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gateway ▸▸▸▸ better video delivery

sencore

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.

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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:

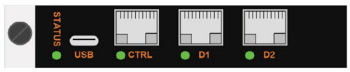
- Multicast forwarding (IGMP join and forward)
- Inspect and forward MPEG-2 TS packets (deep layer 5/6 packet inspection)
- De-multiplex MPEG-2 TS streams
- Encryption and decryption of video data
- Seamless network protection according to SMPTE 2022-7
- Encode and decode SMPTE 2022-1 supplementary FEC

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



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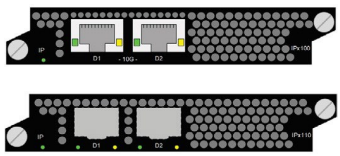
SFP+

DMG 4200	140 Gbps full duplex
Total capacity:	10 Gbps routing between modules in a chassis
Bitrate:	2 1/10G Base-T Ethernet or SFP+ 2x 1G Base-T
Interface:	Ethernet IPv4, IPv6, IGMP v2/v3, ICMP, ARP, 802.1Q
Protocols:	(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-
Clock Options:	generation 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
Frequency range:	Services
Modulation:	L-band (950 – 2150 MHz)
Symbol rate:	QPSK, 8PSK, 16APSK, 32APSK, 64 APSK, 128 APSK, 256 APSK
Descrambling:	Up to 64 MBaud
TS Processing:	BISS 1 Mode 1/E, BISS2 Mode 1/E, BISS CA
	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 (optional):	(redundancy) 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

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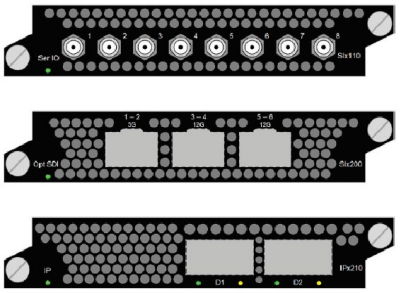
SDI/2110/2022-6 IO

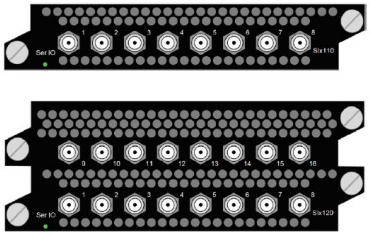
Connectors:	8x HD BNC 75 Ohm (SIx110) 3x Video SFP (Non-MSA Dual rx/ Dual Tx) (SIx200) 2x QSFP (10GbE, 25GbE or 40GbE) (IPx210)
Video Format:	12G-SDI (SMPTE 2082) 3G-SDI (SMPTE 424M) HD-SDI (SMPTE 292M) SD-SDI (SMPTE 259M)
Data flow:	Input or output
Codecs – encoding/decoding:	Uncompressed, TICO, JPEG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

** IPx210 currently supports uncompressed and JPEG XS*



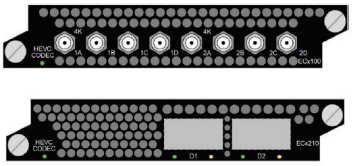
ASI IO

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 encapulation:	TS
TS Processing:	De-multiplexing, Multiplexing, Service and PID filtering, PSI/SI re-generation



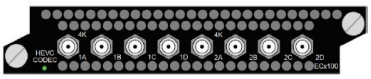
HEVC Encoder

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



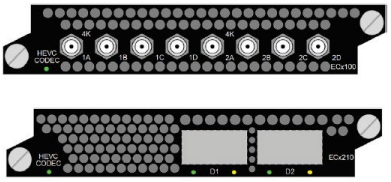
HEVC Transcoder

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



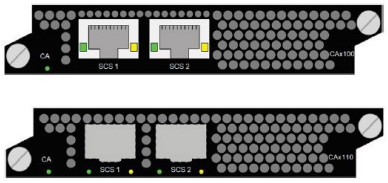
HEVC Decoder

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



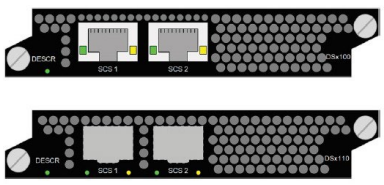
Scrambler

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)



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)	

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	

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
	Output redundancy:	Automatic mute or switch to RF backup on error. Reverting or “switch once” mode
Additional features	DC output:	24V, max 500mA
	10MHz reference output:	0dBm +- 2dB
	Carrier ID:	DVB
	Precorrection:	Static linear gain and group delay
	Number of DVB-S outputs	
Licensed Features:	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	

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 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 : 8 MPEG-4 AVC/HEVC HD/SD 2 HEVC UHD	6 MPEG-2 HD/SD
	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) Frame accurate key frame alignment across all profiles Fixed IDR to IDR distance.
	Key Frame Alignment :	
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)**
	Audio Downmix:	Dolby E**
Audio Encoder	Audio CODECS:	Multichannel audio (5.1 or 7.1) can be downmixed to 2.0 as part of transcode process.
		MPEG-1 Layer 2
		AAC-LC
		HE-AAC v1/2
		Dolby Digital / Dolby Digital Plus**
	Audio Channel Modes:	Pass though of all audio types
	AAC Data Encapsulation:	Stereo, Mono
	Audio Lipsync Adjustment:	ADTS or LATM selectable per encoded channel
	Audio Level Adjustment:	+500ms /-200ms
	Audio Transcode Density:	+20/-20dB
		Limited to 24 stereo (2.0) transcodes per module.
		One 5.1 transcode consumes resources equivalent to three stereo (2.0) transcodes
Audio Leveling	Long Term Loudness Levelling:	One 7.1 transcode consumes resources equivalent to four stereo (2.0) transcodes
	Short Term Loudness Levelling :	EBU-R128 / ATSC A/85
	Peak Loudness Levelling:	EBU-R128 / ATSC A/85
Picture-in-Picture	Resolutions :	Limits sample peaks based on the configured threshold
	Codec:	All available ABR resolutions
VBI	Digital Program Insertion (DPI):	MPEG-4 AVC and HEVC (ref coder specification above)
		SCTE35 passthrough
	Pass-through:	I-frame insertion based on SCTE35 marker***
		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: (sum all CA systems)	16000
	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*
*** Dolby Audio™. Dolby, Dolby Audio, and the double-D symbol are trademarks of Dolby Laboratories.*
**** Denotes a future software option*