- Null packet insertion and deletion with PCR correction
- Still picture playout; customized picture content can be loaded to the modulator unit
- Symbol rates from 8 ksps to 80 Msps
- Data rate max approx. 213 Mbps per ASI Interface
- Data rate max 356 Mbps with SPI Interface
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP with MIBs downloadable from the device
- Summary alarm output with dual change over switch contact
- Transmit mute input
- 10 MHz Reference OCXO included
- Optional test output of modulated signal 990 MHz
- Extended operating temperature range option -30 °C to 60 °C (-22 °F to 140 °F)
- CE compliant
- 3 years warranty

#### Open questions, demo units

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

#### Wide C-, X-, Ku-, K-, Ka-band Ka-Band available on request (contact factory)

Modulator-Upconverter Type:		VHM2CU-C / SM2CU-C	VHM2CU-X	VHM2CU-Ku / SM2CU-Ku	VHM2CU-K / SM2CU-K	
		Dualband (e	.g. CKu, KuK) or Triband ve	rsions (e.g. CXKu, CKuK) are a	llso available	
RF-Output Frequency:		C-Band 5.85 6.65 GHz	X-Band 7.90 8.40 GHz	Ku-Band 12.75 14.5 GHz	K-Band 17.3 18.4 GHz	
Frequency Resolution:				0 Hz		
Phase Noise:	10 Hz	-55	-53	-50	-50	
	100 Hz	-75	-73	-70	-70	
	1 kHz	-85	-83	-80	-80	
	10 kHz	-87	-87	-85	-84	
	100 kHz	-100 1)	-98 <sup>1)</sup>	-95 <sup>1)</sup>	-95 <sup>1)</sup>	
	1 MHz	-110 <sup>1)</sup>	-108 <sup>1)</sup>	-105 <sup>1)</sup>	-105 <sup>1)</sup>	
		max. values in dBc/ Hz	z <sup>1)</sup> 0°C 50°C, o	outside this temperature range of	degraded by max 5 dB.	
Conversion Scheme:			IQ-Modulator at 2450 I	MHz, single up-conversion		
RF-Output Characteristics:		Impedance:	50 Ω			
		Return Loss:	> 20 dB or > 17 dB *)			
		Output Power:		steps or -30 dBm 0 dBm , 0.1		
		Output Muting:		ense input or by alarm conditior	ר)	
		RF-Connectors:	SMA female			
				and and all triband versions		
Test Output		8.3 9.1 GHz	10.35 10.85 GHz	15.2 16.95 GHz	14.85 15.95 GHz	
(Microwave Oscillator):		-7 ± 3 dBm	-7 ± 3 dBm	-7 ± 3 dBm	-7 ± 3 dBm	
		-13 ± 3 dBm *)	-13 ± 3 dBm *)	-13 ± 3 dBm *)	-13 ± 3 dBm *)	
		SMA female	SMA female	SMA female	SMA female	
			alband and all triband versio			
Monitoring Output		Output Power:	-20 dB of RF O	utput		
(on front panel):		Impedance:	50 Ω			
		Return Loss:	>20 dB			
		Connector:	SMA female			
L-band Test Output		Frequency:	990 MHz			
(Option LT)		Level:	-45 ± 3 dBm			
		Connector:	F female			
Spurious Outputs:		Signal related:	< -60 dBc (∆f <	2 MHz)		
			< -70 dBc (∆f ≥	2 MHz)		
Frequency Stability:		±2 x 10 <sup>-8</sup> (-30 °C 60 °C, af	ter warm up), aging: ±1 x 10	<sup>-9</sup> per day, ±1 x 10 <sup>-7</sup> per year		
Reference Input:		Frequency:	10 MHz or 5 M	Hz		
•		Level: -3 10 dBm				
		Modes: internal, external, auto (senses reference input)				
		Connector: BNC female				
Symbol Rate:		Max Range,	8 ksps 80 M	sps		
		Step size:	1 sps			
Clock Stability:		±2 x 10 <sup>-8</sup> (-30 °C 60 °C, af	ter warm up), aging: ±1 x 10	<sup>9</sup> per day, ±1 x 10 <sup>-7</sup> per year		
Data Rate:		3 kbps 356 Mbps (SPI inte				
		3 kbps 213 Mbps (ASI inte				
		10 kbps 213 Mbps (TS ov	er IP interface) *)	*) max 1	170 Mbps, when BISS-1/E active	
Modulation / Encoding		ModCods:	QSPK	13/45, 9/20, 11/20		
DVB-S2X:		(normal FEC frame)	8PSK	23/36, 25/36, 13/18		
			16APSK	26/45, 3/5, 28/45, 23/36, 25/3	36, 13/18, 7/9, 77/90	
			32APSK	32/45, 11/15, 7/9		
			64APSK	11/15, 7/9, 4/5, 5/6		
			128APSK	3/4, 7/9		
			256APSK	32/45, 3/4		
		ModCods:	QPSK	11/45, 4/15, 14/45, 7/15, 8/15	5, 32/45	
		(short FEC frame)	8PSK	7/15, 8/15, 26/45, 32/45		
			16APSK	7/15, 8/15, 26/45, 3/5, 32/45		
			32APSK	2/3, 32/45		
		ModCods linear:	8PSK	5/9-L, 26/45-L		
		(normal FEC frame)	16APSK	1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3	3-L	
			32APSK	25/36-L		
			64APSK	32/45-L		
			256APSK	29/45-L, 2/3-L, 31/45-L, 11/1	b-L	
				ETSI EN 302307-2		
Modulation / Encoding		MadCada:		ion MT6 limited to 32APSK)		
Modulation / Encoding DVB-S2:		ModCods:	QPSK	1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4	+, 4/0, 0/0, 0/9, 9/10	
DVD-32.		(normal and short FEC frame		3/5, 2/3, 3/4, 5/6, 8/9, 9/10 2/3, 3/4, 4/5, 5/6, 8/9, 9/10		
		except 9/10 short FEC frame				
		Pilots Insertion:	32APSK	3/4, 4/5, 5/6, 8/9, 9/10		
			on / off N = 0 … 26214	1		
		Physical Layer Scrambling:				
Modulation / Encoding		Outer Deed Onland on "		ETSI EN 302307-1		
MODULATION / Encoding		Outer Reed Solomon Coding				
			Depth I =12			
DVB-S / DVB-DSNG:		Convolutional Interleaving:				
		Inner Coding	BPSK or QPSk	( 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Cor	nvolutional K=7)	
			BPSK or QPSK 8PSK 2/3, 5/6,	( 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Cor 8/9 (Pragmatic Trellis) 8 (Pragmatic Trellis)	volutional K=7)	

#### Wide C-, X-, Ku-, K-, Ka-band Ka-Band available on request (contact factory)

Carrier ID:	DVB-CID according to ETSI TS 103219
Signal Spectrum Mask:	α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05
Transport Stream Inputs:	<ul> <li>DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)</li> <li>Alternatively with option MT6, 6 DVB ASI electrical interfaces (6 x Connector BNC female, Impedance 75 Ω, cable EQ) 3 pairs of auto switching inputs or 6 individual inputs for multiple transport stream support</li> <li>Additionally with option TI1 or TI2 up to two individual Transport Stream over IP Inputs (Connector RJ-45,</li> </ul>
	100/1000 Mbps, auto sensing), IPv4, UDP and RTP support, FEC according SMPTE 2022 1/2, Jitter tolerance 1 500 ms, Conversion TS over IP to ASI, internally bridged with option MT6, external bridging for all other versions.
Multiple Transport Streams:	Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.
Baseband Frame Input:	Through DVB-ASI inputs or DVB-SPI input alternatively to Transport stream input, configurable Support of VCM/ACM in band signaling according to ETSI EN 302307-1, Annex I.2 Flow control signal available as LVDS Output signal on DVB-SPI connector or RS232 Signal on DVB-SPI connector (Option BBR)
Transport Stream Security (Option BI):	BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2         Supports single or multi program transport streams in BISS Mode 0, 1 and E         BISS Mode 0:       no scrambling, MPEG transport stream is transferred untouched         BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session Word         BISS Mode E:       MPEG transport stream is scrambled using a session word which is derived from a         16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected         Identifier         Max. input rate for Clear Session Word and Encrypted Session Word:         - 10 times per 5 minutes
	- 1 time per 10 seconds Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not contain the otherwise included support for 2 input streams!
Transport Stream Frames Size:	188 or 204 bytes
Packet Stuffing:	TS Null packet or TS All Zero packet insertion (DVB-S, DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2 only), when the data rate to transmit is higher than the data rate at the data input. Null packet deletion can be enabled to remove incoming null packets. PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs included. Not supported in case of DVB-S2 multiple input stream operation
Still Picture Playout:	As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECAM). As option an alternative, customized still picture can be loaded (different content, different aspect ratio, different frame rate).
Compliant with Standards:	ETSI EN 300421, 301210, 302307-1 and 2,ETSI TS 103129 EN 50083-9 (ASI electrical, SPI Interface)
Broadcast Predistortion (Option XB) Extended Predistortion (Option XE):	Hardware and signal processing can be enabled through customer field selectable firmware options. An external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.
Monitoring:	Faults, stored faults with time stamps
Monitoring and Control Interface:	Protocol:         SNMP           Connection:         UDP over Ethernet (10/100 Mbps, auto sensing), IPv4,connector RJ-45           Protocol:         HTTP (web browser interface)
	Protocol:         Fill P (web browser interface)           Connection:         TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4,connector RJ-45
	Protocol: Multipoint Connection: RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, 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:	VHM2CU: -30 °C 60°C operating (10 minutes warm up at -30 °C) VSM2CU: 0 °C 50°C operating -30 °C 80°C storage
Relative Humidity:	<95% non condensing
User Interface:	VSM2CU: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys VHM2CU: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys (Option VFD for SM2CU)
Mains Power Input:	100 240 V AC nominal, 90264 V AC max, 5060 Hz
Mains Power Consumption:	Typ: 45 VA / 30 W
Mains Power Input Connector:	IÉC C14
Mains Fuse:	2 x 2 A time-lag fuse
Dimension and Weight:	483 x 44 x 505 mm <sup>3</sup> (WxHxD), 1 RU (19"), approx. 10 kg

Specifications are subject to change

Indoor Unit

**Order Information:** 

VSM2CU-[RF Band]-[Options] [Firmware Option] VHM2CU-[RF Band]-[Options] [Firmware Option] VHM2CUx-[RF Band(s)]-[Options]-[Firmware Option] Single Band modulator-upconverter Single Band modulator-upconverter Multiband modulator-upconverter

x=2: Dualband modulator-upconverter, x=3: Triband modulator-upconverter

Possible Options are:		Cannot be combined with:	Requires:
VFD	VFD display, standard with HCU-type converters	-	-
LT	L-band test output	-	-
FAN	internal Fan	-	-
BBR	Baseband Frame flow control as RS232 signal	MT6	-
BI	BISS scrambling	MT6	-
TI1	one TS over IP input interface	TI2	-
TI2	two TS over IP input interfaces	TI1	-
MT6	Support of 6 Multiple ASI Input streams	BI, BBR	-
ХВ	Broadcast Predistortion	-	-
XE	Extended Predistortion	-	-

#### Examples:

VHM2CU-Ku-FAN	Ku-band Modulator-Upconverter with fan
VSM2CU2-KuK-	Dualband Modulator-Upconverter KuK
VSM2CU3-CKuK-FAN	Triband Modulator-Upconverter CKuK with fan



## **DVB-S2X Wideband Modulator**

L-band Output





WORK Microwave's Wideband Modulator provides operators a platform for transferring Transport Streams in DVB-S2 multicast format as well IP/Ethernet data over DVB-S2/DVB-S2X satellite connections. Ethernet frames and IP packets are encapsulated directly within DVB-S2 baseband frames, resulting in low encapsulation overhead. For maximum bandwidth efficiency and ease of operation the device uses Generic Stream Encapsulation according to TS 102 606.

An aggregate data throughput of more than 1 Gbps can be achieved. Symbol rates up to 400 Msps are supported.

The unit is suitable for uplinks of High Throughput Satellites. It supports Broadcast, Broadband or hybrid Broadcast/Broadband systems.

#### **OptiACM**

An integrated OptiACM controller provides adaptive or variable FEC- and modulation setting for point-to-point or point-to-multipoint IP applications.

#### Predistortion

Broadcast Predistortion and Extended Predistortion operating in the background during regular transmission - mitigates the negative effects in the filters and amplifiers of satellites by automatically compensating for linear and non linear distortions. Subsequently the satellite link can be operated with less back off/higher power and a higher signal-tonoise ratio increases beam coverage ensuring higher throughput and availability for the satellite operator.

#### **High signal integrity**

Low spurious emissions make the modem perfect for use in environments with demanding requirements, like high-power uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

# Operating and control - easy integration into your system

The modem can be operated via push buttons on the front panel using intuitive display menus or via remote control (RS232, RS422/485 and TCP/IP over Ethernet). For the remote control addressable packet-based commands, a Web interface (HTTP browser). Detailed monitoring of system parameters is possible.

#### **Key features**

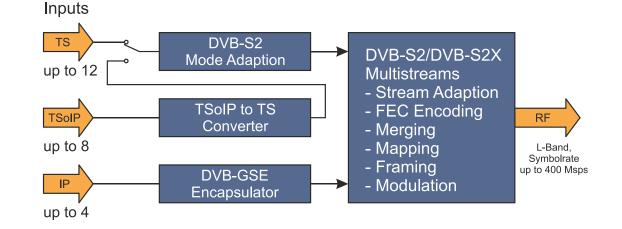
- Up to 12 ASI Input Interfaces for Multiple Transport Stream Inputs
- Up to 8 Transport Stream over IP Inputs
- Up to 4 Inputs for GSE encapsulators
- DVB-S2 ETSI EN 302 307
   DVB-S2X ETSI EN 302 307-2
- DVB-S2/S2X modulations: QPSK / 8PSK / 16APSK / 32APSK 64APSK / 128APSK / 256APSK coming soon
- Normal and short FEC frames, pilots on or off
- Broadcast Predistortion including automatic group delay and dynamic constellation predistortion for QPSK and 8PSK (preliminary option XB)
- Extended Predistortion including automatic group delay and static constellation predistortion up to 32APSK (preliminary option XE)
- Physical layer framing with scrambling codes 0 to 262141 according to DVB-S2
- Physical layer framing according DVB-S2 Annex M (time-slicing)
- Physical layer framing according DVB-S2X Annex E, Format 4: "Flexible Format with VL-SNR PLH Tracking"
- Symbol rates from 1 Msps to 400 Msps
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Adjustable digital gain slope equalizer

- Low spurious output
- OptiACM system for optimized bandwidth usage and extended weather insensitivity for IP transmission
- Gigabit Ethernet data interface
- IP and baseband traffic shaping
- Generic Stream Encapsulation (GSE) direct to DVB-S2 baseband frames
- Multiprotocol Encapsulation (MPE)
- Operates as Layer 2 Bridge, Layer 3 Bridge or Layer 3 Router
- Capacity calculator, optional capacity limitation
   per TS input
- Transmit mute input
- Tx Monitor Output on Frontpanel
- Remote control through RS232, RS422/485 (2wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface
- 10 MHz Reference OCXO included

- Ext. 10 MHz reference input
- 10 MHz reference output
- Summary alarm output with dual change over switch contacts
- Operating temperature range 0 °C to 50 °C (32 °F to 122 °F)
- CE compliant
- 3 years warranty

#### Open questions, demo units

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





## **DVB-S2X Wideband Modulator**

Modulator Type:	SDMW	
IF-Output Frequency:	L-band Output 950 2150 MH	Hz
Frequency Resolution:	1 Hz	12
Phase Noise: 10 Hz	-65	
100 Hz	-05	
1 kHz	-88	
10 kHz	-90	
100 kHz	-100	
1 MHz	-120	
10 MHz	-125	
100 MHz	-130	
		max. values in dBc/Hz
IF-Output Characteristics:	Impedance:	50 Ω
	Return Loss:	> 18 dB
	Output Power: Output Power muted:	-30 dBm 0 dBm, 0.1 dB steps, ±0.5 dBm accuracy
	Connector:	< -85 dBm
Monitoring Output	Output Power:	SMA female -20 dB of L-band Output
(on front panel):	Impedance:	$50 \Omega$
(on none panel).	Return Loss:	> 18 dB
	Connector:	SMA female
Spurious Outputs:	Signal related:	< -55 dBc, nearby carrier
Spundas Outputs.	Signal related.	< -50 dBc, meanly carrier, 950 2150 MHz
Frequency and Clock Stability	±2 x 10 <sup>-8</sup> (-30 °C 60 °C. after	warm up), aging: $\pm 1 \times 10^{-9}$ per day, $\pm 1 \times 10^{-7}$ per year
Symbol Rate:	Max. Range:	1 Msps 400 Msps
- ,	Step size:	1 sps
Modulation / Encoding	ModCods non-linear:	QSPK 13/45, 9/20, 11/20
DVB-S2X:	(normal FEC frame)	8PSK 23/36, 25/36, 13/18
	. ,	16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90
	1	32APSK 32/45, 11/15, 7/9
	ModCods non-linear:	QPSK 11/45, 4/15, 14/45, 7/15, 8/15, 32/45
	(short FEC frame)	8PSK 7/15, 8/15, 26/45, 32/45
		16APSK 7/15, 8/15, 26/45, 3/5, 32/45
		32APSK 2/3, 32/45
	ModCods linear:	8PSK 5/9-L, 26/45-L
	(normal FEC frame)	16APSK 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L
		32APSK 2/3-L, 25/36-L (contact factory for 64APSK, 128APSK, 256 APSK modulation types)
	Physical Layer Framing:	According ETSI EN 302307
	T Hysical Layer Framing.	ETSI EN 302307 Annex M: Time-slicing
		ETSI EN 302307-2, Annex E, Format 4
	Physical Layer Signaling:	yes
	Pilots Insertion:	on / off
	Physical Layer Scrambling:	N = 0 … 262141 (ETSI EN 302307)
		N = 01048575 for reference and payload scrambler
		(ETSI EN 302307-2, Annex E)
Modulation / Coding	Outer BCH Code:	FEC-Frames nldpc = 64800 (normal FEC Frame)
DVB-S2:		nldpc = 16200 (short FEC Frame)
	Inner LDPC Code:	QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
		16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 32APSK 3/4, 4/5, 5/6, 8/9, 9/10
	Physical Layer Framing:	Ves
	Physical Layer Signaling:	yes
	Pilots Insertion:	on / off
	Physical Layer Scrambling:	N = 0 262141
	,	all according ETSI EN 302307
Packet Stuffing:	Dummy PLFRAME insertion wh	en the data rate to transmit is higher than the data rate at the inputs.
Signal Spectrum Mask:	$\alpha = 0.35, 0.25, 0.20$ according E	
-	$\alpha = 0.15, 0.10, 0.05$ according E	
Broadcast Predistortion (Option XB)		can be enabled through customer field selectable firmware options.
Extended Predistortion (Option XE):		ired to run the application program, which optimizes the predistortion parameters
,		issions (if activated), by reading information from a reference demodulator. For all
		erence demodulator, the application program and the modulator IP connectivity is
	used.	
Stream Adaption:	Stream Adaption:	yes
	Baseband Scrambling:	yes (according ETSI EN 302307)
Transport Stream Inputs:	Up to 12 x ASI (BNC female 75	
		Insport Stream Input (auto switching dual input)
		ts Transport Stream over IP Inputs (Connector RJ-45,
		, IPv4, UDP and RTP support, FEC according SMPTE 2022 1/2,
Multiple Transment Of	Jitter tolerance 1 500 ms, Co	Driversion IS over IP to IS.
Multiple Transport Stream Input		(MODCOD) configuration per TS input.
Operation:		itation per TS input can be activated.
Transport Stream Frames Size:	188 or 204 bytes	
Data Rate:	3 kbps 213 Mbps (ASI interf	
Transport Stroom Made Adaption	10 kbps 213 Mbps (TS over I	
Transport Stream Mode Adaption DVB-S2:	Input Stream Synchroniser Null-Packet Deletion	yes (according ETSI EN 302307 Annex D.2)
<b>U V U-</b> JZ.	CRC-8 Encoder:	yes (according ETSI EN 302307 Annex D.3) yes
	Baseband Header Insertion:	yes
		,~~

GSE Encapsulator	Up to 4			
Baseband Channels:	16 baseband channel with separate DVB-S2 baseband settings			
	(MODCOD, FEC frame length, pilots, encapsulation type, multistream ID, timeout)			
OptiACM:	CCM / VCM / ACM functionality for point-to-point and point-to-multipoint links			
	16 ACM channels with separate MODCOD range and Es/N0 sensitivity			
	ACM channels arbitrary assignable to baseband channels			
BB Traffic Shaper:	Baseband channel limits based on symbol rate for virtual share of the carrier			
	Guaranteed and limited bandwidth individually configurable			
Data Interface:	Ethernet (1xRJ-45, 10/100/1000 Mbps auto sensing)			
IP Data Rate:	up to 400 Mbps or 80000 pps			
Network Operation:	Layer 2: Bridge (Ethernet frame transmission)			
	STP/RSTP			
	Layer 3: Bridge/Router (IP packet transmission), IPv4, IPv6			
	256 IP/subnet routes per port			
	16 DVB-S2 baseband channels			
Data Encapsulation:	Generic Stream Encapsulation (GSE) according ETSI TS 102606			
	Multiprotocol Encapsulation (MPE) according to ETSI EN 301192			
IP Traffic Shaper:	64 independent rules			
	Guaranteed and limited bandwidths			
	Fixed or dynamically integrated into ACM (bind to MODCOD)			
	Match criteria: source/destination IP subnet, source MAC, UDP/TCP port ranges, TOS/DS field, packet s	size		
	(Active IP Traffic shaper reduces max. packet rate to typ. 50000 pps)			

Monitoring and Control Interface:	Protocol:	SNMP (tbc)			
-	Connection:	UDP over Ethernet (10/100 Mbps auto sensing) IPv4, IPv6, connector RJ-45			
	Protocol:	HTTP (web browser interface)			
	Connection:	TCP/IP over Ethernet (10/100 Mbps, auto sensing) IPv4, IPv6, connector RJ-45			
	Protocol:	Multipoint			
	Connection:	RS232 or RS422/RS485 (configurable), connector DSUB09 female or			
		TCP/IP over Ethernet (10/100 Mbps, auto sensing) IPv4, IPv6, connector RJ-45			
Alarm Interface:	Alarm: two potential free	e contacts (DPDT),			
Mute Input:	Mute Input: TTL logic in	put with internal pull up			
	Connector DSUB09	Connector DSUB09			
Internal Fan	Fan included				
Temperature Range:	0°C 50°C operating				
	-30°C 80°C storage				
Relative Humidity:	< 95% non condensing	< 95% non condensing			
User Interface:	LCD-Display 2 x 40 cha	LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys			
Mains Power Input:	100 240 V AC nominal, 90 264 V AC max, 50 60 Hz				
Mains Power Consumption:	Typ 78 W / 115 VA (2 x GSE Encapsulator, 2x TSoIP ;Module)				
Mains Power Input Connector:	IEC C14				
Mains Fuse:	2 x 5 A time lag fus	2 x 5 A time lag fuse			
Dimension and Weight:	483 x 98 x 470 mm <sup>3</sup> (W	/xHxD), 2 RU (19")			
	approx. 15 kg max				

Specifications are subject to change

dBm -40	Mo	dulated	Carrier:	400	Msps			
-50			Roll-off:	<mark>35 %</mark> 25 %		The second secon		
-60	Y/			20 % 15 %		+ 111		
-70				10 % 5 %				
-80		92 - S				+		
-90			Span:	800	MHz		-	000a

Order Information: SDMW

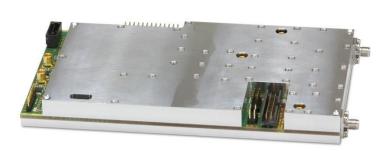
Wideband Modulator with L-band Output 50  $\Omega~$  (customized options on request)



## DVB Satellite Modulator OEM Module SDMO







The DVB Satellite Modulator OEM Module SDMO is a cost effective, high performance OEM solution designed to be easily integrated into any kind of platform.

The board is in compliance with DVB-S2X standard offering an advanced feature set including Carrier ID and symbol rates up to 80 Msps.

Benefiting from WORK Microwave's years of experience in digital design the modulator board has been developed to provide a highly compact solution to fit into third-party vendors' products such as video encoders and fly-away systems.

#### **Key features**

- DVB-S2X ETSI EN 302 307-2 DVB-S2 - ETSI EN 302 307-1 DVB-DSNG - ETSI EN 301 210 DVB-S - ETSI EN 300 421
- DVB-S2X modulations: QPSK / 8PSK / 16APSK / 32APSK / 64APSK / 128APSK / 256APSK normal, short and linear
- DVB-S2 modulations: QPSK / 8PSK / 16APSK / 32APSK normal, short
- DVB-S and DVB-DSNG: QPSK / 8PSK / 16QAM modulation
- DVB Carrier ID ETSI TS 103 129
- Optional BISS-E encryption, supports multi program transport stream

Additionally the board will also serve for rackmount and module-based versions of WORK Microwave's A-Series product line.

The board's design integrates all required subsystems without compromising modulation performance. Furthermore, low power consumption combined with intelligent housing enable the module to be operated in challenging thermal environments.

Available as standard size or customized dimensions the SDMO is easily integrated into any third-party products.

- Physical layer framing with scrambling codes 0 to 262141 according to DVB-S2 standard
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Adjustable digital slope equalizer
- Dual ASI interfaces with automatic cable equalizer and auto-switchover
- DVB-S2 Multistream support with capacity management with two input streams supported
- Null packet insertion and deletion with PCR correction
- Symbol rates from 8 ksps to 80 Msps
- Data rate max 213 Mbps per ASI Interface
- Extended operating temperature range option -30 °C to 60 °C (-22 °F to 140 °F)

## DVB Satellite Modulator OEM Module SDMO

IF-Output Frequency:         50 180.MHz (pation V)         950 2150.MHz           Prequency Resolution         114         -70         -65           Phase Noise:         10 Hz         -70         -65           10 Hz         -80         -78         -70           10 Hz         -80         -78         -90           10 Hz         -90         -100         -100         -100           10 Hz         -90         -100         -100         -100         -100           10 Hz         -90         -100         -100         -100         -100           10 Hz         -90         -100         -100         -100         -100           Accuracy:         -10.5         -	Modulator Type:	SDMO					
Frequency Resolution         1 Hz	IF-Output Frequency:	50 180 MHz (option					
Phase Noise:     10 Hz     70     -65       100 Hz     -80     -75       100 Hz     -80     -75       100 Hz     -80     -75       100 Hz     -80     -75       100 Hz     -80     -83       100 Hz     -80     -75       100 Hz     -80     -83       100 Hz     -100     -115       115     -20 dB tp > 18 dB min     -100       0upul Power:     -25 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power:     -25 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power:     -25 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min       0upul Power mutod:     -85 dBm. 21 dB min     -26 dBm. 21 dB min <th>Frequency Resolution</th> <th></th> <th>1</th> <th></th>	Frequency Resolution		1				
100 Hz         -80         -75           100 Hz         -80         -90           100 Hz         -90         -100           100 Hz         -90         -100           100 Hz         -90         -100           110 Hz         -25 GB         -100           Aurany:         2 0 B         -0.10 B steps (V-Band output)           Accuracy:         -90 Bm         -0.6 B         -0.0 Bm           Compot Dupt Power mudet:         -95 GB         -90 Bm         -0.0 Bm           Compot Dupt Power mudet:         -95 GB         -90 Bm         -10 Bm cb, + 1 to 10 per year           Symbol Rate:         Max Pange:         2 2 to 7 (97 C.Bord, and wavenup ignet at a to 10 band)           Symbol Rate:         Mod Code:         -90 CPR         1143 (445, 715 (915, 345, 510 (145, 910 (145,				-65			
1 Hrz 10 KHz 10 KHz         -88 -100         -88 -90 -100           IF-Output Characteristics:         Impedance: Return Loss: -20 dB typ > 18 dB min Output Power: -25 dBm0 dBm. 0.1 dB steps (-b land output) -30 dBm0 dBm. 0.1 dB steps (-b land output) -30 dBm0 dBm. 0.1 dB steps (-b land output) -45 dBm0 dBm.0.1 dB steps (-b land output) -45 dBm.0.1 dB							
10 kHz 100 Hz         -90 -115         -90 -115         -90 -115           IF-Output Characteristics:         Impedance:         50.0         max. values in dBcHz           IF-Output Characteristics:         Impedance:         50.0         max. values in dBcHz           Output Power:         -20 dBm.         50 dBm.         50 dBm.         10 Bit steps (V-Band output)           Accuracy:         ± 0.5 dB         50 dBm.         50 dBm.         10 Bit steps (V-Band output)           Accuracy:         ± 0.5 dB         50 dBm.         10 Bit steps (V-Band output)         1.5 dB           Sympton Soutputs:         Signal related:				-			
100 kHz 11 MHz         -100 -15         -100 -15           IF-Output Characteristics:         Impedance: 0.0uput Power: -30 db typ > 18 dB min 0.0uput Power: -30 db typ > 18 dB min -30 db m, 0.1 dB steps (V-Band output) -30 db steps (V-Band output) -30 d							
1 MHz         -115         -115           IF-Output Characteristics:         Impedance:         50 Ω           Return Loss:         -25 dBm 6 dBm in         Output Power           -26 dBm 6 dBm 0 dBm, 0.1 dB steps (V-Band output)         -0 dBm in           Output Power ruled:         -26 dBm 6 dBm in           Connector:         -87 dBe (unmodulated carrier, in band)           Stability:         -47 dBe (unmodulated carrier, in band)           Signal related:         -47 dBe (unmodulated carrier, in band)           Signal related:         -24 t0° (Or - 45 dBe (unmodulated carrier, in band)           Signal related:         -24 t0° (Or - 45 dBe (unmodulated carrier, in band)           Signal related:         -115 dB m synthetic           Signal related:         -116 (SB m synthetic           Signal related:         -24 t0° (Or - 45 dB m synthetic           Signal related:         Skps							
Image:         max. values in dBpHz           F-Output Characteristics:         Impedance:         520 GB (ps. > 16 dB min           Output Power:         -20 dB (ps. > 16 dB min         0 dBm. > 0							
IF-Output Characteristics:       Impodance: Return Loss: -20 dB trp. > 18 dB min Output Power: -25 dB m. : 0 dB m, 0.1 dB steps (U-Band output) -30 dB m. : 0 dB m. 0.1 dB steps (U-Band output) -30 dB m. : 0 dB m. 0.1 dB steps (U-Band output) -30 dB m. : 0 dB m. 0.1 dB steps (U-Band output) -30 dB m. : 0 dB m. : 0 dB m. 0.1 dB steps (U-Band output) -30 dB m. : 0							
Refum Loss:         -20 dB tpp > 18 dB min           Output Power:         -25 dB m., 5 dBm., 0.1 dB steps (V-Band output)           -30 dBm., 10 dBm, 0.1 dB steps (L-band output)           -30 dBm., 10 dBm, 0.1 dB steps (L-band output)           -45 dB           Spurious Outputs:           Signal related:           -45 dB           -45 dB           Signal related:           -45 dB           -45 dB           Option EXT:           42 x 10° (10°C, 50°C, after warm up), aging: ±1 x 10° per day, ±1 x 10° per year           Option EXT:         ±2 x 10° (10°C, 50°C, after warm up), aging: ±1 x 10° per day, ±1 x 10° per year           Step size:         MaR Pange:         1 sps           Data Rate:         MaR Pange:         1 sps           ModCods:         0 SPK         1245, 226, 11/20           107 Ber day, 41 x 10° per day, 41 x 10° pe	IF-Output Characteristics:	Impedance:					
Output Power:         -25 dBm 0 dBm 0 1 dB steps (L-Band output)           -30 dBm 0 dBm				8 dB min			
-30 dBm. 0. dBm, 0.1 dB steps (L-band output)           Accuracy:         ± 0.5 dB           Stability:         ± 0.5 dB           Output Power muted:							
Accuracy:     ± 0.5 dB       Stability:     ± 0.5 dB       Output Power muted:     -							
Stability:     ± 0.5 dB       Output Power nuted:     < 65 dB       Spurious Outputs:     SIgnal related:     < 67 dB       Spurious Outputs:     Signal related:     < 67 dB       Frequency/Clock Stability:     Standard:     ±2 x 10° (0°C 50°C, after warm up), aging: ±1 x 10° per year       Symbol Rate:     Max Range:     8 ksps 80 Msps       Step Size:     3 kdps213 Mbps (ASI interface) *     7 max 170 Mbps, when BiSs-1E active       Modulation / Encoding     ModCods:     0 SPK     13/45, 3/20, 11/20       DyB-SZX:     ModCods:     0 SPK     23/86, 23/36, 13/18     7 max 170 Mbps, when BiSs-1E active       ModLation / Encoding     ModCods:     0 SPK     13/45, 3/20, 11/20       DyB-SZX:     ModCods:     0 SPK     13/45, 3/24, 5/36, 13/18, 7/9, 77/90       Gold Cods:     0 SPK     13/45, 3/24, 5/36, 13/18, 7/9, 77/90       Gold Cods:     0 SPK     13/45, 13/16, 7/9, 4/5, 56       UBA-SZX:     ModCods:     0 SPK     13/45, 3/24, 5/36, 13/18, 7/9, 27/30       ModCods:     0 SPK     13/45, 13/16, 7/16, 8/15, 23/45, 5/36, 13/18, 7/15, 8/15, 23/45, 5/36, 8/3, 24/5       ModCods:     0 SPK     13/45, 14/16, 7/16, 8/15, 23/45, 5/36, 8/9, 9/10       ModCods:     0 SPK     13/45, 14/5, 5/14, 3/51, 2/34, 5/56, 8/9, 9/10       ModCods:     0 SPK     12/44, 5/56, 8/9, 9/10 <th></th> <th>Accuracy:</th> <th></th> <th>bill, 0.1 db steps (L-balld bulput)</th>		Accuracy:		bill, 0.1 db steps (L-balld bulput)			
Output Power mutad:                Spurious Outputs:         Signal related:							
Connector:         SNA female           10 MHz reference over L-band output:         511.5 dBm, switchable           Spurious Outputs:         Signal related:         <67.68c (unmodulated carrier harmonics, out of band)							
10 MHz reference over L-band output:         1.5 ± 1.5 dBm, switchable           Spurious Outputs:         Signal related:         < 47 dB, (unmodulated carrier, in band)							
Spurious Outputs:         Signal related:         <-67 dBc         (unmodulated carrier, in band)           Frequency/Clock Stability:         Standard:         ±2 x 10 <sup>-6</sup> (0°C. 50°C, after warm up), aging: ±2 x 10 <sup>-6</sup> per day, ±1 x 10 <sup>-7</sup> per year           Symbol Rate:         Max Range:         ±2 x 10 <sup>-6</sup> (3°C. 6°C, after warm up), aging: ±1 x 10 <sup>-7</sup> per day, ±1 x 10 <sup>-7</sup> per year           Step size:         1 sps         ') max 170 Mps, when BiSS-1/E active           Modulation / Encoding         Modulation / Encoding         OSPK         1345, 9/20, 11/20           DVB-S2X:         ModCods:         OSPK         225/26, 13/18, 7/9, 77/90           GAAPSK         324245, 11/15, 7/9         64APSK         314, 7/9           Step size:         1 sps         1/1200         1/200           NodCods:         CPSK         11/15, 7/15, 5/16         1/245, 5/15, 2/45           ModCods:         CPSK         11/15, 7/15, 8/15, 2/45         1/45, 7/15, 8/15, 2/45           ModCods:         CPSK         11/15, 7/15, 8/15, 2/45, 3/245         1/45, 7/15, 8/15, 2/45, 3/245           ModCods:         CPSK         1/24, 8/15, 1/445, 7/15, 8/15, 3/245           ModCods:         CPSK         1/24, 8/15, 2/245, 1/23, 3/145, 1/145,				witchable			
requency(clock Stability:         Standard:         ± × 10 <sup>-</sup> (°C. 50°C, after warm up), aging: ± × 10 <sup>-</sup> per day. ± 1 × 10 <sup>-</sup> per day.	<u> </u>						
Frequency/Clock Stability:         Standard:         ±2 x 10 <sup>7</sup> (°C 60°C, after warm up), aging: ±2 x 10 <sup>3</sup> per day, ±1 x 10 <sup>3</sup> d	Spurious Outputs:	Signal related:					
Option EXT:         ±2 x 10 <sup>-8</sup> (30°C 60°C, after warm up), aging: ±1 x 10 <sup>-8</sup> per day, ±1 x 10 <sup>-7</sup> per year           Max. Range:         Max. Bange:         1 sps         80 Msps           Date Rate:         3 kbps         21 max. 170 Mbps, when BISS-1/E active           Modulation / Encoding         ModCods:         CGSPK         1 max. 170 Mbps, when BISS-1/E active           ModUlation / Encoding         ModCods:         CGSPK         1 max. 170 Mbps, when BISS-1/E active           ModCods:         CGSPK         1 max. 170 Mbps, when BISS-1/E active           ModCods:         CGSPK         12/45, 9/20, 11/20           Introduction / Encoding         ModCods:         CGSPK         32/45, 11/15, 7/9           ModCods:         COPSK         11/45, 4/15, 7/9, 7/5, 8/15, 32/45           Introduction / Encoding         ModCods:         COPSK         11/45, 4/15, 1/445, 7/15, 8/15, 32/45           ModLotion / Encoding         ModCods:         COPSK         12/44, 5/15, 29/2, 3/2, 2/3, 2/45           Modulation / Encoding         ModCods:         COPSK         12/44, 5/15, 29/2, 3/4, 5/6, 8/9, 9/10           DVB-S2:         ModCods:         COPSK         12/44, 5/6, 8/9, 9/10           Modulation / Encoding         ModCods:         COPSK         12/44, 5/5, 5/6, 8/9, 9/10           DVB-S2: <t< td=""><td>-</td><td></td><td>&lt;-45 dBc (unr</td><td>modulated carrier harmonics, out of band)</td></t<>	-		<-45 dBc (unr	modulated carrier harmonics, out of band)			
Symbol Rate:         Max Range:         6 ksps         1 step         1 max 170 Mps, when BISS-1/E active           Data Rate:         3 kbps	Frequency/Clock Stability:	Standard: ±2 x 10 <sup>-7</sup> (0°C	. 50°C, after warm	up), aging: ±2 x 10° per day, ±1 x 10° per year			
Step size:         1 spin           Data Rate:         3 kbps:			; 60°C, after war	m up), aging: ±1 x 10 <sup>-9</sup> per day, ±1 x 10 <sup>-7</sup> per year			
Date Rate:         3 kbps	Symbol Rate:			Msps			
Modulation / Encoding DVB-S2X:         ModCods: (normal FEC trame)         QSPK         13/45, 9/20, 11/20           WB-S2X:         (normal FEC trame)         BPSK         23/68, 25/266, 13/18, 7/9, 77/90           98/PSK         32/45, 23/36, 25/26, 13/18, 7/9, 77/90         32/46, 3/3         32/45, 23/36, 25/26, 13/18, 7/9, 77/90           98/PSK         32/46, 3/3         32/45, 3/3         32/45, 3/3         32/45, 3/3           ModCods:         (opPK         11/46, 4/15, 14/45, 7/15, 8/15, 32/45         32/45, 3/3           (short FEC frame)         BPSK         7/15, 8/15, 26/45, 32/45         32/45, 12/45           16APSK         12/4, 8/15, 14/45, 7/15, 8/15, 32/45         32/45         32/45           16APSK         12/4, 8/15, 14/45, 7/15, 8/15, 32/45         32/45         32/45           32/APSK         32/45         32/45         32/45         32/45           16APSK         12/2, 8/15, 12/45, 3/5, 32/45         32/45			1 sps				
DVB-S2X:       (normal FEC frame)       8PSK       23/36, 25/36, 13/18         Instruction       15APSK       28/45, 37, 28/45, 23/36, 23/36, 13/18, 7/9, 77/90         SQAPSK       32/45, 11/15, 7/9, 4/5, 5/6         128APSK       32/45, 11/15, 7/9, 4/5, 5/6         128APSK       32/45, 11/15, 7/9, 4/5, 5/6         128APSK       32/45, 11/15, 4/15, 7/15, 8/15, 32/45         (short FEC frame)       8PSK         16APSK       7/15, 8/15, 26/45, 32/45         ModCods:       0PSK         (inormal FEC frame)       8PSK         16APSK       7/15, 8/15, 26/45, 15, 32/45         16APSK       7/15, 8/15, 26/45, 12, 3/2, 12/3         ModCods:       0PSK         16APSK       12/4, 5/15, 12/45, 12/3, 12/45         17.       16APSK         17.       16APSK         17.       17/17, 2/5, 1/2, 2/3, 2/3         ModUlation / Encoding       ModCods:         OPSK       11/4, 1/3, 2/5, 1/2, 2/3, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10         Inormal and short FEC frame:       8/5K or 2/3, 2/3, 4/4, 5/6, 8/9, 9/10         Inormal and short FEC frame only       32APSK         23/4, 15/6, 8/9, 9/10       0/16         Physical Layer Scrambling:       1/4, 1/3, 2/5, 1/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10							
16APSK       26/45, 3/6, 20/45, 23/6, 23/36, 25/36, 13/18, 7/9, 77/90         32APSK       32/45, 3/4         926APSK       32/45, 3/3, 32/45         926APSK       2/3, 4/45, 7/15, 8/15, 32/45         926APSK       2/3, 4/45, 7/15, 8/15, 32/45         926APSK       2/3, 2/45         927SK       1/3, 2/45, 1/3, 2/45         928APSK       2/3, 2/45, 1/3, 2/45         928APSK       2/3, 2/45, 1/3, 2/45, 1/2, 3/5, 1/2, 3/5, 1/2, 3/4, 1/2, 1/2, 1/2, 1/2, 1/2, 1/2, 1/2, 1/2			QSPK				
32APSK       32/45, 11/15, 7/9       46, 5/6         64APSK       11/15, 7/9, 4/6, 5/6         128APSK       32/4, 5/8         9265APSK       32/45, 3/4         ModCods:       0PSK         (short FEC frame)       8PSK         9PSK       7/15, 8/15, 28/45, 32/45         16APSK       12/4, 28/15-1, 29/4-1, 5/9-1, 3/5-1, 2/3-1         16APSK       12/4, 28/45-1, 2/3-1, 28/4-2         16APSK       22/45         16APSK       22/3/36-1         64APSK       32/45-1, 2/3-1, 3/4-5, 1/1/15-1         all according to ETSI EN 302307-2         ModCods:       0PSK         (normal and short FEC frame)       8/5-8/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10         9/B-S2:       except 9/10 short FEC frame         Modulation / Encoding       0uter Reed Solomon Coding:         18/204, T-8       2/3, 3/4, 4/5, 5/6, 8/9, 9/10         0.9/B-S / DVB-DSNG:       0uter Reed Solomon Coding:         18/204, T-8       2/2/3, 3/4, 4/5, 5/6, 8/9, 9/10         0.9/B-S / DVB-DSNG:       0uter Reed Solomon Coding:         18/204, T-8       2/2/3, 3/4, 4/	DVB-S2X:	(normal FEC frame)	8PSK	23/36, 25/36, 13/18			
64APSK       11/15, 79, 4/5, 5/6         128APSK       3/4, 7/9         266APSK       3/4, 7/9         266APSK       3/4, 7/9         266APSK       11/45, 4/15, 14/45, 7/15, 8/15, 32/45         (short FEC frame)       8PSK         9PSK       7/15, 8/15, 26/45, 3/5, 32/45         16APSK       32, 24/5         16APSK       25/9-L, 26/45, 1/5, 26/45, 3/5, 32/45         32APSK       25/3-L         (normal FEC frame)       16APSK         32APSK       23/4, 21, 8/15, L, 5/9-L, 3/5-L, 2/3-L         32APSK       25/3-L         (normal and short FEC frame)       8PSK         9PSK       23/45-L         26APSK       23/45-L         26APSK       23/45-L         26APSK       23/45-L         26APSK       23/45-L         26APSK       23/45-L         26APSK       23/45-L         27/45-L       27/5-L, 2/3-L         37/45-K       11/15, 7/15, 8/15, 22/3, 3/4, 4/5, 5/6, 8/9, 9/10         9/10       32/45-L         20/10       32/45-L         20/10       32/45-L         20/10       32/45-L         20/10       32/4, 5/6, 8/9, 9/10         9			16APSK	26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90			
128APSK       3/4, 7/9         ModCods:       OPSK         11/45, 415, 1445, 715, 8/15, 32/45         (short FEC frame)       8PSK         15APSK       27/45         ModCods linear:       8PSK         (normal FEC frame)       16APSK         32APSK       23/45         ModCods linear:       8PSK         (normal FEC frame)       16APSK         32APSK       23/45-L         256APSK       32/45-L         326APSK       32/45-L         256APSK       32/45-L         326APSK       32/45-L         256APSK       32/45-L         326APSK       32/45-L         256APSK       32/45-L         326APSK       32/4-S5,6,89,9/10         90F-S2:       0Uter Reed Solomon Coding:       188/204, T=E         0DVB-S2:       0Uter Reed Solomon Coding:       188/204, T=E         0DVB-S1       0Uter Reed Solomon Coding:       188/204, T=E         0DVB-S1 </td <td></td> <td></td> <td>32APSK</td> <td>32/45, 11/15, 7/9</td>			32APSK	32/45, 11/15, 7/9			
128APSK       3/4, 7/9         ModCods:       OPSK         11/45, 415, 1445, 715, 8/15, 32/45         (short FEC frame)       8PSK         15APSK       27/45         ModCods linear:       8PSK         (normal FEC frame)       16APSK         32APSK       23/45         ModCods linear:       8PSK         (normal FEC frame)       16APSK         32APSK       23/45-L         256APSK       32/45-L         326APSK       32/45-L         256APSK       32/45-L         326APSK       32/45-L         256APSK       32/45-L         326APSK       32/45-L         256APSK       32/45-L         326APSK       32/4-S5,6,89,9/10         90F-S2:       0Uter Reed Solomon Coding:       188/204, T=E         0DVB-S2:       0Uter Reed Solomon Coding:       188/204, T=E         0DVB-S1       0Uter Reed Solomon Coding:       188/204, T=E         0DVB-S1 </th <th></th> <th></th> <th>64APSK</th> <th></th>			64APSK				
ModCods:         QPSK         32/45, 3/4           ModCods:         QPSK         7/15, 8/15, 28/45, 32/45           (short FEC frame)         8PSK         7/15, 8/15, 28/45, 32/45           16APSK         7/15, 8/15, 28/45, 32/45         32/45           (mormal FEC frame)         16APSK         7/15, 8/15, 28/45, 12/35           ModCods linear:         8PSK         59-1, 28/45-L           (normal FEC frame)         16APSK         27/3, 32/45           32APSK         25/36-L         64APSK           (normal and short FEC frame)         16APSK         12/4, 13, 2/5, 1/2, 35, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           OVB-S2:         ModCods:         OPSK         1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           Modulation / Encoding         ModCods:         OPSK         1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           DVB-S2:         (normal and short FEC frame;         9PSK         3/3, 4/5, 5/6, 8/9, 9/10           Outer Reed Solomon Coding:         0.7 6/1         0.7 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           DVB-S2         Outer Reed Solomon Coding:         Depth 1=12           Inner Coding         DPSK OPSK 1/2, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           BYSK 2/3, 5/6, 8/9, 9/10         BYSK 2/3, 5/6, 8/9, 9/10           DVB-S2         DVB-DSNG:							
ModCods:         OPSK         11/45, 4/15, 14/45, 7/15, 8/15, 32/45           (short FEC frame)         8PSK         7/15, 8/15, 26/45, 3/5, 3/245           32APSK         2/3, 32/45         32APSK         2/3, 32/45           32APSK         2/3, 32/45         32APSK         2/3, 32/45           ModCods linear:         8PSK         5/9-L, 26/45-L         4/45-L           (normal FEC frame)         16APSK         2/2/3, 5/2-L, 2/3-L         32APSK           ModCods:         0PSK         1/4, 1/3, 2/5, 1/2, 3/5-L, 2/3-L         3/4, 4/5-L           ModCods:         0PSK         3/4, 5/6, 8/9, 9/10         3/4, 5/6, 8/9, 9/10           WodCods:         0PSK         3/4, 4/5, 5/6, 8/9, 9/10         3/4, 4/5, 5/6, 8/9, 9/10           PHots Insertion:         modulation / Encoding         0/14 Preced Solomon Coding:         3/4, 4/5, 5/6, 8/9, 9/10           Physical Layer Scrambling:         N = 0							
		ModCods:					
16APSK       7/15, 8/15, 26/45, 3/5, 3/245         32APSK       2/3, 3/245         32APSK       2/3, 3/245         BPSK       5/9-L, 26/45-L         (normal FEC frame)       16APSK         16APSK       1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L         32APSK       22/3-L         32APSK       23/4-5L         32APSK       23/4-5L         32APSK       23/4-5C         895K       3/4, 4/5, 5/6, 8/9, 9/10         32APSK       2/3, 3/4, 5/6, 8/9, 9/10         32APSK <th></th> <th></th> <th></th> <th></th>							
ModCods linear:       324PSK       2/3, 32/45         ModCods linear:       8PSK       5/94. L 26/45-L         (normal FEC frame)       16APSK       1/2.L, 8/15-L, 5/9-L, 3/5-L, 2/3-L         Modulation / Encoding       ModCods:       0PSK       2/3/45-L         256APSK       29/45-L, 2/3-L, 31/45-L, 11/15-L       all according to ETSI EN 302307-2         Modulation / Encoding       ModCods:       0PSK       1/4, 1/3, 2/5, 1/2, 3/6, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10         pVB-S2:       ModCods:       0PSK       3/4, 4/5, 5/6, 8/9, 9/10         wcopt 9/10 short FEC frame;       8PSK       3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10         pVB-S2:       0n/ off       0hysical Layer Scrambling:       N = 0 262141         all according to ETSI EN 302307-1       0uter Reed Solomon Coding:       188/204, T=8         DVB-S / DVB-DSNG:       0uter Reed Solomon Coding:       188/204, T=8         Convolutional Interleaving:       Dept 1 = 12         Inner Coding       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask: $\alpha = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ)auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missingsupport 0 2 TS multiple input streams (except with option B)      $		(Shorr Eo hane)					
ModCods linear: (normal FEC frame)       BPSK 16APSK 16APSK 2245L 22APSK 2566PSK 2245L 226APSK 234, 4/5, 5/6, 8/9, 9/10         ModCods: (normal and short FEC frame; except 9/10							
(normal FEC frame)       16APSK       1/2-L, 8/15-L, 5/9-L, 3/3-L, 2/3-L         32APSK       25/36-L         64APSK       32/45-L         256APSK       29/45-L, 2/3-L, 31/45-L, 11/15-L         all according to ETSI EN 302307-2         Modulation / Encoding       ModCods:         DVB-52:       ModCods:         wexept 9/10 short FEC frame;       8PSK         32APSK       2/3, 3/4, 4/5, 5/6, 8/9, 9/10         32APSK       3/4, 5/6, 6/7, 7/8 (Convolutional K=7)         By 5/2 OVB-DSNG:       Duter Reed Solomon Coding:         Inner Coding       DPSK 12/2, 5/6, 8/9		ModCode linear:					
Modulation / Encoding       ModCods:       QPSK       1/4 / 3/2, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10         DVB-S2:       ModCods:       QPSK       1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10         Boyser       grad and short FEC frame;       grad short FEC frame;							
Modulation / Encoding DVB-S2:         ModCods: (normal and short FEC frame; except 9/10 short FEC frame only)         OPSK 14, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           DVB-S2:         all according to ETSI EN 302307-2           ModLation / Encoding DVB-S2:         ModCods: (normal and short FEC frame only)         16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           Pilots Insertion: Physical Layer Scrambling: Modulation / Encoding DVB-S / DVB-DSNG:         01/61           ModLulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: BPSK or OPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) all according to ETSI EN 302307-1           Modulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: BPSK or OPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK or OPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)           Carrier ID:         DVB-CID according to ETSI TS 103 129           Signal Spectrum Mask: $\alpha = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05$ Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input Capacity calculator/limitation per TS input Capacity calculator/limitation per TS input cacording to ETSI EN 302307-1, Annex D.2, D.3. <th></th> <th>(normal FEC frame)</th> <th></th> <th></th>		(normal FEC frame)					
Modulation / Encoding DVB-S2:         ModCods: (normal and short FEC frame; except 9/10 short FEC frame; BPSK 2/3, 5/6, 8/9, 9/Pagmatic Trellis) for a 0.35, 0.25, 0.20, 0.15, 0.10, 0.05           Carrier ID:         DVB-CID according to ETSI TS 103 129           Signal Spectrum Mask:         α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05           Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input stream (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization per TS input can be activated Input stream synchronization per TS inpu							
all according to ETSI EN 302307-2           Modulation / Encoding DVB-S2:         ModCods:         OPSK         1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10           addition / Encoding DVB-S2:         Inormal and short FEC frame; except 9/10 short FEC frame; on / off         QPSK         1/4, 1/3, 2/5, 1/2, 3/5, 8/9, 9/10           Modulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: Inner Coding         188/204, T=8         0.032307-1           Modulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: Inner Coding         188/204, T=8         0.075K 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)           Carrier ID:         DVB-CID according to ETSI TS 103 129         DVB-CID according to ETSI TS 103 129           Signal Spectrum Mask:         α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input carb be activated Input stream synchronization and NuII-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           BISS Mode 0:							
Modulation / Encoding DVB-S2:       ModCods: (normal and short FEC frame; except 9/10 short FEC frame; except 9/10 short FEC frame; except 9/10 short FEC frame; except 9/10 short FEC frame; prilots Insertion: Physical Layer Scrambling: DVB-S / DVB-DSNG:       QPSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 al Acposed Solomon Coding: N = 0 262141 all according to ETSI EN 302307-1         Modulation / Encoding DVB-S / DVB-DSNG:       Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129 a = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       DUB -QSL-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISSS Mode 0: BISS Mode 0: BISS Mode 0: BISS Mode 1: MPEG transport stream is BISS Mode 0, 1 and E BISS Mode 0: BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session VW BISS Mode 1: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
DVB-S2:       (normal and short FEC frame; except 9/10 short FEC frame only)       8PSK       3/5, 2/3, 3/4, 5/6, 8/9, 9/10         Modulation / Encoding DVB-S / DVB-DSNG:       Pilots Insertion: Physical Layer Scrambling:       N = 0 262141 all according to ETSI EN 302307-1         Modulation / Encoding DVB-S / DVB-DSNG:       Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding       188/204, T=8 Depth 1 = 12         DVB-S / DVB-DSNG:       Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding       188/204, T=8 Depth 1 = 12         DVB-CID according to ETSI TS 103 129       BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2       Supports single or multi program transport stream is ISM Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is scrambled us							
except 9/10 short FEC frame only)       16APSK       2/3, 3/4, 4/5, 5/6, 8/9, 9/10         32APSK       3/4, 4/5, 5/6, 8/9, 9/10         9/10ts Insertion:       on / off         Physical Layer Scrambling:       N = 0 262141         all according to ETSI EN 302307-1         Modulation / Encoding       Outer Reed Solomon Coding:         DVB-S / DVB-DSNG:       Outer Reed Solomon Coding:         Inner Coding       Depth I = 12         Inner Coding       BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7)         8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis)         16QAM 3/4, 7/8 (Pragmatic Trellis)							
Modulation / Encoding       Outer Reed Solomon Coding:       188/204, T=8         DVB-S / DVB-DSNG:       Outer Reed Solomon Coding:       188/204, T=8         DVB-S / DVB-DSNG:       Outer Reed Solomon Coding:       188/204, T=8         Convolutional Interleaving:       Depth I =12         Inner Coding       BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7)         8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis)       16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask: $\alpha = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05$ Transport Stream Inputs:       Dual DVB-ASI-electrical (2 × Connector MCX female, Impedance 75 Ω, cable EQ)         auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2       Supports single or multi program transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode 0: no scrambling, MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode 1: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecim	DVB-S2:						
Pilots Insertion:       on / off         Physical Layer Scrambling:       N = 0 262141 all according to ETSI EN 302307-1         Modulation / Encoding DVB-S / DVB-DSNG:       Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding       188/204, T=8 Depth I = 12 Inner Coding         DVB-S / DVB-DSNG:       DVB-CID according to ETSI TS 103 129       Depth I = 12 Inner Coding to ETSI TS 103 129         Carrier ID:       DVB-CID according to ETSI TS 103 129       Signal Spectrum Mask:         Ca = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport stream is BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier		except 9/10 short FEC frame only)					
Physical Layer Scrambling:         N = 0 262141 all according to ETSI EN 302307-1           Modulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding         Depth 1 = 12 BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)           Carrier ID:         DVB-CID according to ETSI TS 103 129           Signal Spectrum Mask:         α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05           Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input and according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2         Supports single or multi program transport stream is BISS Mode 0, 1 and E BISS Mode 0:         BISS Mode 0:         MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode 1:         MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier				3/4, 4/5, 5/6, 8/9, 9/10			
Modulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding         188/204, T=8 Depth I = 12 Inner Coding           Inner Coding         BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)           Carrier ID:         DVB-CID according to ETSI TS 103 129           Signal Spectrum Mask:         α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05           Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS Mode 0: BISS Mode 0: BISS Mode 0: BISS Mode 0: BISS Mode 0: MPEG transport stream is transferred untouched BISS Mode 0: BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier		Pilots Insertion:					
Modulation / Encoding DVB-S / DVB-DSNG:         Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding         188/204, T=8 Depth I =12 BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK 0/3, 5/6, 8/9 (Pragmatic Trellis) 18QAM 3/4, 7/8 (Pragmatic Trellis)           Carrier ID:         DVB-CID according to ETSI TS 103 129 Signal Spectrum Mask:         α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05           Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport stream is BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier		Physical Layer Scrambling:	N = 0 2621	41			
DVB-S / DVB-DSNG:       Convolutional Interleaving: Inner Coding       Depth I = 12 BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       Supports single or multi program transport stream in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is crambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
DVB-S / DVB-DSNG:       Convolutional Interleaving: Inner Coding       Depth I = 12 BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) BPSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       Supports single or multi program transport stream in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is crambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier		Outer Reed Solomon Coding:	188/204, T=8				
Inner Coding       BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
BPSK 2/3, 5/6, 8/9 (Pragmatic Trellis)         16QAM 3/4, 7/8 (Pragmatic Trellis)         Carrier ID:       DVB-CID according to ETSI TS 103 129         Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport stream is BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier				K 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7)			
Image: Carrier ID:         DVB-CID according to ETSI TS 103 129           Signal Spectrum Mask:         α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05           Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport stream is BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode 1: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
Signal Spectrum Mask:       α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05         Transport Stream Inputs:       Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier	Carrier ID:	DVB-CID according to ETSI TS 103 12					
Transport Stream Inputs:         Dual DVB-ASI-electrical (2 x Connector MCX female, Impedance 75 Ω, cable EQ) auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
auto switching selectable between input 1 and 2 in case of ASI signal interruption, ASI data missing support of 2 TS multiple input streams (except with option BI)         Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2         Supports single or multi program transport streams in BISS Mode 0, 1 and E       BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched         BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W         BISS Mode E:       MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier			r MCX female Imr	pedance 75 $\Omega$ cable E $\Omega$			
support of 2 TS multiple input streams (except with option BI)           Multiple Transport Streams:         Individual modulation and FEC (MODCOD) configuration per TS input Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
Multiple Transport Streams:       Individual modulation and FEC (MODCOD) configuration per TS input         Capacity calculator/limitation per TS input can be activated       Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.         Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2         Supports single or multi program transport streams in BISS Mode 0, 1 and E       BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched         BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W         BISS Mode E:       MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
Capacity calculator/limitation per TS input can be activated Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3. Transport Stream Security (Option BI): BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier	Multiple Transport Streemer						
Input stream synchronization and Null-Packet deletion according to ETSI EN 302307-1, Annex D.2, D.3.           Transport Stream Security (Option BI):         BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2           Supports single or multi program transport streams in BISS Mode 0, 1 and E BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier	multiple transport Streams:						
Transport Stream Security (Option BI):       BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2         Supports single or multi program transport streams in BISS Mode 0, 1 and E         BISS Mode 0:       no scrambling, MPEG transport stream is transferred untouched         BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W         BISS Mode E:       MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
Supports single or multi program transport streams in BISS Mode 0, 1 and E           BISS Mode 0:         no scrambling, MPEG transport stream is transferred untouched           BISS Mode 1:         MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W           BISS Mode 1:         MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W           BISS Mode 1:         MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier	Trenenert Chroem Committee			COTUING TO ET OF EN 302307-1, ANNEX D.2, D.3.			
BISS Mode 0:       no scrambling, MPEG transport stream is transferred untouched         BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W         BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W         BISS Mode 1:       MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
BISS Mode 1:       MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session W         BISS Mode E:       MPEG transport stream is scrambled using a session word which is derived from a         16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected         Identifier	(Option BI):						
BISS Mode E: MPEG transport stream is scrambled using a session word which is derived from a 16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier							
16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-character Injected Identifier			BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-character Clear Session Word				
Identifier							
Identifier			Encrypted Session	Word and 14-hexadecimal-character Injected			
Max input rate for Clear Passion Word and Engrupted Cassion Words				-			
Max. input rate for Clear Session Word and Encrypted Session Word:		Max. input rate for Clear Session Word	and Encrypted Se	ession Word:			
- 10 times per 5 minutes			2000 T				
- 1 time per 10 seconds							
Important note: Option BI operates exclusively with single stream operation. Devices with option BI do not co							
otherwise included support for 2 input streams!							

## DVB Satellite Modulator OEM Module SDMO

Transport Stream Frames Size:	188 or 204 bytes
Packet Stuffing:	TS Null packet or TS All Zero packet insertion (DVB-S, DVB-DSNG, DVB-S2) or Dummy PLFRAME insertion (DVB-S2
	only), when the data rate to transmit is higher than the data rate at the data input.
	Null packet deletion can be enabled to remove incoming null packets.
	PCR (program clock reference) correction (with Null packet insertion/deletion) for max 250 PID streams with PCRs
	included.
	Not supported in case of DVB-S2 multiple input stream operation.
Still Picture Playout:	As standard a color bar pattern is transmitted with main profile at main level (MPML) MPEG-2 encoding, 4:3 aspect
	ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECAM). As option an alternative, customized still picture can
	be loaded (different content, different aspect ratio, different frame rate).
Compliant with Standards:	ETSI EN 300421, ETSI EN 301210, ETSI EN 302307-1 and -2, ETSI TS 103129
	EN 50083-9 (ASI electrical, SPI Interface)
Monitoring:	Faults, stored faults with time stamps
Monitoring and Control Interface:	Protocol: Multipoint
	Connection: RS232 over 2.54mm pin header
Temperature Range:	0°C 50 °C operating
	-30°C 60 °C operating with 10 minutes warm up at -30°C (option EXT)
	-30°C 80 °C storage
Relative Humidity:	<95% non condensing
Mains Power Input:	12 24 V DC nominal, 11 26 V DC max
Mains Power Consumption:	Standard: 14 W typ.
•	Option EXT: 17 W typ.
Mains Power Input Connector:	2.54mm pin header
Dimension and Weight:	185 x 17 x 100 mm <sup>3</sup> (WxHxD) standard module
	185 x 25 x 100 mm³ (WxHxD) with cables and/or option EXT
	approx. 0.45 kg

Specifications are subject to change

#### Order information:

SDMO-[options]

# Possible options are:Cannot be combined with:Requires:Vadditional VHF-band output--EXTextended temperature range and clock stability--BIBISS scrambling--

#### Examples:

SDMO-V	Modulator with 50 $\Omega$ L-band output and 50 $\Omega$ VHF-band output
SDMO-EXT	Modulator with extended temperature range, including higher clock stability



#### DVB-S2 Modem sk-IP / sk-dv / sk-ts





WORK Microwave's high-speed DVB-S2 IP modem SK-IP provides operators with a platform for transferring IP/Ethernet data over DVB-S2 satellite connections. Ethernet frames and IP packets are encapsulated directly within DVB-S2 baseband frames, resulting in low encapsulation overhead.

In order to achieve speeds up to 356 Mbit/s, only the fastest and most bandwidth efficient encapsulation and modulation parameters are supported. For maximum bandwidth efficiency and ease of operation the device uses Generic Stream Encapsulation according to TS 102 606 and Multiprotocol Encapsulation according to EN 301 192.

The modem SK-TS is used for transmitting and receiving signals as MPEG transport streams. DVB-S as well as DVB-S2 modulation types are supported.

#### **DaVid technology**

Utilizing DaVid technology, WORK Microwave's DVB-S2 Modem SK-DV system offers simultaneous transportation of IP data (i.e., network connection) and live broadcasting (i.e., video content) over a single satellite carrier. The DaVid technology works by aggregating multiple transport streams and IP data into a DVB-S2 multiplex while providing end-user control of all transmission types.

#### **OptiACM**

An integrated OptiACM controller provides adaptive or variable FEC- and modulation setting for point-to-point or point-to-multipoint IP applications.

#### VideoACM

An integrated VideoACM controller provides adaptive or variable FEC- and modulation setting for point-topoint or point-to-multipoint Transport Stream transmissions.

#### Predistortion

Broadcast Predistortion and Extended Predistortion operating in the background during regular transmission - mitigates the negative effects in the filters and amplifiers of satellites by automatically compensating for linear and non linear distortions. Subsequently the satellite link can be operated with less back off/higher power and a higher signal-tonoise ratio increases beam coverage ensuring higher throughput and availability for the satellite operator.

#### Flexible RF connectivity

The modulator provides the modulated signal from 50 to 180 MHz IF or at L-band. With the L-band output, a 10 MHz reference signal for a block upconverter can be enabled on the TX port, as well as DC power 24 V or 48 V (Option DC24 or DC48).

The demodulator accepts an L-band signal in the range from 950 to 2150 MHz on two inputs or alternatively an IF signal in the range from 50 to 180 MHz on a single input. On L-band devices, LNBs can be powered directly over the inputs.

#### **High signal integrity**

Low spurious emissions make the modem perfect for use in environments with demanding requirements, like high-power uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

# Operating and control - easy integration into your system

The modem can be operated via push buttons on the front panel using intuitive display menus or via remote control (RS232, RS422/485 and TCP/IP over Ethernet). For the remote control addressable packet-based commands, a Web interface (HTTP browser) or SNMP can be used. Detailed monitoring of system parameters is possible.

#### **Key features**

 DVB-S2 - ETSI EN 302 307-1 DVB-DSNG - ETSI EN 301 210 DVB-S - ETSI EN 300 421

- DVB-S2 modulations: QPSK / 8PSK / 16APSK / 32APSK normal, short
- DVB-S and DVB-DSNG: QPSK / 8PSK / 16QAM modulation (SK-TS)
- DVB Carrier ID ETSI TS 103 129
- Broadcast Predistortion including automatic group delay and dynamic constellation predistortion for QPSK and 8PSK (option XB)
- Extended Predistortion including automatic group delay and static constellation predistortion up to 32APSK (option XE)
- Normal and short FEC frames, pilots on or off (DVB-S2)
- Physical layer framing with scrambling codes 0 to 262141 according to DVB-S2 standard
- Symbol rates from 60 ksps to 80 Msps
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Adjustable digital gain slope equalizer
- Low spurious output
- An output signal multiplexer integrated within the L-band version allows to combine the modulated signal, the 10 MHz reference signal and DC power (option DC24 or DC48) to drive an external power block upconverter
- Automatic integrated uplink power control (option)
- DISEqC 1.1 support on LNB L-band input
- OptiACM system for optimized bandwidth usage and extended weather insensitivity for IP transmission
- Gigabit Ethernet data interface
- IP and baseband traffic shaping
- Generic Stream Encapsulation (GSE) direct to DVB-S2 baseband frames
- Multiprotocol Encapsulation (MPE)
- Operates as Layer 2 Bridge, Layer 3 Bridge or Layer 3 Router

- 2 ASI Input and 2 ASI Output Interfaces (SK-DV, SK-TS)
- Transport Stream Input for DVB-S2 Multiple Input Stream operation, capacity calculator, optional capacity limitation per TS input (SK-DV only)
- Transport Stream over IP Inputs (option TI1,TI2) (SK-DV, SK-TS only)
- Support of 2 Multiple Transport Stream Inputs and Outputs (SK-DV, SK-TS)
- VideoACM system for optimized bandwidth usage and extended weather insensitivity for Transport Stream video transmission
- BISS-E encryption of transport streams on transmit side (option BI), supports multi program transport stream
- Transmit mute input
- Tx Monitor Output on Frontpanel
- Remote control through RS232, RS422/485 (2wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP with MIBs downloadable form the device
- 10 MHz Reference OCXO included
- Summary alarm output with dual change over switch contacts
- Operating temperature range 0 °C to 50 °C (32 °F to 122 °F)
- CE compliant
- 3 years warranty

#### Open questions, demo units

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

SK-IP / SK-DV / SK-TS

Modulator Part of Modem Type: Signal Outputs: IF-Output Frequency: Frequency Resolution: Phase Noise: 100 Hz 100 Hz 1 kHz 10 kHz	SK-xx-Lx-xx: SK-xx-Vx/Lx-xx:	1x L-band output 1x VHF-band output 1x L-band output /HF-band Output	(950 t (50 1	<b>SK-DV</b> / <b>SK-TS</b> 2150 MHz) 80 MHz), 2150 MHz), can be a			
IF-Output Frequency: Frequency Resolution: Phase Noise: 10 Hz 100 Hz 1 kHz 10 kHz	SK-xx-Vx/Lx-xx:	1x VHF-band output 1x L-band output	t (̀501	80 MHz),			
Frequency Resolution: Phase Noise: 10 Hz 100 Hz 1 kHz 10 kHz		1x L-band output	(950				
Frequency Resolution: Phase Noise: 10 Hz 100 Hz 1 kHz 10 kHz	V	HF-band Output		, our bo b	liternatively e	enabled	
Frequency Resolution: Phase Noise: 10 Hz 100 Hz 1 kHz 10 kHz					L-band O		
Phase Noise: 10 Hz 100 Hz 1 kHz 10 kHz		50 180 MHz		950 2150 MHz			
100 Hz 1 kHz 10 kHz		1 Hz		1 Hz			
1 kHz 10 kHz		-70			-65		
10 kHz		-80			-75		
		-88 -90			-88 -90		
100 kHz		-100			-100	1	
1 MHz		-115			-115		
			max. va	lues in dBc/Hz	-		
IF-Output Characteristics:	Impedance:	50 Ω or 75 Ω		Impedance:	50 Ω or 75	Ω	
	Return Loss:	> 18 dB		Return Loss:	> 18 dB		
	Output Power:	-25 dBm 5 dBm,		Output Power:	-30 dBm		
	0 · · · P	0.1 dB steps, ±0.5 dBm	accuracy		0.1 dB step	s, ±0.5 dBm accuracy	
	Output Power muted:	0 E dDm		Output Power muted:			
	Connector:	< -85 dBm BNC female		Connector:	< -85 dBm N female (5	<b>30</b> O)	
		Divo lemaie			F female (7		
				10 MHz reference	i ionale (7		
				output on L-band			
				output:	1.5 ±1.5 dB	Bm (can be switched on/off)	
				DC output on L-			
				band output:	24 V or 48		
						an be switched on/off) 24 or DC48)	
Monitoring Output	Output Power:	-20 dB of IF Output		Output Power:		-band Output	
(on front panel):	Impedance:	50 Ω		Impedance:	50 Ω	Sand Output	
( ,	Return Loss:	> 20 dB		Return Loss:	> 20 dB		
	Connector:	SMA female		Connector:	SMA female	e	
Spurious Outputs:	Signal related:	< -67 dBc, unmodulated	l carrier,	Signal related:		(unmodulated carrier, in	
		50 90 MHz or			band)		
		100 180 MHz	loorrior			(unmodulated carrier	
		< -45 dBc, unmodulated out of band	Camer,		nannonics,	out of band)	
Frequency and Clock Stability	+2 x 10 <sup>-8</sup> (-30 °C	60 °C, after warm up), a	aging: +1 x	10 <sup>-9</sup> per day +1 x 10	) <sup>-/</sup> per vear		
Symbol Rate:	Max. Range:	<u>, , , , , , , , , , , , , , , , , , , </u>		. 80 Msps (depending		e option)	
	Step size:		1 sps	··· ··· ··· · · · · · · · · · · · · ·			
Modulation / Coding	Outer BCH Code:		FEC-Fram	nes nldpc = 64800	) (normal FE	C Frame)	
DVB-S2:				nldpc = 16200			
	Inner LDPC Code:		QPSK			3/4, 4/5, 5/6, 8/9, 9/10	
			8PSK 16APSK	3/5, 2/3, 3/4, 5 2/3, 3/4, 4/5, 5			
			32APSK	3/4, 4/5, 5/6, 8			
	Physical Layer Fra	aming:	yes	,,,,,,,			
	Physical Layer Sig		yes				
	Pilots Insertion:		on / off				
	Physical Layer Sci	rambling:	N = 0 2				
Modulation / Coding	Outer Reed Solom	on Codina:	all accordi 188/204, T	ng ETSI EN 302307			
DVB-S / DVB-DSNG:	Convolutional Inte		Depth I =1				
	Inner Coding depe		BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7)			Convolutional K=7)	
	Firmware Option:		8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis)				
	(according ETSI E	N 300421, 301210)		4, 7/8 (Pragmatic Tre		(SK-TS only)	
Carrier ID:		ng to ETSI TS 103 129					
Signal Spectrum Mask:		20 according ETSI EN 30					
		05 (with Firmware Option					
Transport Stream Adaption	CRC-8 Encoder:		yes				
DVB-S2:	Merger/Slicer:	Insortion:	yes				
	Baseband Header Stream Adaption:	insention:	yes				
		lina:	yes yes	(according ETSI EN	J 302307)	(SK-DV, SK-TS only)	
	Loasepado Scramr						
Transport Stream Adaption	Baseband Scramb Transport Stream		yes		<u> </u>	(0	

SK-IP / SK-DV / SK-TS

Transport Stream Inputs:	2x ASI (BNC female 75 Ω) (SK-DV only)				
	Supporting 1 Multiple Transport Stream Input (auto switching dual ir	Supporting 1 Multiple Transport Stream Input (auto switching dual input)			
	With option MT2:				
	$2x \text{ ASI}$ (BNC female 75 $\Omega$ ) (SK-DV only)				
	Supporting 2 Multiple Transport Stream Inputs or 1 Multiple Transpo	ort Stream (auto switching dual input)			
	Additionally with option TI1 or TI2 up to two individual Transport Stre	eam over IP Inputs (Connector RJ-45,			
	100/1000 Mbps, auto sensing), IPv4, UDP and RTP support, FEC	according SMPTE 2022 1/2,			
	Jitter tolerance 1 500 ms, Conversion TS over IP to TS.	(SK-DV, SK-TS only)			
Multiple Transport Stream Input	Individual modulation and FEC (MODCOD) configuration per TS inp				
Operation:	TS input can be activated. Input stream synchronization and Null-Pa				
	Annex D.2, D.3.	(SK-DV, SK-TS only)			
Transport Stream Frames Size:	188 or 204 bytes	(SK-DV, SK-TS only)			
Packet Stuffing:	TS Null packet or TS All Zero packet insertion	(SK-TS only)			
	or Dummy PLFRAME insertion	(SK-IP, SK-DV only),			
	when the data rate to transmit is higher than the data rate at the data	a input.			
	Null packet deletion can be enabled to remove incoming null packet	ts (SK-TS only).			
	PCR (program clock reference) correction (with Null packet insertion	n/deletion) for max 250 PID streams with PCRs			
	included (SK-TS only, not supported in case of DVB-S2 multiple inp	ut stream operatio).			
		(SK-DV, SK-TS only)			
Still Picture Playout:	As standard a color bar pattern is transmitted with main profile at ma				
	aspect ratio, 25 Hz frame rate, interlaced (suitable for PAL or SECA	M). As option an alternative, customized still			
	picture can be loaded (different content, different aspect ratio, different	ent frame rate). (SK-DV, SK-TS only)			

Demodulator Part of Modem Type:		SK-IP / S	K-DV / SK-TS								
Signal Inputs:		nd input (950 2150 M		tively enabled							
		band input (50 180 N									
		nd input (950 2150 M	Hz), can be alterna								
	VHF-band I			L-band Input							
IF-Input Frequency:	50 180		Impedance:	950 2150 MHz							
IF-Input Characteristics:	Impedance:     50 Ω or 75 Ω       Return Loss:     >18 dB       Input Power:     -60 dBm ·       (total aggreg       IF-Connector:     BNC female	75 Ω >13 dB -70 dBm20 dBn (total aggregate pov 2x F female, input selectable 13.5V or 18 VA (450	ver)								
			LNB DC-Feed:	22 kHz tone on/off, short circuit protecte	DISÉqC 1.1						
Symbol Rate:	Max. Range:	60 ksps 76 Msps ( 60 ksps 62 Msps (		PSK)							
	Step size:	1 sps									
Demodulation / Decoding DVB-S2:	Outer BCH Code: Inner LDPC Code:	nld QPSK 1/4 8PSK 3/5 16APSK 2/3	, 2/3, 3/4, 5/6, 8/9, , 3/4, 4/5, 5/6, 8/9, , 4/5, 5/6, 8/9, 9/10	FEC Frame) ´ 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 9/10							
	Physical Layer Scrambling:	N = 0 262141 all according ETSI EN		are automatically dete	CIEU						
Demodulation / Decoding DVB-S:	Outer Reed Solomon Code: Convolutional Interleaving: Inner Code:	188/204, T=8 Depth I=12 QPSK 1/2, 2/3, 3/4, 5, automatically selected all according ETSI EN	/6, 6/7, 7/8 (Convo	,	DV, SK-TS only)						
Signal Spectrum Mask:	$\alpha$ = 0.35, 0.25, 0.20 according $\alpha$ = 0.15, 0.10, 0.05 (compatible										
Transport Stream Output:	2x ASI (BNC female 75 Ω) Supporting Single Transport St Processing of 2 Multiple Transp Up to 6 x RTP/UDP IP over Ett	port Streams (can be ass nernet according to IETF	signed arbitrarily to RFC 2250	Output) (Option MT2)	)						
Trenenert Streem Freme Size	Support of Null Packet Reinser	tion according to ETSTE	IN 302 307 Annex		-DV, SK-TS only)						
Transport Stream Frame Size:	188 bytes			(SK	-DV, SK-TS only)						

SK-IP / SK-DV / SK-TS

Common Parameters:	SK-IP / SK-DV / SK-TS	
Baseband Channels:	16 baseband channel with separate DVB-S2 baseband settings	
	(MODCOD, FEC frame length, pilots, encapsulation type, multistream ID, timeout)	(SK-IP, SK-DV only)
OptiACM:	CCM / VCM / ACM functionality for point-to-point and point-to-multipoint links	
	16 ACM channels with separate MODCOD range and Es/N0 sensitivity	
	ACM channels arbitrary assignable to baseband channels	(SK-IP, SK-DV only)
BB Traffic Shaper:	Baseband channel limits based on symbol rate for virtual share of the carrier	
	Guaranteed and limited bandwidth individually configurable	(SK-IP, SK-DV only)
Data Interface:	Ethernet (1xRJ-45, 10/100/1000 Mbps auto sensing)	
IP Data Rate:	up to 356 Mbps or 80000 pps	(SK-IP, SK-DV only)
Network Operation:	Layer 2: Bridge (Ethernet frame transmission)	
	STP/RSTP Bridge/Beuter (ID peol/et transmission) (Dr.4. (Dr.6	
	Layer 3: Bridge/Router (IP packet transmission), IPv4, IPv6 256 IP/subnet routes per port	
	16 DVB-S2 baseband channels	(SK-IP, SK-DV only)
Data Encapsulation:	Generic Stream Encapsulation (GSE) according ETSI TS 102606	
	Multiprotocol Encapsulation (MPE) according to ETSI EN 301192	(SK-IP, SK-DV only)
IP Traffic Shaper:	64 independent rules	
	Guaranteed and limited bandwidths	
	Fixed or dynamically integrated into ACM (bind to MODCOD)	
	Match criteria: source/destination IP subnet, source MAC, UDP/TCP port ranges, TOS/	DS field, packet size
	(Active IP Traffic shaper reduces max. packet rate to typ. 50000 pps)	(SK-IP, SK-DV only)
Transport Stream Security	BISS-E Scrambler on transmit side, compliant to EBU Tech 3292 rev. 2	(SK-DV, SK-TS only)
(Option BI):	For use with unit supporting 1 Multiple Transport Stream input.	(- ) )
,	Supports Single or Multi Program Streams in BISS Mode 0, 1 and E	
	BISS Mode 0: no scrambling, MPEG transport stream is transferred untouched	
	BISS Mode 1: MPEG transport stream is scrambled using 12-hexadecimal-cha	racter Clear Session Word
	BISS Mode E: MPEG transport stream is scrambled using a session word whic	h is derived from a
	16-hexadecimal-character Encrypted Session Word and 14-hexadecimal-ch	aracter Injected
	Identifier	
	Max. input rate for Clear Session Word and Encrypted Session Word:	
	- 10 times per 5 minutes	
	- 1 time per 10 seconds	
	Important note: Option BI operates exclusively with single stream operation.	
Broadcast Predistortion (Option XB)	Hardware and signal processing can be enabled through customer field selectable firms	ware options
Extended Predistortion (Option XE):	An external windows PC is required to run the application program, which optimizes the	
( <b>-</b>   <b>-</b> )	in the background of live transmissions (if activated), by reading information from a refe	
	communication between the reference demodulator, the application program and the m	odulator IP connectivity is
	used.	2
Monitoring and Control Interface:	Protocol: SNMP	
	Connection: UDP over Ethernet (10/100 Mbps auto sensing) IPv4,	IPv6, connector RJ-45
	Protocol: HTTP (web browser interface)	
	Connection: TCP/IP over Ethernet (10/100 Mbps, auto sensing) IP	v4, IPv6, connector RJ-45
	Protocol: Multipoint	
	Connection: RS232 or RS422/RS485 (configurable), connector DS	
	TCP/IP over Ethernet (10/100 Mbps, auto sensing) IP	v4, IPv6, connector RJ-45
Alarm Interface:	Alarm: two potential free contacts (DPDT),	
Mute Input:	Mute Input: TTL logic input with internal pull up	
· · · · -	Connector DSUB09	
Internal Fan	FAN included	
Temperature Range:	0°C 50°C operating	
<b>B</b> 1 0 10	-30°C 80°C storage	
Relative Humidity:	< 95% non condensing	
User Interface:	LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys	
Mains Power Input:	100 240 V AC nominal, 90 264 V AC max, 50 60 Hz	
Mains Power Consumption:	Typ.: 65 VA / 45 W,	
	Max 190 W (with option DC24, DC power on)	
	Max 300 W (with option DC48, DC power on)	
Mains Power Input Connector:	IEC C14	
Mains Fuse:	2 x 3.15 A time-lag fuse (standard)	
	2 x 5 A time lag fuse (with option DC24 or DC48)	
	$1492 \times 44 \times 470 \text{ mm}^3 (M/vHvD) + DH/(10")$	
Dimension and Weight:	483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19")	
Dimension and Weight:	approx. 8 kg (standard) approx. 10 kg (with option DC24 or DC48)	

Specifications are subject to change

SK-IP / SK-DV / SK-TS

#### **Order Information:**

SK-[Device Type]-[Output Band Output Imp]-[Input Band Input Imp]-[Options]-[Modulator Firmware Option]

#### **Device Types:**

- IP DVB-S2 IP Modem
- DV DaVid Technology Modem (combination of TS and IP into one carrier)
- TS DVB-S/S2 Transport Stream Modem

Possible (	Options are:	Cannot be combined with:	Available for:
BBO	Baseband frame input and output	-	SK-IP, SK-DV, SK-TS
DC24	24 V DC power on L-band output	DC48	SK-IP, SK-DV, SK-TS
DC48	48 V DC power on L-band output	DC24	SK-IP, SK-DV, SK-TS
TI1	one TS over IP input interface	TI2	SK-DV, SK-TS
TI2	two TS over IP input interfaces	TI1	SK-DV, SK-TS
BI	BISS scrambling and descrambling for Transport Stream	MT2	SK-DV, SK-TS
MT2	Support of 2 Multiple Transport Stream inputs and outputs	BI	SK-DV, SK-TS
ХВ	Broadcast Predistortion	-	SK-IP, SK-DV, SK-TS
XE	Extended Predistortion	-	SK-IP, SK-DV, SK-TS

Modulator Firmware Option	Max Symbol Rate, Supported Modulation Types and other Features DVB-S2
- P2L	15 Msps, QPSK / 8PSK
- P2N	30 Msps, QPSK / 8PSK
- P2M	45 Msps, QPSK / 8PSK
- P2H	60 Msps, QPSK / 8PSK
- P2E	80 Msps, QPSK / 8PSK
- A2L	15 Msps, QPSK / 8PSK / 16APSK / 32APSK
- A2N	30 Msps, QPSK / 8PSK / 16APSK / 32APSK
- A2M	45 Msps, QPSK / 8PSK / 16APSK / 32APSK
- A2H	60 Msps, QPSK / 8PSK / 16APSK / 32APSK
- A2E	80 Msps, QPSK / 8PSK / 16APSK / 32APSK
S	Support of Roll-Off-Filters down to 5%

#### Examples:

SK-IP-L50-L75-DC24-A2H SK-IP-L50-L75-DC24-A2HS SK-IP-V50/L50-V75/L75-P2N SK-DV-V75/L50-V75/L75-A2L

#### IP Modem with L-band Output 50 $\Omega$ and L-band Input 75 $\Omega,$ DC24 Volt

IP Modem with L-band Output 50  $\Omega$  and L-band Input 75  $\Omega$ , DC24 Volt, Roll-Off-Filters down to 5 % IP Modem with VHF-band and L-band Output, VHF-band and L-band Input DaVid Technology Modem with VHF-band and L-band Output and Input



## **DVB-S2 Demodulator**

SDD-IP / SDD-DV / SDD-TS





WORK Microwave's high-speed DVB-S2 demodulator SDD is designed to provide demodulation of DVB-S and DVB-S2 signals.

The SDD-IP demodulator provides operators with a platform for receiving IP/Ethernet data over DVB-S2 satellite connections. The device is the corresponding demodulator unit to the DVB-S2 IP modem SK-IP and supports low overhead Generic Stream Encapsulation and Multiprotocol Encapsulation. In combination with the integrated support of OptiACM and VideoACM, the demodulator provides adaptive or variable FEC and modulation setting for point-to-point or point-to-multipoint applications.

The SDD-TS device can be used for receiving digital video broadcast contribution or distribution signals as MPEG transport streams and is suitable for a wide range of applications, including video reception sites, monitoring facilities, and program exchange points.

The SDD-DV device combines both operation types in a single device.

The demodulator has two L-band inputs in the range from 950 to 2150 MHz or alternatively one L-band input and one VHF-band input in the range from 50 to 180 MHz, with one input being selected. On L-band inputs, LNBs can be powered directly.

# Operating and control – easy integration into your system

The configuration of the demodulator can be controlled via the front panel keys or remotely via RS232, RS422/485 and TCP/IP (over Ethernet). For the remote control addressable packet-based commands, an HTTP Web browser interface, or SNMP can be used. Detailed monitoring of system parameters is possible.

#### **Key features**

- DVB-S2 ETSI EN 302 307-1 DVB-S - ETSI EN 300 421
- DVB-S2 demodulation QPSK / 8PSK / 16APSK / 32APSK
- DVB-S demodulation QPSK
- Normal and short FEC frames, pilots on or off (DVB-S2)
- Physical layer framing with descrambling codes 0 to 262141 according to DVB-S2 standard
- Automatic reception of Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %
- Symbol rates from 60 ksps to 80 Msps
- Data rate max 356 Mbps
- OptiACM and VideoACM
- Gigabit Ethernet data interface
- 2 ASI Output Interfaces (SDD-TS / SDD-DV)
- 6 ASI Output Interfaces for up to 6 Multiple Transport Streams (Option MT6) (SDD-TS / SDD-DV)
- Generic Stream Encapsulation (GSE), Multiprotocol Encapsulation (MPE)
- Network layer 2 or layer 3 operation
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP with MIBs downloadable from the device
- Summary alarm output with dual change over switch contacts
- Operating temperature range 0° C to 50 °C (32 °F to 122 °F)
- CE compliant
- 3 years warranty

## **DVB-S2 Demodulator**

SDD-IP / SDD-DV / SDD-TS

Demodulator Type:		SDD-IP / SDD-D	DV / SDD-TS	
Signal Inputs:		d input (9502150 MHz)		
		d input (9502150 MHz),		
		pand input (50180 MHz), c	an be alternative	ly enabled
	VHF-band I			L-band Input
Input Characteristics:	Frequency: 50 180 MH		Frequency:	950 2150 MHz
	Impedance: 50 $\Omega$ or 75 $\Omega$		Impedance:	75 Ω
	Return Loss: > 18 dB		Return Loss:	> 13 dB
	Input Power: -60 dBm1		Input Power:	-70 dBm20 dBm
	(total aggrega	ate power)		(total aggregate power)
	IF-Connector: BNC female		IF-Connector:	F female
			LNB DC-Feed:	13.5 V or 18 V (450 mA) switchable
				22 kHz tone on/off, DISEqC 1.1 short circuit protected
Symbol Rate:	Max. Range:	60 ksps 76 Msps (QPS	W ADOK 164DO	
Symbol nate.	Max. Hange.	60 ksps 62 Msps (32Al		K)
	Max. Range (option S80):	500 ksps 80 Msps (32A		SK 32APSK)
	Step size:	1 sps		
Demodulation / Decoding	Outer BCH Code:		4800 (normal FE	C Frame)
DVB-S2:			6200 (short FEC	
	Inner LDPC Code:			3/4, 4/5, 5/6, 8/9, 9/10
			3/4, 5/6, 8/9, 9/10	
			/5, 5/6, 8/9, 9/10	
		32APSK 3/4, 4/5, 5	5/6, 8/9, 9/10	
	Demodulator auto detection:	Modulation- and FEC-type	e, pilots on/off are	automatically detected
	Physical Layer Scrambling:	N = 0 262141		
		all according ETSI EN 30	2307-1	
Demodulation / Decoding	Outer Reed Solomon Code:	188/204, T=8		
DVB-S:	Convolutional Interleaving:	Depth I=12		
	Inner Code:	QPSK 1/2, 2/3, 3/4, 5/6, 6	7, 7/8 (Convolut	onal K=7)
		automatically selected		2 ambril
OptiACM:	CCM / VCM / ACM functionality	all according ETSI EN 300		
Signal Spectrum Mask:	$\alpha = 0.35, 0.25, 0.20$ according E			5
Signal Spectrum Mask.	$\alpha = 0.35, 0.25, 0.20$ according E $\alpha = 0.15, 0.10, 0.05$ (compatible			
Data Interfaces:	$\alpha = 0.13, 0.10, 0.03$ (compatible) 1x Ethernet (RJ-45, 10/100/1000			
Data interfaces.	$2x \text{ ASI (BNC female 75 }\Omega; \text{ SDD}$			
	$6x  ASI (BNC female 75 \Omega; SDD$		MT6)	
Data Rate:	up to 356 Mbps		WIT 0)	
Network Operation:	Layer 2 (Ethernet frame reception	on) or Laver 3 (IP packet re	cention) IPv4 an	d IPv6 dual stack
Data Encapsulation:	Generic Stream Encapsulation (	(GSE) according ETSLTS 1	02606 (SDD-IP	SDD-DV only)
Bata Enoupediation	Multiprotocol Encapsulation (MP			
Transport Stream Output:	2x ASI (BNC female 75 Ω) (SDE		01102 (022 11 )	
	Supporting Single Transport Stre		e Transport Strea	am Operation (Dual Output)
	1x RTP/UDP IP over Ethernet a			
	With Option MT6 (SDD-TS, SDD			
	Processing of 6 Multiple Transpo			
	Support of Null Packet Reinserti	ion according to ETSI EN 3	02 307 Annex G.	3
	6x ASI (BNC female 75 Ω) Outp			
	Up to 6x RTP/UDP IP over Ethe		2250	
Transport Stream Frame Size:	188 bytes (SDD-TS and SDD-D			
Transport Stream Security:	BISS-E Descrambler, compliant			S only)
(Option BI)	Supports single or multi program	n transport stream in BISS I	Modes 0, 1 and E	
		ambling, MPEG transport s		
		ansport stream is descramb		
			bied using 64-bit	Encrypted Session Word and 56-bit
	Injected I Max, input rate for Session Wor			
	Max. input rate for Session Word	as: er 10 seconds		
		per 5 minutes		
	10 unles	por o minutoo		
	Important note: Option BI operation	ates exclusively with single	stream operation	
	Instead of Transport Stream over			
DVB-S2 Baseband Frame Output:				
DVB-S2 Baseband Frame Output: (Option BBO)	BTP/UDP IP over Ethernet Jum	the Frames over GhE (SDE	)-IP SI)D-DV $\cap$ n	V)
(Option BBO)	RTP/UDP IP over Ethernet, Jum Streaming of CADU frames accord	to Frames over GbE (SDL ording to CCSDS blue book	-IP, SDD-DV on (131_3-B -1	ý)
	RTP/UDP IP over Ethernet, Jum Streaming of CADU frames accor Automatic detection of CADU pa	ording to CCSDS blue book	0-IP, SDD-DV on 131. 3-B -1	у)

## **DVB-S2 Demodulator**

SDD-IP / SDD-DV / SDD-TS

Monitoring and Control Interface:	Protocol:	SNMP								
-	Connection:	UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45								
	Protocol:	HTTP (web browser interface)								
	Connection:	TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45								
	Protocol:	Multipoint								
	Connection:	RS232 or RS422/RS485 (configurable), connector DSUB09 female or								
		TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6,connector RJ-45								
Alarm Interface:	Alarm: two potential fre	ee contacts (DPDT), Connector DSUB09								
Temperature Range:	0 °C 50 °C operat	ting								
	-30 °C 80 °C storag	e								
Relative Humidity:	<95% non condensing									
User Interface:	LCD-Display 2 x 40 ch	aracters, 4 cursor keys, 2 function keys								
Mains Power Input:	100 240 V AC nomi	inal, 90264 V AC max, 5060 Hz								
Mains Power Consumption:	Typ.: 35 VA / 25 W									
Mains Power Input Connector:	IEC C14									
Mains Fuse:	2 x 2 A time-lag fuse									
Dimension and Weight:	483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19")									
-	approx. 5.5 kg									

Specifications are subject to change

#### Order Information:

#### SDD-[Device Type]-[Input Band Input Imp]-[Options]

#### Device Types:

- IP DVB-S2 IP Demodulator
- DV DaVid Technology Demodulator (switchable combination of TS and IP)
- TS DVB-S/S2 Transport Stream Demodulator

Possible Option	ns are:	Cannot be combined with:	Available for:
BBO	Baseband frame output	-	SDD-IP, SDD-DV, SDD-TS
BI	BISS decryption	MT6	SDD-DV, SDD-TS
MT6	Support of 6 Multiple Transport Stream outputs	BI	SDD-DV, SDD-TS
S80	Support of symbol rates up to 80 Msps for 32APS	K -	SDD-IP, SDD-DV
CCSDS	Output of CCSDS CADU frames -	-	SDD-IP, SDD-DV

#### Examples:

SDD-TS-L75	DVB-S/S2 TS Demodulator with L-band Input 75 $\Omega$
SDD-IP-L75	DVB-S2 IP Demodulator with L-band Input 75 $\Omega$
SDD-IP-V75/L75	DVB-S2 IP Demodulator with VHF-band and L-band Input
SDD-DV-V50/L75-BBO	DVB-S2 DaVid Demodulator with VHF-band 50 $\Omega$ and L-band Input 75 $\Omega$ , Baseband Frame Output option



#### Notes

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