

# MGW Diamond TOUGH

Military Grade HEVC & H.264 HD/SD Quad channel Encoder



MGW Diamond TOUGH is a fanless, power-efficient quad channel HEVC and H.264 HD/SD encoder designed in a military grade rugged enclosure. Up to 4x 3G/HD/SD-SDI or composite inputs can be captured and streamed live. With support of HDR sources (High Dynamic Range), the encoder provides exceptional contrast, brightness and details in any conditions.

MGW Diamond TOUGH is easy to integrate, providing the best Size, Weight and Power (SWaP) per encoding channel in a rugged appliance. In addition to providing H.264 encoding, the Diamond TOUGH delivers advanced HEVC compression, allowing users to stream HD/SD video (up to 1080p60), with up to 50% bandwidth savings compared to current H.264 standards.

Designed to meet the growing demand for real-time imagery in the most demanding environments, the Diamond TOUGH appliance packs all the necessary capabilities for delivering any type of Intelligence, Surveillance, and Reconnaissance (ISR) or Situational Awareness (SA) video generated by ground vehicles, manned or unmanned airborne platforms and marine vessels in extreme conditions.

Diamond TOUGH supports simultaneous encoding and streaming of analog and SDI sources, KLV / STANAG metadata ingested from various sources (SDI/IP or Serial), real-time image cropping and video scaling, Forward Error Correction (FEC) streaming and JITC compliant output streams.

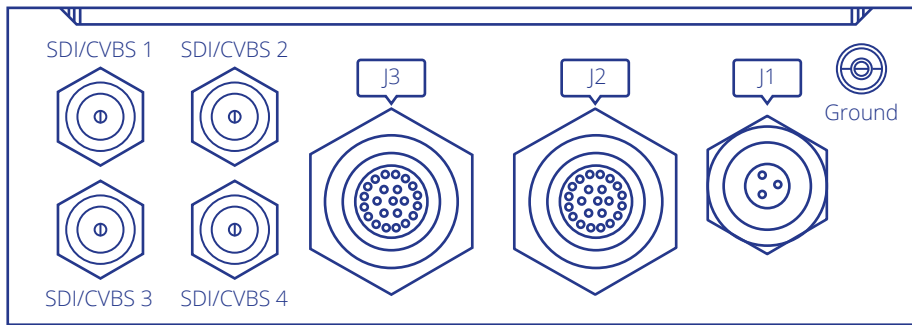
## Features & Benefits

- Multi-channel low latency streaming from up to 4x SDI and or composite sources
- High Dynamic Range (HDR) support for exceptional video contrast, brightness and details
- Up to 8x output streams
- Next-generation HEVC (H.265) compression support to reduce network bandwidth utilisation by up to 50% compared to H.264
- Stream protection for reliable video/ audio and metadata transmission (Zixi™, SRT, RIST and Pro-MPEG)
- KLV / STANAG metadata ingest from SDI, IP or Serial
- Not controlled under ITAR

## Applications

- IP Video dissemination from multiple video sources (analog/digital) for Situational Awareness (SA) within ground vehicles, navy ships or aircraft
- Streaming Situational Awareness and Full Motion Video (FMV) content across LANs and WANs with KLV / STANAG metadata
- Intelligence, Surveillance and Reconnaissance (ISR) video from ground and airborne vehicles over RF or satellite link
- Streaming Full Motion Video to desktop, TV and mobile devices over bandwidth-limited pipes

## Rear Panel Interfaces



### J1 - Power

### J2 - Ethernet 1 / Serial / USB / Reset

### J3 - Ethernet 2 / Audio In / Serial / Serial Talkback Out\*

## Technical Specification

### Video Inputs

- SDI / Composite Inputs
- Supported standards:
  - 4x3G-SDI (SMPTE 425-5 Level A / Two-Sample Interleave)
  - 3G/HD/SD-SDI (SMPTE 259M-C, SMPTE 292M, SMPTE 274M, SMPTE 296M, SMPTE 424M, 425M Level A only)
  - Analog Composite / RS-170 (NTSC, PAL, PAL-M)
- Quad channel mode in 3G-SDI, HD-SDI, SD-SDI and Composite

### Input Resolutions / frame rates

- 4096x2160p @ 60, 59.94, 50, 30, 29.97, 25, 24, 23.98 Hz (4K DCI)
- 3840x2160p @ 60, 59.94, 50, 30, 29.97, 25, 24, 23.98 Hz (UHD)
- 2048x1080p @ 60, 59.94, 50, 30, 29.97, 25, 24, 23.98 Hz
- 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 (NTSC, PAL, PAL-M)

### Audio Inputs

- SDI Embedded audio (stereo and mono)
- 2x Analog unbalanced audio (stereo and mono)

### Video Output

- Simultaneous H.264 and HEVC (as an option P/N 17247/17850) encoding of 4 x independent channels (up to 1080p60 per channel)
- Up to 8 output streams with independent resolution (downscaling), frame-rate and bit rate
- Up to 1x 4K60p output stream

### H.264 (MPEG-4 AVC Part 10) - ISO/IEC 14496-10 MPEG-4 AVC - Rec. ITU-T

- Modes:
  - Baseline Profile L3
  - Main Profile L3 and L4
  - High Profile L4 and L4.2
- Bit Rate: 64Kbps to 80Mbps
- Selectable GOP structure and size: I, IP, IBP, IBBP, I(3)BP, I(4)BP
- Frame Rate: 1-60 fps. Configurable framerate from 60 down to 1fps
- Bit Rate Regulation Modes: Constant (CBR), Variable (VBR)
- Output Resolutions: Configurable from CIF up to 3840x2160p60
- Encoding latency less than 20ms

### HEVC (H.265) MPEG-H HEVC (ISO/IEC 23008-2) - P/N 17247/17850

- Main / Main 10 and Main 4:2:2 - up to 4:2:2 10-bits
- Level up to Level 5.2, Main and High Tier
- Selectable GOP structure and size: I, IP, IBP, IBBP, I(3)BP, I(4)BP
- Bit Rate: 36Kbps to 80Mbps
- Frame Rate: 1-60 fps. Configurable frame rate from 60 down to 1fps
- Bit Rate Regulation Modes: Constant (CBR), Variable (VBR)
- Output Resolutions: Configurable from CIF up to 3840x2160p60
- Encoding latency less than 20ms

## Audio Output

- Up to x32 audio encoding channels
- Codec: MPEG-4 AAC-LC (ISO/IEC 14496-3)
- Stereo and mono modes
- Bit Rate: 32Kbps - 256Kbps in stereo, 16Kbps - 128Kbps in mono
- Sampling Rate: 16 kHz - 48 kHz

## Ancillary Data Support

- Timecode (SMPTE12M-2)
- Closed captions :
  - CEA-708 / CEA-608
  - Transport: ANSI/SCTE 128, ATSC A/72 (CC in HEVC user data)
- High Dynamic Range (HDR) :
  - HDR10 (SMPTE ST 2084/ITU-R BT.2100)
  - HLG (ITU-R BT.2100) from SDI (SMPTE ST 2108)

## Network Protocols

- UDP TS: MPEG Transport Stream over UDP
- RTP TS: MPEG Transport Stream over RTP
- SRT (Caller, Listener and RendezVous)
- RIST
- RTMP (H.264)
- RTP ES (RTSP): Elementary stream over RTP
- Zixi™ Stream protection
  - Zixi™ P2P and Broadcaster modes
  - Zixi™ ABR streaming (Adaptive Bitrate)
  - Zixi™ Low Latency
- RTP TS with ProMPEG Forward Error Correction (SMPTE 2022)
- SRT (Caller, Listener and RendezVous)
- RTMP (H.264)
- Unicast and Multicast (IGMPv3) streaming
- HTTPS, NTP, SSH, SAP

## Encryption

- Real-time AES encryption for video, audio and metadata
- 128 and 256-bit encryption key support

## Network Interfaces

- x2 Gigabit ethernet ports for streaming and/or management
- (10/100/1000 Base-T, Auto Detect, Half/Full Duplex)
- DHCP / Static IP address, IPv4 and IPv6 support

## Management

- Secure web-based remote management interface (HTTPS), password-protected
- Custom SSL certificate loading capability
- Customisable notice and consent login banner
- Zixi™ / SRT streaming statistics for easier configuration and enhanced quality of service
- Autostart mode recovers saved configuration after powercycle
- Remote firmware and software upgrade capability via command line or web-GUI
- System and channel event logging
- Easy-to-use HTTPS Rest API for control and status monitoring from 3rd-party control software
- Status LEDs for power, network activity, temperature and fan errors, streaming and video source indications
- Recovery or initialisation of ethernet settings over USB thumb drive
- System discovery to retrieve Diamond IP address on a network
- SSH/Telnet interface for management (status and control)

## Peripherals

- 2x RS-232 / Serial interface for KLV ingest
- 1x USB 2.0 port for easy configuration of system settings
- 1x Hardware system reset for factory reset or reboot

## Metadata

- Support for KLV over UDP and SDI (MISB STD 0605.7, VANC per SMPTE 336M)
- Absolute time system and timestamps (MISB STD 0603.4)
- Time stamping and transport of compressed motion imagery and metadata (MISB STD 0604.5)
- Security metadata universal and local sets for digital motion imagery (MISB STD 0102.11)
- UAS datalink local metadata set (MISB STD 0601.11, STD 0902.6)
- STANAG 4609 output stream over UDP/IP
- JITC-MISB compliant streaming of HD/SD ISR video

## Environmental / Regulation

- Operating Temperatures: -55°C to +70°C (-67°F to +158°F)
- Storage Temperatures: -55°C to 85°C (-67°F to 185°F), battery-free
- Relative Humidity: 5% to 95% (non-condensing)
- Rugged design to meet DO-160G, MIL-STD-810G
- Complies with MIL-STD-461G
- MTBF:
  - Ground - 19.19 years
  - Airborne Inhabited Cargo - 9.87 years (as per MIL-HDBK-217F, 20°C, Operation time 100%)
- Not controlled under ITAR
- TAA Compliant

## Physical

- Dimensions: 58.6mm H x 170mm W x 117mm D ( 2.31" H x 6.69" W x 4.61" D)
- Weight: 1.08Kg (2.37lb)
- Enclosure: Military-grade rugged aluminium case, MIL38999 connectors
- Status LEDs for power, streaming and video source indication
- Fanless, no moving parts design, 100% silent operation
- Mounting holes for seamless installation in vehicles / flat surface
- IP67

## Advanced Features

- Multi-channel low latency HD/SD streaming from SDI and/ or composite sources with metadata
- Hardware-based resolution and frame-rate scaling
- Highly flexible hardware-based resolution scaling (11 configurations) and frame-rate sampling (1 to 60fps)
- Zixi™, SRT, RIST and ProMPEG FEC error correction / packet recovery
- Time-synchronised playback: synchronise the playback of multiple independent streams using with MGW Ace Decoder
- On-the-fly bit rate change and Zixi™ ABR streaming for auto adaptive bit rate based on network conditions
- HEVC/H.264
- Latency monitoring when paired with MGW Ace Decoder
- Fast boot time, less than 20 seconds

## Power

- DC Input: 16-40VDC, +28VDC Nominal, 14W (Typical), 17W (Max)
- MIL38999 connector
- Complies with MIL-STD-704F and MIL-STD-1275E

## OEM / Integration ready PCB

- MGW Diamond TOUGH product was designed with industrial, military and commercial integrators in mind
- The encoder is also available as a board level / PCB unit for integrators

## Ordering Information

- 1738 – MGW Diamond TOUGH - 4 channels - H.264 Encoder
- 17247 – MGW Diamond TOUGH - 4 channels - HEVC/H.264 Encoder
- 17849 – MGW Diamond TOUGH - 2 channels - H.264 Encoder
- 17850 – MGW Diamond TOUGH - 2 channels - HEVC/H.264 Encoder
- 17457 – MGW Diamond TOUGH Cable Kit (Power supply, network and data cables MIL38999 to Commercial plugs)
- 17360 – MGW Diamond TOUGH - PCB / OEM - HEVC/H.264 Encoder
- 17334 – MGW Diamond - HEVC licence

\* Feature to be activated by firmware upgrade