

The world's premier telepresence codec – Extreme low latency HD or SD multi-stream H.264

The **hai 1000™** series network video system defines a new level of performance for interactive media communication. Incorporating the latest H.264 / MPEG-4 AVC compression technology for standard definition and high definition HD video, the **hai 1000** delivers **TRUE TO LIFE** video communication experience at remarkably low bandwidth.

Designed around HaiVision's new MPEG-4 AVC H.264 core compression engine hardware (TRUE-H.264), the **hai 1000** delivers unsurpassed high resolution HD (up to 1080p) or SD video and super wideband audio across IP networks at bandwidths anywhere from 256 kbps to 10 Mbps. The **hai 1000** is designed for flawless bi-directional communications and achieves the lowest end to end latency (70 milliseconds). Adhering tightly to industry standards for H.264 video, AAC audio, and Session Initiation Protocol, the hai1000 is interoperable with traditional video conferencing endpoints, media storage, and IPTV distribution systems.

The **hai 1000** builds on the extreme quality, high resolution and low latency benefits that have made its predecessor, the **hai500**, the ultimate network video system and global standard for "extreme conferencing" within the world's foremost boardrooms, telepresence suites, classrooms, control rooms, and medical operating theaters. With the **hai 1000** and TRUE-H.264, such performance is now available using less than 50% of the required bandwidth, enabling deployments of this technology even to the most remote locations.



TELEPRESENCE SUITES

...where you need to present, discuss and debate ideas clearly and completely without having to cut corners because the technology gets in the way

MEDICAL SYSTEMS

...bringing procedures to critical audiences where reliability, quality and precision is a must.

INTERACTIVE BROADCAST

...connecting facilities, affiliates, and event locations to enable flexible video distribution and interactive real-time commentary without the costs and inherent delay of satellite.

hai 1000 features

- ☛ hai1060 – up to 10 channels
- ☛ hai1020 – single encode/decode
- ☛ Fully H.264 MPEG-4 AVC compliant
- ☛ INVITATION Videoconference Interop
- ☛ Latency less than 70 milliseconds
- ☛ Logical multicast / multiple unicast
- ☛ Telecom grade reliability
- ☛ Robust frame & blade design
- ☛ Web, CLI, and SNMP interfaces
- ☛ AMX and Crestron compatible

SD blade (HMF2) features

- ☛ SD D1 and Half D1 Resolution
- ☛ 150 kbps to 6 Mbps video bitrate
- ☛ As low as 150 millisecond latency
- ☛ I/O configurable (PIC) architecture
- ☛ Encoder, decoder, or encoder/decoder
- ☛ SDI, S-Video, Composite Video I/O
- ☛ HDMI 720p/1080i output for flat panel
- ☛ Main and Enhanced Baseline Profile
- ☛ 20 Hz - 22 kHz Audio
- ☛ Balanced/unbalanced XLR or RCA Audio

HD blade (MAKO-HD) features

- ☛ 1080p 25/30, 1080i 25/30
- ☛ 720p 25/30/50/60
- ☛ 256 kbps to 10 Mbps video bitrate
- ☛ Add'l RGBHV input up to 1280x768 60Hz
- ☛ I/O #1 - HD SDI, SDI, embedded digital audio
- ☛ I/O #2 – RGBHV or YPbPr or DVI (output only)
- ☛ Separate 4 channel analog audio
- ☛ Unique – 2 Channel Encoding (Video / RGB)
- ☛ Encoder/decoder design
- ☛ Latency less than 70 milliseconds



MAKO-HD – up to 1080p High Definition with Media Sharing

The **MAKO-HD** is the highest performance HD codec available supporting up to 1080p and achieving end to end latency below 70 milliseconds. Each **MAKO-HD** has a digital (HD-SDI/SD-SDI) and an analog (RGBHV/YPbPr) input port. The output design is similar with the addition of DVI support. The **MAKO-HD** can encode up to 1080p 30 video and up to 1280x768 on RGB. Uniquely, the MAKO-HD can share its compression power between both input ports simultaneously – each at adjusted frame rates. So, for example, one may wish to encode the video at 720p 50 frames per second and simultaneously encode an RGB source at 1024x768 10 frames per second. Or perhaps encode the HD-SDI at 720p 30 and the YPbPr at 720p 30. Effectively this gives integrators extreme flexibility in addressing their client's exact needs and maximizing resources.

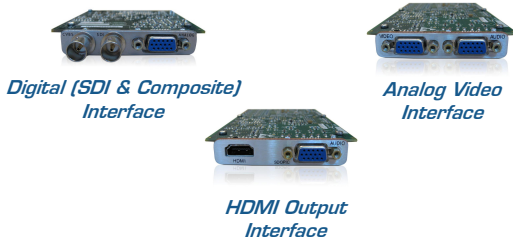


HMF2 - Performance Standard Definition Video

The **hai 1000** SD configurations are based on high performance **HMF2** codec blade technology supporting a variety of audio/video interfaces. In addition to standard analog (S-Video & composite) and digital (SDI) audio and video, the **HMF2** can be ordered with a unique HDMI output module. The HDMI module incorporates very high quality real time image processing and upscaling to exactly match video to the requirements of flat panel (LCD/plasma) displays. The output of the HDMI is a pure 720p/1080i – beautiful flat panel presentation of your video transmission.



HMF2 Encoder/Decoder Blade



The **HMF2** blade is multi-format as it can be firmware programmed to support either H.264 (MPEG-4 AVC) or MPEG-2 (optional). Dedicated to maintaining systems compatibility, the HMF2 MPEG-2 is fully compatible with HaiVision's installed base of **hai500** high performance MPEG-2 systems. Further, MPEG-2 and H.264 may co-exist within the same **hai 1000** chassis, and as well may co-exist with HaiVision's **MAKO-HD** high definition H.264 codecs.

"TRUE-H.264" Technology

HaiVision has invested in the development of the most advanced and reliable H.264 compression core available today. The result is a compact system capable of delivering unsurpassed high resolution DVD quality at less than 700 kbps. Combined with its four (4) audio channels compressed using MPEG-4 AAC per video encoder channel, the **hai 1000** addresses the full array of video delivery needs ranging from TRUE TO LIFE interactive video to recorded video playback and streaming.

INVITATION provides videoconferencing access

INVITATION enables each/any codec pair (blade) within the **hai 1000** to interact with traditional videoconference endpoints. This is accomplished through the support of industry standards (H.264 video compression, AAC audio compression, and SIP signaling) and proven 3rd party videoconferencing MCU's. Within the context of a telepresence suite, high performance channels between suite locations can be maintained on specific codec blades while others are tasked with interfacing with MCUs.

Ideal for Systems Integration!

The **hai 1000** has been designed to meet the exacting requirements of leading systems integrators. Matched with excellent audio visual products and attention to details with respect to room design, lighting, acoustics, and room control systems, the **hai 1000** is the heart of the most critical A/V projects, where quality and reliability are paramount.

True multi-site, multi-channel capability in a box!

The **hai 1060** model supports up to 10 HD or SD video channels in a single 3 RU frame and a single IP port without the need for any external devices (no MCU required). The **hai 1020** provides the most cost-effective solution for deploying a single encoder/decoder, encoder only, or decoder only blade in a compact 1RU chassis.



Frame & Blade Architecture

The **hai 1000** is constructed to the highest quality standards. Each chassis contains a single host module (bottom slot). The host manages the system, the network interfaces, the interoperability protocols, the web configuration interface, the command line interface, and the SNMP engines. The system can be controlled either over IP or via the serial management port. In the slots above the host (one in the **hai 1020**, 5 in the **hai 1060**) the codec blades are placed. Each blade can be an encoder/decoder pair or a single encoder or single decoder. In the system shown, the **hai 1000** is populated with 4 **MAKO-HD** codec blades. An ideal configuration for telepresence, this system can accommodate up to 4 high definition cameras and 4 high definition displays at full frame rate. Also as noted, any of the **MAKO-HD** codecs can simultaneously support RGBHV inputs and outputs, or multiple reduced frame rate HD signals.



Specifications - hai 1000 series systems

NETWORK & MANAGEMENT INTERFACES

IP Network Interface

Standard

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

Connector

RJ45

Networking Protocols

H.264 over RTP (RFC 3984)
Transport Stream over UDP / RTP
RTP / RTCP
Optional SIP protocol with INVITATION

Signaling Protocols

INVITATION for SIP signaling interoperability with
supported conferencing MCUs.

Management Interface

Standard

RS-232
RJ45 to RS-232 DB-9 Management Cable Req'd.

Management

HTTP (web browser)
Command line over Telnet/RS-232
FTP/TFTP
AMX/Crestron module provided

PHYSICAL

hai 1060, 6 slot (3RU)

Temperature

0° to 50° C [32° to 122° F] operating
-40° to 70° C [-40° to 158° F] non-operating

Dimensions (H x W x D)

130 x 438 x 343 mm
5.125 x 17.25 x 13.5 in.

Power Requirements

110-240V AC or -48V DC; 200 W max

Weight

Approximately 9.1 kg [20 lbs] fully loaded

Relative Humidity

Up to 95% without condensation

Certification

UL/CSA/CE, RoHS/WEEE

Compliance

EN 55022/55024;
FCC Part 15, Subpart B, Class A

Rackmount

19" included

PHYSICAL

hai 1020, 2 slot (1RU)

Temperature

0° to 50° C [32° to 122° F] operating
-40° to 70° C [-40° to 158° F] non-operating

Dimensions (H x W x D)

44 x 438 x 305 mm
1.75 x 17.25 x 12.0 in.

Power Requirements

110-240V AC; 125 W max

Weight

Approximately 4.5 kg [10 lbs]

Relative Humidity

Up to 95% without condensation

Certification

UL/CSA/CE, RoHS/WEEE

Compliance

EN 55022/55024;
FCC Part 15, Subpart B, Class A

Rackmount

19" included

Specifications - hai 1000 series MAKO-HD codec blades (encode with decode)

VIDEO ENCODING / DECODING

H.264 AVC (MPEG-4 part 10)

HD-SDI/SDI Resolution:

720x480/576i	25, 30
1280x720p	25, 30, 50, 60
1920x1080i	25, 30
1920x1080p	25, 30

YPbPr Resolution:

720x480/576p	25, 30, 50, 60
720x480/576i	25, 30
1280x720p	25, 30, 50, 60
1920x1080i	25, 30

RGBHV Resolution:

VGA	640x480	Up to 85 Hz
SVGA	800x600	Up to 85 Hz
XGA	1024x768	Up to 85 Hz
WXGA	1280x768	Up to 60 Hz

Bit Rates

HD from 256 kbps to 10 Mbps
SD from 64 kbps to 6 Mbps

Traffic Shaping

Constant (CBR)
Variable (VBR)

Latency (end to end)

Less than 70ms

Compression Standard

H.264 AVC (MPEG-4 part 10)
ISO/IEC 14496-10
Baseline Profile
Level 4.1 and lower Intermediate Levels
I, IP framing
Variable Group of Picture (GOP) size

AUDIO ENCODING / DECODING

MPEG-4 AAC

Audio Channels

Up to 4 per video channel

Compression Standard

MPEG-4 AAC-LC
ISO/IEC 14496-3

Bit Rates

From 32 to 256 kbps per audio pair

Frequency Response

From 20 Hz to 22 kHz

A-V Synchronization

Under 20 milliseconds

ADVANCED FEATURES

Text / Logo Insertion
Closed Captioning Support
Video Noise Filtering and Noise Reduction
Start-up Effects (fade/zoom)
Deblocking Filter
Video noise filtering - MCTF (motion-compensated
temporal filter)
Dual port encoding optional
(HD-SDI with YPbPr or RGBHV)

AUDIO/VIDEO INTERFACES

MAKO-HD Inputs/outputs

SDI / HD-SDI (Input/Output)

SMPTE-259M-C	75Ω BNC
SMPTE-296M	75Ω BNC
SMPTE-274M	75Ω BNC
Embedded Audio Supported	

YPbPr (Input/Output)

CEA_770.2-C
CEA_770.3-C
DB15 to 3xBNC breakout req'd on input
DVI-I to 3xBNC breakout req'd on output

RGBHV (Input/Output)

VGA
SVGA
XGA
WXGA
No breakout req'd on input
DVI-I to VGA DB-15 breakout req'd. on output)

Audio (Input/Output)

4 analog audio channels
Balanced XLR connectors
Unbalanced RCA connectors
DB15 breakout req'd, specify when ordering
Embedded Audio Supported on SDI

Specifications - hai 1000 series *HMF2* codec blades (encode and/or decode)

VIDEO ENCODING / DECODING

H.264 AVC (MPEG-4 part 10)

Resolution NTSC/PAL

Full-D1	720x480/576
Half-D1	352x480/576

Bit Rates

Encoder:
From 150 kbps to 6 Mbps
Decoder:
From 150 kbps to 5 Mbps

Traffic Shaping

Constant (CBR)
Variable (VBR)

Latency (end to end)

From 190ms to 300ms

Compression Standard

H.264 AVC (MPEG-4 part 10)
ISO/IEC 14496-10

Baseline & Main Profiles

Level 3.0 and lower Intermediate Levels

I, IP, IBP, IBBP framing

Variable Group of Picture (GOP) size with Intra-frame insertion at scene cut

Support of CABAC & CAVLC

AUDIO ENCODING / DECODING

MPEG-4 AAC

Compression Standard

MPEG-4 AAC-LC
ISO/IEC 14496-3

Bit Rates

From 64 to 256 kbps

VIDEO ENCODING / DECODING

MPEG-2 (optional)

Standard

MPEG-2 according to ISO/IEC 13818-2

Sampling

4:2:0 Main Profile @ Main Level

Bit Rate

400 kbps to 15 Mbps

Framing

I, IP, IBP, IBBP Frame Structure

Group of Pictures

Flexible GOP size from 1 to 127

End to end delay

150 ms – 240 ms

Video Resolution

Full-D1	720x480/576
Half-D1	352x480/576

AUDIO ENCODING / DECODING

MPEG-2 Audio (optional)

Standard

MPEG-2 layer 1 & 2 according to ISO/IEC 13818-3

Bit Rate

<384 kbps

AUDIO/VIDEO INTERFACES

HMxxxF Analog Input Analog Output Blade

Video Inputs/Outputs

S-Video 4-pin Mini-DIN
Composite 75Ω BNC

Audio Inputs/Outputs

4 analog audio channels
Balanced XLR connectors
Unbalanced RCA connectors
DB15 breakout req'd, specify when ordering

PICSDx Digital Input or Output Interface

Video Inputs/Outputs

Composite 75Ω BNC
SDI SMPTE – 259M-C 75Ω BNC

Audio Inputs/Outputs

4 analog audio channels
Balanced XLR connectors
Unbalanced RCA connectors
DB15 breakout req'd, specify when ordering
Embedded Audio Supported on SDI

PICSCx Analog Input or Output Interface

Video Inputs/Outputs

S-Video 4-pin Mini-DIN
Composite 75Ω BNC

YPbPr 3 x 75Ω BNC

DB15 breakout req'd, specify when ordering

Audio Inputs/Outputs

4 analog audio channels
Balanced XLR connectors
Unbalanced RCA connectors
DB15 breakout req'd, specify when ordering

PICHDO HDMI Digital Output Interface

Video Outputs

HDMI Type A
EDID Display Capability Detect
1080i, 720p, 480p, 480i 50, 60

Audio Inputs/Outputs

4 analog audio channels
Balanced XLR connectors
Unbalanced RCA connectors
DB15 breakout req'd, specify when ordering
Embedded Audio Supported on HDMI

Ordering Information (please obtain complete system quotations from HaiVision or an authorized HaiVision integration partner)

F-1060-AC	hai1060 6 slots chassis with CPU & IP Ethernet Network Interface Blade (AC Power Supply)
F-1020	hai1020 2 slots chassis with CPU & IP Ethernet Network Interface Blade (AC Power Supply)
B-1000-HM4EDF	HMF2 MPEG-4 AVC (H.264) Encoder/Decoder Blade (HM4ED-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM4DF	HMF2 MPEG-4 AVC (H.264) Decoder Blade (HM4D-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM4EF	HMF2 MPEG-4 AVC (H.264) Encoder Blade (HM4E-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HM2EDF	HMF2 MPEG-2 Encoder/Decoder Blade (HM2ED-F) - Analog S-Video and Composite Video, 4 Channel Audio
B-1000-HDED	MAKO-HD - MPEG-4 AVC (H.264) HD Encoder/Decoder Blade - HD-SDI w/ AES/EBU and YPbPr/RGBHV w/ 4 Channel Analog Audio - 720p/1080i/1080p
B-1000-HM4EDC	HMF2 H.264 MPEG-4 AVC Encoder/Decoder Carrier Blade (HM4ED-C) - Requires 1 Input PIC and 1 Output PIC
B-1000-HM4DC	HMF2 MPEG-4 AVC (H.264) Decoder Carrier Blade (HM4D-C) - Requires 1 Output PIC
B-1000-HM4EC	HMF2 MPEG-4 AVC (H.264) Encoder Carrier Blade (HM4E-C) - Requires 1 Input PIC
B-1000-HM2EDC	HMF2 MPEG-2 Encoder/Decoder Carrier Blade (HM2ED-C) - Requires 1 Input PIC and 1 Output PIC
B-1000-PICSCI	HMF2 Analog Input (SCI) PIC - Analog S-Video, Composite Video, Component Video YPbPr, 4 Channel Audio
B-1000-PICSCO	HMF2 Analog Output (SCO) PIC - Analog S-Video, Composite Video, Component Video YPbPr, 4 Channel Audio
B-1000-PICSDI	HMF2 Digital Input (SDI) PIC - SDI, Composite Video, 4 Channel Analog Audio, 4 Channel SDI Embedded Digital Audio
B-1000-PICSDO	HMF2 Digital Output (SDO) PIC - SDI, Composite Video, 4 Channel Analog Audio, 4 Channel SDI Embedded Digital Audio
B-1000-PICHDO	HMF2 HD Digital Output (HDO) PIC - HDMI, Embedded Digital Audio, 4 Channel Analog Audio, 720p/60 or 720p/50
SW-1000-MP2	HMF2 MPEG-2 Encoder/Decoder Firmware for any HMF2 MPEG-4 AVC Blade, enables MPEG-2 on a MPEG-4 AVC encode/decode Blade (switchable)
SW-1060-INV	INVITATION Firmware for SIP based interoperability with Codian 4500 MCU, per hai1060 system
SW-1020-INV	INVITATION Firmware for SIP based interoperability with Codian 4500 MCU, per hai1020 system

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