A-Series AX-60
All-IP Platform

DVB S2X **DVB GSE** **DVB CID**

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

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

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

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

Key features

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

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

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Modulator Parameters:		AX-60 / AT-60	
Signal Outputs:		1x L-band output 950 … 2150 MHz 1x IF output 50 … 180 MHz (option IF)	
		IF Output	**L-band Output**
IF-Output Frequency:		50 … 180 MHz	950 … 2150 MHz
Frequency Resolution:		1 Hz	1 Hz
Phase Noise:	**10 Hz**	-45	-45
	100 Hz	-80	-75
	1 kHz	-88	-88
	10 kHz	-90	-90
	100 kHz	-100	-100
	1 MHz	-115	-115
		max. values in dBc/Hz	

IF-Output Characteristics:		Impedance: 50 Ω or 75 Ω
		Return Loss: > 18 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
			Return Loss: > 18 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
			10 MHz reference
			output: 1.5 ±1.5 dBm (can be switched on/off)

Spurious Outputs:		Signal related: < -70 dBc, unmodulated carrier,
		    50 … 90 MHz or
		    100 … 180 MHz
		    < -45 dBc, unmodulated carrier
		    harmonics, out of band
			Signal related: < -70 dBc, unmodulated carrier,
			    950 … 1900 MHz
			    < -55 dBc, unmodulated carrier,
			    1900 … 2150 MHz
			    < -45 dBc, unmodulated carrier
			    harmonics, out of band

Frequency and Clock Stability:		Standard: $\pm 2 \times 10^{-7}$ (0°C ... 50°C, after warm up), aging: $\pm 2 \times 10^{-8}$ per day, $\pm 1 \times 10^{-6}$ per year Option EXT: $\pm 2 \times 10^{-8}$ (-30°C ... 60°C, after warm up), aging: $\pm 1 \times 10^{-9}$ per day, $\pm 1 \times 10^{-7}$ per year	
Symbol Rate:		Max. Range: 100 ksps … 75 Msps (depending on firmware option) Step size: 1 sps	

DVB-S2X Modulation / Coding:		ModCods:
		(normal FEC frame) QSPK 13/45, 9/20, 11/20
		    8PSK 23/36, 25/36, 13/18
		    16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90
		    32APSK 32/45, 11/15, 7/9
		    64APSK 11/15, 7/9, 4/5, 5/6
		    128APSK 3/4, 7/9
		    256APSK 32/45, 3/4
		ModCods: QPSK 11/45, 4/15, 14/45, 7/15, 8/15, 32/45
		(short FEC frame) 8PSK 7/15, 8/15, 26/45, 32/45
		    16APSK 7/15, 8/15, 26/45, 3/5, 32/45
		    32APSK 2/3, 32/45
		ModCods linear: 8PSK 5/9-L, 26/45-L
		(normal FEC frame) 16APSK 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L
		    32APSK 25/36-L
		    64APSK 32/45-L
		    256APSK 29/45-L, 2/3-L, 31/45-L, 11/15-L
		all according to ETSI EN 302307-2	

DVB-S2 Modulation / Coding:		ModCods: QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		(normal and short FEC frame; 8PSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
		except 9/10 short FEC frame only) 16APSK 2/3, 3/4, 4/5, 5/6, 8/9, 9/10
		    32APSK 3/4, 4/5, 5/6, 8/9, 9/10
		Pilots Insertion: on / off
		Physical Layer Scrambling: N = 0 … 262141
		    all according to ETSI EN 302307-1	

Carrier ID:		DVB-CID according to ETSI TS 103129	
Signal Spectrum Mask:		α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05 according ETSI EN 302307	

Specifications continued next page

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Demodulator Parameters:	AX-60 / AR-60			
Signal Inputs:	1x L-band input 950 … 2150 MHz 1x IF input 50 … 180 MHz (option IF)			
	IF Input		**L-band Input**	
IF-Input Frequency:	50 … 180 MHz		950 … 2150 MHz	
IF-Input Characteristics:	Impedance: 50 Ω / 75 Ω switchable Return Loss: >18 dB Input Power: -60 dBm … -15 dBm (total aggregate power) IF-Connector: BNC female 50 Ω		Impedance: 75 Ω Return Loss: >13 dB Input Power: -70 dBm … -20 dBm (total aggregate power) IF-Connector: F female LNB DC-Feed: 13.5V or 18 V (450mA) switchable, 22 kHz tone on/off, DISEqC 1.1 short circuit protected	
Symbol Rate:	Max. Range: 100 ksps … 75 Msps Step size: 1 sps			
DVB-S2X Demodulation / Decoding:	ModCods non-linear: (normal FEC frame)	QSPK 8PSK 16APSK 32APSK 64APSK 128APSK 256APSK	13/45, 9/20, 11/20 23/36, 25/36, 13/18 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90 32/45, 11/15, 7/9 11/15, 7/9, 4/5, 5/6 3/4, 7/9 32/45, 3/4	
	ModCods non-linear: (short FEC frame)	QPSK 8PSK 16APSK 32APSK	11/45, 4/15, 14/45, 7/15, 8/15, 32/45 7/15, 8/15, 26/45, 32/45 7/15, 8/15, 26/45, 3/5, 32/45 2/3, 32/45	
	ModCods linear: (normal FEC frame)	8PSK 16APSK 32APSK 64APSK 256APSK	5/9-L, 26/45-L 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L 25/36-L 32/45-L 29/45, 2/3, 31/45, 11/15 all according to ETSI EN 302307-2	
DVB-S2 Demodulation / Decoding:	ModCods: (normal and short FEC frame; except 9/10 short FEC frame only)	QPSK 8PSK 16APSK 32APSK	1/4, 1/3, 1/2, 2/5, 3/5, 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 3/5, 2/3, 3/4, 5/6, 8/9, 9/10 2/3, 3/4, 4/5, 5/6, 8/9, 9/10 3/4, 4/5, 5/6, 8/9, 9/10	
	Demodulator auto detection: Physical Layer Scrambling:	Modulation- and FEC-type, pilots on/off are automatically detected N = 0 … 262141 all according to ETSI EN 302307-1		
Signal Spectrum Mask:	α = 0.35, 0.25, 0.20, 0.15, 0.10, 0.05 according ETSI EN 302307-2			
Common Parameters:	**AX-60 / AT-60 / AR-60**			
Data Interfaces:	2x Ethernet RJ-45, 10/100/1000 Mbps auto sensing arbitrarily assignable for M&C and/or traffic operation			
Network Operation:	Layer 3 Bridge or Router for IPv4 and IPv6 packet transmission 256 IP/subnet routes towards satellite 64 baseband channels with independent DVB-S2X and encapsulation settings			
Data Encapsulation:	Generic Stream Encapsulation (GSE) according to ETSI TS 102606 Multiprotocol Encapsulation (MPE) according to ETSI EN 301192			
IP Data Rate:	up to 360 Mbps or 80000 pps rx+tx processing, subject to prevailing modem limits data rates/packet rates can vary in combination with complex internal processing (i.e. traffic shaping)			
Traffic Shaper/QoS on BB level:	configurable baseband channel limits based on symbol rate guaranteed and limited bandwidth individually configurable			
Traffic Shaper/QoS on IP level:	(contact factory for options)			
Transport Stream Output:	1x RTP/UDP IP over Ethernet according to IETF RFC 2250 1x ISI selectable from multistream carrier; null packet reinsertion			
OptiACM:	CCM / VCM / ACM functionality for point-to-point and point-to-multipoint links 64 ACM channels with separate MODCOD range and Es/N0 sensitivity			
Predistortion:	(contact factory for options)			
Monitoring and Control:	Protocol: SNMP Connection: UDP/IP over Ethernet/RJ-45 or in-band via satellite link Protocol: HTTP (web browser interface) Connection: TCP/IP over Ethernet/RJ-45 or in-band via satellite link			
Internal Fan	FAN included			
Temperature Range:	0°C ... 50°C operating or -30°C ... 60°C operating (option EXT) -30°C ... 80°C storage			
Relative Humidity:	< 95% non condensing			
User Interface:	LCD-Display 2 x 40 characters, 4 cursor keys, 2/4 function keys VFD-Display 2 x 40 characters, 4 cursor keys, 2/4 function keys (option EXT)			
Mains Power Input:	100 … 240 V AC nominal, 90 … 264 V AC max, 50 … 60 Hz			
Mains Power Consumption:	Typ.: 65 VA / 45 W			
Mains Power Input Connector:	IEC C14			
Mains Fuse:	2 x 3.15 A time-lag fuse			
Dimension and Weight:	483 x 44 x 505 mm³ (WxHxD), 1 RU (19") up to approx. 8 kg depending on device type			

Specifications are subject to change

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Order Information:

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

Hardware options:

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

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

License based options:

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

TXDxxx	transmission data rate limit / applicable to AX-60 and AT-60 devices	
	TXD10	max 10 Mbps throughput towards satellite
	TXD30	max 30 Mbps throughput towards satellite
	TXD100	max 100 Mbps throughput towards satellite
	TXD160	max 160 Mbps throughput towards satellite
	TXDmax	max throughput according to specification
TXSxxx	transmission symbol rate limit / applicable to AX-60 and AT-60 devices	
	TXS15	max 15 Msps Tx carrier
	TXS30	max 30 Msps Tx carrier
	TXS45	max 45 Msps Tx carrier
	TXS60	max 60 Msps Tx carrier
	TXSmax	max Tx carrier according to specification

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

RXDxxx	reception data rate limit / applicable to AX-60 and AR-60 devices	
	RXD10	max 10 Mbps throughput from satellite
	RXD30	max 30 Mbps throughput from satellite
	RXD100	max 100 Mbps throughput from satellite
	RXD160	max 160 Mbps throughput from satellite
	RXDmax	max throughput according to specification
RXSxxx	reception symbol rate limit / applicable to AX-60 and AR-60 devices	
	RXS15	max 15 Msps Rx carrier
	RXS30	max 30 Msps Rx carrier
	RXS45	max 45 Msps Rx carrier
	RXS60	max 60 Msps Rx carrier
	RXSmax	max Rx carrier according to specification

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

BBO	baseband frame output interface over IP
BBI	baseband frame input interface over IP
TSO	transport stream over IP output
IQ	IQ raw data output over IP

Available licenses are subject to change. Please contact factory for additional features and customized licenses for OEM products.

DVB®
Digital **V**ideo
Broadcasting

Trade Mark of the DVB Digital Video Broadcasting Project