DVB Satellite Broadcast Modulator

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 dramatically 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-to-noise 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, and 32APSK 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
  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 auto-switchover and SPI electrical interfaces
- 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.de or call us. We are glad to assist you.

DVB Satellite Broadcast Modulator

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	see HDM2-Vx and HDM2-Lx
100 Hz	-80	-75	
1 kHz	-88	-88	
10 kHz	-90	-90	
100 kHz	-100	-100	
1 MHz	-115	-115	
	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 typ > 18 dB min	
	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 supply over L-band output:	24 V DC or 48 V DC, max 4 A, switchable (option DC24 or DC48)	
	10 MHz reference over L-band output:	1.5 ±1.5 dBm, switchable	
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	available only on HDM2-Vx / SDM2-Vx and HDM2-Vx-Lx / SDM2-Vx-Lx
	Output Power:	-45 dBm approx	
	Impedance:	75 Ω	
	Return Loss:	>15 dB	
	Connector:	BNC female	
Spurious Outputs:	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)	
Frequency Stability:	±2 x 10^{-8} (-30°C ... 60°C, after warm up), aging: ±1 x 10^{-9} per day, ±1 x 10^{-7} per year		
Symbol Rate:	Max Range:	8 ksps … 80 Msps	
	Step size:	1 sps	
Clock Stability:	±2 x 10^{-8} (-30°C ... 60°C, after warm up), aging: ±1 x 10^{-9} per day, ±1 x 10^{-7} per year		
Data Rate:	3 kbps … 356 Mbps (SPI interface) *) 3 kbps … 213 Mbps (ASI interface) *) 10 kbps … 213 Mbps (TS over IP interface) *)		*) max 170 Mbps, when BISS-1/E active
Modulation / Encoding DVB-S2X:	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	
	ModCods non-linear: (short 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	
	ModCods linear: (normal FEC frame)	8PSK 5/9-L, 26/45-L 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)	
Modulation / Encoding DVB-S2:	FEC Frame Lengths:	FEC-Frames n_{ldpc} = 64800 (normal FEC Frame) or n_{ldpc} = 16200 (short FEC frame)	
	ModCods:	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_{ldpc}=64800) 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 (only n_{ldpc}=64800) 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 (only n_{ldpc}=64800) 32APSK 3/4, 4/5, 5/6, 8/9, 9/10 (only n_{ldpc}=64800)	
	Pilots Insertion:	on / off	
	Physical Layer Scrambling:	N=0 … 262141	
Modulation / Encoding 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		

Specifications continued next page

DVB Satellite Broadcast Modulator

Indoor Unit

Signal Spectrum Mask:	α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05 (other values on request)
Transport Stream Inputs:	DVB-SPI (DSUB25 female) and Dual DVB-ASI-electrical (2 x Connector BNC female, Impedance 75 Ω) 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) 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 multiple transport stream support 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 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, ETSI EN 301210, ETSI EN 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, 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 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
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 mm³ (WxHxD), 1 RU (19") approx. 8 kg approx. 10 kg (with option DC24 or DC 48)

Specifications are subject to change

DVB Satellite Broadcast Modulator
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	-
XB	Broadcast Predistortion	-	-
XE	Extended Predistortion	-	-

Examples:

SDM2-V75	Modulator with VHF-band Output 75 Ω
HDM2-L50	Modulator with L-band Output 50 Ω,
HDM2-V75-FAN	Modulator with VHF-band Output 75 Ω 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