# High Capacity Digital Media Gateway

DMG 4000

## LIMITLESS VIDEO NETWORK OVER IP

The Sencore DMG 4000 - Digital Media Gateway platform is a dedicated solution for high speed video networking, enhanced IP security, video distribution and contribution. Designed for near limitless capacity, extensive video awareness, enhanced security, operational simplicity and exceptionally high reliability, the platform redefines video delivery.

With IP network technology and infrastructure evolving, the distribution of video is changing. Legacy infrastructure are being replaced by transmission over standard IP-based networks. With 10G and 100G IP infrastructures available, broadcasters seek ways to use the added capacity, primarily for internal uncompressed or lightly compressed video contribution.

Specifically designed for IP-centric operations, the 4100/4200 chassis has a significant video processing capacity. 10G bi-directional IP interfaces provide firewall-grade IP security at every connection node. Operating at a minimum internal throughput of 140G, the new backplane extends Sencore's tradition of patented redundancy options.

The DMG 4000 platform supports conversion of uncompressed video from/to legacy SDI and SDI over IP with options to perform "light" compression/decompression using intra-codecs such as TICO, JPEG XS and JPEG2000 or full encoding/decoding using AVC or HEVC. With backplane latency of less than 1ms, universal applicability for virtually any video application is ensured, as is the implementation of both current and future IP video standards, including SMPTE 2110 and SMPTE 2022-6.

## CHASSIS

The DMG 4000 platform consists of a compact 1RU - DMG 4100 as well as a capacious 2RU - DMG 4200 option. Both chassis can be used independently, or in conjunction with Sencore's widely deployed DMG 3000 series chassis. Built around an in-house developed, high capacity bus architecture that connects all modules, the DMG 4000 platform operates with dual hot-swappable power supplies, dual front-mounted control modules and six or twelve rear-mounted option slots. A -48VDC power supply option is also available.

Dual control modules can optionally be fitted to either model, and will operate in active/active redundancy mode with redundant backplanes to provide seamless recovery from many critical fault scenarios. All option modules mounted in the rear are interchangeable between the DMG 4100 and DMG 4200. All modules are hot-swappable (including power supplies and fans). The new software architecture enables different software versions to run on different modules, allowing new functionalities to be delivered to customers faster.

The product can be fitted with a range of input, processing, and output modules that enable bridging between commonly used legacy video platforms and an all IP infrastructure. With support for MPEG TS multiplexing, DVB scrambling/descrambling and dense power efficient AVC/HEVC encoding/decoding, the DMG 4000 platform is ideal for video processing in legacy DVB networks such as cable, satellite, terrestrial and IPTV. The Control/Switch module and the Dual IP IO modules provide native 10G uni-directional and bi-directional port connectivity.

Service density can be defined up to 2,000 services in and out per module, while set-up and configuration is streamlined. The user interface offers multi-selection of channels or multiplexes enabling configuration changes on multiple of flows with a minimum number of operations. Extensive search capabilities allow the operator to easily locate groups, services, etc.

# FEATURES

**2RU - DMG 4200**
- Modular configuration with up to 12 option slot boards
- WEB based configuration, LED indicators on PS and modules
- Forced air-cooling (front to back)
- Dual redundant hot-swappable PS
- Hot-swappable modules
- 100-240 V AC, 50/60 Hz
- -48VDC

**1RU - DMG 4100**
- Modular configuration with up to 6 option slot boards
- WEB based configuration, LED indicators on PS and modules
- Forced air-cooling (front to back)
- Dual redundant hot-swappable PS
- Hot-swappable modules
- 100-240 V AC, 50/60 Hz

# DIMENSIONS

**2RU (DMG 4200)**
19" x 2RU x 540 mm (440 x 88 x 540 mm) (w x h x d mm)

**1RU (DMG 4100)**
19" x 1RU x 540 mm (440 x 44 x 540 mm) (w x h x d mm)

The DMG 4200 and DMG 4100 use the same set of modules and same SW, although the Control/Switch module differs between the two.

# HIGHLIGHTS

The DMG 4000 platform has been developed to exploit new opportunities driven by the increasing deployment of ultra-high speed IP networks within all areas of broadcasting. Designed to meet all challenges that a full IP-based infrastructure presents, the platform features:

**HIGH SPEED**
Multiple bi-directional 10G interfaces with the ability to route up to 140G of traffic internally.

**DELAY**
Low backplane latency (below 1ms) making overall contribution to delay negligible. Whenever delay buffers are required (such as IP de-jitter), buffer size and consequently delay is adjustable.

**MPEG & NATIVE IP HANDLING**
The ability to handle all commonly used video protocols provides a future proof solution. The DMG 4000 platform is based on flexible programmable hardware, new standards not currently defined will be added when required.

**AVC, HEVC, TICO, JPEG XS AND JPEG2000 COMPRESSION**
All common compression technologies used in professional broadcasting are supported, making the DMG 4000 platform adaptable to all operational requirements within contribution, remote production, video networking and distribution.

**IP NETWORK SECURITY**
A video centric, cost-effective, easy to deploy, high-capacity firewall feature that can monitor and regenerate traffic as required.

**CAPACITY**
Most modules support up to 4,000 (2,000 in and 2,000 out) streams / services per module and 10G of traffic.

**MONITORING & CONTROL**
A built-in management system to control a potentially vast array of linear and on-demand service traffic effectively, as traditional IPTV / OTT worlds merge. A wide range of external monitoring and control options including SNMP, Syslog & Prometheus support.

**SDI TO IP**
A high-density SDI input / output module supporting SMPTE 2110 and SMPTE 2022-6 enables bridging classical SDI based coax / fibre networks to IP.

**ACCESS CONTROL**
A new standard of access control, user management and IP security to secure access to critical network devices. A user account with four different access levels can be defined per user.

**REDUNDANCY**
Designed to be as reliable and failsafe as possible, even when used stand-alone. The uniquely efficient, built for purpose hardware design is engineered for high reliability and stability. Should an internal failure take place, a range of redundancy options can take effect to keep the chassis fully operational. Dual active - active control/switch module redundancy with internal seamless traffic switching can optionally be deployed within the chassis to make recovery from many critical errors totally seamless.

# ENHANCED SECURITY

There are typically multiple locations within a modern broadcasting environment necessitating secure video interfaces between sites, especially when implemented using public networks. The high level of security needed must protect the different sites from outside attacks as well as protect the integrity of video transmission itself. Being a fully operational video firewall, the DMG 4000 platform maintains tight security on its control layer, supporting many advanced features encompassing Authentication, Authorisation and Audit. Security is assured by Sencore's own FPGA based IP packet forwarding mechanism and proprietary internal network structure.

Video-centric features provided in the DMG 4000 platform include:
- Multicast forwarding (IGMP join and forward)
- Inspect and forward MPEG-2 TS packets (deep layer 5/6 packet inspection)
- De-multiplex MPEG-2 TS streams
- Encryption and decryption of video data
- Seamless network protection according to SMPTE 2022-7
- Encode and decode SMPTE 2022-1 supplementary FEC

# OVERVIEW

- Modular
- Scalable
- Compact with multiple inputs/outputs per module
- Advanced input analysis and status information

- Easy to configure from one common web GUI interface
- Hot swappable
- Wide range of optional modules
- Mix and match card types freely, and add as many as you need

# MODULES

## Control/Switch
### DMG 4100
| | |
|---|---|
| Total capacity: | 80 Gbps full duplex |
| Bitrate: | 10 Gbps routing between modules in a chassis |
| Interface: | 2  1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order) |
| Protocols: | IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag) |
| Data encapsulation: | TS over UDP/RTP, SDI over SMPTE 2022-6 / SMPTE 2110, AES67, L2TP (Output) |
| Scrambling/descrambling: | BISS2 Mode 1/E, BISS CA |
| TS Processing: | De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation |
| Clock Options: | Free running, PTP, GenLock*, GPS** |


RJ45


SFP+

### DMG 4200
| | |
|---|---|
| Total capacity: | 140 Gbps full duplex |
| Bitrate: | 10 Gbps routing between modules in a chassis |
| Interface: | 2  1/10G Base-T Ethernet or SFP+ 2x 1G Base-T Ethernet |
| Protocols: | IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag) |
| Data encapsulation: | TS over UDP/RTP, SDI over SMPTE 2022-6 / SMPTE 2110, AES67, L2TP (Output), Port data tunneling |
| Scrambling/descrambling: | BISS2 Mode 1/E, BISS CA |
| TS Processing: | De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation |
| Clock Options: | Free running, PTP, GenLock*, 10MHz, GPS** |



*Must be selected at order. ** Future, requires hardware options*

## Dual 10G IP IO
| | |
|---|---|
| Interface: | 2  1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order) |
| Protocols: | IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag) |
| Data encapsulation: | TS over UDP/RTP, SDI over SMPTE 2022-6 / SMPTE 2110, AES67, L2TP (Output), SRT, Zixi |
| TS Processing: | De-multiplexing, Multiplexing, Service and PIDfiltering, PSI/SI re-generation |
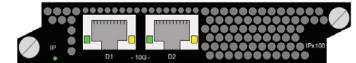




## DVB-S/S2X Input
| | |
|---|---|
| Connectors: | 4 x F 75 Ohm |
| Demodulators: | 32 in blocks of 16 (each block has 2 RF inputs) |
| Satellite standards: | DVB-S EN 300 421, DVB-S2 EN 302 307 – 1, DVB-S2X EN 302 307 -2 Broadcast Services |
| Frequency range: | L-band (950 – 2150 MHz) |
| Modulation: | QPSK, 8PSK, 16APSK, 32APSK, 64 APSK, 128 APSK, 256 APSK |
| Symbol rate: | Up to 64 MBaud |
| Descrambling: | BISS 1 Mode 1/E, BISS2 Mode 1/E, BISS CA |
| TS Processing: | De-multiplexing, Service and PID filtering, PSI/SIre generation |
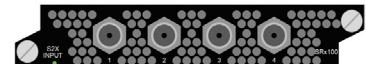


## DVB-S/S2X Modulator
| | |
|---|---|
| Number of modulators: | 2 |
| Interface per modulator: | 1x SMA 50 Ohm output, 1x SMA 50 Ohm monitoring output, 1x SMA 50 Ohm input (redundancy) |
| Redundancy (optional): | Relay switch on output for each modulator |
| Satellite standards: | DVB-S EN 300 421, DVB-S2 EN 302 307 – 1, DVB-S2X EN 302 307 -2 Broadcast Services |
| Frequency range: | IF and L-band (950 – 2150 MHz) |
| Modulation: | QPSK, 8PSK, 16APSK, 32APSK, 64 APSK, 128 APSK, 256 APSK |
| Symbol rate: | Up to 72 MBaud |
| Scrambling: | BISS 1 Mode 1/E, BISS2 Mode 1/E, BISS CA |
| TS Processing: | Multiplexing, PSI/SI re-generation |
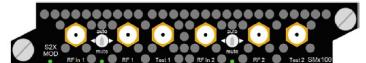
## SDI/2110/2022-6 IO

| | |
|---|---|
| Connectors: | 8x HD BNC 75 Ohm (SIx110) |
| | 3x Video SFP (Non-MSA Dual rx/ Dual Tx) (SIx200) |
| | 2x QSFP (10GbE, 25GbE or 40GbE) (IPx210) |
| Video Format: | 12G-SDI (SMPTE 2082) |
| | 3G-SDI (SMPTE 424M) |
| | HD-SDI (SMPTE 292M) |
| | SD-SDI (SMPTE 259M) |
| Data flow: | Input or output |
| Codecs – encoding/decoding: | Uncompressed, TICO, JPEG XS, JPEG2000 (SIx110/SIx200/IPx210*) |
| Video encapsulation: | SMPTE 2110-20, SMPTE 2022-6, TS |

*IPx210 currently supports uncompressed and JPEG XS*

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## ASI IO

| | |
|---|---|
| Connectors: | 8x HD BNC 75 Ohm |
| | 16x HD BNC 75 Ohm (SIx110/SIx120) |
| ASI Format: | 188 byte TS – spread and burst mode |
| Data flow: | Input or output |
| Video encapsulation: | TS |
| TS Processing: | De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation |

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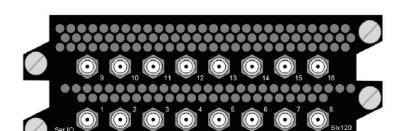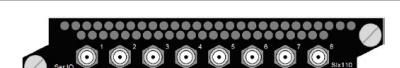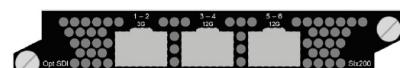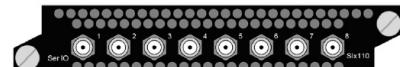
## HEVC Encoder

| | |
|---|---|
| Video Input connectors: | 8x HD BNC 75 Ohm or 2x QSFP (10GbE, 25GbE or 40GbE) |
| Number of Services: | 2x UHD, 8xFHD, HD, SD |
| Video Input format: | 12G-SDI (SMPTE 2082) |
| | 3G-SDI (SMPTE 424M) |
| | HD-SDI (SMPTE 292M) |
| | SD-SDI (SMPTE 259M) |
| Data encapsulation: | SDI over SMPTE 2022-6 |
| | SDI over SMPTE 2110 with PTP |
| Codecs: | AVC and HEVC |
| Resolutions: | SD, HD, FHD, UHD (UHD only on HEVC) |
| Encoding mode: | 8/10 bit, 4:2:0/4:2:2, Standard/Low delay/Ultra low delay |
| Audio leveling: | Long-term and short-term loudness leveling, peak limiting |

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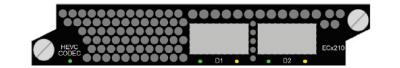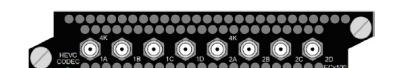
## HEVC Transcoder

| | |
|---|---|
| Number of Services: | Up to 2x UHD or 8xFHD, HD, SD |
| Decoder: | MPEG-2, AVC and HEVC |
| Encoder: | AVC and HEVC |
| Operation modes: | Combined Multiscreen and broadcast |
| Component: | Passthrough with PCR/PTS sync |
| Audio leveling: | Long-term and short-term loudness leveling, peak limiting |

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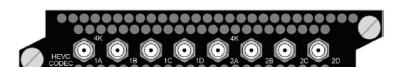
## HEVC Decoder

| | |
|---|---|
| Video output connectors: | 8x HD BNC 75 Ohm or 2x QSFP (10GbE, 25GbE or 40GbE) |
| Number of Services: | 2x UHD, 4xFHD, HD, SD |
| Video output format: | 12G-SDI (SMPTE 2082) |
| | 3G-SDI (SMPTE 424M) |
| | HD-SDI (SMPTE 292M) |
| | SD-SDI (SMPTE 259M) |
| Data encapsulation: | SDI over SMPTE 2110 with PTP |
| Codecs: | AVC and HEVC |
| Resolutions: | SD, HD, FHD, UHD (UHD only on HEVC) |
| Decoding Modes: | 8/10 bit, 4:2:0/4:2:2, Standard/Low delay/Ultra low delay |

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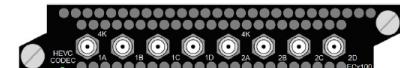
## Scrambler

| | |
|---|---|
| Scrambling capacity: | 2000 services/6 Gbit/s |
| Scrambling algorithm: | DVB-CSA v1 (48-bit) |
| | DVB-CSA v2 (64-bit) |
| | AES (128-bit) |
| Entropy reduction: | Yes for DVB-CSA v1 (Reduced to 48-bit) |
| CA system interface: | DVB simulcrypt compliant |
| | BISS1 Mode 1 |
| Simulcrypt scrambling: | Up to 8 CA systems |
| Simulcrypt interface: | 2  1/10G Base-T Ethernet or 1G SFP/10G SFP+ |
| | (Base-T or SFP must be selected at order) |

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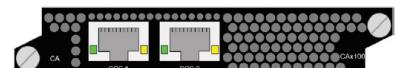
## Bulk Descrambler

| | |
|---|---|
| Descrambling capacity: | 2000 services/6 Gbit/s (depends on crypto period) |
| Scrambling algorithm: | DVB-CSA (64-bit) |
| | AES (128-bit) |
| CA systems: | Verimatrix, BISS1 Mode 1/E, BISS2 Mode 1/E |
| CA authentication interface: | 2  1/10G Base-T Ethernet or 1G SFP/10G SFP+ |
| | (Base-T or SFP must be selected at order) |
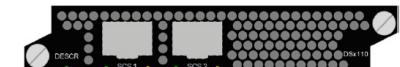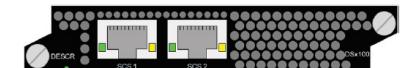
# SPECIFICATIONS

## CONTROL/SWITCH MODULE - SWx100, SWx110, SWx120, SWx130, SWx200, SWx210

| | | |
|---|---|---|
| DMG 4100 Switch fabric | Total capacity: | 80 Gbps full duplex |
| | Bitrate: | 10 Gbps routing between modules in a chassis |
| | Placement: | Front loaded |
| | Interface: | 2  1/10G Base-T Ethernet or 2x1G SFP/10G SFP+ |
| | | (Base-T or SFP must be selected at order) |
| | | |
| DMG 4200 Switch fabric | Total capacity: | 140 Gbps full duplex |
| | Bitrate: | 10 Gbps routing between modules in a chassis |
| | Placement: | Front loaded |
| | Interface: | 2  1/10G Base-T Ethernet, SFP/SFP+, and 2x 1G Base-T Ethernet |

### Control/Switch module - common features for DMG 4100 and DMG 4200

| | | |
|---|---|---|
| Dataports | Operational mode: | Seamless Input (SMPTE 2022 7) |
| | | Cloned Output (SMPTE 2022-7) |
| | | Seamless Input and Cloned Output (SMPTE 2022-7 Full Duplex) |
| | | Single Input and Single Output (on separate interfaces) |
| | | Exclusive output (if D1 has link D2 is muted, D3 has link D4 is muted) |
| | Seamless buffer size | |
| | (network path differential): | Configurable up to 400ms |
| | Protocols: | IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q (VLAN tag including PCP priority), DSCP (IP Priority flag) |
| | IO Data Rate: | 1/10Gbps Bi-directional |
| Control Interface | Interface: | 0/100/1000 Base-T Ethernet |
| | Built-in user interface: | Web (HTTPS) |
| | Protocols: | IPv4, IPv6, HTTPS, SSH, ICMP, ARP, LLDP |
| | External interface: | SNMP for alarms, JSON for configuration and status |
| Processing | Protocols: | UDP, RTP, SMPTE 2022-6, SMPTE 2110 VSF TR-03, VSF TR-04, AES67, L2TPv3 (Tx only) |
| | IP input de-jitter: | Yes, based on RTP timestamps or CBR bitrate |
| | IP input de-jitter buffer size: | Configurable up to 1500ms |
| Maximum number of streams per port: | 2000 input and 2000 output streams | |
| | Processing capacity: | 10 Gbps Bi-directional |
| | Scrambling/Descrambling: | BISS2 Mode 1/E |
| | | BISS CA |
| MPEG TS | Key reference specification: | SO/IEC 13818-1:2015, ETSI TS 102 034 V2.1.1 |
| | | SMPTE 2022-2, ETSI TR 101 211 V1.9.1 |
| | Protocols: | UDP, RTP |
| | | Multicast, Unicast |
| | IP input de-jitter: | Yes, based on PCR timestamps or CBR bitrate |
| | IP input de-jitter buffer size: | Configurable up to 1500ms |
| | Maximum number of streams per port: | 2000 input and 2000 output streams |
| | Forward Error Correction: | SMPTE 2022-1 |
| | Transport stream: | Single program (SPTS) and multi program (MPTS) |
| | MPEG TS processing capacity: | 6Gbps Bi-directional |
| | Maximum per-TS bitrate: | 3 Gbps |
| | Service filtering: | Yes |
| | Video formats: | MPEG-2, AVC, HEVC, JPEG XS, JPEG2000 (in MPEG2-TS) |
| | Multiplexing (MPTS output): | Yes |
| | PCR regeneration: | Yes |
| | Tables Supported: | MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| | PSI/SI Table Regeneration: | Yes, based on input and operations performed |
| Clock Options | Chassis synronisation: | Free Running (on internal clock) |
| | | PTP (SMPTE 2059-2 or ITU-T G.8275.2) |
| | | GenLock (only on switch modules SWx120, SWx130 and SWx210) |
| | | 10MHz (only on switch module SWx220) |
| | | GPS (Future hardware option) |
| Licensed: | Features Forward Error Correction (SMPTE 2022-1) | |
| | Seamless Input (SMPTE 2022-7) | |
| | MPEG TS multiplexing (MPTS output) | |
| | TS input analysis | |
| | BISS2 mode 1/E scrambling/descrambling (per TS) | |
| | BISS CA scrambling/descrambling (per service or TS) | |

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## DUAL 10G IP IO MODULE - IPx100, IPx110

| | | |
|---|---|---|
| Dataports | Interface: | 2  1/10G Base-T Ethernet or 1G SFP/10G SFP+ (Base-T or SFP must be selected at order) |
| | Operational modes: | Seamless Input (SMPTE 2022-7) |
| | | Cloned Output (SMPTE 2022-7) |
| | | Seamless Input and Cloned Output (SMPTE 2022-7 Full Duplex) |
| | | Single Input and Single Output (on separate interfaces) |
| | | Exclusive output |
| | | (if D1 has link D2 is muted, D3 has link D4 is muted) |
| | | TS over SRT |
| | | TS over Zixi |
| | Seamless buffer size | |
| | (network path differential): | Configurable up to 400ms |
| | Protocols: | IPv4, IPv6, IGMP v2/v3, ICMP, ARP, |
| | 802.1Q (VLAN tag including PCP priority), DSCP (IP Priority flag) | |
| | IO Data Rate: | 1/10Gbps Bi-directional |
| Processing | Protocols: | UDP, RTP, SMPTE 2022-6, SMPTE 2110 |
| | | VSF TR-03, VSF TR-04, AES67, L2TPv3 (Tx only) |
| | IP input de-jitter: | Yes, based on RTP timestamps or CBR bitrate |
| | IP input de-jitter buffer size: | Configurable up to 1500ms |
| | Maximum number of streams per port: | 2000 input and 2000 output streams |
| | Processing capacity: | 10 Gbps Bi-directional |
| SRT | Modes : | Caller/Listener/Rendezvous |
| | Scrambling: | AES |
| | Capacity: | Up to 32 flows, 100 Mbps per flow, 200Mbps total |

## DUAL 10G IP IO MODULE - IPx100, IPx110 (cont.)

| | | |
|---|---|---|
| Zixi | Modes: | "Connect" to/from Broadcaster |
| | Scrambling: | AES |
| | Capacity: | Up to 32 flows, 100 Mbps per flow, 200Mbps total |
| | FEC: | Yes |
| MPEG TS | Key reference specification: | ISO/IEC 13818-1:2015, ETSI TS 102 034 V2.1.1 |
| | | SMPTE 2022-2, ETSI TR 101 211 V1.9.1 |
| | Protocols: | UDP, RTP |
| | | Multicast, Unicast |
| | IP input de-jitter: | Yes, based on PCR timestamps or CBR bitrate |
| | IP input de-jitter buffer size: | Configurable up to 1500ms |
| | Maximum number of streams per port: | 2000 input and 2000 output streams |
| | Forward Error Correction: | SMPTE 2022-1 |
| | Transport stream: | Single program (SPTS) and multi program (MPTS) |
| | MPEG TS processing capacity: | 6Gbps Bi-directional |
| | Maximum per-TS bitrate: | 3 Gbps |
| | Service filtering: | Yes |
| | Video formats: | MPEG-2, AVC, HEVC, JPEG XS, JPEG2000 (in MPEG2-TS) |
| | Multiplexing (MPTS output): | Yes |
| | PCR regeneration: | Yes |
| | Tables Supported: | MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| | PSI/SI Table Regeneration: | Yes, based on input and operations performed |
| Licensed Features: | Forward Error Correction (SMPTE 2022-1) | |
| | Seamless Input (SMPTE 2022-7) | |
| | MPEG TS multiplexing (MPTS output) | |
| | TS input analysis | |
| | SRT TX/RX connections | |
| | Zixi TX/RX connections | |

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## SDI/2110/2022-6 IO MODULE - SIx110, SIx200, IPx210

| | | |
|---|---|---|
| Connectors: | 8x HD BNC 75 Ohm (SIx110) | |
| | 3x Video SFP (Non-MSA Dual rx/ Dual Tx) (SIx200) | |
| | 2x QSFP (10GbE, 25GbE or 40GbE) (IPx210) | |
| Operational modes | Software images: | SDI IO (No compression), 2022-6 reception/transmission (SIx110/SIx120) |
| | | SDI/2110 in with JPEG XS SD/HD/UHD encoding and 2110 transmission (SIx110/IPx210) (also supports uncompressed SD/HD 2110 transmission) |
| | | 2110 reception with JPEG XS SD/HD/UHD decompression, SDI/2110 out (SIx110/IPx210) (also supports uncompressed SD/HD 2110 reception) |
| | | SDI in with TICO UHD compression, 2022-6 transmission (SIx110/SIx200) (also supports uncompressed SD/HD 2022-6 transmission) |
| | | 2022-6 reception with TICO UHD decompression, SDI out (SIx110/SIx200) (also supports uncompressed SD/HD 2022-6 reception) |
| | | SDI in with TICO HD compression, 2110 transmission (SIx110/SIx200) (also supports uncompressed SD/HD 2110 transmission) |
| | | 2110 reception with TICO HD decompression, SDI out (SIx110/SIx200) (also supports uncompressed SD/HD 2110 reception) |
| | | SDI in with JPEG2K encoding and TS out (SIx110) |
| | | TS in with JPEG2K decoding and SDI out (SIx110) |
| Data formats | SDI Video Format: | 12G-SDI (SMPTE 2082) |
| | | 12G-QUAD-2SI (SMPTE 425-5) |
| | | 12G-QUAD-SQD (SMPTE 425-1) |
| | | 3G-SDI (SMPTE 424M) |
| | | HD-SDI (SMPTE 292M) |
| | | SD-SDI (SMPTE 259M) |
| | Data encapsulation: | SDI over SMPTE 2022-6 |
| | | SDI over SMPTE 2110 with PTP |
| | Data flow : | Input or output (configurable) |
| SDI In/Out | Key reference specification SD: | SMPTE 259M Resolution / Frame rates |
| | Resolution SD: | 480i/29.97 |
| | | 576i/25 |
| | Key reference specification HD : | SMPTE 292M |
| | Resolution / Frame rates HD: | 720p50/59.94 |
| | | 1080i25/29.97 |
| | Key reference specification FHD: | SMPTE 424M |
| | Resolution / Frame rates FHD: | 1080p59.94/50 |
| | Key reference specification UHD: | SMPTE 2082 |
| | Resolution / Frame rates UHD: | 2160p60/59.94/50 |
| | Key reference specification AUDIO: | SMPTE 272M (SD), SMPTE 299M (HD/3G), AES67, SMPTE 2110-31 |
| | Sample Rate AUDIO: | 48kHz, synchronous to video |
| Encapsulation | Video: | SMPTE 2110-20 (Uncompressed) |
| | | SMPTE 2110-22 (HD TICO compressed) |
| | | SMPTE 2022-6 (Uncompressed, UHD TICO compressed) |
| | Audio | SMPTE 2110-30 (Audio, Based on AES67, |
| | | SMPTE 2110-31 (Conformance Level B, 1-8 Audio per channel) |
| | | SMPTE 302 (JPEG2K only, AES3 or PCM) |
| | Ancillary: | SMPTE 2110-40 |
| TICO Encode/Decode | Number of UHD channels: | 2 |
| | UHD Compression ratio: | 4:1 |
| | Data encapsulation: | 2022-6 |
| | Number of HD channels: | 6 |
| | HD Compression ratio: | 2:1,4:1,5:1 |
| | Data encapsulation: | 2110 |
| JPEG XS Encode/Decode | Number of SD/HD/UHD channels:: | 4 (maximum 2 UHD out of the 4) (SIx110) |
| | | 6 (maximum 2 UHD out of the 6) (IPx210) |
| | Compression ratio: | from 1.8 to 40.0 (480i/576i) |
| | | from 3.1 to 40.0 (720p) |
| | | from 4.7 to 40.0 (1080i/1080p/2160p) |
| | Data encapsulation: | TS and 2110 with PTP |

## SDI/2110/2022-6 IO MODULE - SIx110, SIx200, IPx210 (cont.)

| | | |
|---|---|---|
| JPEG2K HD Encode/Decode | Key reference specification: | VSF-TR01 (partial) |
| | Number of HD channels: | 4 |
| | Bandwidth: | 20 – 400 Mbps |
| | Audio: | 20bit audio, max 8 Stereo pairs |
| | Ancillary data: | Transparent |
| | MPEG TS Descriptors: | JP2K Video, Audio registration, Anc Data |
| | Encapsulation mode: | ITU-T H.222.0/Amd.5 |
| Licensed Features: | Number of TICO HD encoders [0-6] | |
| | Number of TICO HD decoders [0-6] | |
| | Number of TICO UHD encoders [0-4] | |
| | Number of TICO UHD decoders [0-4] | |
| | Number of JPEG XS SD/HD/UHD encoders [0-4/6] | |
| | Number of JPEG XS SD/HD/UHD decoders [0-4/6] | |
| | Number of JPEG2K HD encoders [0-4] | |
| | Number of JPEG2K HD decoders [0-4] | |

## ASI IO MODULE - SIx110, SIx120

| | | |
|---|---|---|
| Connectors: | | 8x HD BNC 75 Ohm (SIx110) |
| | | 16x HD BNC 75 Ohm (SIx120) |
| Operational modes | Software images: | ASI IO (SIx110/SIx120) |
| Data formats | ASI Format: | 88 byte TS – spread and burst mode |
| ASI In/Out | Key reference specification: | EN 50083-9 Annex B |
| | Maximum input bit-rate per port: | Up to 213.7 Mbit/s burst mode, 72 Mbit/s spread mode |
| | Maximum output bit-rate per port: | Up to 213.7 Mbit/s burst mode, 72 Mbit/s spread mode |
| | Number of MPEG services (sum all ports): | Up to 2,000 services in and out per module |
| | Input signal protection: | Traffic policing, configurable maximum allowed input bitrate |
| | Input monitoring: | ETR290: Priority 1, Selected Priority 2 |
| | Operational modes: | Input / Output - configurable per port |
| | | Cloned ASI out |
| | | Dual ASI in with seamless switchover |
| | Transport stream: | Single program (SPTS) and multi program (MPTS) |
| | Service filtering: | Yes |
| | Video formats: | MPEG- 2, AVC, HEVC, JPEG2000 (in MPEG2-TS) |
| | Multiplexing (MPTS output): | Yes |
| | PCR regeneration: | Yes |
| | Tables Supported: | MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| | PSI/SI Table Regeneration: | Yes, based on input and operations performed |
| Licensed Features: | MPEG TS processing | |
| | Number of MPTS outputs | |

## DVB-S/S2X INPUT - SRx100

| | | |
|---|---|---|
| Connectors | Number of connectors: | 4 |
| | Connector: | F female, 75Ω |
| | Max number of transponders: | 32 |
| | Number of transponders per input: | 1-16 |
| | Input level: | -77 to -10dBm @16APSK-9/10, 30MBd |
| | Frequency range: | 950 – 2150MHz |
| | Spectrum inversion: | Auto |
| | LNB signaling: | 22kHz continuous tone and 0/13/18V DC, max 400mA |
| Demodulation | Standards: | DVB-S/S2/S2x |
| | FEC frame size: | Normal, Short |
| | Roll off: | 0.05 – 0.35 |
| | Symbol rates, 8 transponders: | QPSK-16APSK 64MBd |
| | | 32APSK 51.5MBd |
| | | 64APSK 42.5MBd |
| | | 128APSK 36.5MBd |
| | | 256APSK 32MBd |
| | Symbol rates, 16 transponders: | QPSK 64MBd |
| | | 8PSK 59.9MBd |
| | | 16APSK 44.9MBd |
| | | 32APSK 35.9MBd |
| | Symbol rates, 32 transponders: | QPSK 44.9MBd |
| | | 8PSK 29.9MBd |
| | | 16APSK 22.4MBd |
| | | 32APSK 17.9MBd |
| | Multistream: | ISI Filtering |
| Processing | Number of MPEG services: | Up to 2000 |
| | Descrambling: | BISS1 Mode 1/E |
| | | BISS2 Mode 1/E |
| | | BISS CA |
| | Service filtering: | Yes |
| | Input analysis: | Yes |
| Licensed features: | DVB-S de-modulation | |
| | DVB-S2 de-modulation | |
| | DVB-S/S2x de-modulation | |
| | BISS 1/2/E de-scrambling (per TS) | |
| | BISS CA de-scrambling (per service or TS) | |

## DVB-S/S2X MODULATOR - SMx100

| | | |
|---|---|---|
| Interfaces | Number of modulated carriers: | 2 |
| | Outputs connectors: | 50Ω SMA + 50Ω SMA monitor per output |
| | Backup connectors: | 50Ω SMA per main output |
| DVB-S Coding and Modulation | Constellation: | QPSK |
| | FEC rates: | 2/3, , 5/6, 7/8 |
| | Symbol rate: | 0.1 – 72MBd |
| | Roll off: | 0.05 - 0.35 |

## DVB-S/S2X MODULATOR - SMx100 (cont.)

| | | |
|---|---|---|
| DVB-S2x Coding and Modulation | Constellation: | QPSK – 256-APSK |
| | Modulation mode: | CCM |
| | FEC rates: | All |
| | Frame length: | Short, Normal |
| | PL scrambling: | Configurable Gold index or root |
| | Symbol rate: | 0.1 – 72MBd |
| | Roll off: | 0.05 - 0.35 |
| IF | Frequency range: | 70 – 200MHz |
| | Frequency accuracy: | 1.5ppm |
| | Output level: | -15 to 0dBm |
| | Output level accuracy: | 0.5dB |
| | Output level setting accuracy: | 1.0dB |
| | In-band flatness: | 0.1dB (typical) |
| | Return loss: | >18dB |
| | Spurious signal related: | < -65dBc/4kHz (typical) @5dBm, 256kBd |
| | Spurious neighbour transponder related: | < -50dBc/4kHz (typical) @0dBm |
| | Spurious non-signal related: | < -80dBc/4kHz (typical) @5dBm |
| | Monitor port level: | -20dB relative to main output |
| L-band | Frequency range: | 950 – 2150MHz |
| | Frequency accuracy : | 1.5ppm |
| | Output level: | -40 to 7dBm |
| | Output level accuracy: | 0.5dB |
| | Output level setting accuracy: | 1.0dB |
| | In-band flatness: | 0.2 dB (typical) |
| | Return loss : | >14dB |
| | Spurious signal related: | < -65dBc/4kHz (typical) @5dBm, 256kBd |
| | Spurious neighbour transponder related: | < -50dBc/4kHz (typical) @0dBm |
| | Spurious non-signal related: | < -80dBc/4kHz (typical) @5dBm |
| | Monitor port level: | -30dB relative to main output |
| Transport Stream | Scrambling: | BISS1 Mode 1/E |
| | | BISS2 Mode 1/E |
| | | BISS CA |
| | Multiplexing: | Yes |
| | PID mapping: | Manual mapping of unreferenced PIDs |
| | PCR regeneration: | Yes |
| | Tables Supported: | MPEG PSI (PAT, CAT, PMT), DVB SI (SDT actual) |
| | PSI/SI Table Regeneration: | Yes, based on input and operations performed |
| Additional features | Output redundancy: | Automatic mute or switch to RF backup on error. |
| | | Reverting or "switch once" mode |
| | DC output: | 24V, max 500mA |
| | 10MHz reference output: | 0dBm +- 2dB |
| | Carrier ID: | DVB |
| | Precorrection: | Static linear gain and group delay |
| Licensed Features: | Number of DVB-S outputs | |
| | Number of DVB-S2 outputs | |
| | Number of DVB-S2x outputs | |
| | Precorrection | |
| | Carrier ID | |
| | BISS1/2 Mode 1/E scrambling (per TS) | |
| | BISS CA scrambling (per service TS) | |
| | Output redundancy | |
| | 24V DC and 10MHz reference output | |

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## HEVC CODEC - ECx110, ECx210

### Common features

| | | |
|---|---|---|
| Connectors: | I/O | 8x HD BNC 75 Ohm |
| | | (converter to BNC available or 2x QSFP 10/25/40 GbE) |
| | SDI key reference specifications: | SMPTE 259M (SD) |
| | | SMPTE 292M (HD) |
| | | SMPTE 424M (FHD) |
| | | SMPTE 2082 (UHD), two connectors |
| | Data encapsulation: | SDI over SMPTE 2022-6 (ECx210 encoding only) |
| | | SDI over SMPTE 2110 with PTP (ECx210) |
| | UHD Input Formats: | Single connector over 12G SDI as SMPTE 2082 |
| | | Quad 3G SDI as SMPTE 425-1 four quadrants |
| | | Quad 3G SDI as SMPTE 425-5 two sample interleaved (input only) |
| Ancillary Data and VBI | VITC Source: | SMPTE 12M-2 / HEVC SEI as per ITU-T H.265 |
| | VITC Output: | HEVC SEI as per ITU-T H.265 / SMPTE 12M-2 |
| Operational modes | HEVC Codec software version: | Encoder mode |
| | (Selected at order): | HEVC Encoder Ultra Low Latency Mode (only on ECx110) |
| | | Transcoder Mode (only on ECx110) |
| | | Decoder mode |

### HEVC Codec - Encoder Mode

| | | |
|---|---|---|
| Video Processing | Density Modes: | 2x UHD / 1x UHD + 4x FHD, HD, SD / 8x FHD/HD/SD |
| | HEVC Compression: | Main@Level 5.1 |
| | Profiles and Max Level: | Main10@Level 5.1 |
| | | Main422@Level 5.1 |
| | AVC Compression: | Main@Level 4.2 |
| | Profiles and Max Level: | High@Level 4.2 |
| | | High10@Level 4.2 |
| | | High422@Level 4.2 |
| | Resolutions: | 3840x2160p60/59.94/50/30/29.97/25 |
| | | 1920x1080p60/59.94/50 |
| | | 1920x1080i29.97/25 |
| | | 1280x720p60/59.94/50 |
| | | 720x576i25 |
| | | 720x480i29.97 |
| | Color Space Handling: | Passthru |

## HEVC CODEC - ECx110, ECx210 (cont.)

| | |
|---|---|
| HDR Signalling: | Passthru of PQ10, HDR10 and HLG |
| Encode latency modes: | Normal – approx. 1800ms |
| | Low – approx. 1000ms (AVC), 600ms (HEVC) |
| | Ultra Low – approx. 400ms (AVC, GDR, Only pass thru audio) |
| | See separate specification for HEVC Ultra Low Latency mode |
| Rate control modes : | CBR |
| GOP Control: | Dynamic, Static, IBP, IP or I |
| Colorimetry: | SDR, PQ10, HDR10, HLG |
| Audio Processing Encode: | MPEG1 Layer2 (Stereo) |
| | AAC LC (Stereo and 5.1) |
| | HE-AACv1 (Stereo and 5.1) |
| | HE-AACv2 (Stereo) |
| | Dolby  Digital (Stereo and 5.1)** |
| | Dolby  Digital Plus (Stereo, 5.1 and 7.1)** |
| Transcode: | Dolby  E to any of above codecs** |
| Passthrough: | Dolby  Digital** |
| | Dolby  Digital Plus** |
| | Dolby  E** |
| | Dolby  ED2** |
| | PCM |
| Capacity per channel | 8 x 2.0 audios in MPEG-1 Layer2, AAC-LC, HE-AACv1 or Dolby Digital (AC-3) |
| | 6 x 2.0 audios in HE-AACv2 or Dolby Digital Plus (E-AC-3). |
| | 4 x 2.0 Dolby E 2.0/5.1/7.1 transcodes to any other codec |
| | 7 x DD/DD+ passthrough |
| | 5 x Dolby E passthrough |
| | 5.1 counts as three 2.0, 7.1 counts as 4 2.0 |
| Audio Level Adjustment | +6/-10dB (1dB steps) |
| Audio Lip Sync Adjustment: | -200/+500ms |

| Audio Leveling | | |
|---|---|---|
| | Long Term Loudness Levelling: | EBU-R128 / ATSC A/85 |
| | Short Term Loudness Levelling: | EBU-R128 / ATSC A/85 |
| | Peak Loudness Levelling: | Limits sample peaks based on the configured threshold |

| Licensed Features: | |
|---|---|
| AVC Encoding SD | |
| AVC Encoding SD/HD | |
| AVC/HEVC Encoding SD | |
| AVC/HEVC Encoding SD/HD | |
| AVC/HEVC Encoding SD/HD/UHD | |
| Low Delay Encoding | |
| Ultra low delay | |
| 4:2:2 Encoding | |
| Extra stereo audio encoding (8 stereo audio default) | |
| Dolby  Digital / Dolby  Digital Plus encoding (per service)** | |
| Dolby  E decoding (per service)**Long term loudness | |
| Short term loudness, includes support for long term | |
| Peak loudness limiter, includes long and short term loudness | |

## HEVC Codec - HEVC Encoder Ultra Low Latency Mode (only available on ECx110)

| Video Processing | Density: | 1x UHD, FHD, HD, SD |
|---|---|---|
| | HEVC Compression: | Main@Level 5.1 |
| | Profiles and Max Level: | Main10@Level 5.1 |
| | | Main422@Level 5.1 |
| | Resolutions: | 3840x2160p60/59.94/50 |
| | | 1920x1080p60/59.94/50 |
| | | 1920x1080i29.97/25 |
| | | 1280x720p60/59.94/50 |
| | | 720x576i25 |
| | | 720x480i29.97 |
| | Encode latency modes: | Ultra Low – approx. 200ms |
| | Rate control modes: | CBR |
| | GOP Control: | GDR |
| Audio Processing | Passthrough: | Dolby  Digital** |
| | | Dolby  Digital Plus** |
| | | Dolby  E** |
| | | Dolby  ED2** |
| | | PCM |
| | Capacity: | 8 |

| Licensed Features: | |
|---|---|
| AVC/HEVC Encoding SD | |
| AVC/HEVC Encoding SD/HD | |
| AVC/HEVC Encoding SD/HD/UHD | |
| Ultra low delay (only for HEVC) | |
| 4:2:2 Encoding | |

## HEVC Codec - Transcoder Mode (only available on ECx110)

| Inputs | MPEG Transport Stream (TS): | From any DMG 4000 platform TS input module |
|---|---|---|
| Resource management | Resource configuration: | Automatic by a resource allocation engine. Max input rate 2x |
| | | 90 Mbit/s per module All modules in a chassis treated as one processing pool. If required, resources from multiple modules can be combined to deliver resolutions for the same service. |
| Video Decoder | Module density : | 6 MPEG-2 HD/SD |
| | 8 MPEG-4 AVC/HEVC HD/SD | |
| | 2 HEVC UHD | |
| | MPEG-2 profiles: | MP@HL (HD) |
| | | MP@ML (SD) |
| | MPEG-4 AVC profiles: | Main Profile up to Level 4.2 (FHD) |
| | | High Profile up to Level 4.2 (FHD) |
| | | Hi 422 Profile up to Level 4.2 (FHD) |
| | HEVC profiles: | Main Profile up to Level 5.1 (UHD) |
| | | Main 10 up to Level 5.1 (UHD) |
| | | Main 422 10 up to Level 5.1 (UHD) |
| | SD 50Hz resolutions: | 720/704x576i25 |
| | SD 60Hz resolutions: | 720/704x480i29.97 |
| | HD 1080i resolutions: | 1920x1080i29.97/25 |

| | | |
|---|---|---|
| | HD 1080p resolutions: | 920x1080p59.94/25 |
| | HD 720p resolutions: | 1280x720p60/59.94/50 |
| Video Encoding | Module Density: | Up to 2x UHD, 8 HD, 16 SD or 40 sub SD |
| | | (or a combination) |
| | HEVC Compression: | Main@Level 5.1 |
| | Profiles and Max Level: | Main10@Level 5.1 |
| | AVC Compression,: | Main@Level 4.2 |
| | Profiles and Max Level: | High@Level 4.2 |
| | | High10@Level 4.2 |
| | Resolutions: | 3840x2160p59.94/50/29.97/25 (HEVC only) |
| | | 2560x1440p59.94/50/29.97/25 (HEVC only) |
| | | 1920x1080p59.94/50 |
| | | 1280x720p59.94/50 |
| | | 1024x576p59.94/50 |
| | | 1920x1080p29.97/25 |
| | | 1280x720p29.97/25 |
| | | 1024x576p29.97/25 |
| | | 848x480p29.97/25 |
| | | 768x432p29.97/25 |
| | | 640x360p29.97/25 |
| | | 512x288p29.97/25 |
| | | 480x270p29.97/25 |
| | | 400x224p29.97/25 |
| | | 320x180p29.97/25 |
| | | 256x144p29.97/25 |
| | | 1920x1080i29.97/25 |
| | | 720x576i25 |
| | Color Space Handling: | Passthru |
| | HDR Signalling: | Passthru of PQ10, HDR10 and HLG |
| | Encode latency modes: | Normal – approx. 2sec |
| | Rate control modes: | CBR |
| | Frame rate conversion: | 60/59.94/50 can be reduced to 30/29.97/25 fps |
| | | Motion adaptive deinterlacing (maximum 4 inputs) |
| | Key Frame Alignment : | Frame accurate key frame alignment across all profiles |
| | | Fixed IDR to IDR distance. |
| Audio Decoder | Audio CODECS: | MPEG-1 Layer 2 (2.0) |
| | | AAC-LC (2.0) |
| | | HE-AAC v1/2 (2.0) |
| | | Dolby  Digital (2.0/5.1) / Dolby  Digital Plus (2.0/5.1/7.1)** |
| | | Dolby  E** |
| | Audio Downmix: | Multichannel audio (5.1 or 7.1) can be downmixed to 2.0 as part of transcode process. |
| Audio Encoder | Audio CODECS: | MPEG-1 Layer 2 |
| | | AAC-LC |
| | | HE-AAC v1/2 |
| | | Dolby  Digital / Dolby  Digital Plus** |
| | | Pass though of all audio types |
| | Audio Channel Modes: | Stereo, Mono |
| | AAC Data Encapsulation: | ADTS or LATM selectable per encoded channel |
| | Audio Lipsync Adjustment: | +500ms /-200ms |
| | Audio Level Adjustment: | +20/-20dB |
| | Audio Transcode Density: | Limited to 24 stereo (2.0) transcodes per module. |
| | | One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes |
| | | One 7.1 transcode consumes resources equivalent to four stereo (2.0) transcodes |
| Audio Leveling | Long Term Loudness Levelling: | EBU-R128 / ATSC A/85 |
| | Short Term Loudness Levelling : | EBU-R128 / ATSC A/85 |
| | Peak Loudness Levelling: | Limits sample peaks based on the configured threshold |
| Picture-in-Picture | Resolutions : | All available ABR resolutions |
| | Codec: | MPEG-4 AVC and HEVC (ref coder specification above) |
| VBI | Digital Program Insertion (DPI): | SCTE35 passthrough |
| | | I-frame insertion based on SCTE35 marker*** |
| | Pass-through: | Components such as EBU Teletext and DVB Subtitling can be passed through. Synchronization to video will be maintained |
| Licensed Features: | AVC Encoding | |
| | AVC/HEVC Encoding | |
| | Extra stereo audio encoding (8 stereo audio default) | |
| | Dolby  Digital / Dolby  Digital Plus decoding (per service)** | |
| | Dolby  Digital / Dolby  Digital Plus encoding (per service)** | |
| | Dolby  E decoding (per service)** | |
| | Long term loudness | |
| | Short term loudness, includes support for long term | |
| | Peak loudness limiter, includes long and short term loudness | |

## HEVC Codec – Decoder Mode

| | | |
|---|---|---|
| Video Processing | Density Modes: | 2x UHD / 1x UHD + 2x FHD, HD, SD / 4x FHD/HD/SD |
| | HEVC Decoder, Profiles and Max Level: | Main@Level 5.1 |
| | | Main10@Level 5.1 |
| | | Main422@Level 5.1 |
| | AVC Decoder, Profiles and Max Level: | Main@Level 4.2 |
| | | High@Level 4.2 |
| | | High10@Level 4.2 |
| | | High422@Level 4.2 |
| | Resolutions: | 3840x2160p60/59.94/50/30/29.97/25 |
| | | 1920x1080p60/59.94/50 |
| | | 1920x1080i29.97/25 |
| | | 1280x720p60/59.94/50 |
| | | 720x576i25 |
| | | 720x480i29.97 |
| | Maximum input bitrate: | 100Mbps per UHD or FHD/HD/SD pair |

## HEVC CODEC - ECx110, ECx210 (cont.)

| | | |
|---|---|---|
| Audio Processing | Decode: | MPEG1 Layer2 |
| | | AAC LC |
| | | HE-AACv1/v2 |
| | | Dolby Digital (2.0/5.1) / Dolby Digital Plus (2.0/5.1/7.1)** |
| | | Dolby E** |
| | Passthrough | Dolby Digital** |
| | | Dolby Digital Plus** |
| | | Dolby E** |
| | | Dolby ED2** |
| | | PCM |
| | Capacity: | 32x 2.0 decodes freely distributable* |
| | | Up to 8x Decodes per UHD/FHD/HD |
| | | Up to 4x Decodes per SD |
| Ancillary Data and VBI | VITC Source : | Extracted from HEVC SEI as per |
| | | ITU-T H.265 |
| | VITC Output: | SMPTE 12M-2 |
| Other | Clock Recovery Modes: | Locked to PCR in video |
| | | GenLock (only in combination with switch modules SWx120, SWx130 or SWx210) |
| Licensed Features: | AVC Decoding SD | |
| | AVC Decoding SD/HD | |
| | AVC/HEVC Decoding SD | |
| | AVC/HEVC Decoding SD/HD | |
| | AVC/HEVC Decoding SD/HD/UHD | |
| | 4:2:2 Decoding | |
| | Extra stereo audio decoding (8 stereo audio default) | |
| | Dolby Digital / Dolby Digital Plus decoding (per service)** | |
| | Dolby E decoding (per service)** | |

## SCRAMBLER - CAx100, CAx110

| | | |
|---|---|---|
| Interfaces: | | 2 1/10G Base-T Ethernet or 2x1G SFP/10G SFP+ |
| | | (Base-T or SFP must be selected at order) |
| Scrambling | Scrambling modes: | CA system |
| | | BISS1 Mode 1 |
| | | Fixed key |
| | Scrambling algorithm: | DVB-CSA v1 (48-bit) |
| | | DVB-CSA v2 (64-bit) |
| | | AES (128-bit) |
| Entropy reduction: | | Yes for DVB-CSA v1 (Reduced to 48-bit) |
| | | No for AES |
| | AES mode of operation: | ATIS IIF Default Scrambling Algorithm (IDSA) |
| | | DVB Common IPTV Software-oriented |
| | | Scrambling Algorithm (DVB-CISSA) |
| | | AES-ECB1 / AES-ECB2 / AES-CBC1 |
| | | Irdeto AES-CBC1 |
| | PVR support (trick mode): | PES header in clear |
| | | (leave a number of packets in clear after PES header) |
| | MPEG TS processing capacity: | 6Gbit/s |
| | Number of services per scrambler card: | 2000 |
| | Video format: | MPEG-2, AVC, HEVC (in MPEG2-TS) |
| | Interface towards CA System: | Simulcrypt interface with optional backup connection |
| | Number of CA systems: | 8 |
| | Maximum number ECM: | 16000 |
| | (sum all CA systems) | |
| | EMM insertion : | Yes |
| | EIS support: | Yes |
| | Tables Supported: | CAT generation |
| Licensed Features: | Number of scrambled services | |
| | Number of CA systems | |

## BULK DESCRAMBLER - DSx100, DSx110

| | | |
|---|---|---|
| Interfaces | 2 1/10G Base-T Ethernet or 2x1G SFP/10G SFP+ | |
| | (Base-T or SFP must be selected at order) | |
| Descrambling | Descrambling modes: | CA system |
| | | BISS1 Mode 1/E |
| | | BISS2 Mode 1/E |
| | | Fixed key |
| | Supported CA system: | Verimatrix (Standard Security profile) |
| | Descrambling algorithm: | DVB-CSA (64-bit) |
| | | AES (128-bit) |
| | AES mode of operation: | ATIS IIF Default Scrambling Algorithm (IDSA) |
| | | DVB common IPTV Software-oriented |
| | | Scrambling Algorithm (DVB-CISSA) |
| | | AES-ECB1 / AES-ECB2 / AES-CBC1 |
| | | Irdeto AES-CBC1 |
| Transport stream | MPEG TS processing capacity: | 6Gbit/s |
| | Number of MPEG TS services: | 2000 |
| | Video format: | MPEG-2, AVC, HEVC (in MPEG2-TS) |

## CHASSIS

| | | |
|---|---|---|
| Physical dimensions | DMG 4100 chassis: | 19" 1RU 540 mm (440 44 540 mm) |
| | DMG 4200 chassis: | 19" 2RU 540 mm (440 88 540 mm) |
| Module slots | Number of switch modules (front): | 1 or 2 (active – active) |
| | DMG 4100 Number of modules (rear): | 6 |
| | DMG 4200 Number of modules (rear): | 12 |
| | Hot swap support: | Yes |
| Power supply | Power rating DMG 4100: | 750 W |
| | Power rating DMG 4200 | |
| | Max Load: | U NOM 100 - 240 VAC /50 - 60 Hz / 12 A |
| | | 1200 W @ 200 - 240 VAC / 800 W @ 100 - 200 VAC |
| | | U NOM 100 - 240 VAC /50 - 60 Hz / 15 A |
| | | 1500 W @ 200 - 240 VAC / 800 W @ 100 - 200 VAC |
| | | -48 to -60 VDC I max: 36.2 A |
| | | Max Load: 1200 W, x2 |
| | Redundancy: | Yes, dual hot-swappable PS |
| | Monitoring: | Via WEB GUI and LED indicators on PS |
| Cooling | DMG 4100 chassis: | Single fan tray with 6 fans |
| | DMG 4200 chassis: | Single fan tray with 5 fans |
| | Airflow direction: | Front to back |
| | Hot swap support: | Yes, complete fan tray |

## ENVIRONMENTAL CONDITIONS

| | | |
|---|---|---|
| Operational conditions | Temperature: | 0 to +40 C |
| | Humidity: | 5–95% (non-condensing) |
| Storage | Temperature: | -20 to +70 C |
| | Humidity: | 5–95% (non-condensing) |
| Safety standards | Electric safety: | IEC 60950-1 |
| | EMC: | EN 55032, EN55024, EN61000-3-2, |
| | | EN61000-3-3, FCC CFR 47 Part 15 |
| | RoHS: | Compliant |
| | WEEE: | Compliant |

*One 5.1 uses three 2.0 resources. One 7.1 uses four 2.0 resources*

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**** Denotes a future software option*