Extreme Encoding The Makito™ X family of H.264 encoders and decoders delivers a complete end-to-end field-proven video solution offering confidence, security, and reliability with a mature feature set. A complete product family, Makito X solves the most demanding encoding and video distribution challenges. Available as single appliances or mini-blades within rack mountable chassis, the Makito X encoders achieve remarkable density supporting up to 12 1080p60 inputs or outputs within a single rack unit.

Highest Quality To maximize video quality over your network, the Makito X supports High Profile H.264 encoding. Tuned to excel in low bandwidth environments, the Makito X gives you twice the quality or uses half the bandwidth compared to other enterprise encoders. Matched with the Makito X Decoder to provide extremely low end-to-end latency, the Makito X delivers pristine quality at sub-2 Mbps bitrates. The Makito X is ideal for video distribution within a facility, to connect facilities or support remote video contribution, to deliver performance video over satellite connections and across the Internet.

Powerful Features With up to 2 inputs and 4 encoding engines per blade, the Makito X carries forward the strong heritage of the Makito family with features designed to address the most rigorous video applications. The excellent picture quality at low bandwidth and the lowest end-to-end latency of the industry makes the Makito X platform ideal for internal broadcast applications. Combining KLV and CoT metadata support makes the Makito X ideal for Full Motion Video (FMV) applications in government and military. Moreover, integrated features such as snapshots, logo insertion, Selective Mute™, talkback, and powerful control interfaces enable advanced video network management in medical applications. Multi-bitrate (MBR) encoding to unicast, multicast, and RTMP enables administrators to direct many unique streams groomed to specific desktop and mobile viewers, set-top boxes, recorders, and Internet destinations.

Integrated Solutions Haivision has designed specific integrated technology supporting end-to-end video applications. The Makito X includes Haivision’s Secure Reliable Transport (SRT) technology enabling video distribution over low cost public Internet connection, AES encryption and Forward Error Correction (FEC) for controlled media distribution throughout facilities with the Furnace IPTV and CoolSign digital signage systems.

The Makito X family includes single HD-SDI encoders, dual HD-SDI encoders, DVI/Component encoders, single or dual encoders for harsh environments and the Makito X dual channel decoders.

<table>
<thead>
<tr>
<th>Product Features</th>
<th>Product Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low end-to-end latency</td>
<td>Supports mission-critical distribution and interactive communication challenge</td>
</tr>
<tr>
<td>4 HD encoding engines</td>
<td>Deliver up to 4 HD streams from 1 or 2 sources for multi-bitrate (MBR) streaming</td>
</tr>
<tr>
<td>Multiple destinations per stream</td>
<td>Target different systems, networks, users, and platforms individually</td>
</tr>
<tr>
<td>Highly efficient encoding</td>
<td>Up to twice the quality or half of the bandwidth, using High Profile H.264</td>
</tr>
<tr>
<td>12 HD 1080p60 channels in 1RU</td>
<td>Highest density available reducing cost, footprint, and energy consumption</td>
</tr>
<tr>
<td>AES 256 bit encryption</td>
<td>Secure unicast or multicast end-to-end video distribution</td>
</tr>
<tr>
<td>Metadata support</td>
<td>Insert synchronized KLV into the MPEG stream from IP, embedded, or serial data sources</td>
</tr>
<tr>
<td>SRT and FEC</td>
<td>Maintain video quality over unqualified networks and low cost public internet connections</td>
</tr>
<tr>
<td>Integrated with Furnace, InStream and CoolSign</td>
<td>Complete end-to-end video solution</td>
</tr>
</tbody>
</table>
**TechSpecs**

**MAKITO X SPECIFICATIONS**

**MAKITO X (SDI ENCODERS & DECODER)**

<table>
<thead>
<tr>
<th>Video Inputs (single or dual input encoder only)</th>
<th>Video Outputs (decoder only - dual channel):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Composite NTSC/PAL/PAL-M SDI SMPTE 295M-C HD-SDI SMPTE 292M 3G-SDI SMPTE 424M</td>
<td></td>
</tr>
</tbody>
</table>

**Video Resolutions:**
- 1920x1080p 60/59.94/50/30/29.97/25/24/23.98 Hz
- 1080i60 59.94/59.94/50/50/29.97/25 Hz
- 720x480/576i 60/59.94/50 Hz
- (interlaced shown in fields per second)

**Audio Inputs/Outputs:**
- Available through a locking mini-DIN-8 connector:
  - Balanced stereo analog audio
  - Unbalanced stereo analog audio
  - Talkback
  - Embedded Audio
- SD-SDI SMPTE 292M HD-SDI SMPTE 295M HDMI (Decoder only)

**MAKITO X (DVI ENCODER)**

<table>
<thead>
<tr>
<th>Video Inputs:</th>
<th>Video Resolutions:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y, Pb, Pr / RGBHV component analog Y,Cb, Cr / DVI component digital</td>
<td></td>
</tr>
<tr>
<td>1920x1080p 60/59.94/50/30/29.97/25/24/23.98 Hz</td>
<td></td>
</tr>
<tr>
<td>1080i60 59.94/59.94/50/50/29.97/25 Hz</td>
<td></td>
</tr>
<tr>
<td>720x480/576i 60/59.94/50 Hz</td>
<td></td>
</tr>
<tr>
<td>720x480/576p 60/59.54/50 Hz</td>
<td></td>
</tr>
</tbody>
</table>

**Audio Inputs/Outputs:**
- Available through a locking mini-DIN-8 connector:
  - Balanced stereo analog audio
  - Unbalanced stereo analog audio
  - Talkback
  - Embedded DVI Audio

**VPD ENCODING/DECODING**

**Compression Standards:**
- H.264 (MPEG-4 AVC part 10)
- ISO/IEC 14496-10
- Baseline, Main, and High Profiles
- Up to Level 4.2 and lower intermediate levels
- I, IP, IIP, IBBP framing
- Configurable Group of Picture (GOP) size
- Configurable frame rate
- Deblocking filter
- Bit Rates:
  - SDHDM from 32 kbps to 25 Mbps
  - Rate Control:
    - CBR/VR
  - Latency (encoder only):
    - Less than 55ms

**AUDI ENCODING/DECODING**

**Compression Standard:**
- MPEG2-AAC-LC ISO/IEC 13818-7
- MPEG4-AAC-LC ISO/IEC 14496-3

**Audio Channels:**
- 2 analog audio per blade
- 16 embedded audio per blade (SDI)
- 2 embedded audio per blade (DVI)

**Bit Rates:**
- From 56 to 320 kbps per audio pair
- Frequency Response:
  - From 20 Hz to 22 Khz

**METADATA (OPTIONAL)**

- CoT to KLV conversion
- KLV or CoT over serial RS-232/422
- KLV or CoT over UDP

**SDI OVER SDI:**

- SMPTE 336M compliant
- MISB 0601.5 compliant
- MISB 0604.2 compliant

**High precision timecode insertion as per MISB 0604.2**

**IP NETWORK PLATFORMS**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Connector</th>
<th>Networking Protocols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethernet 10/100/100 Base-T, auto-detect, Half/Full-duplex</td>
<td>Ethernet RJ45</td>
<td>Unicast streaming</td>
</tr>
<tr>
<td>Static IP/DHCP</td>
<td></td>
<td>Multicast streaming (IGMP v3)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Multiple unicast streaming</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MPEG transport stream over UDP / RTP</td>
</tr>
<tr>
<td></td>
<td></td>
<td>RTMP</td>
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<tr>
<td></td>
<td></td>
<td>SAP (RFC 2974)</td>
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<tr>
<td></td>
<td></td>
<td>Direct RTP - H.264 over RTP (RFC 3984)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SRT (Secure Reliable Transport)</td>
</tr>
</tbody>
</table>

**ADVANCED FEATURES**

- Multi-bitrate (MBR) streaming
- HDSD de-interlacing
- Built-in downsampling
- EIA-608-B/NTSC Line 21 closed captioning
- EIA-709-B/SDI closed captioning
- Forward Error Correction (FEC)
- AES encryption 128-bit or 256-bit with Furnace
- Aspect ratio configuration
- Active Format Description (AFD)
- Wide Screen Signaling (WSS)
- Logo overlay
- Selective Mute
- Talkback (encoder only)
- Color Space Conversion (DVI only)

**MANAGEMENT INTERFACES**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Ethernet:</th>
</tr>
</thead>
<tbody>
<tr>
<td>RS-232</td>
<td>HTTPS (web browser)</td>
</tr>
<tr>
<td>RJ45 to RS-232 (DB-9 Management Cable Required)</td>
<td>Command line over SSH/Telnet/RS-232</td>
</tr>
<tr>
<td>Ethernet</td>
<td>SFTP/TFTP/SCP</td>
</tr>
<tr>
<td>Management:</td>
<td>SNMP v3</td>
</tr>
</tbody>
</table>

**SINGLE BLADE APPLIANCE**

**Dimensions:**
- 24mm H x 149mm W x 202mm D (0.92”H x 5.85”W x 8.0”D)
- Weight: 2.5 lbs.

**Power:**
- 12VDC, 20W
- 100-240VAC 30W external locking power supply

**HARSH ENVIRONMENT CHASSIS OPTION**

- Fanless operation for high temperature applications
- Dimensions: 44mm H x 137mm W x 202mm D (1.73”H x 5.4”W x 8.0”D)
- Weight: 4 lbs. / 1.8 kg

**MULTI-BLADE CHASSIS OPTIONS**

- 6 blade chassis(S-MB6X-RAF, S-MB6X-DC, S-MB6X-MED)
- 21 blade chassis (F-MB21B-R)

**See MB6/MB21 Datasheet for specification details**