



## Ruggedized Low Latency 1080p60 HD H.264 Encoder

**Designed for Airborne & Mobile ISR** Makito™ Air combines the unrivaled low latency and performance of Haivision’s commercial Makito HD H.264 encoder in a completely ruggedized DO-160 compliant form-factor with full KLV/CoT metadata support. The Makito Air addresses the most demanding intelligence, surveillance, and reconnaissance (ISR) video challenges by delivering H.264 video up to 1080p60 with metadata, encoding latency as low as 55 milliseconds, and end-to-end latency as low as 70 milliseconds when coupled with a Makito decoder. The Makito Air encoder can support constrained data links found in the most challenging operating environments by reducing the spatial resolution of the video without affecting image aspect ratios. Additionally, two different bitrate (resolution/framerate) H.264 streams can be produced simultaneously from the same source. The Makito Air allows for scaling and frame rate settings to be adjusted on-the-fly, should controls be established from data rate sensing systems.

**KLV Metadata** Makito Air supports industry standard MISP-compliant Key-Length-Value (KLV) metadata transport within the MPEG-2 transport stream. Metadata is captured via serial port, Ethernet or the SDI-VANC embedded input stream. Synchronous transport of the metadata with the associated image frames is guaranteed through Presentation Time Stamp (PTS). Additionally, Makito Air supports Cursor-on-Target (CoT) metadata. CoT is converted into standard KLV format prior to being multiplexed in the MPEG-2 transport stream.

**In the Air or on the Ground** Makito Air is ideal for installations on-board manned and unmanned aerial platforms used for ISR applications; where video and metadata are transmitted over microwave (LOS) or satellite (BLOS) networks to operations and exploitation centers. The Makito Air is also suitable for ISR applications on ground-based platforms, equipped with wireless transmitters. For emergency aid and disaster recovery efforts, Makito Air is ideal for streaming live video from sensor-equipped platforms to first-responders and news outlets.

**JITC Certification** As the industry’s first and only JITC certified H.264 1080p60 HD encoders for both airborne and ground-based applications, Makito Air and Makito guarantee interoperability of field systems and ensures compliance with the U.S. Department of Defense (DoD) standards for encoding Full Motion Video (FMV) for ISR.

### Features

### Benefits

<b>Commercial-Off-The-Shelf (COTS)</b>	Continuous product evolution and improvement with powerful feature sets
<b>Ruggedized DO-160 design</b>	Designed for airborne and ground-based vehicles
<b>Low latency - 70ms end-to-end</b>	Support mission-critical communication challenges
<b>JITC Certified H.264 1080p60 HD encoder</b>	Guaranteed interoperability & compliance with DoD and ISR
<b>Performance in a compact form-factor</b>	Three encoders can be mounted in a single rack unit, each encoder weighing under 3 lbs.
<b>Multi-bitrate (MBR) streaming</b>	Multiple stream output from a single source

**Makito Air (S-290E-AIR, S-290E-AIR-COT)**

*Video (Inputs):*

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

*Video Resolutions:*

1920x1080p 60/59.94/50/30/24/23.98/29.97/25 Hz  
 1920x1080i 60/59.94/50 Hz  
 1280x720p 60/59.94/50/30/29.97/25 Hz  
 720x480/576i 60/59.94/50 Hz  
 (interlaced shown in fields per second)

*Audio (Input):*

Balanced Stereo Analog Audio  
 Unbalanced Stereo Analog Audio  
 Embedded Audio  
 SD-SDI SMPTE 272M  
 HD-SDI SMPTE 299M

**ADVANCED FEATURES**

Multi-bitrate (MBR) streaming  
 SD de-interlacing  
 Built-in downscaling  
 Deblocking filter  
 EIA-608-B/NTSC Line 21 Closed Captioning  
 EIA-708-B/SDI Closed Captioning  
 Forward Error Correction (FEC)  
 AES Encryption 128-bit or 256-bit  
 Logo overlay  
 Selective Mute  
 SD aspect ratio configuration  
 SD AFD and WSS (x-290E-HDSDI)

**VIDEO ENCODING**

*Compression Standard:*

H.264 (MPEG-4 AVC part 10)  
 ISO/IEC 14496-10  
 Level 4.2 and lower Intermediate Levels  
 I, IP framing  
 Configurable Group of Picture (GOP) size  
 Configurable frame rate

*Bit Rates:*

SD/HD from 150 kbps to 15 Mbps

*Rate Control:*

Traffic Shaping

*Latency (encode only):*

Less than 55ms

**AUDIO ENCODING**

*Compression Standard:*

MPEG-2 AAC-LC ISO/IEC 13818-7  
 MPEG-4 AAC-LC ISO/IEC 14496-3

*Audio Channels:*

2 per video channel

*Bit Rates:*

From 32 to 448 kbps per audio pair

*Frequency Response:*

From 20 Hz to 22 kHz

**IP NETWORK INTERFACES**

*Standard:*

Ethernet 10/100/1000 Base-T, auto-detect, Half/Full-duplex

*Networking Protocols:*

Unicast Streaming  
 Multicast Streaming (IGMP v3)  
 Multiple Unicast Streaming  
 MPEG Transport Stream over UDP / RTP  
 Direct RTP - H.264 over RTP (RFC 3984)  
 RTP / RTCP (RFC 3550)  
 RTMP  
 QuickTime RTSP (RFC 3640) (Progressive resolutions only)  
 SAP (RFC 2974)

**MANAGEMENT INTERFACES**

*Standard:*

RS-232 or Ethernet

*Management:*

HTTPS (web browser)  
 Command line over Telnet/RS-232/SSH  
 FTP/TFTP  
 Furnace Portal Server (VF Pilot)  
 SNMPv3  
 Common Criteria: NDPP 1.1 support

**KLV METADATA**

*MISB Compliant, considering:*

IETF RFC 2250  
 Video over IP using MPEG-2 systems (TS mode)  
 MISB 0601.3 compliant  
 UAS Datalink Local Metadata Set, Section 5  
 MISB 0604.2 compliant  
 Time Stamping Compressed Motion Imagery  
 SMPTE 336M-2007 Data Encoding Protocol  
 Using Key-Length-Value

**Makito Air (S-290E-AIR-x)**

*Dimensions:*

41mm H x 143mm W x 216mm D  
 (1.6"H x 5.6"W x 8.5"D)

*Weight:*

3.6 lbs.

*Power:*

28VDC, 17W  
 MIL-STD connector

*Temperature:*

Operating: -55° to 50°C  
 Non-operating: -65° to 85°C

*Compliances/Certifications:*

Designed for specific sections of:  
 RTCA-DO-160F  
 MIL-STD-810F  
 MIL-STD-704F  
 IEC60529:2001-02  
 J1TC MISP 5.5



Makito Air

**Makito Air Product Portfolio & Ordering Information \*\***

Makito Air	<b>S-290E-AIR</b>	Makito AIR ruggedized HD H.264 Encoder with KLV. MIL-STD connectors optional
Makito Air	<b>S-290E-AIR-COT</b>	Makito AIR ruggedized HD H.264 Encoder with KLV and CoT. MIL-STD connectors optional. For US Federal use only

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