

# Dual channel video analytics encoder “MagicBox” datasheet

## 1. Product overview

### 1.1 Introduction

MagicBox encoder is a high performance, temperature hardened, ONVIF compliant, video analytics device for mission critical customers in Border Security, Transportation and Energy Infrastructure.

The intelligent encoder features Fast Ethernet network connection, two analogue video inputs, two managed analogue outputs, bidirectional audio communication and digital I/O interfaces.

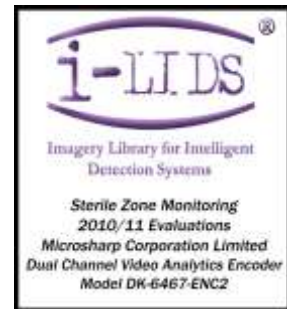
The device delivers DVD-like quality video and analytics metadata from analogue cameras to ONVIF network video clients (NVC).



### 1.2 Embedded video analytics

MagicBox is self contained video analytics machine enabling robust object detection in an outdoor environment, rule-driven event recognition and advanced tracking features such as multiple camera tracking, real-time map positing and PTZ camera targeting.

The encoder is i-LIDS<sup>®</sup> approved primary detection system both for operational alert use and event recording in sterile zone monitoring applications. i-LIDS<sup>®</sup>, the Image library for intelligent detection systems, is the UK government’s benchmark for video analytics systems. The encoder is listed under the model name of DK-6467-ENC2 in the UK Government’s catalogue of approved security equipment.



MagicBox embedded video analytics is optimized to run on DSP at the native resolution and frame rates to ensure maximum accuracy. This concept of embedded analytics ensures scalability and avoids bottlenecks in large networks.



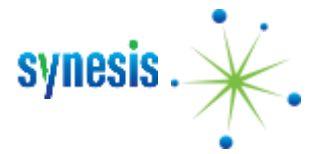
### 1.3 Native ONVIF support

The encoder is based on ONVIF, the global standard for the interface of IP-based physical security products. The ONVIF specification ensures interoperability between MagicBox and video management systems (VMS), network video recorders (NVRs) and other third-party products.



Unlike competitor encoders, MagicBox is natively based on ONVIF and use no other proprietary protocol for its advanced functionality. All the following features are implemented in accordance with the ONVIF standard:

- 1) Network device discovery
- 2) Live video streaming



- 3) Video compression configuration
- 4) Video analytics configuration
- 5) Event and metadata configuration
- 6) Rule management for alerts
- 7) Secure firmware update
- 8) Local storage / network storage recording
- 9) PTZ camera control

#### 1.4 Open source ONVIF Device Manager and ONVIF NVC Library

ONVIF Network Video Client (NVC) Library implements the protocol to manage video analytics devices such as MagicBox. Based on the library, ONVIF Device Manager is a Windows application providing the graphic user interface (GUI). Both the application and library are developed by Synesis and released to the public domain under GNU GPL. This free software is written in C# are useful to implement video analytics GUI in third-party systems. The source code and binaries are available at <https://sourceforge.net/projects/onvifdm/>.

#### 1.5 Customization options

The encoder can be customized both on the ARM side (Linux-based middleware) and DSP side (video analytics and codecs). Examples of customization include custom protocol handling (in addition to ONVIF), third-party device support (over USB and RS485 interfaces) and custom video analytics.

#### 1.6 Main profile H.264 encoding

The encoder features high quality H.264 (MPEG-4 Part 10 / AVC) with Main Profile (MP) and Basic Profile (BP) and Variable Bit Rate (VBR) control algorithm targeting low latency applications.

#### 1.7 Heavy duty design

The encoder operates in the extended temperature range between -40°C and 50°C with electrostatic protection and backup power supply.

#### 1.8 Hardware configuration options

MagicBox is available in single or dual channel versions. Electronic boards can be supplied without the aluminium case to be fitted in camera enclosures. Instead of PAL/NTSC decoder, a high definition (HD) sensor front-end can be connected to the encoder over its digital interface.

## 2 Specifications

### 2.1 Hardware

#### 2.1.1 Analogue video inputs and outputs

Video inputs	2 x BNC 75 ohms Composite (M, J) NTSC, NTSC 4.43, (B, D, G, H, I, N, M) PAL, (combined-N) PAL, PAL 60, SECAM
LED indicators	Green on – video signal present Green flashing – video signal lost Orange on – device not ready Orange flashing – video analytics event

### 2.1.2 Analogue audio inputs and outputs

Audio input	1 x Camp single channel line-in or mic-in (combined) with automatic gain
Audio output	1 x Camp stereo line-out with gain control 16 ohms, 30 mW

### 2.1.3 Network interfaces

Network interface	1 x 10/100 Base-T, auto-sensing, half/full duplex, RJ45
LED indicators	Green on – connection present Green flashing – data transmission
Power over Ethernet	POE (option)

### 2.1.4 Digital inputs and outputs

Alarm inputs	2 x Clamp Normally open or normally closed DC up to 60B 1V AC up to 125B 0.6V
Relay output	2 x Clamp Normally open DC up to 60B 1V AC up to 125B 0.6V
DC output	9 – 14V 100 mA

### 2.1.5 Serial interfaces

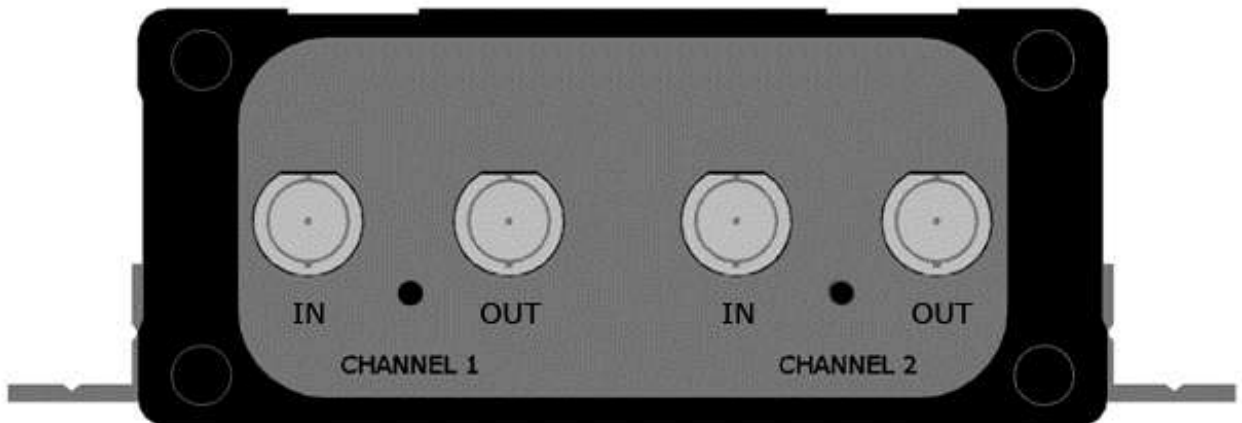
USB	1 x USB type A (host) USB 2.0, client specification 2.3
RS422/RS485	1 x Clamp Up to 1 Mbps half duplex
RS232	Isolated $\pm 50V$ , up to 250 Kbps

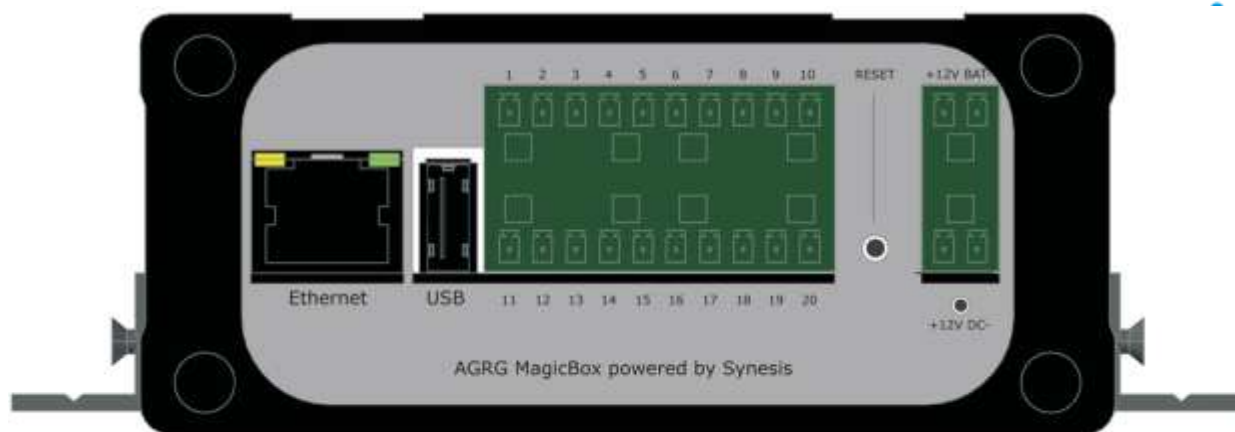
### 2.1.6 Resilience features

Loop through analogue video	Video channels are automatically switched to the loop-through mode upon complete power loss.	
Electrostatic discharge (ESD) protection	Video input/output	$\pm 2$ kV
	Ethernet network	$\pm 2$ kV
Thunderstorm protection	Video input/output	
	10/1000 $\mu s$ impulse	1000 V, 100 A
	2/10 $\mu s$ impulse	5000 V, 500 A
	Ethernet network	
	10/1000 $\mu s$ impulse	1000 V, 100 A
	2/10 $\mu s$ impulse	5000 V, 500 A
Backup power	Automatic switch to backup power upon main power loss Automatic backup battery charging from main power	
Polarity reversal protection	Main power polarity reversal protection	
Factory reset	Panel button	

### 2.1.7 Power and operating environment

Power	12V DC +/-10% main power PoE (option) 12-14 V DC backup battery	
LED power status	Green on – main power Orange on – battery power	
Power consumption (12 V DC)	Without battery and without external device	7W
	Without battery and with USB device	12W
	With battery and without USB device	19W
	With battery and with external device	20W
	With battery, with USB device and with external device	30W
Power consumption (PoE+)		24W
Operating temperature range	- 40° ... +50° C	
Storage temperature range	- 50° ... +70° C	
IP code	IP54	
Dimensions	187x110x48 mm (without wall mount) 187x140x48 mm (with wall mount)	
Weight	515 g ( without wall mount) 700 g ( with wall mount)	





### 2.1.8 Camp connector specification

Digital input	1	GND
	2	GND
	11	IN2
	12	IN1
Power out	3	12 L
	4	GND 12L
Audio	5	Audio L
	6	Audio GND
	7	Audio R
	8	Mic In
	9	Mic GND
RS232	10	REMOTE GND
	19	TX
	20	RX
Digital output (Relay)	13	Ext In2
	14	Ext In2
	15	Ext In1
	16	Ext In1
RS485	17	A
	18	B

### 2.2 System software

Operating system	Linux kernel 2.6.18, libc 2.5.90 MontaVista Linux 5.0, BusyBox v1.9.1
Application software	Synesis MW-ONVIF-NVT
Network video protocol	ONVIF 1.02 (upgradeable to ONVIF 2.0)
Supported services	1) Network device discovery 2) Live video streaming 3) Video capture configuration 4) Video compression configuration 5) Video analytics configuration 6) Event and metadata configuration

	7) Rule management for alerts 8) Firmware update 9) Local storage / network storage recording 10) PTZ camera control
Network protocols	Data: RTP, UDP, TCP, IP, RTSP, RTCP, HTTP, XML Management: ONVIF 1.02, DHCP, SSH, Telnet General: DHCP, DNS, ICMP, IGMPv3, ARP, NTP, QoS
Firmware upgrade protocol	ONVIF 2.0 (HTTP POST)
PTZ-camera control	ONVIF 1.02 to Pelco D, Pelco D Extended over RS485 Automatic camera targeting using video analytics

### 2.3 Embedded video analytics

Scenarios	1. Perimeter security / sterile zone 2. Railway safety/security 3. Automatic camera targeting 4. Multiple camera tracking
Algorithms	N. Ptitsyn, <i>Embedded video analytics for object detection and tracking using multiscale features</i> , Proceedings of GraphiCon'2010, 20th International Conference on Computer Graphics, Computer Vision, Image and Video processing, Saint-Petersburg, 20-24 September 2010 <a href="http://synesis.ru/en/surveillance/contents/multiscale-va">http://synesis.ru/en/surveillance/contents/multiscale-va</a>
Maximum number of simultaneous targets	10
Performance indicators	$F_1 = 0.99$ for operational alert role $F_1 = 0.99$ for event recording role i-LIDS® approved primary detection system both for operational alert use and event recording in sterile zone monitoring applications
Tampering detectors	See section 2.4.2
Rule-based event recognition	See section 2.4.4
Control parameters	Contrast sensitivity (16 levels) Special sensitivity (16 level) Scene stabilization time Object dimension range Object speed range
Digital image stabilizer (antishker)	Multiple scale image analysis Quarter pixel estimation and compensation Shift compensation in both directions Moving object compensation
Output data	Event type, date and time Zone ID and name Object features: position (pixels), dimensions (pixels), $\mu$ speed (pixel/s), contrast [0..255] Annotated JPEG image with object bounding box and trajectory
Live video annotation	Data and time Camera name

	Device IP address Object bounding box Object trajectory Calibration map System information
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## 2.4 ONVIF event specification

### 2.4.1 Device event

Device started	
Device shutting down	
Power lost/ Power restored	
Firmware update started/ Firmware update completed	
Digital input	

### 2.4.2 Tampering events

Signal loss	
Image too bright	
Image too light	
Image too noisy	
Image too blurry	
View obstructed	
Camera redirected	
Global scene change	

### 2.4.3 Media (channel) events

Profile changed	
Video source configuration changed	
Video encoder configuration changed	
Audio source configuration changed	
Audio encoder configuration changed	
Video analytics configuration changed	

### 2.4.4 Rule-based video analytics events

Motion alarm	Zone entrance / zone leaving
Stop Alarm	
Speed Alarm	
Tripwire Alarm	
Abandoned Item Alarm	
Meeting Alarm	

## 2.5 Video streaming

Coders	H.264 (MP, BP), MJPEG
Overall latency	< 240 ms
Frame size	PAL (720x576), NTSC (720x480) 2x and 4x downscaling

Frame rates	1..25 fps (PAL), 1..30 fps (NTSC)
Bitrates	128 Kbps to 6 Mbps, CBR or VBR

## 2.6 Audio streaming

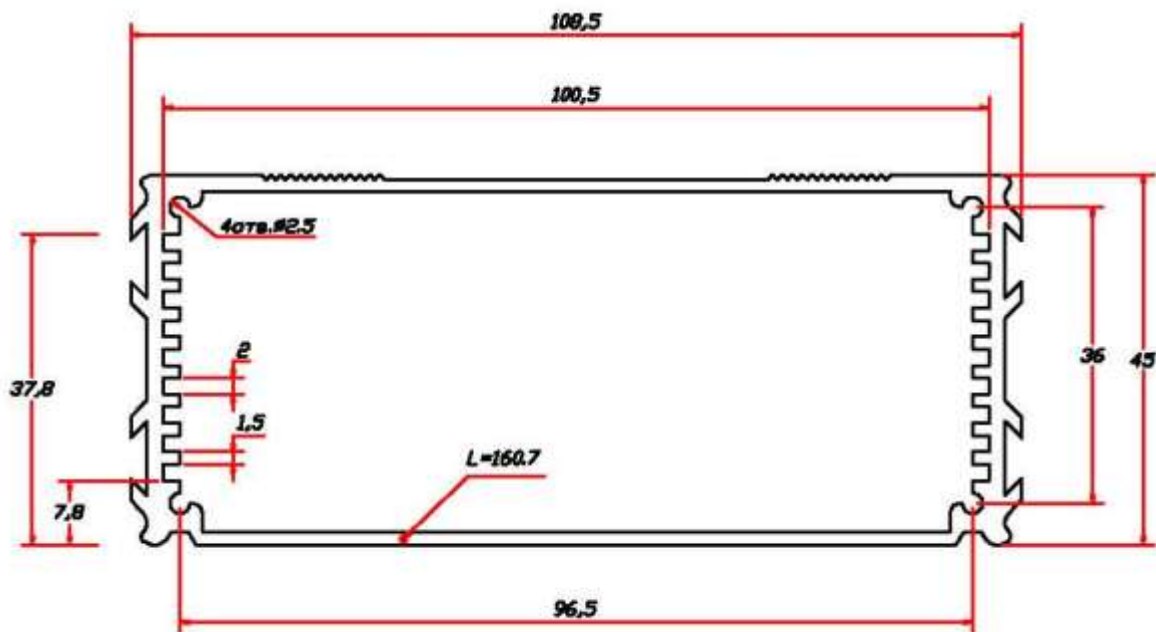
Audio coders	G.711, AAC
Bitrates	Up to 128 Kbps

## 2.7 Recording

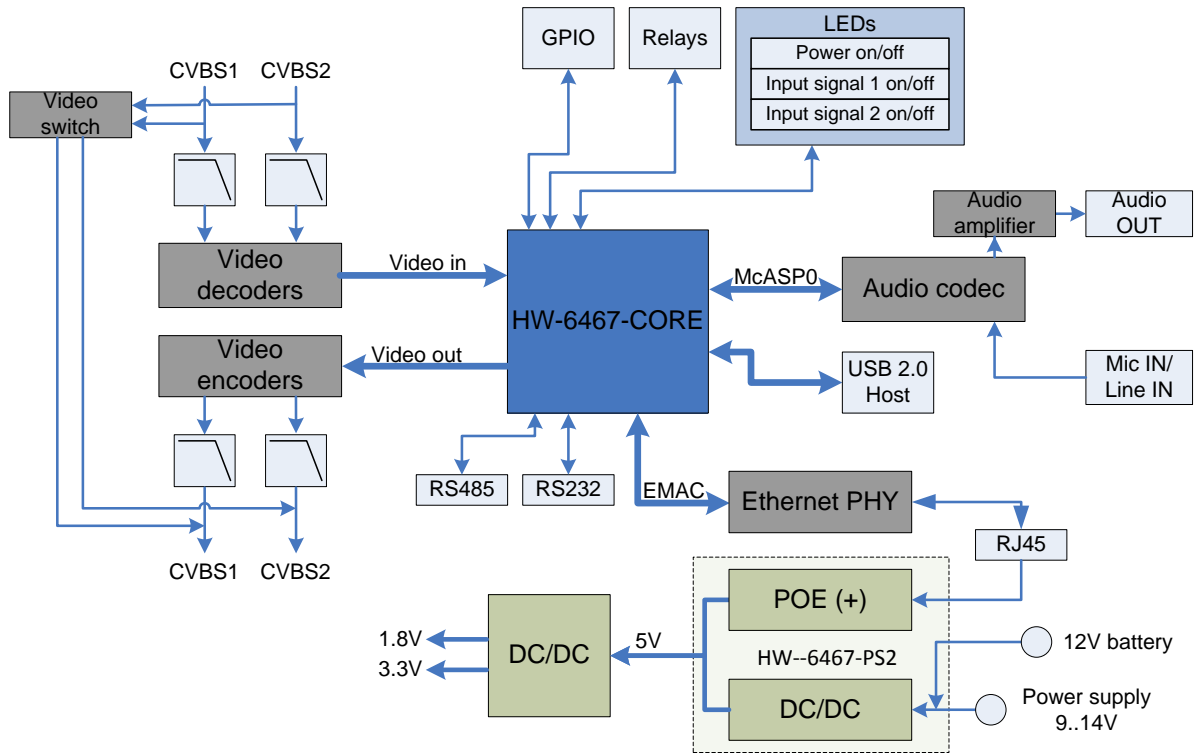
Record triggers	Video analytics event Digital input ONVIF event
Recording media	Network drive (NFS) Local drive (USB)
Pre-alarm buffer	Up to 30 s
Post-alarm buffer	Configurable
Container	.TS
Coders	See section 2.5

## 2.8 Management software

Application name	ONVIF Device Manager
Operating environment	.NET 4.0/Mono
Installers	Windows XP SP3 / Vista / 7
Source code	C# <a href="https://sourceforge.net/projects/onvifdm/">https://sourceforge.net/projects/onvifdm/</a>



Enclose profile for DIN-mounting (length 187 mm)



MagicBox circuit diagram