

# 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)

<b>Modulator Type:</b>	HDM2-Vx / SDM2-Vx	HDM2-Lx / SDM2-Lx	HDM2-Vx/Lx / SDM2-Vx/Lx
<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		
<b>Phase Noise:</b>	10 Hz 100 Hz 1 kHz 10 kHz 100 kHz 1 MHz	-70 -80 -88 -90 -100 -115	-65 -75 -88 -90 -100 -115  see HDM2-Vx and HDM2-Lx
max. values in dBc/Hz			
<b>IF-Output Characteristics:</b>	Impedance: Return Loss: Output Power: Accuracy: Stability: Output Power muted: Connector:  DC-output on IF-Output: 10 MHz ref. output on IF-Output:	50 Ω or 75 Ω (VHF-Band output) 50 Ω or 75 Ω (L-Band output) >20 dB -25 dBm ... 5 dBm, 0.1 dB steps (V-Band output) -30 dBm ... 0 dBm, 0.1 dB steps (L-Band output) ± 0.5 dB ± 0.5 dB <-85 dBm BNC female (V-Band output) N female (L-Band output 50 Ω) F female (L-Band output 75 Ω) 24 V DC or 48 V DC, max 4 A (can be switched on/off) (option DC24 or DC48) (L-Band output)) 1.5 ±1.5 dBm (can be switched on/off) (L-Band output)	
<b>Monitoring Output (on front panel):</b>	Output Power:  Impedance: Return Loss: Connector:	-20 dB of IF Output  50 Ω >20 dB SMA female	on SDM2-Vx / HDM2-Vx and HDM2-Vx-Lx / SDM2-Vx-Lx on SDM2-Lx / HDM2-Lx and
<b>L-Band Monitoring: (on rear panel):</b>	Output Frequency: Output Power: Impedance: Return Loss: Connector:	1.4 GHz -45 dBm approx 75 Ω >15 dB BNC female	available only on HDM2-Vx / SDM2-Vx and HDM2-Vx-Lx / SDM2-Vx-Lx
<b>Spurious Outputs:</b>	Signal related:	<-70 dBc (unmodulated carrier, 50 ... 90 MHz or 100 ... 180 MHz for V-Band output) <-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)	
<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: Step size:	8 ksps ... 60 Msps (depending on Firmware Option) 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: (according EN 302307)	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	
<b>Modulation / Encoding DVB-S / DVB-DSNG:</b>	Outer Reed Solomon Coding: Convolutional Interleaving: Inner Coding depending on Firmware Option: (according EN300421, EN 301210)	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)	

# 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>	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> <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