

SATCOM  
Technologies

DVB-S/S2  
Modulators

DVB-S/S2  
Demodulators

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DVB-S/S2  
Modems



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# Challenge Series Satellite High Speed DVB-S2 Modulator

70/140 MHz IF Output  
L-Band Output



## CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 modulator with 70 MHz/140 MHz IF or L-Band output provides high flexibility for the station design. The modulator can be integrated in most standard station configurations and can be used in fixed satellite ground stations as well as in satellite news gathering (SNG) vehicles, Fly-Aways or any other mobile or portable applications

## MPEG Transport Stream Input – L-Band or IF output

The modulator accepts an MPEG transport stream on an ASI, SPI or TS over IP inputs from a video encoder or MPEG multiplexer and provides a DVB-S or DVB-S2 modulated carrier anywhere between 50 to 180 MHz or L-Band.

## Baseband Frame Data Input

For DVB-S2 VCM and ACM applications the modulator accepts on its input a baseband frame plus an additional header, which defines the modulation and FEC to be applied to each specific baseband frame. Also here the ASI or SPI input is used as interface. A hardware flow control signal can be used for synchronization purposes between the modulator and the multiplexer or encapsulator.

## High signal integrity

Low spurious emissions allow using the modulator also in environments with demanding requirements, like high power video uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

## Flexibility, backward compatibility

Mode adaptation, FEC Encoding, and Modulation is compliant with the DVB-S2 Standard EN 302307. QPSK / 8PSK / 16APSK and 32APSK modulation is available. For backward compatibility also framing, scrambling, FEC encoding as well as QPSK / 8PSK / 16QAM modulation according to the DVB-S Standards EN 300421 and EN 301210 is supported. BPSK modulation is also possible. Carriers with symbol rates from very low rates (8 kbps) up to 60 Msps can be transmitted.

## Operating and control – easy integration into your system

The modulator can be operated via the push buttons on the front panel using self-explanatory 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

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

- Customized M&C interface and control syntax
- Military versions for hostile environment (shock, vibration, humidity, temperature)

## Key features

- DVB Satellite modulator for digital TV satellite uplinks and digital SNG applications
- DVB-S2 compliant (EN 302 307)  
DVB-DSNG compliant (EN 301 210)  
DVB-S compliant (EN 300 421)
- QPSK / 8PSK / 16 QAM modulation (DVB-S, DVB-DSNG)
- QPSK / 8PSK / 16APSK / 32 APSK modulation (DVB-S2)
- Normal and short FEC frames, Pilots on or off (DVB-S2)
- BISS-E encryption (option), supports multi program transport stream
- Physical layer framing (PL scrambling with codes 0 to 262141) according to DVB-S2 standard
- Roll-Off: 35%, 25%, 20%
- Adjustable digital slope equalizer
- Low spurious output
- Dual ASI (with auto-switchover) and SPI electrical interfaces
- ASI optical interface (option)
- Hex ASI Multistream-Interface (with additional auto-switchover) (option)
- DVB-S2 Multistream support (option)
- Transport Stream over IP inputs (option)
- Null packet insertion and deletion with PCR correction
- Still picture playout (customized picture content can be loaded to the modulator unit, option)
- Symbol rates from 8 ksps to 60 Msps
- Data rate max approx. 213 Mbps with ASI Interface (depending on modulation type and FEC)
- Data rate max 267 Mbps with SPI Interface (depending on modulation type and FEC)
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP (MIBs are provided).
- Summary alarm output (dual change over switch contacts)
- Transmit mute input
- Oven controlled 10 MHz reference oscillator.
- L-Band Monitor 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.
- Operating temperature range -30°C to 60°C (-22°F to 140°F) (option)
- CE compliant
- **3 years warranty**

## Order Information

### Customer Field selectable Firmware Option

In order to meet your requirements different maximum symbol rates and different sets of modulation types are supported depending on the selected firmware option. The firmware option is password upgradeable in the field, which allows easy enhancement of the modulators if requirements change.

Summary of firmware options:

Firmware Option	Max Symbol Rate, Supported Modulation Types
	1) DVB-S / DVB-DSNG 2) DVB-S2
- QL	20 Msps, BPSK / QPSK 1)
- QH	60 Msps, BPSK / QPSK 1)
- PL	20 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- PH	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- P2L	15 Msps, BPSK / QPSK 1) 15 Msps, QPSK / 8PSK 2)
- P2N	30 Msps, BPSK / QPSK 1) 30 Msps, QPSK / 8PSK 2)
- P2M	45 Msps, BPSK / QPSK 1) 45 Msps, QPSK / 8PSK 2)
- P2H	60 Msps, BPSK / QPSK 1) 60 Msps, QPSK / 8PSK 2)
- A2L	15 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 15 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2N	30 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 30 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2M	45 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 45 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2H	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 60 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)

### Open questions, demo units

If you need more information about WORK Microwave's new satellite modulator or if you would like to have demo a unit, please contact us via e-mail: [sales@work-microwave.de](mailto:sales@work-microwave.de) or call us. We are glad to assist you.

# Challenge Series

## Satellite High Speed DVB-S2 Modulator

### Indoor Unit

70 MHz / 140 MHz or L-Band Output

S-Type (standard version), H-Type (extended temperature range)

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 -70 100 Hz -80 1 kHz -88 10 kHz -90 100 kHz -100 1 MHz -115	-65 -75 -88 -90 -100 -115	see HDM2-Vx and HDM2-Lx
max. values in dBc/Hz			
IF-Output Characteristics:	Impedance: 50 Ω or 75 Ω (VHF-Band output) 50 Ω or 75 Ω (L-Band output) Return Loss: >20 dB Output Power: -25 dBm ... 5 dBm, 0.1 dB steps (V-Band output) -30 dBm ... 0 dBm, 0.1 dB steps (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 Ω) F female (L-Band output 75 Ω) DC-output on IF-Output: 24 V DC or 48 V DC, max 4 A (can be switched on/off) (option DC24 or DC48) (L-Band output) 10 MHz ref. output on IF-Output: 1.5 ±1.5 dBm (can be switched on/off) (L-Band output)		
Monitoring Output (on front panel):	Output Power: -20 dB of IF Output on SDM2-Vx / HDM2-Vx and 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: (on rear panel):	Output Frequency: 1.4 GHz Output Power: -45 dBm approx Impedance: 75 Ω Return Loss: >15 dB Connector: BNC female	available only on HDM2-Vx / SDM2-Vx and HDM2-Vx-Lx / SDM2-Vx-Lx	
Spurious Outputs:	<-70 dBc (unmodulated carrier, 50 ... 90 MHz or 100 ... 180 MHz for V-Band output) Signal related: <-70 dBc (unmodulated carrier, 950 ... 1900 MHz L-Band output) <-55 dBc (unmodulated carrier, 1900 ... 2150 MHz L-Band output) <-45 dBc (unmodulated carrier, 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 ... 60 Msps (depending on Firmware Option) 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 ... 267 Mbps (depending on firmware option, modulation, coding) (SPI interface) 3 kbps ... 213 Mbps (depending on firmware option, modulation, coding) (ASI interface) *) *) 3 kbps ... 170 Mbps (option BI, when BISS-1/E active)		
Transport Stream Adaption DVB-S2:	CRC-8 Encoder: yes Merger/Slicer: yes Baseband Header Insertion: yes Stream Adaption: yes Baseband Scrambling: yes (according EN 302307)		
Transport Stream Adaption DVB-S / DVB-DSNG:	Transport Stream Adaption: yes Randomization: yes (according EN 300421)		
Modulation / Encoding DVB-S2:	Outer BCH Coding: FEC-Frames n <sub>ldpc</sub> = 64800 (normal FEC Frame) or n <sub>ldpc</sub> = 16200 (short FEC frame) Inner LDPC Coding, depending on Firmware Option: QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) Physical Layer Framing: yes Physical Layer Signaling: yes Pilots Insertion: on / off Physical Layer Scrambling: N=0 ... 262141 (according EN 302307)		
Modulation / Encoding DVB-S / DVB-DSNG:	Outer Reed Solomon Coding: 188/204, T=8 Convolutional Interleaving: Depth I =12 Inner Coding depending on Firmware Option: 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)		

# Challenge Series

## Satellite High Speed DVB-S2 Modulator

### Indoor Unit

70 MHz / 140 MHz or L-Band Output

Specifications continued:

<b>Signal Spectrum Mask:</b>	$\alpha = 0,35$ (according EN 300421) $\alpha = 0,25$ (according EN 301210, EN 302307) $\alpha = 0,20$ (according EN 302307)												
<b>Transport Stream Inputs:</b>	DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 $\Omega$ ) auto switching (can be enabled) between input 1 and 2 in case of ASI signal interruption, ASI data missing DVB-ASI-optical (Connector ST female, Multimode, 1300 nm) (option, ask factory) With option MT2 additionally support of two 2 TS multiple input streams. Alternatively with option MT6, 6 DVB ASI electrical interfaces (6 x Connector BNC female, Impedance 75 $\Omega$ ) 3 pairs of auto switching inputs or 6 individual inputs for TS multiple input stream support Additionally with option T11 or T12 up to two individual Transport Stream 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.												
<b>Baseband Frame Input:</b>	Through DVB-ASI inputs or DVB-SPI input (can be used alternatively to Transport stream input, configurable), Flow control signal available as LVDS Output signal on DVB-SPI connector or RS232 Signal on DVB-SPI connector (Option BBR)												
<b>Transport Stream Security (Option BI):</b>	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												
<b>Transport Stream Frames Size:</b>	188 or 204 bytes												
<b>Packet Stuffing:</b>	TS Null 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.												
<b>Still Picture Playback</b>	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).												
<b>Compliant with Standards:</b>	EN 300421, EN 301210, EN 302307 EN 50083-9 (ASI electrical, SPI Interface)												
<b>Monitoring:</b>	Faults, stored faults with time stamps												
<b>Monitoring and Control Interface:</b>	<table border="0"> <tr> <td>Protocol:</td> <td>SNMP</td> </tr> <tr> <td>Connection:</td> <td>UDP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45</td> </tr> <tr> <td>Protocol:</td> <td>HTTP (web browser interface)</td> </tr> <tr> <td>Connection:</td> <td>TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45</td> </tr> <tr> <td>Protocol:</td> <td>Multipoint</td> </tr> <tr> <td>Connection:</td> <td>RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing), IPv4, IPv6, connector RJ-45</td> </tr> </table>	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
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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												
<b>Alarm Interface:</b> <b>Mute Input:</b>	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09 female												
<b>Temperature Range:</b>	HDM2: -30°C ... 60°C operating (10 minutes warm up at -30°C) SDM2: 0°C ... 50°C operating -30°C ... 80°C storage												
<b>Relative Humidity:</b>	<95% non condensing												
<b>User Interface:</b>	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												
<b>Mains Power Input:</b>	100 ... 240 V AC nominal, 90...264 V AC max, 50...60 Hz												
<b>Mains Power Consumption:</b>	Typ: 31 VA / 23 W Max 170 W (with option DC24, DC power on) Max 280 W (with option DC48, DC power on)												
<b>Mains Power Input</b>	IEC C14												
<b>Mains Fuse:</b>	2 x 2 A (or 2.5 A) time-lag fuse 2 x 5 A time lag fuse (with option DC24 or DC 48)												
<b>Dimension and Weight:</b>	483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg approx. 10 kg (with option DC24 or DC 48)												

**Specifications are subject to change**

# Challenge Series

## Satellite High Speed DVB-S2 Modulator

### Indoor Unit

**Order Information:** HDM2-[Output Band and Impedance]-[Options]-[Firmware Option] or  
 SDM2-[Output Band and Impedance]-[Options]-[Firmware Option] or  
 Modulator with VHF-Band and L-Band output:  
 HDM2-V[Impedance]/L[Impedance]-[Options]-[Firmware Option] or  
 SDM2-V[Impedance]/L[Impedance]-[Options]-[Firmware Option]

Possible Options are:		Cannot be combined with:		Requires:
<b>FAN</b>	internal Fan	-	-	
<b>BBR</b>	Baseband Frame flow control as RS232 signal	MT6	-	
<b>BI</b>	BISS scrambling	MT2, MT6	-	
<b>DC24</b>	24 V DC power on L-band output		DC48	FAN
<b>DC48</b>	48 V DC power on L-Band output		DC24	FAN
<b>TI1</b>	one TS over IP input interface	TI2	-	
<b>TI2</b>	two TS over IP input interfaces	TI1	-	
<b>MT2</b>	Support of 2 Multiple ASI input streams	MT6, BI	-	
<b>MT6</b>	Support of 6 Multiple ASI Input streams	MT2, BI	-	

**Examples:**

<b>SDM2-V75-PL</b>	Modulator with VHF-Band Output 75 Ω
<b>HDM2-L50-A2H</b>	Modulator with L-Band Output 50 Ω
<b>HDM2-V75-FAN-PL</b>	Modulator with VHF-Band Output 75 Ω with Fan
<b>HDM2-V75/L50-TI2-MT6-FAN-A2L</b>	Modulator with VHF-Band and L-Band output with 2 TS over IP inputs, support of 6 multiple input streams, Fan



Trade Mark of the DVB Digital Video Broadcasting Project

# Challenge Series Satellite High Speed DVB-S2 Modulator-Block Upconverter

C-, X-, Ku-Band



## CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 modulator with Block Upconverter constitutes a very cost effective solution of a modulator including an upconverter. The modulator is ideally suited for satellite news gathering (SNG) or similar portable applications. Due to the immediate RF output an SSPA or HPA can be directly connected. No interference susceptible IF cabling is used within the transmit chain.

## MPEG Transport Stream Input – RF output

The modulator accepts an MPEG transport stream on an ASI or SPI input from a video encoder or MPEG multiplexer and provides a DVB-S or DVB-S2 modulated carrier in the C-, X- or Ku-band.

## Baseband Frame Data Input

For DVB-S2 VCM and ACM applications the modulator accepts on its input a baseband frame plus an additional header, which defines the modulation and FEC to be applied to each specific baseband frame. Also here the ASI or SPI input is used as interface. A hardware flow control signal can be used for synchronization purposes between the modulator and the multiplexer or encapsulator.

## High signal integrity

Low spurious emissions allow using the modulator also in environments with demanding requirements, like high power video uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

## Flexibility, backward compatibility

Mode adaptation, FEC Encoding, and Modulation is compliant with the DVB-S2 Standard EN 302307. QPSK / 8PSK / 16APSK and 32APSK modulation is available. For backward compatibility also framing, scrambling, FEC encoding as well as QPSK / 8PSK / 16QAM modulation according to the DVB-S Standards EN 300421 and EN 301210 is supported. BPSK modulation is also possible. Carriers with symbol rates from very low rates (8 kbps) up to 60 Msps can be transmitted.

## Operating and control – easy integration into your system

The modulator can be operated via the push buttons on the front panel using self-explanatory 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 also available.

## Specials and OEM Products

WORK Microwave is specialized to offer custom tailored products. We offer specials as follows:

- Combination with complete 70/140 MHz upconverter in one housing.
- Customized M&C interface and control syntax
- Military versions for hostile environment (shock, vibration, humidity, temperature)

## Key features

- DVB Satellite modulator for digital TV satellite uplinks and digital SNG applications
- DVB-S2 compliant (EN 302 307)  
DVB-DSNG compliant (EN 301 210)  
DVB-S compliant (EN 300 421)
- QPSK / 8PSK / 16 QAM modulation (DVB-S, DVB-DSNG)
- QPSK / 8PSK / 16APSK / 32 APSK modulation (DVB-S2)
- Normal and short FEC frames, Pilots on or off (DVB-S2)
- BISS-E encryption (option), supports multi program transport stream
- Physical layer framing (PL scrambling with codes 0 to 262141) according to DVB-S2 standard
- Roll-Off: 35%, 25%, 20%
- Adjustable digital slope equalizer
- Low spurious output
- Dual ASI (with auto-switchover) and SPI electrical interfaces
- ASI optical interface (option)
- Hex ASI Multistream-Interface (with additional auto-switchover) (option)
- DVB-S2 Multistream support (option)
- Transport Stream over IP input (option)
- Null packet insertion and deletion with PCR correction
- Still picture playout (customized picture content can be loaded to the modulator unit, option)
- Symbol rates from 8 ksps to 60 Msps
- Data rate max approx. 213 Mbps with ASI Interface (depending on modulation type and FEC)
- Data rate max 267 Mbps with SPI Interface (depending on modulation type and FEC)
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP (MIBs are provided).
- Summary alarm output (dual change over switch contacts)
- Transmit mute input
- Oven controlled 10 MHz reference oscillator.
- C-, X-, or Ku-Band output by using an integrated block converter.
- L-Band Monitor Output on Frontpanel
- Small housing.

- Operating temperature range -30°C to 60°C (-22°F to 140°F) (option)
- CE compliant
- **3 years warranty**

## Order Information

### Customer Field selectable Firmware Option

In order to meet your requirements different maximum symbol rates and different sets of modulation types are supported depending on the selected firmware option. The firmware option is password upgradeable in the field, which allows easy enhancement of the modulators if requirements change.

Summary of firmware options:

Firmware Option	Max Symbol Rate, Supported Modulation Types
	1) DVB-S / DVB-DSNG 2) DVB-S2
- QL	20 Msps, BPSK / QPSK 1)
- QH	60 Msps, BPSK / QPSK 1)
- PL	20 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- PH	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- P2L	15 Msps, BPSK / QPSK 1) 15 Msps, QPSK / 8PSK 2)
- P2N	30 Msps, BPSK / QPSK 1) 30 Msps, QPSK / 8PSK 2)
- P2M	45 Msps, BPSK / QPSK 1) 45 Msps, QPSK / 8PSK 2)
- P2H	60 Msps, BPSK / QPSK 1) 60 Msps, QPSK / 8PSK 2)
- A2L	15 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 15 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2N	30 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 30 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
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## Open questions, demo units

If you need more information about WORK Microwave's new satellite modulator or if you would like to have demo a unit, please contact us via e-mail: [sales@work-microwave.de](mailto:sales@work-microwave.de) or call us. We are glad to assist you.

# Challenge Series

## Satellite High Speed DVB-S2 Modulator-Block

### Upconverter

Indoor Unit

C-, X-, Ku-Band

S-Type (standard version), H-Type (extended temperature range)

Modulator Type:	HM2BU-C / SM2BU-C	HM2BU-X / SM2BU-X	HM2BU-Ku1 / SM2BU-Ku1 HM2BU-Ku3 / SM2BU-Ku3
<b>RF-Output Frequency:</b>	C-Band 5.850 ... 6.450 GHz	X-Band 7.9 ... 8.4 GHz	Ku-Band Ku1: 13.75 ... 14.50 GHz Ku3: 12.75 ... 13.50 GHz
<b>Phase Noise:</b>	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	-58 -70 -80 -85 -94 -112	-53 -65 -75 -83 -91 -112
	max values in dBc/Hz		
<b>Frequency Resolution:</b>	1 Hz		
<b>RF-Output Characteristics:</b>	Impedance: Return Loss: Output Power: Accuracy: Stability: Output Power muted: Connector:	50 Ω >18 dB -25 dBm ... 5 dBm, 0.1 dB steps ±0.5 dB ±1 dB <-85 dBm SMA female	
<b>L-Band Monitoring Output (on front panel):</b>	Output Frequency: Output Power: Impedance: Return Loss: Connector:	950 ... 1700 MHz (max) -40 ... -50 dBm 50 Ω >15 dB SMA female	
<b>Spurious Outputs:</b>	Signal related:	<-70 dBc (Pout > 0 dBm) <-65 dBc (-20 dBm < Pout ≤ 0 dBm) <-60 dBc (Pout ≤ -20 dBm) -	
<b>Frequency Stability:</b>	±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		
<b>Symbol Rate:</b>	Max Range, depending on Firmware Option: Step size:	8 ksps ... 60 Msps 1 sps	
<b>Clock Stability:</b>	±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		
<b>Data Rate:</b>	3 kbps ... 267 Mbps (depending on firmware option, modulation, coding) (SPI interface) 3 kbps ... 213 Mbps (depending on firmware option, modulation, coding) (ASI interface) *) *) 3 kbps ... 170 Mbps (option BI, when BISS-1/E active)		
<b>Transport Stream Adaption DVB-S2:</b>	CRC-8 Encoder Merger/Slicer Baseband Header Insertion Stream Adaption Baseband Scrambling	yes yes yes yes yes according EN 302307	
<b>Transport Stream Adaption DVB-S / DVB-DSNG:</b>	Transport Stream Adaption Randomization	yes yes according EN 300421	
<b>Modulation / Encoding DVB-S2:</b>	Outer BCH Coding: Inner LDPC Coding, depending on Firmware Option:  Physical Layer Framing: Physical Layer Signaling: Pilots Insertion: Physical Layer Scrambling:	FEC-Frames n <sub>ldpc</sub> = 64800 (normal FEC Frame) or n <sub>ldpc</sub> = 16200 (short FEC frame) QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) yes yes on / off N=0 ... 262141 according EN 302307	
<b>Modulation / Encoding DVB-S / DVB-DSNG:</b>	Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding depending on Firmware Option:	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) 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis) according EN300421, EN 301210	
<b>Signal Spectrum Mask:</b>	α = 0,35 according EN 300421 α = 0,25 according EN 301210, EN 302307 α = 0,20 according EN 302307		

Specifications continued next page

# Challenge Series

## Satellite High Speed DVB-S2 Modulator-Block

### Upconverter

#### Indoor Unit

C-, X-, Ku-Band

Specifications continued:

<b>Transport Stream Input Interface:</b>	DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 Ω) auto switching (can be enabled) between input 1 and 2 in case of ASI signal interruption, ASI data missing DVB-ASI-optical (Connector ST female, Multimode, 1300 nm) (option, ask factory) With option MT2 additionally support of two 2 TS multiple input streams. Alternatively with option MT6, 6 DVB ASI electrical interfaces (6 x Connector BNC female, Impedance 75 Ω) 3 pairs of auto switching inputs or 6 individual inputs for TS multiple input stream support Additionally with option T11 or T12 up to two individual Transport Stream 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
<b>Baseband Frame Input:</b>	Through DVB-ASI inputs or DVB-SPI input (can be used alternatively to Transport stream input, configurable) , Flow control signal available as LVDS Output signal on DVB-SPI connector or RS232 Signal on DVB-SPI connector (Option BBR)
<b>Transport Stream Security (Option BI):</b>	BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 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 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
<b>Transport Stream Frames Size:</b>	188 or 204 bytes
<b>Packet Stuffing:</b>	TS Null 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.
<b>Still Picture Layout</b>	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).
<b>Compliant with Standards:</b>	EN 300421, EN 301210, EN 302307 EN 50083-9 (ASI electrical, SPI Interface)
<b>Monitoring:</b>	Faults, stored faults with time stamps
<b>Monitoring and Control Interface:</b>	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
<b>Alarm Interface: Mute Input:</b>	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09 female
<b>Temperature Range:</b>	HDM2: -30°C ... 60°C operating (10 minutes warm up at -30°C) SDM2: 0°C ... 50°C operating -30°C ... 80°C storage
<b>Relative Humidity:</b>	<95% non condensing
<b>User Interface:</b>	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
<b>Mains Power Input:</b>	100 ... 240 V AC nominal, 90 ... 264 V AC max, 50 ... 60 Hz
<b>Mains Power Consumption:</b>	Typ: 31 VA / 23 W
<b>Mains Power Input</b>	IEC C14
<b>Mains Fuse:</b>	2 x 2 A time-lag fuse
<b>Dimension and Weight:</b>	483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg

Specifications are subject to change

**Order Information:**                      **HM2BU-[Output Band]-[Options] [Firmware Option] or  
SM2BU-[Output Band]-[Options] [Firmware Option]**

<b>Possible Options are:</b>		<b>Cannot be combined with:</b>	<b>Requires:</b>
<b>FAN</b>	internal Fan	-	-
<b>BBR</b>	Baseband Fframe flow control as RS232 signal	MT6	-
<b>BI</b>	BISS scrambling	MT2, MT6	-
<b>TI1</b>	one TS over IP input interface	TI2	-
<b>TI2</b>	two TS over IP input interfaces	TI1	-
<b>MT2</b>	Support of 2 Multiple TS input streams	MT6, BI	-
<b>MT6</b>	Support of 6 Multiple TS Input streams	MT2, BI	-

**Examples:**

**SM2BU-Ku1-PL**                      Ku1-Band Modulator-Block-Upconverter  
**HM2BU-C-A2H**                      C-Band Modulator-Block-Upconverter  
**HM2BU-Ku1-FAN PL**    Ku1-Band Modulator-Block-Upconverter with Fan



# Challenge Series Satellite High Speed DVB-S2 Modulator-Upconverter

## Wide C-, X-, Ku-, K-Band



### CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 modulator / upconverter series combines WORK Microwave's 4<sup>th</sup> generation upconverters with a high-speed DVB-S2 modulator in one housing. This combination offers a cost and space saving solution. No extra modulator is required. The unit can be used in fixed satellite ground stations as well as in satellite news gathering (SNG) vehicles, Fly-Aways or any other mobile or portable applications.

### New approach – better solution

For all high power TV-uplink which require low spurious emissions, two separate units were needed, a modulator plus a conventional upconverter. WORK Microwave's modulator / converter concept allows both units in one housing. This approach provides a very low spurious signal over the whole frequency band. In Ku-Band we cover the complete frequency range from 12.75-14.50 GHz with one unit only: The same is true for other bands. This is a significant advantage compared to the combination L-Band modulator / blockconverter.

### MPEG Transport Stream Input-RF Output

The unit accepts an MPEG transport stream on an ASI or SPI input from a video encoder or MPEG multiplexer and provides a DVB-S or DVB-S2 modulated carrier in the C-Band, Ku-Band or K-Band, which can be directly connected to a high power amplifier.

### Baseband Frame Data Input

For DVB-S2 VCM and ACM applications the modulator accepts on its input a baseband frame plus an additional header, which defines the modulation and FEC to be applied to each specific baseband frame. Also here the ASI or SPI input is used as

interface. A hardware flow control signal can be used for synchronization purposes between the modulator and the multiplexer or encapsulator.

### High signal integrity

Low spurious emissions allow using the modulator-upconverters also in environments with demanding requirements, like high power video uplinks. Sophisticated temperature compensation guarantees gain stability over a very wide temperature range.

### Flexibility, Backward Compatibility

Mode adaptation, FEC Encoding, and Modulation is compliant with the DVB-S2 Standard EN 302307. QPSK / 8PSK / 16APSK and 32APSK modulation is available. For backward compatibility also framing, scrambling, FEC encoding as well as QPSK / 8PSK / 16QAM modulation according to the DVB-S Standards EN 300421 and EN 301210 is supported. BPSK modulation is also possible. Carriers with symbol rates from very low rates (8 kbps) up to 60 Msps can be transmitted.

### Operating and control – easy integration into your system

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 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 is specialized to offer custom tailored products. 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 Satellite modulator-upconverter for digital TV satellite uplinks and digital SNG applications
- DVB-S2 compliant (EN 302 307)  
DVB-DSNG compliant (EN 301 210)  
DVB-S compliant (EN 300 421)
- QPSK / 8PSK / 16 QAM modulation (DVB-S, DVB-DSNG)
- QPSK / 8PSK / 16APSK / 32 APSK modulation (DVB-S2)
- Normal and short FEC frames, Pilots on or off (DVB-S2)
- BISS-E encryption (option), supports multi program transport stream
- Physical layer framing (PL scrambling with codes 0 to 262141) according to DVB-S2 standard
- Roll-Off: 35%, 25%, 20%
- Adjustable digital slope equalizer
- Low spurious output
- Dual ASI (with auto-switchover) and SPI electrical interfaces
- ASI optical interface (option)
- Null packet insertion and deletion and with PCR correction
- Still picture playout (customized picture content can be loaded to the modulator unit, option)
- Symbol rates from 8 ksps to 60 Msps
- Data rate max approx. 213 Mbps with ASI Interface (depending on modulation type and FEC)
- Data rate max 267 Mbps with SPI Interface (depending on modulation type and FEC)
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP (MIBs are provided).
- Summary alarm output (dual change over switch contacts)
- Transmit mute input

- Oven controlled 10 MHz reference oscillator.
- Test output of modulated signal 1.4 GHz
- Operating temperature range -30°C to 60°C (-22°F to 140°F) (option)
- CE compliant
- **3 years warranty**

## Order Information

### Customer Field selectable Firmware Option

In order to meet your requirements different maximum symbol rates and different sets of modulation types are supported depending on the selected firmware option. The firmware option is password upgradeable in the field, which allows easy enhancement of the modulators if requirements change.

Summary of firmware options:

Firmware Option	Max Symbol Rate, Supported Modulation Types
	1) DVB-S / DVB-DSNG 2) DVB-S2
- QL	20 Msps, BPSK / QPSK 1)
- QH	60 Msps, BPSK / QPSK 1)
- PL	20 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- PH	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1)
- P2L	15 Msps, BPSK / QPSK 1) 15 Msps, QPSK / 8PSK 2)
- P2N	30 Msps, BPSK / QPSK 1) 30 Msps, QPSK / 8PSK 2)
- P2M	45 Msps, BPSK / QPSK 1) 45 Msps, QPSK / 8PSK 2)
- P2H	60 Msps, BPSK / QPSK 1) 60 Msps, QPSK / 8PSK 2)
- A2L	15 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 15 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2N	30 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 30 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2M	45 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 45 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2H	60 Msps, BPSK / QPSK / 8PSK / 16QAM 1) 60 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)

## Open questions, demo units

If you need more information about WORK Microwave's new satellite modulator or if you would like to have demo a unit, please contact us via e-mail: [sales@work-microwave.de](mailto:sales@work-microwave.de) or call us. We are glad to assist you.

# Challenge Series

## Satellite High Speed DVB-S2 Modulator-Upconverter

### Indoor Unit

Wide C-, X-, Ku-, K-Band  
S-Type (standard version), H-Type (extended temperature range)

Modulator-Upconverter Type:	HM2CU-C / SM2CU-C	HM2CU-X	HM2CU-Ku / SM2CU-Ku	HM2CU-K / SM2CU-K
	Dualband (e.g. CKu, KuK) or Triband versions (e.g. CXKu, CKuK) are also available			
<b>RF-Output Frequency:</b>	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
<b>Phase Noise:</b>	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	-55 -75 -85 -87 -100 <sup>1)</sup> -110 <sup>1)</sup>	-53 -73 -83 -87 -98 <sup>1)</sup> -108 <sup>1)</sup>	-50 -70 -80 -85 -95 <sup>1)</sup> -105 <sup>1)</sup>
	max. values in dBc/ Hz <sup>1)</sup> 0°C ... 50°C, outside this temperature range degraded by max 5 dB.			
<b>Frequency Resolution:</b>	10 Hz			
<b>Conversion Scheme:</b>	IQ-Modulator at 2450 MHz, single up-conversion			
<b>RF-Output Characteristics:</b>	Impedance: 50 Ω Return Loss: >20 dB >17 dB *) Output Power: -25 dBm ... 5 dBm, 0.1 dB steps -30 dBm ... 0 dBm, 0.1 dB steps *) Output Muting: >70 dB (by command or sense input or by alarm condition) RF-Connectors: SMA female *) valid for some dual band and all triband versions			
<b>Test Output (Microwave Oscillator):</b>	8.3 ... 9.1 GHz -7 ± 3 dBm -13 ± 3 dBm *) SMA female	10.35 ... 10.85 GHz -7 ± 3 dBm -13 ± 3 dBm *) SMA female	15.2 ... 16.95 GHz -7 ± 3 dBm -13 ± 3 dBm *) SMA female	14.85 ... 15.95 GHz -7 ± 3 dBm -13 ± 3 dBm *) SMA female
	*) valid for some dualband and all triband versions			
<b>Monitoring Output (on front panel):</b>	Output Power: -20 dB of RF Output Impedance: 50 Ω Return Loss: >20 dB Connector: SMA female			
<b>L-Band Test Output (Option LT)</b>	Frequency: 990 MHz Level: -45 ± 3 dBm Connector: F female			
<b>Spurious Outputs:</b>	Signal related: <-70 dBc (Pout > 0 dBm) <-65 dBc (-20 dBm < Pout ≤ 0 dBm) <-60 dBc (Pout ≤ -20 dBm) -			
<b>Frequency Stability:</b>	±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			
<b>Reference Input:</b>	Frequency: 10 MHz or 5 MHz Level: -3 ... 10 dBm Modes: internal, external, auto (senses reference input) Connector: BNC female			
<b>Symbol Rate:</b>	Max Range, depending on Firmware Option: 8 ksp/s ... 60 Msp/s Step size: 1 sp/s			
<b>Clock Stability:</b>	±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			
<b>Data Rate:</b>	3 kbps ... 267 Mbps (depending on firmware option, modulation, coding) (SPI interface) 3 kbps ... 213 Mbps (depending on firmware option, modulation, coding) (ASI interface *) *) 3 kbps ... 170 Mbps (option BI, when BISS-1/E active)			
<b>Transport Stream Adaption DVB-S2:</b>	CRC-8 Encoder: yes Merger/Slicer: yes Baseband Header Insertion: yes Stream Adaption: yes Baseband Scrambling: yes according EN 302307			
<b>Transport Stream Adaption DVB-S / DVB-DSNG:</b>	Transport Stream Adaption: yes Randomization: yes according EN 300421			
<b>Modulation / Encoding DVB-S2:</b>	Outer BCH Coding: FEC-Frames n <sub>ldpc</sub> = 64800 (normal FEC Frame) or n <sub>ldpc</sub> = 16200 (short FEC frame) Inner LDPC Coding, depending on Firmware Option: QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 (only n <sub>ldpc</sub> =64800) Physical Layer Framing: yes Physical Layer Signaling: yes Pilots Insertion: on / off Physical Layer Scrambling: N=0 ... 262141 according EN 302307			

Specifications continued next page

# Challenge Series

## Satellite High Speed DVB-S2 Modulator-Upconverter

### Indoor Unit

Wide C-, X-, Ku-, K-Band

Specifications continued:

<b>Modulation / Encoding DVB-S / DVB-DSNG:</b>	Outer Reed Solomon Coding: 188/204, T=8 Convolutional Interleaving: Depth l =12 Inner Coding depending on BPSK or QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) Firmware Option: 8PSK 2/3, 5/6, 8/9 (Pragmatic Trellis) 16QAM 3/4, 7/8 (Pragmatic Trellis) according EN300421, EN 301210
<b>Transport Stream Input Interface:</b>	DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 Ω) auto switching (can be enabled) between input 1 and 2 in case of ASI signal interruption, ASI data missing DVB-ASI-optical (Connector ST female, Multimode, 1300 nm) (option, ask factory)
<b>Baseband Frame Input:</b>	Through DVB-ASI inputs or DVB-SPI input (can be used alternatively to Transport stream input, configurable) , Flow control signal available as LVDS Output signal on DVB-SPI connector or RS232 Signal on DVB-SPI connector (Option BBR)
<b>Transport Stream Security (Option BI):</b>	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
<b>Signal Spectrum Mask:</b>	$\alpha = 0,35$ according EN 300421 $\alpha = 0,25$ according EN 301210, EN 302307 $\alpha = 0,20$ according EN 302307
<b>Transport Stream Frames Size:</b>	188 or 204 bytes
<b>Packet Stuffing:</b>	TS Null 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.
<b>Still Picture Playback</b>	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).
<b>Compliant with Standards:</b>	EN 300421, EN 301210, EN 302307 EN 50083-9 (ASI electrical, SPI Interface)
<b>Monitoring:</b>	Faults, stored faults with time stamps
<b>Monitoring and Control Interface:</b>	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
<b>Alarm Interface: Mute Input:</b>	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09 female
<b>Temperature Range:</b>	HM2CU: -30°C ... 60°C operating (10 minutes warm up at -30°C) SM2CU: 0°C ... 50°C operating -30°C ... 80°C storage
<b>User Interface:</b>	SM2CU: LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys HM2CU: VFD-Display 2 x 40 characters, 4 cursor keys, 4 function keys (Option VFD for SM2CU)
<b>Mains Power Input:</b>	100 ... 240 V AC nominal, 90...264 V AC max, 50...60 Hz
<b>Mains Power Consumption:</b>	Typ: 45 VA / 30 W
<b>Mains Power Input</b>	IEC C14
<b>Mains Fuse:</b>	2 x 2 A time-lag fuse
<b>Dimension and Weight:</b>	483 x 44 x 505 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 10 kg

Specifications are subject to change

# Challenge Series

## Satellite High Speed DVB-S2 Modulator-Upconverter

### Indoor Unit

**Order Information:**

<b>SM2CU-[RF Band]-[Options] [Firmware Option]</b>	Single Band modulator-upconverter
<b>HM2CU-[RF Band]-[Options] [Firmware Option]</b>	Single Band modulator-upconverter
<b>HM2CUx-[RF Band(s)]-[Options]-[Firmware Option]</b>	Multiband modulator-upconverter

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

Possible Options are:		Cannot be combined with:	Requires:
<b>VFD</b>	VFD display, standard with HCU-type converters	-	-
<b>LT</b>	L-Band test output	-	-
<b>FAN</b>	internal Fan	-	-
<b>BBR</b>	Baseband Frame flow control as RS232 signal	-	-
<b>BI</b>	BISS scrambling	-	-

**Examples:**

<b>HM2CU-Ku-FAN-QH</b>	Ku-band Modulator-Upconverter with fan
<b>SM2CU2-KuK-P2H</b>	Dualband Modulator-Upconverter KuK
<b>SM2CU3-CKuK-FAN-A2H</b>	Triband Modulator-Upconverter CKuK with fan



Trade Mark of the DVB Digital Video Broadcasting Project

# Challenge Series Satellite High Speed DVB-S2 Demodulator SDD-TS



## CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 demodulator SDD allows demodulation of DVB-S and DVB-S2 signals, where in DVB-S2 all standard modulation types and FEC schemes are supported. The demodulator can be used for receiving digital video broadcast contribution or distribution signals as MPEG transport streams. Among other applications it is suitable for video reception sites, monitoring facilities or program exchange points. Besides standard CCM it supports also VCM and ACM using a baseband frame output (option BBO).

## L-Band input, standard outputs

The demodulator accepts an L-Band signal in the range from 950 to 2150 MHz on two inputs (L-Band unit) or alternatively in between 50 to 180 MHz (V-band unit). It supports QPSK modulation for DVB-S and QPSK, 8PSK, 16APSK, 32APSK modulation for DVB-S2 transmissions. The output MPEG transport stream is provided through 2 ASI interfaces or as Video over IP stream through a Gigabit-Ethernet interface.

## Operating and control – easy integration into your system

The demodulator 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)). For the remote control either addressable, packet based commands, a WEB interface (HTTP web browser interface) or SNMP can be used. For SNMP MIBS are available. Detailed monitoring of signal quality and receive parameters is possible. A summary alarm output (dual change over switch contacts) is provided, which allows easy setup of redundant configuration as well as integration into alarm systems.

## Key features

- DVB Satellite demodulator for digital TV satellite signals
- DVB-S2 compliant (EN 302 307)
- DVB-S compliant (EN 300 421)
- QPSK demodulation (DVB-S)
- QPSK / 8PSK / 16APSK / 32APSK demodulation (DVB-S2)
- Normal and short FEC frames, Pilots on or off (DVB-S2)
- Physical layer framing (PL descrambling with codes 0 to 262141) according to DVB-S2 standard
- Roll-Off: 35%, 25%, 20%
- ASI and Gigabit Ethernet electrical output interfaces
- Support of one DVB-S2 Multistream output
- Symbol rates from 60 ksps to 60 Msps
- BISS-E decryption (option), supports multi program transport stream
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP (MIBs are provided).
- Summary alarm output (dual change over switch contacts)
- LNB DC supply 14V / 18 V DC, 22 kHz on/off
- Operating temperature range 0°C to 50°C (32°F to 122°F)
- CE compliant
- **3 years warranty**

# Challenge Series

## Satellite High Speed DVB-S2 Demodulator

### SDD-TS

#### DVB Demodulator L-Band and IF Input

Demodulator Type:	SDD-TS-V50 or SDD-TS-V75	SDD-TS-L75	SDD-TS-Vx/L75
<b>IF-Input Frequency:</b>	50 ... 180 MHz	950 ... 2150 MHz	50 ... 180 MHz and 950 ... 2150 MHz (2 inputs, can be alternatively enabled)
<b>IF-Input Characteristics:</b>	Impedance: 50 $\Omega$ or 75 $\Omega$ Return Loss: >18 dB Input Power: -60 dBm -15 dBm (total aggregate power) IF-Connector: BNC female	Impedance: 75 $\Omega$ Return Loss: >13 dB Input Power: -70 dBm ... -20 dBm (total aggregate power) IF-Connector: 2x F female, input selectable LNB DC-Feed: 13.5V or 18 VA (450mA) switchable, 22 kHz tone on/off, short circuit protected	see SDD-TS-Vx and SDD-TS-L75  one 50 ... 180 MHz and one L-Band input
<b>Symbol Rate:</b>	DVB-S: 60 ksp/s ... 60 Msp/s DVB-S2: 60 ksp/s ... 60 Msp/s (QPSK, 8PSK) 60 ksp/s ... 45 Msp/s (16APSK) 60 ksp/s ... 40 Msp/s (32APSK) Step size: 1 sp/s		
<b>Demodulation / Decoding DVB-S2:</b>	Outer BCH Code: FEC-Frames 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: yes Pilots processing: yes, automatically selected Physical Layer Scrambling: N=0 ... 262141 Support of Multiple inputs streams: all according EN 302307 Selection of one ISI	nldpc = 64800 (normal FEC Frame) nldpc = 16200 (short FEC Frame) automatically selected	
<b>Demodulation / Decoding DVB-S:</b>	Outer Reed Solomon Code: 188/204, T=8 Convolutional Interleaving: Depth I =12 Inner Code: QPSK 1/2, 2/3, 3/4, 5/6, 6/7, 7/8 (Convolutional K=7) automatically selected all according EN300421		
<b>Transport Stream Output Interface:</b>	2x DVB-ASI-electrical (BNC female 75 $\Omega$ ) 1x RTP/UDP IP over Ethernet (RJ-45, 10/100/1000 Mbps auto sensing) according to IETF RFC 2250.		
<b>Baseband Frame Output:</b>	Instead of Transport Stream output through ASI Interface (Option BBO)		
<b>Transport Stream Security (Option BI):</b>	BISS-E Scrambler, compliant to EBU Tech 3292 rev. 2 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 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		
<b>Signal Spectrum Mask:</b>	$\alpha$ = 0.35 according EN 300421 $\alpha$ = 0.25 according EN 301210 $\alpha$ = 0.20 according EN 302307		
<b>Transport Stream Frames Size:</b>	188 bytes		
<b>Compliant with Standards:</b>	EN 300421, EN 302307 EN 50083-9 (ASI electrical)		
<b>Monitoring:</b>	Es/NO, Eb/NO, signal input level, lock losses, TS packet errors, Viterbi/LDPC corrected bits, internal temperature, internal voltages, faults		
<b>Configuration Memory:</b>	16 programmable memory settings for configuration storage		
<b>Monitoring and Control Interface:</b>	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		
<b>Alarm Interface:</b>	Two potential free contacts (DPDT) , connector DSUB09 female		

Specifications continued next page



# Challenge Series

## Satellite High Speed DVB-S2 Demodulator

### SDD-TS

**Specifications continued:**

<b>Temperature Range:</b>	0°C ... 50°C operating -30°C ... 80°C storage
<b>Relative Humidity:</b>	<95% non condensing
<b>User Interface:</b>	LCD-Display 2 x 40 characters, 4 cursor keys, 2 function keys
<b>Mains Power Input:</b>	100 ... 240 V AC nominal, 90...264 V AC max, 50...60 Hz
<b>Mains Power Consumption:</b>	Typ: 35 VA / 25 W
<b>Mains Power Input Connector:</b>	IEC C14
<b>Mains Fuse:</b>	2 x 2 A time-lag fuse
<b>Dimension and Weight:</b>	483 x 44 x 270 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 4 kg

**Specifications are subject to change**

**Order Information:**

**SDD-TS- [Input Band Input Imp]-[Options]**

**Possible Options are:** **BI** (BISS descrambling)  
**BBO** (Baseband Frame Output)

**Examples:**

**SDD-TS-V50**

Demodulator with VHF-Band Input 50 Ω

**SDD-TS-V75-BI**

Demodulator with VHF-Band Input 75 Ω, BISS descrambling

**SDD-TS-L75**

Demodulator with L-Band Input 75 Ω



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# Challenge Series Satellite High Speed DVB-S2 Modem SK-TS



## CCM, VCM, ACM Functionality

This satellite high speed DVB-S2 modem provides a platform for modulation and demodulation according to the DVB-S and DVB-S2 standard. The modulator part accepts an MPEG transport stream on an ASI or SPI input from a video encoder or MPEG multiplexer and provides a modulated carrier anywhere between 50 to 180 MHz or at L-Band. The demodulator part accepts an IF input signal in between 50 to 180 MHz or at L-Band. The output MPEG transport stream is provided through 2 ASI interfaces or as Video over IP stream through a Gigabit-Ethernet interface.

The modem combines within one housing a DVB-S2 modulator similar to the type SDM2 and a DVB-S2 demodulator similar to type SDD-TS.

The technical parameters are similar to these units. For details please refer to the datasheets of the DVB-S2 modulator of the type SDM2 and the DVB-S2 demodulator of the type SDD-TS.

A Fan is included as standard.

## Customer Field selectable Firmware Option

In order to meet your requirements different maximum symbol rates and different sets of modulation types are supported on the modulator, depending on the selected firmware option. The firmware option is password upgradeable in the field, which allows easy enhancement of the modulators if requirements change.

## Summary of firmware options:

Modulator Firmware Option	Max Symbol Rate, Supported Modulation Types
	1) DVB-S / DVB-DSNG 2) DVB-S2
- QL	20 Msps, BPSK / QPSK 1)
- QH	60 Msps, BPSK / QPSK 1)
- P2L	15 Msps, BPSK / QPSK 1) 15 Msps, QPSK / 8PSK 2)
- P2N	30 Msps, BPSK / QPSK 1) 30 Msps, QPSK / 8PSK 2)
- P2M	45 Msps, BPSK / QPSK 1) 45 Msps, QPSK / 8PSK 2)
- P2H	60 Msps, BPSK / QPSK 1) 60 Msps, QPSK / 8PSK 2)
- A2L	15 Msps, BPSK / QPSK 1) 15 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2N	30 Msps, BPSK / QPSK 1) 30 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2M	45 Msps, BPSK / QPSK 1) 45 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)
- A2H	60 Msps, BPSK / QPSK 1) 60 Msps, QPSK / 8PSK / 16APSK / 32APSK 2)

## Order Information:

**SK-TS-[Output Band and Impedance]-[Input Band and Impedance]-[Options]-[Modulator Firmware Option]**

For possible options ask factory

## Examples:

**SK-TS-L50-L75-A2H**

Modem with L-Band Output 50 Ω, L-Band Input 50 Ω

**SK-TS-L50-V75-P2N**

Modem with L-Band Output 50 Ω, VHF-Band Input 75 Ω

**SK-TS-V50/L50-V50/L75-A2L**

Modem with L-Band and VHF-Band Output and Input



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# Challenge Series

## Satellite High Speed DVB-S2 IP Modem

### SK-IP



#### CCM, VCM, ACM Functionality, Additional TS inputs with DVB-S2 Multiple input stream support

The satellite high speed DVB-S2 IP modem SK-IP provides 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, which results in low encapsulation overhead. In combination with the integrated OptiACM controller the modem provides adaptive or variable FEC- and modulation setting for point-to-point or point-to-multipoint applications.

The modulator provides the modulated signal from 50 to 180 MHz IF or at L-band. With the L-band output also 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.

QPSK, 8PSK, 16APSK, 32APSK modulation is supported, which allows big flexibility in the satellite link design.

#### Operating and control - easy integration into your system

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

#### Key features

- DVB-S2 satellite modem for IP/Ethernet data transmission.
- DVB-S2 compliant (EN 302 307)
- QPSK / 8PSK / 16APSK / 32APSK modulation
- Normal and short FEC frames, pilots on or off
- Physical layer framing (PL scrambling with codes 0 to 262141) according to DVB-S2 standard
- Symbol rates from 60 ksps to 60 Msps
- OptiACM system (programmable or automatic) for optimized bandwidth usage
- Gigabit Ethernet data interface
- Generic Stream Encapsulation (GSE) direct to DVB-S2 base band frames
- Operates as Layer 2 Bridge, Layer 3 Bridge or Layer 3 Router
- Transport Stream inputs for DVB-S2 Multiple input stream operation (option)
- Transport Stream over IP inputs (option)
- Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface, SNMP (MIBs are provided)
- 10 MHz Reference OCXO included
- Summary alarm output (dual change over switch contacts)
- Operating temperature range 0°C to 50°C (32°F to 122°F)
- Fan included as standard
- CE compliant
- **3 years warranty**

# Challenge Series

## Satellite High Speed DVB-S2 IP Modem

### SK-IP

Modulator Part of Modem Type:	SK-IP-V50-xx / SK-IP-V75-xx	SK-IP-L50-xx / SK-IP-L75-xx	SK-IP-Vx/Lx-xx
<b>IF-Output Frequency:</b>	50 ... 180 MHz	950 ... 2150 MHz	50 ... 180 MHz and 950 ... 2150 MHz (2 outputs, can be alternatively enabled)
<b>Frequency Resolution:</b>	1 Hz	1 Hz	see SK-IP-Vx-xx and SK-IP-Lx-xx
<b>Phase Noise:</b>	10 Hz -70 100 Hz -80 1 kHz -88 10 kHz -90 100 kHz -100 1 MHz -115	-65 -75 -88 -90 -100 -115	
<b>IF-Output Characteristics:</b>	max. values in dBc/Hz Impedance: 50 Ω or 75 Ω Return Loss: >20 dB Output Power: -25 dBm ... 5 dBm, 0.1 dB steps, ±0.5 dBm accuracy Output Power muted: <-85 dBm Connector: BNC female	Impedance: 50 Ω or 75 Ω Return Loss: >20 dB Output Power: -30 dBm ... 0 dBm, 0.1 dB steps, ±0.5 dBm accuracy Output Power muted: <-85 dBm Connector: N female (50 Ω) F female (75 Ω) 10 MHz reference output on L-Band (can be switched on/off) DC output on L-Band output: 24 V or 48 V, 4 A max (can be switched on/off) (option DC24 or DC48)	see SK-IP-Vx-xx and SK-IP-Lx-xx
<b>Monitoring Output (on front panel):</b>	Output Power: -20 dB of IF Output Impedance: 50 Ω Return Loss: >20 dB Connector: SMA female	Output Power: -20 dB of L-Band Output Impedance: 50 Ω Return Loss: >20 dB Connector: SMA female	
<b>Spurious Outputs:</b>	Signal related: <-70 dBc, unmodulated carrier, 50 ... 90 MHz or 100 ... 180 MHz <-45 dBc, unmodulated carrier, out of band	Signal related: <-70 dBc, unmodulated carrier, 950 ... 1900 MHz <-55 dBc, unmodulated carrier, 1900 ... 2150 MHz <-45 dBc, unmodulated carrier, out of band	
<b>Frequency and Clock Stability</b>	±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		
<b>Symbol Rate:</b>	Max. Range: 60 ksps ... 60 Msps (depending on firmware option) Step size: 1 sps		
<b>Modulation / Coding DVB-S2:</b>	Outer BCH Code: FEC-Frames 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: yes Physical Layer Signaling: yes Pilots Insertion: on / off Physical Layer Scrambling: N = 0 ... 262141 all according EN 302307	nldpc = 64800 (normal FEC Frame) nldpc = 16200 (short FEC Frame)	
<b>Transport Stream Inputs (Options MT, TI1, TI2) :</b>	With option MT additionally support of two TS multiple input streams with 2 ASI-inputs (without option BI) In combination with option BI one additional TS multiple input stream is supported. (2 x Connector BNC female, Impedance 75 Ω). In case of operation of only one multiple input stream auto switching (can be enabled) between input 1 and input 2. Additionally with option TI1 or TI2 up to two individual Transport Stream 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.		

Specifications continued next page

# Challenge Series

## Satellite High Speed DVB-S2 IP Modem

### SK-IP

Specifications continued:

<b>Transport Stream Security (Option BI):</b>	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
<b>Transport Stream Frames Size:</b>	188 or 204 bytes
<b>Still Picture Playback:</b>	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).

Demodulator Part of Modem Type:	SK-IP-xx-V50 or SK-IP-xx-V75	SK-IP-xx-L75	SK-IP-xx-Vx/L75
<b>IF-Input Frequency:</b>	50 ... 180 MHz	950 ... 2150 MHz	50 ... 180 MHz and 950 ... 2150 MHz (2 inputs, can be alternatively enabled)
<b>IF-Input Characteristics:</b>	Impedance: 50 Ω or 75 Ω Return Loss: >18 dB Input Power: -60 dBm -15 dBm (total aggregate power) IF-Connector: BNC female	Impedance: 75 Ω Return Loss: >13 dB Input Power: -70 dBm ... -20 dBm (total aggregate power) IF-Connector: 2x F female, input selectable LNB DC-Feed: 13.5V or 18 VA (450mA) switchable, 22 kHz tone on/off, short circuit protected	see SK-IP-xx-Vx and SK-IP-xx-L75  one 50 ... 180 MHz and one L-Band input
<b>Symbol Rate:</b>	Max. Range: 60 ksps ... 60 Msps (QPSK, 8PSK) 60 ksps ... 45 Msps (16APSK) 60 ksps ... 40 Msps (32APSK) Step size: 1 sps		
<b>Demodulation / Decoding DVB-S2:</b>	Outer BCH Code: FEC-Frames 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 Demodulator auto detection: Modulation- and FEC-type, pilots on/off are automatically detected Physical Layer Scrambling: N = 0 ... 262141 all according EN 302307	nldpc = 64800 (normal FEC Frame) nldpc = 16200 (short FEC Frame)	

Common Parameters:	SK-IP-x
<b>OptiACM:</b>	CCM / VCM / ACM functionality for point-to-point and point-to-multipoint links 16 ACM channels with separate MODCOD range and Es/NO sensitivity ACM channels arbitrary assignable to baseband channels
<b>Signal Spectrum Mask:</b>	$\alpha = 0.35, 0.25, 0.20$ according EN 302307
<b>Data Interface:</b>	Ethernet (1xRJ-45, 10/100/1000 Mbps auto sensing)
<b>Data Rate:</b>	up to 160 Mbps
<b>Network Operation:</b>	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
<b>Data Encapsulation:</b>	Generic Stream Encapsulation (GSE) according TS 102606
<b>Monitoring and Control Interface:</b>	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
<b>Alarm Interface: Mute Input:</b>	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09

Specifications continued next page

# Challenge Series

## Satellite High Speed DVB-S2 IP Modem

### SK-IP

<b>Temperature Range:</b>	0°C ... 50°C operating -30°C ... 80°C storage
<b>Relative Humidity:</b>	<95% non condensing
<b>User Interface:</b>	LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys
<b>Mains Power Input:</b>	100 ... 240 V AC nominal, 90...264 V AC max, 50...60 Hz
<b>Mains Power Consumption:</b>	Typ: 60 VA / 45 W, Max 190 W (with option DC24, DC power on) Max 300 W (with option DC48, DC power on)
<b>Mains Power Input Connector:</b>	IEC C14
<b>Mains Fuse:</b>	2 x 2.5 A time-lag fuse (standard) 2 x 5 A time lag fuse (with option DC24 or DC48)
<b>Dimension and Weight:</b>	483 x 44 x 470 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 8 kg (standard) approx. 10 kg (with option DC24 or DC48)

Specifications are subject to change

**Order Information:** SK-IP-[Output Band Output Imp]-[Input Band Input Imp]-[Options]-[Modulator Firmware Option]

**Possible Options are:**

<b>DC24</b>	24 V DC power on L-band output
<b>DC48</b>	48 V DC power on L-Band output
<b>MT</b>	Support of Multiple TS input streams
<b>TI1</b>	one TS over IP input Interface
<b>TI2</b>	two TS over IP input Interfaces
<b>BI</b>	BISS scrambling for Transport Stream Input

**Cannot be combined with:**

DC48
DC24
-
TI2
TI1
-

**Requires:**

-
-
-
MT
MT
MT

**Examples:**

<b>SK-IP-L50-L75-DC24-A2H</b>	Modem with L-Band Output 50 Ω and L-Band Input 75 Ω, DC24 Volt
<b>SK-IP-V75-V75-P2N</b>	Modem with VHF-Band Output 75 Ω and VHF-Band Input 75 Ω
<b>SK-IP-V50-V50-A2L</b>	Modem with VHF-Band Output 50 Ω and VHF-Band Input 50 Ω
<b>SK-IP-V75/L50-V75/L75-A2L</b>	Modem with VHF-Band and L-Band Output and Input

<b>Modulator Firmware Option</b>	<b>Max Symbol Rate, Supported Modulation Types DVB-S2</b>
- P2L	15 Msps, QPSK / 8PSK
- P2N	30 Msps, QPSK / 8PSK
- P2M	45 Msps, QPSK / 8PSK
- P2H	60 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



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# Challenge Series Satellite High Speed DVB-S2 IP Demodulator SDD-IP



## CCM, VCM, ACM Functionality

The satellite high speed DVB-S2 IP demodulator SDD-IP provides 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. In combination with the integrated OptiACM controller the demodulator provides adaptive or variable FEC- and modulation setting for point-to-point or point-to-multipoint applications.

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.

QPSK, 8PSK, 16APSK, 32APSK modulation is supported, which allows a lot of flexibility in the satellite link design.

## 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 either addressable packet based commands, a HTTP web browser interface or SNMP can be used. Detailed monitoring of system parameters is possible.

## Key features

- DVB-S2 demodulator for IP/Ethernet data reception
- DVB-S2 compliant (EN 302 307)
- QPSK / 8PSK / 16APSK / 32APSK modulation
- Normal and short FEC frames, pilots on or off
- Physical layer framing (PL descrambling with codes 0 to 262141) according to DVB-S2 standard
- Symbol rates from 60 ksps to 60 Msps
- OptiACM system (programmable or automatic) for optimized bandwidth usage
- Gigabit Ethernet data interface
- Generic Stream Encapsulation (GSE)
- 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 (MIBs are provided)
- Summary alarm output (dual change over switch contacts)
- Operating temperature range 0°C to 50°C (32°F to 122°F)
- CE compliant
- **3 years warranty**

# Challenge Series

## Satellite High Speed DVB-S2 IP Demodulator

### SDD-IP

Demodulator Type:	SDD-IP-V50 or SDD-IP-V75	SDD-IP-L75	SDD-IP-Vx/L75
IF-Input Frequency:	50 ... 180 MHz	950 ... 2150 MHz	50 ... 180 MHz and 950 ... 2150 MHz (2 inputs, can be alternatively enabled)
IF-Input Characteristics:	Impedance: 50 $\Omega$ or 75 $\Omega$ Return Loss: >18 dB Input Power: -60 dBm -15 dBm (total aggregate power) IF-Connector: BNC female	Impedance: 75 $\Omega$ Return Loss: >13 dB Input Power: -70 dBm ... -20 dBm (total aggregate power) IF-Connector: 2x F female, input selectable LNB DC-Feed: 13.5V or 18 VA (450mA) switchable, 22 kHz tone on/off, short circuit protected	see SDD-IP-Vx and SDD-IP-L75  one 50 ... 180 MHz and one L-Band input
Symbol Rate:	Max. Range: Step size:	60 kspss ... 60 Mspss (QPSK, 8PSK) 60 kspss ... 45 Mspss (16APSK) 60 kspss ... 40 Mspss (32APSK) 1 sps	
Demodulation / Decoding DVB-S2:	Outer BCH Code: Inner LDPC Code:  Demodulator auto detection: Physical Layer Scrambling:	FEC-Frames nldpc = 64800 (normal FEC Frame) nldpc = 16200 (short FEC Frame)  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  Modulation- and FEC-type, pilots on/off are automatically detected N = 0 ... 262141 all according EN 302307	
OptiACM:	CCM / VCM / ACM functionality for point-to-point and point-to-multipoint links		
Signal Spectrum Mask:	$\alpha = 0.35, 0.25, 0.20$ according EN 302307		
Data Interface:	Ethernet (1xRJ-45, 10/100/1000 Mbps auto sensing)		
Data Rate:	up to 160 Mbps		
Network Operation:	Layer 2 (Ethernet frame reception) or Layer 3 (IP packet reception) IPv4, IPv6		
Data Encapsulation:	Generic Stream Encapsulation (GSE) according TS 102606		
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: Mute Input:	Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up Connector DSUB09		
Temperature Range:	0°C ... 50°C operating -30°C ... 80°C storage		
Relative Humidity:	<95% non condensing		
User Interface:	LCD-Display 2 x 40 characters, 4 cursor keys, 2 function keys		
Mains Power Input:	100 ... 240 V AC nominal, 90...264 V AC max, 50...60 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 270 mm <sup>3</sup> (WxHxD), 1 RU (19") approx. 4 kg		

Specifications are subject to change

Order Information:

SDD-IP-[Input Band Input Imp]

Examples:

SDD-IP-L75

Demodulator with L-Band Input 75  $\Omega$

SDD-IP-V75/L75

Demodulator with VHF-Band and L-Band Input





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