



Ultra-Compact ISR Video Encoder

The Makito X1 Rugged is an ultra-compact H.265/HEVC and H.264/AVC low latency encoder for real-time streaming of MISB/JITC-compliant full motion video in the most demanding ISR environments.

HEVC Encoding at the Edge Make more informed and timely decisions with pristine quality video imagery from tactical systems. Featuring two encoding cores, the Makito X1 can process a single HD 1080p60 source as two outgoing streams with their own H.265/HEVC or H.264/AVC compression, scaling, cropping, and other settings for different destinations. H.265/HEVC delivers better picture quality at lower bit rates when compared to H.264/AVC, packing more visual information over constrained network links. And with Network Adaptive Encoding, the Makito X1 Rugged can address one of the fundamental challenges of mobile tactical networks: providing quality streams even when network bandwidth is variable or unpredictable. With the Makito X1 Rugged, downstream exploitation systems can receive the best video possible over IP networks, line-of-sight (LOS), and satellite links.

Small Size, Mighty Encoding The Makito X1 Rugged is a portable, SWaP-optimized video encoder available as a hardened appliance or OEM board for advanced integrations. About the size of a deck of cards, the Makito X1 appliance can be deployed in portable and wearable equipment or on small platforms in harsh environments around the world. When systems call for tighter integration of ISR capabilities, the OEM board is ideally suited for deep integration within ISR sensor, datalink, or mission systems. The Makito X1 Rugged in either appliance or board form is the smallest, lightest, and most power-efficient ruggedized H.265/HEVC encoder on the market, leveraging the Makito X heritage for proven reliability, quality and innovation.

Ultra-Low Latency for ISR and Situational Awareness The Makito X1 Rugged video encoder streams high-quality full motion video at encoding latencies suitable for the most demanding Intelligence, Surveillance and Reconnaissance (ISR) applications. Combined with the excellent picture quality at low bit rates, the ultra-low latency Makito X1 Rugged encoder addresses the real-time requirements for air, ground, manned or unmanned platforms.

Compliant Encoding with KLV Metadata from Haivision Adhering to MISB/STANAG specifications for encoding and KLV metadata, and with support for KLV filtering, Makito X1 Rugged is designed to ensure downstream interoperability with exploitation systems and cross-domain applications. It provides the flexibility to combine H.265/HEVC and H.264/AVC encoded video with synchronous or asynchronous KLV metadata, and optimizes streaming bandwidth through highly efficient encoding options and selective filtering of KLV metadata parameters. Even in the most constrained network environments, it provides the imagery and metadata needed to meet mission requirements.

FEATURES

BENEFITS

Network Adaptive H.265/HEVC Encoding

Ensures the highest quality video even when streaming at lower bit rates over constrained networks

Rugged Appliance or Board

Immediately deploy the Makito X1 Rugged appliance on small ISR platforms and manpack systems, or deeply integrate the OEM board into ISR sensors, datalinks and mission computers

Ultra Low Latency

Respond in real-time to mission-critical full motion video

Interoperable Video & Metadata Filtering

MISB/STANAG-compliant streams and KLV metadata provide downstream compatibility with bit rate optimization via KLV filtering

Makito X Heritage

Proven technology family for ISR workflows deployed in applications worldwide

INPUT VIDEO INTERFACES

Composite NTSC/PAL/PAL-M
 SD-SDI SMPTE 259M-C
 HD-SDI SMPTE 292M, 274M, 296M
 3G-SDI SMPTE 424M (Level A Only)
 SMPTE 425M

INPUT VIDEO RESOLUTIONS*

1920x1080p 60/59.94/50/30/29.97/25/24/23.98 Hz
 1920x1080i 60/59.94/50 Hz
 1280x720p 60/59.94/50/30/29.97/25 Hz
 720x480/576i 60/59.94/50 Hz

VIDEO ENCODING

8-bit or 10-bit pixel depth
 Chroma sub-sampling 4:2:0 or 4:2:2
 BT.709 color space and WCG (BT.2020)
 SDR and HDR - HLG or PQ (ST 2084)
 Configurable Group of Picture (GOP) size
 I, IP, IBBP, IBBBP, IBBBPB Framing
 Bitrates from 32 Kbps up to 120 Mbps**
 Configurable frame rate
 Intra-refresh
 Slice-based encoding
 Scene-Change Detection

H.264/AVC Profiles:

MPEG-4 AVC part 10 / ISO/IEC 14496-10
 Baseline, Main, High, High 10- Bit and High 4:2:2
 10- Bit Profiles up to Level 4.2 (1920x1080p60)
 and lower intermediate levels

H.265/HEVC Profiles:

ISO/IEC 23008-2
 Main, Main 10-Bit, Main 4:2:2 10- Bit Profiles
 up to Level 4.2 (1920x1080p60) and lower
 intermediate levels

AUDIO INTERFACES**Embedded Audio:**

SD-SDI SMPTE 272M
 HD/3G-SDI SMPTE 299M

Analog Audio Input:

Unbalanced Stereo

* interlaced shown in fields per second

** bitrate depends on configuration

AUDIO ENCODING**Compression Standard:**

SMPTE 302M uncompressed LPCM passthrough
 AC3/E-AC3 Dolby passthrough
 MPEG-2 AAC-LC ISO/IEC 13818-7
 MPEG-4 AAC-LC ISO/IEC 14496-3

Audio Channels:

8 embedded audio sources (SDI)
 1 stereo or mono analog input
 Surround audio grouping up to 7.1

Bit Rates:

From 4 to 576 kbps per audio pair**

Frequency Response:

From 20 Hz to 22 kHz

METADATA**Input Metadata:**

CoT to KLV conversion
 KLV or CoT over serial RS-232/422
 KLV or CoT over UDP
 KLV over SDI
 SMPTE 336M compliant
 MISB 0601.10 compliant
 MISB 0604.2 compliant
 MISB 0605 compliant
 SMPTE 12M Timecode
 SMPTE 334-1/2 closed captioning
 SCTE 104 insertion markers

Output Metadata:

EIA/CEA/CTA-608/708 CC pass-through
 Asynchronous & synchronous modes
 as per MISB 0604.2
 High precision timecode insertion
 as per MISB 0604.2
 KLV Metadata Processing
 SCTE 35 insertion markers

STANDARD COMPLIANCE

IP67
 RTCA-DO-160G
 STANAG 4609
 MISP 2019
 MIL-STD-810G
 MIL-STD-704F (+28 VDC only)

NETWORKING**Interfaces:**

1x Ethernet 10/100/1000 Mbps
 1x Serial RS-232

Streaming Protocols:

MPEG-TS over UDP
 MPEG-TS over RTP
 Secure Reliable Transport (SRT)
 RTSP/RTP
 Unicast streaming

Multicast streaming (IGMPv3)
 Multiple unicast streaming

Advanced Streaming Features:

AES encryption 128-bit or 256-bit
 SRT Latency Control
 Forward Error Correction (FEC)
 Both IPv4 and IPv6 Support

Management:

HTTPS (web browser)
 REST API
 Haivision EMS and Haivision Hub
 Command line over SSH/Telnet/RS-232
 SFTP/TFTP/SCP
 SNMP v3
 ONVIF

SIZE, WEIGHT, POWER**Appliance:**

32.8 mm H x 72.5 mm W x 90.2 mm D
 (1.293" H x 2.85" W x 3.55" D)

+5 VDC:

254g (0.56 lbs)
 6W at 70°C
 5W at 40°C

+28 VDC:

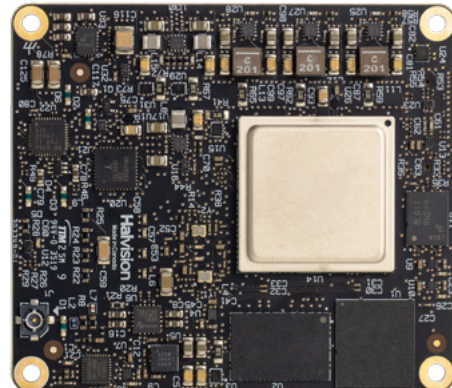
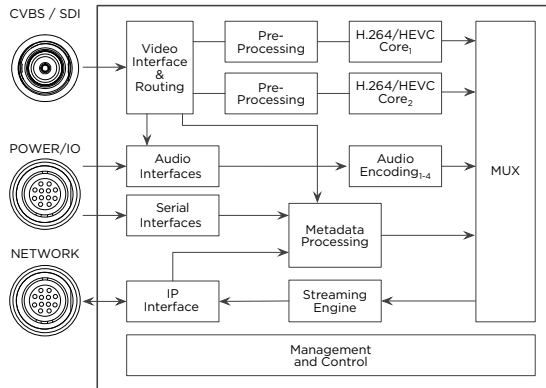
325g (0.72 lbs)
 8.5W at 70°C
 6.8W at 40°C

Board (+5 VDC only):

58.0 mm H x 66.0 mm W
 (2.28" H x 2.60" W)
 45g (0.11 lbs)

Temperature:

Operating: -40° to 70°C (-25° to 160°F)
 Non-operating: -45° to 85°C (-49° to 185°F)
 Humidity: 0-100% condensing

Software Version: 1.4

Makito X1 Rugged Product Portfolio & Ordering Information **

Makito X1 Rugged SDI Encoder
 +28 VDC Appliance

S-MX1E-R-V2-28V-SDI1-ISR

Makito X1 Rugged appliance encoder with single input; up to 1920x1080p60; 2x H.265/HEVC or H.264/AVC encoding engines; with KLV metadata. +28 VDC MIL-STD-704F

Makito X1 Rugged SDI Encoder
 +5 VDC Appliance

S-MX1E-R-V2-SDI1-ISR

Makito X1 Rugged appliance encoder with single input; up to 1920x1080p60; 2x H.265/HEVC or H.264/AVC encoding engines; with KLV metadata. +5 VDC

Makito X1 SDI Encoder
 Integrator's Board

B-MX1E-I-SDI1-ISR

Makito X1 board encoder with single input; up to 1920x1080p60; 2x H.265/HEVC or H.264/AVC encoding engines; with KLV metadata; no heatsink for OEM integration. +5 VDC

** For complete pricing and ordering, contact us at sales@haivision.com or your certified Haivision reseller.

DoDIN APL Certified

Makito X1 Rugged is on the Department of Defense Information Network Approved Product List (DoDIN APL) under tracking number **2118301**.