MFR-DB-ENC
User Manual

Dual Optical & Thermal PTZ Camera
With Encoded Output

Table of Contents

Document History

Version	Date	Change Summary
v1.00	25/05/2023	Initial Release based on MFR-DB
v1.01	19/11/2024	Updates to PTZ controller, ONVIF control and Fischer pin-out
v1.02	18/12/2024	Additional detail on thermal camera zoom messages

Warranty and Support

All Visual Engineering products are supplied as standard with a 12 month 'Return to Base' warranty.

Please note: Any unauthorised product disassembly, modification or the removal of tamper proof labels will void the warranty.

In the event of a suspected product failure, users should contact the Visual Engineering support team on the telephone number +44 (0) 1206 211842 or please email us at:

support@visualengineering.co.uk

Should the fault persist or if the support team are unable to resolve the fault, it may be necessary to return the equipment.

Equipment should only be returned using the RMA (Returns Management Authorisation) process. Users should contact the support team on the above number and request an RMA number.

Introduction

The MFR-DB-ENC is a dual band PTZ camera incorporating both an optical and a thermal camera. Housed in a very rugged environmentally sealed casing it is ideal for use in harsh environments.

It incorporates a Sony HD camera with a 30x optical zoom lens and a 63.7° wide angle of view.

The Flir thermal camera incorporates radiometric technology which delivers high precision temperature monitoring. It supports an 8x digital zoom and spot metering to further optimise the exposure control for each particular scenario.

The HD-SDI video signal output can be user switched between either camera as and when required. The zoom is synchronised between the two cameras, up to the maximum FOV capability of the thermal camera. This allows convenient switching between the two camera views.

Speeds are zoom factor corrected, giving fine control over the entire range of the lens with pan speeds up to 100º per second.

The MFR-DB-ENC has absolute position feedback and therefore has the ability to self correct its actual position if external forces act upon it. User presets can be saved allowing PTZ framing and camera racking profiles to be easily recalled.

The encoded video output is an ONVIF profile S & T compliant stream for use in IP networks. There are several encoding options including H265 and H264. Streaming also offers several options including RTSP and UDP. Down-scaling of the encoded image is possible to match backhaul bandwidth limitations.

Remote control of the camera is through VISCA protocol over USB or a RS232/RS485 serial connection. Extended control of the Flir camera is supported an adapted pass-through protocol.

All power, data and video signals are through the Fischer MiniMax connector on the camera's base. The outer casing is manufactured from aluminium. All external mating surfaces are gasket sealed to maintain its IP67 rating.

Connections

Power & Ethernet Cable

Supports a network connection to the MFR-DB-ENC camera.

Connect the Fischer connector to the base of the camera and the RJ45 connector to the LAN.

Connect the supplied PSU into the remaining connector to power the camera

Power Comms Cable

Supports a RS232/RS485 serial connection to the MFR-DB-ENC camera.

Connect the Fischer connector to the base of the camera and the D-Type connector to a serial comms source.

Connect the supplied PSU into the remaining connector to power the camera.

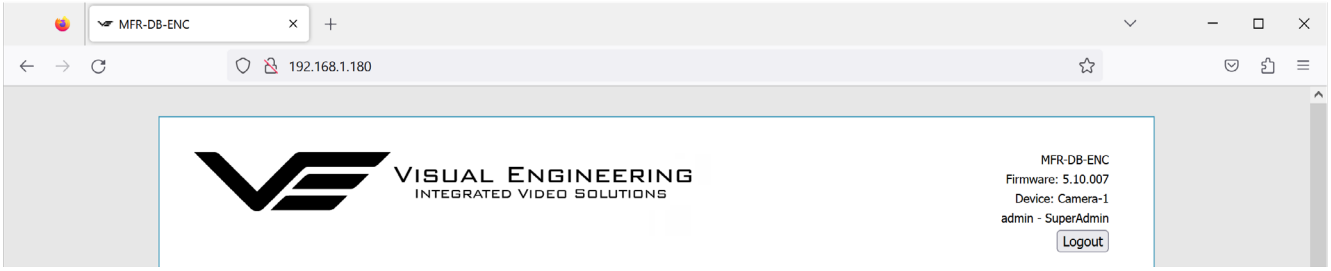
Connecting to the Encoder

Once the camera is powered it is possible to view the camera's video and configure the encoder's parameters over an IP connection to a PC.

The web browser control of the camera's encoder allows the configuration of parameters such streaming methods, video codec as well as network settings. Once saved all configuration changes will be retained.

For best results Firefox or chrome web browsers are recommended.

Browse to the camera's web page by typing the camera's IP address into the web browser address bar.



Default IP Addresses

MFR-DB-ENC cameras are by default set with a fixed IP address of either **192.168.1.120** or **192.168.1.121** this is detailed on the camera's part number label. The default control port is 2000.

If the camera is not responding on this address it is possible that the IP address has been changed. If the new IP address is not known it may be necessary to contact Visual Engineering to recover the location of the camera.

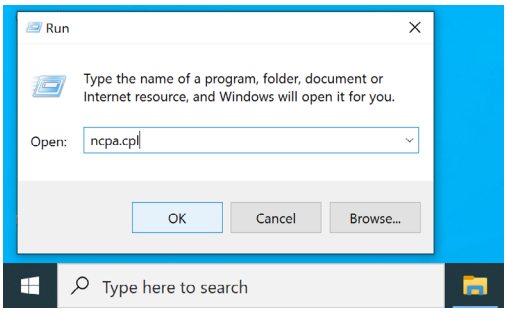
support@visualengineering.co.uk

Camera Login

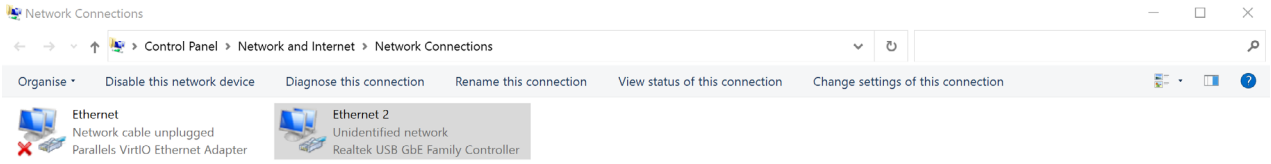
On trying to establish a connection if the user is prompted for login details the default password is **admin**

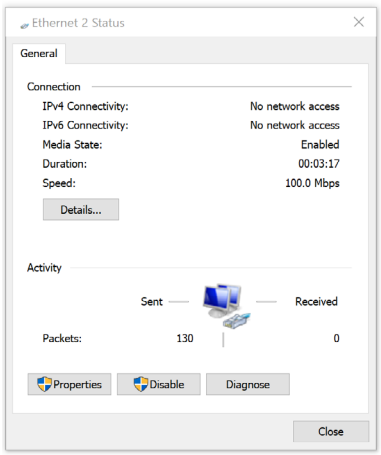
PC IP Address Configuration

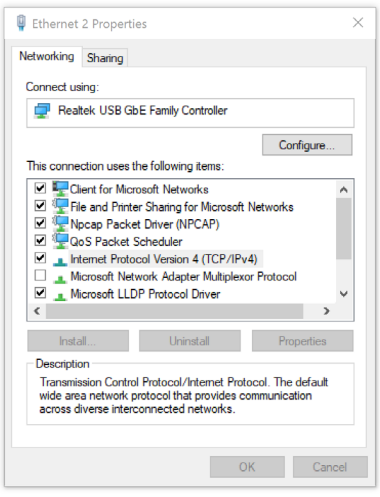
If you are connecting the camera via Ethernet directly to a computer, you will need to configure the PC's network adapter to use a static IP address, this can be done using the steps below:

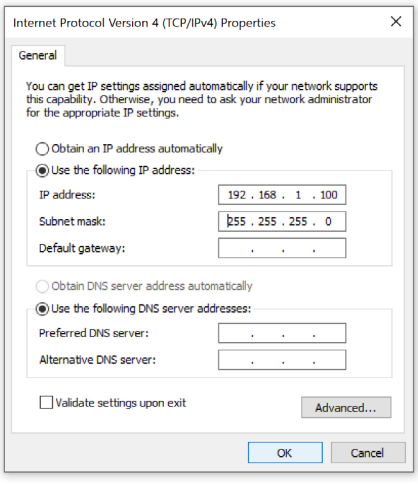


1. Open the Run app. (To do this, Press and hold Windows Key (W) on the keyboard, then press the "R" key)
2. Type the command "ncpa.cpl", then click OK.
3. Right click on the network adapter where the camera is connected to, then click "Properties". (If there are multiple adapters, the correct one can be identified by disconnecting the Ethernet cable from the camera, one of the adapters should now show "Network cable unplugged" and then upon reconnection of the cable it should eventually change to "Unidentified Network", this is the one connected to the Camera)
4. In the window that pops up, select "Internet Protocol Version 4 (TCP/IPv4)" then click "Properties".
5. Another window will now pop up, select "Use the following IP Address" and enter the following: IP Address: 192.168.1.100, Subnet Mask: 255.255.255.0
6. Click "OK".
7. Click "Close".









To re-configure to the original settings where the PC's IP address is obtained automatically follow the steps above except in step 5 select "Obtain an IP address automatically"

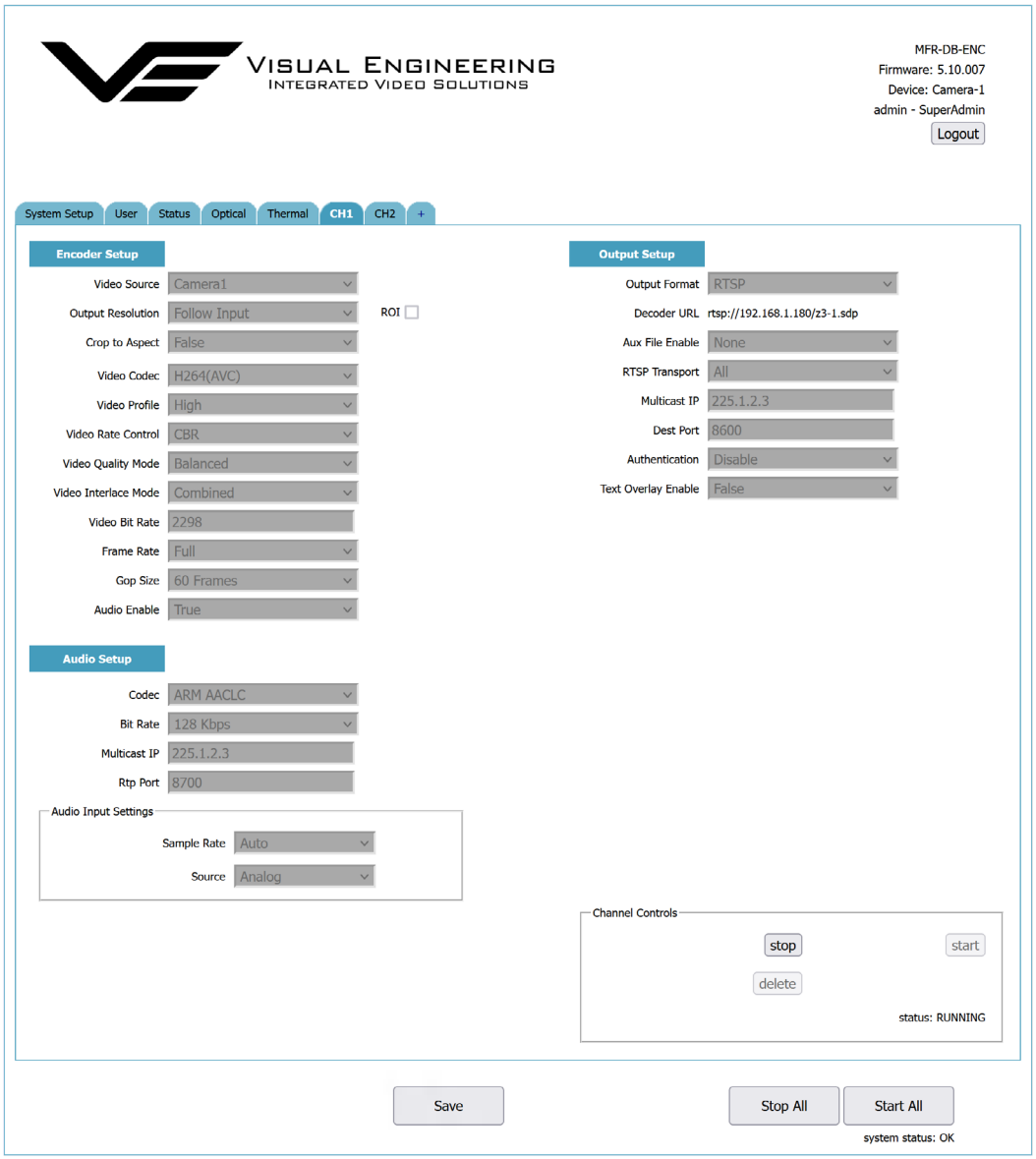
Encoder Web Page Control

On the initial connection to the encoder's web page the **CH1** tab is loaded.

The **CH1** tab allows control of the **Optical Camera** stream.
The **CH2** tab allows the control of the **Thermal Camera** stream.

In the screen grab below the **CH1** settings are greyed out and the status shows RUNNING, therefore the optical camera is streaming video as described in the settings.

Control and adjustments to these settings are described in the Video Streaming section.

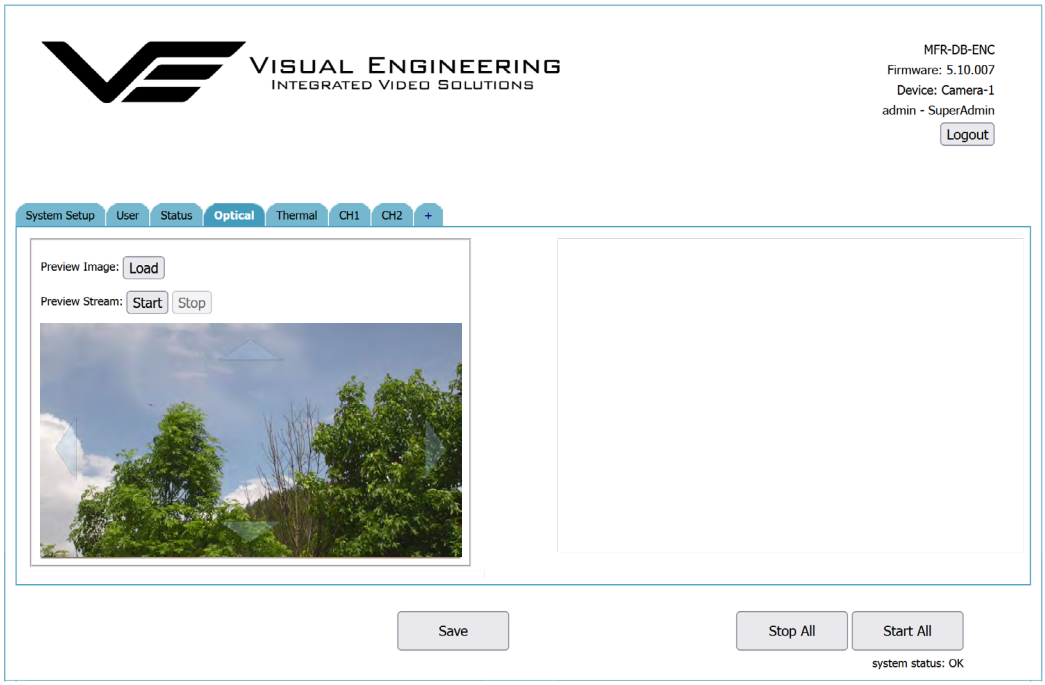


The Optical tab displays a preview panel of the video from the optical camera.

Load a still image using the Preview Image Load button, the image can be saved to the PC with a right click.

Start the Preview Stream button to view the video.

PTZ control of the camera and other camera functions including exposure, colour adjustment and camera orientation are to be included in the web page control as a future firmware upgrade.



The Thermal tab allows the thermal camera's image to be previewed.

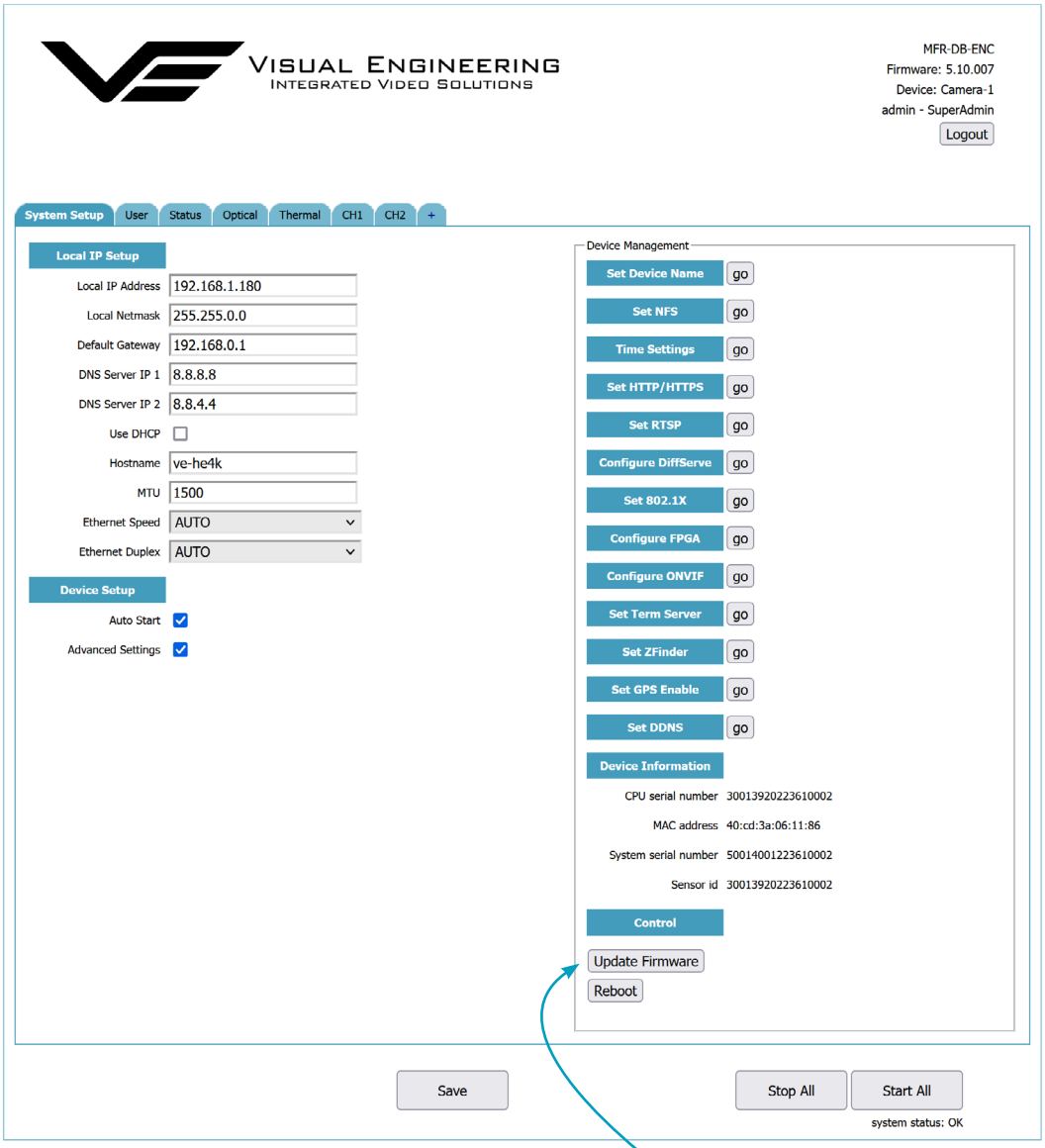
Load a still image using the Preview Image Load button, the image can be saved to the PC with a right click.

Start the Preview Stream button to view the video.

The System Setup tab allows changes to the IP setup of the encoder. The cameras are shipped with static IP addresses as detailed in the Default IP Addresses section.

The Device Management section allows the configuration of parameters such as the Device name, Time Settings, HTTP and RTSP port numbers.

Several options available, such as Configure FPGA, are not required to be adjusted and may cause problems with the cameras operation. If unsure please first check with Visual Engineering before making changes.



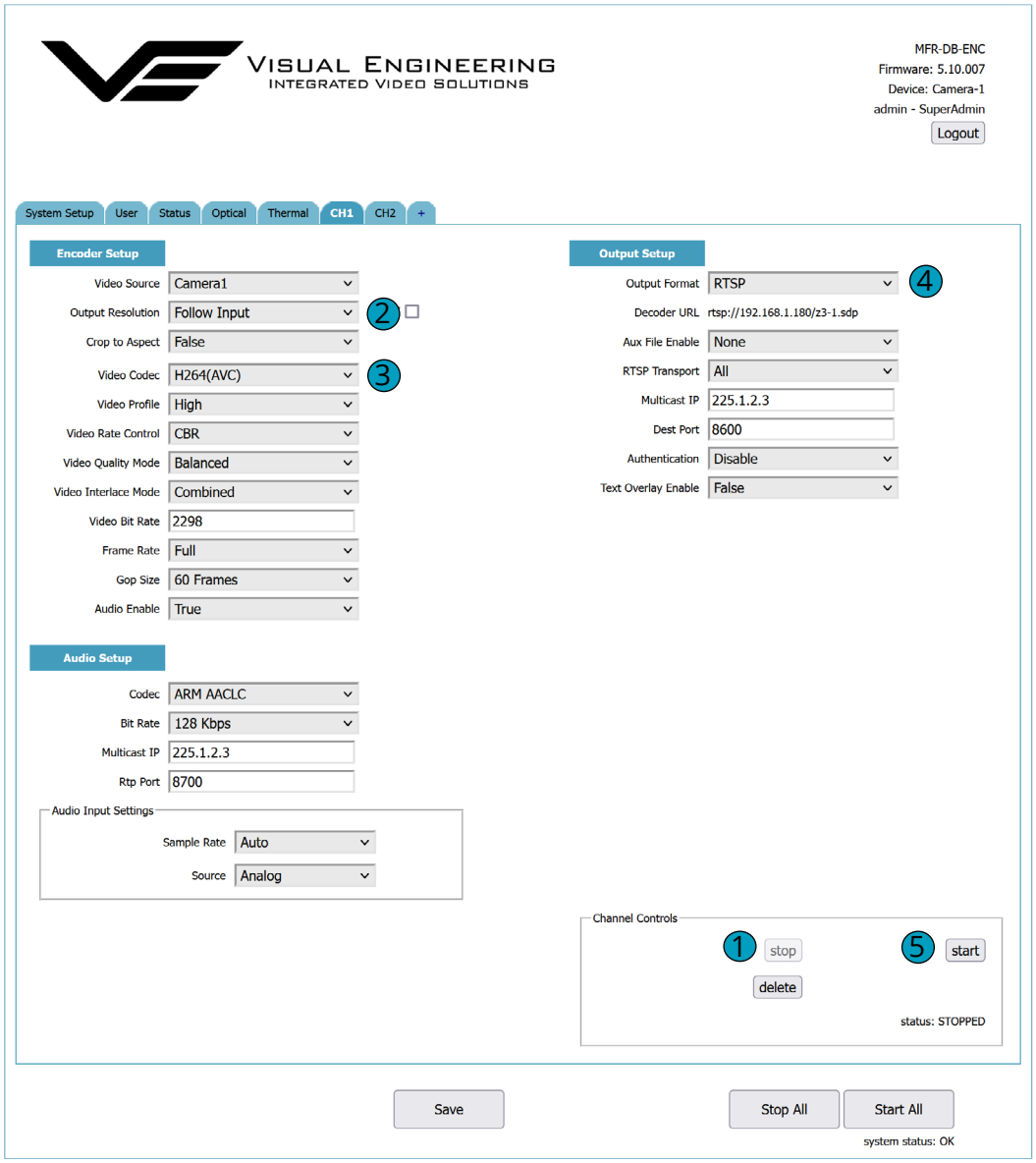
It is possible to update the firmware in the encoder using the Update Firmware button, only update with files sourced from Visual Engineering. Follow the procedure described on screen to complete the update.

Video Streaming

RTSP Streaming Configuration

The Camera's encoder is capable of streaming video in multiple formats. To configure a RTSP format stream select the CH1 tab and follow the steps below:

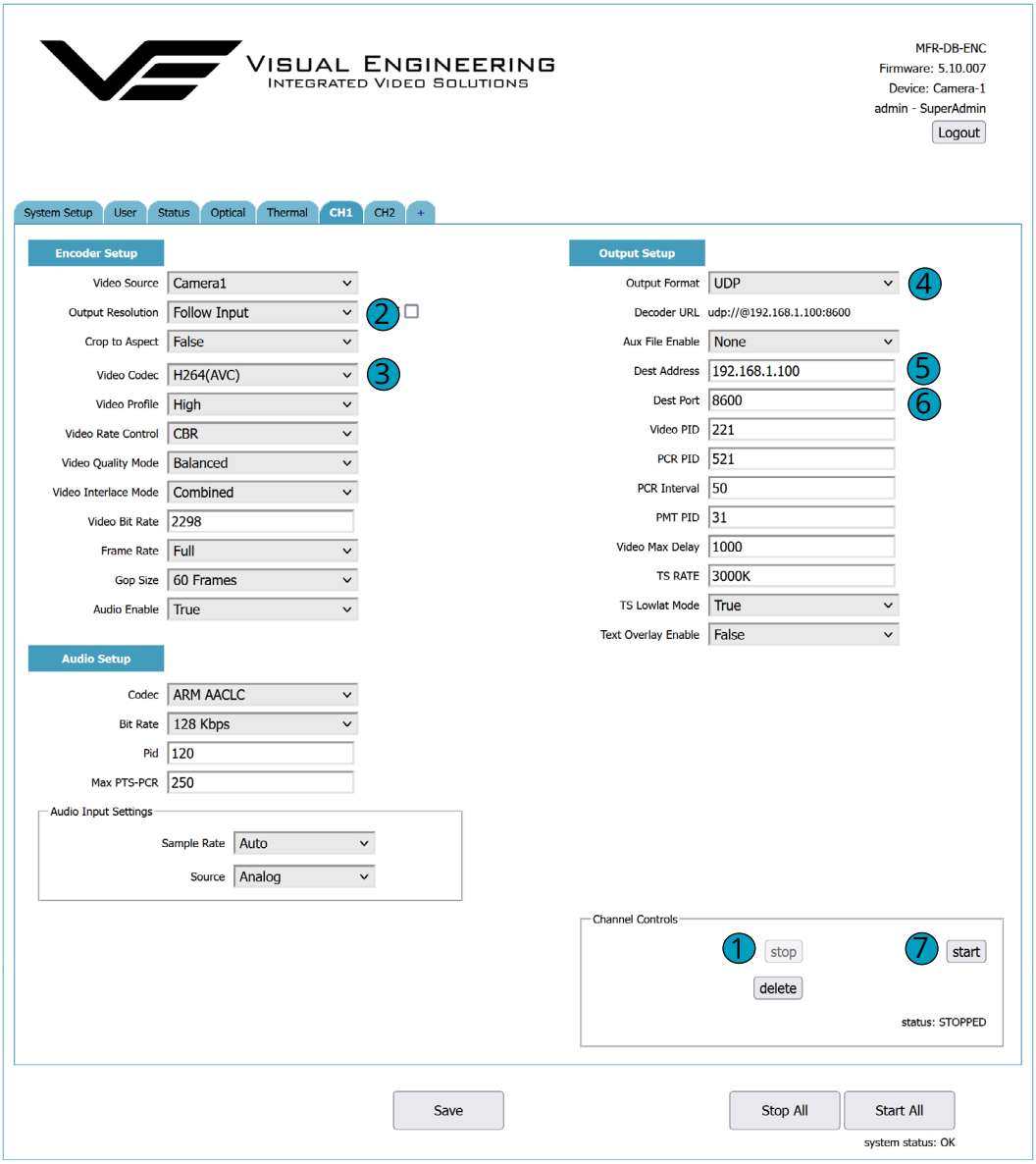
1. Click Stop to enable parameter editing, the status will display STOPPED.
2. Set Output Resolution - Follow Input will output a HD stream, selecting a lower resolution will downsize the video output.
3. Select Video Codec - H265, H264 or MJPEG.
4. Select RTSP Output Format.
5. Click Start to begin the stream, the status will change to RUNNING.



UDP Streaming Configuration

To configure the encoder to stream in UDP format select the CH1 tab and follow the steps below:

1. Click Stop to enable parameter editing, the status will display STOPPED.
2. Set Output Resolution - Follow Input will output a HD stream, selecting a lower resolution will downsize the video output.
3. Select Video Codec - H265, H264 or MJPEG.
4. Select UDP Output Format.
5. Set Dest Address to either the IP address of your PC that will be running the media player or a multicast address (e.g.. 225.1.2.3) In this example 192.168.1.100 is used.
6. Note the Dest Port, the default is 8600.
7. Click Start to begin the stream, the status will change to RUNNING.

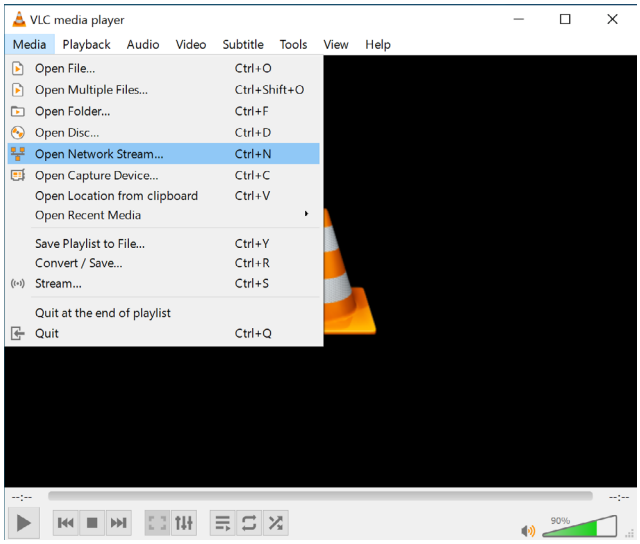


View Video Stream

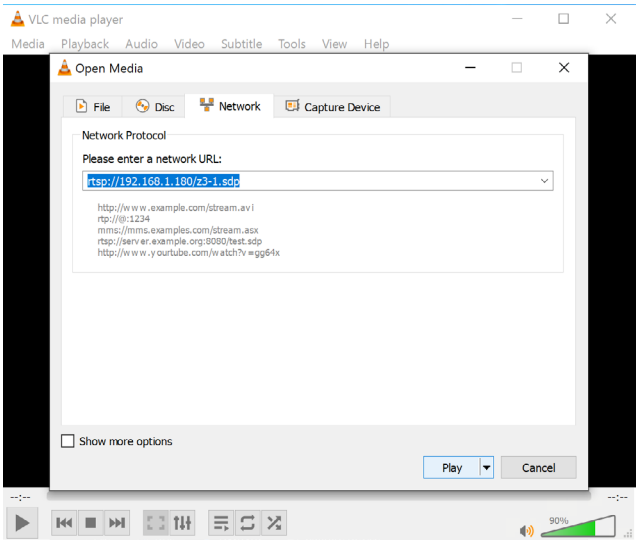
All streaming formats are compatible with many media players. VLC is a freeware media player which can be downloaded from: http://www.videolan.org/vlc/index.en_GB.html

RTSP Stream

To stream an RTSP stream using VLC player select Open Network Stream in the Media menu.



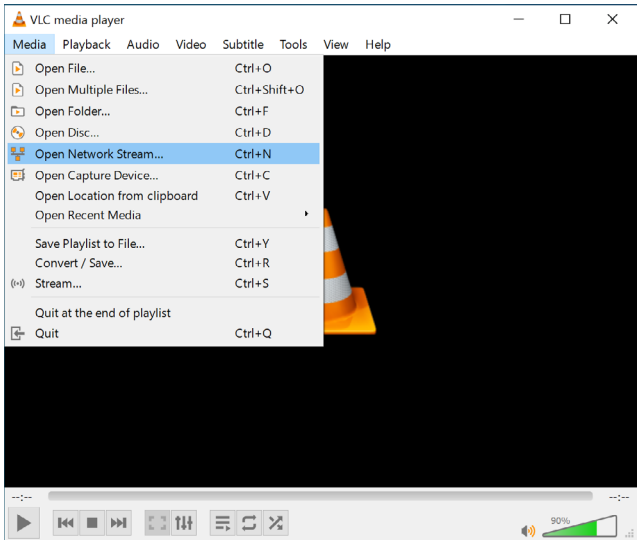
Enter the following URL:
rtsp://192.168.1.180/z3-1.sdp
Substitute the actual IP address of the encoder in place of **192.168.1.180**



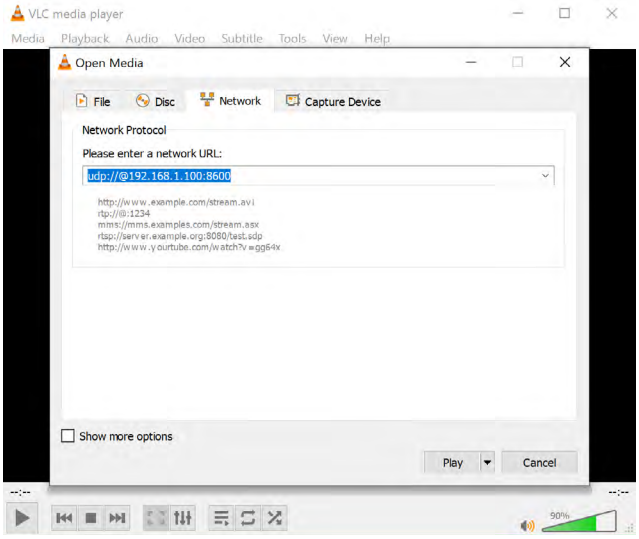
The RTSP video stream can then be viewed.

UDP Stream

To stream an UDP stream using VLC player select Open Network Stream in the Media menu.



Enter the following URL:
udp://@192.168.1.100:8600
Using the IP address and port number as set in the UDP Streaming Configuration section.

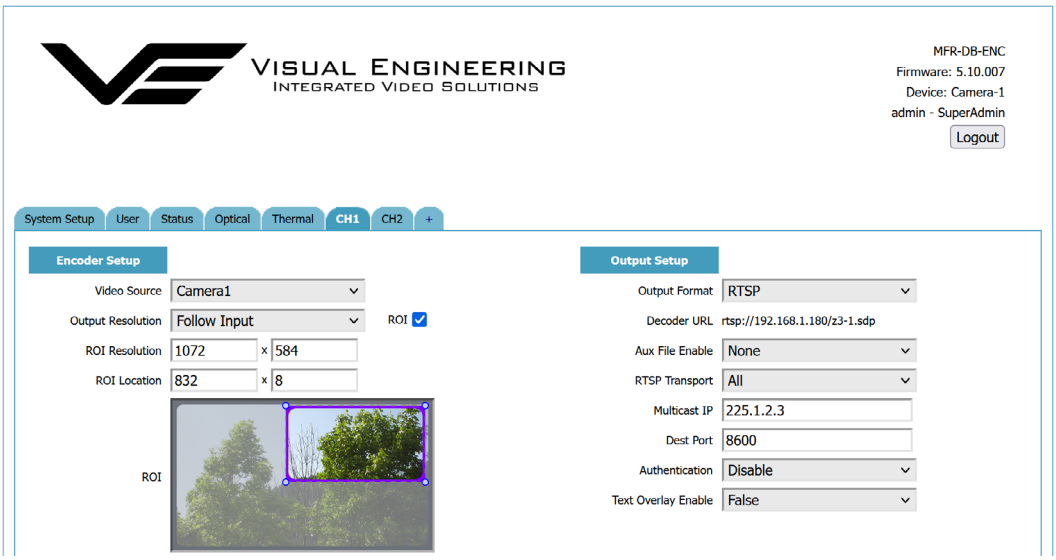


The UDP video stream can then be viewed.

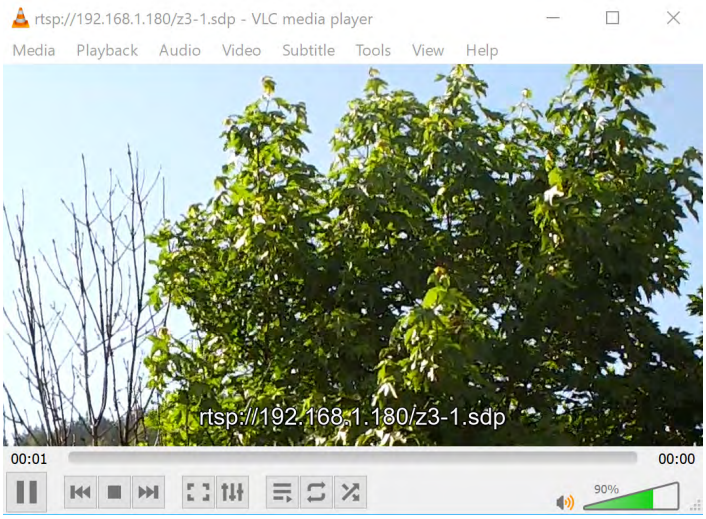
Region of Interest

The encoder allows for the encoding of a Region of Interest (ROI). This allows the encoding of only a specified region of the video.

- Click on the CH1 tab and stop the stream.
- Check the ROI checkbox. ROI options will appear below the checkbox, including a screen-shot.
- Resize the selection box as desired.
- When satisfied click Start to begin encoding. Only the selected area will be encoded.



The encoded stream includes just the Region of Interest.

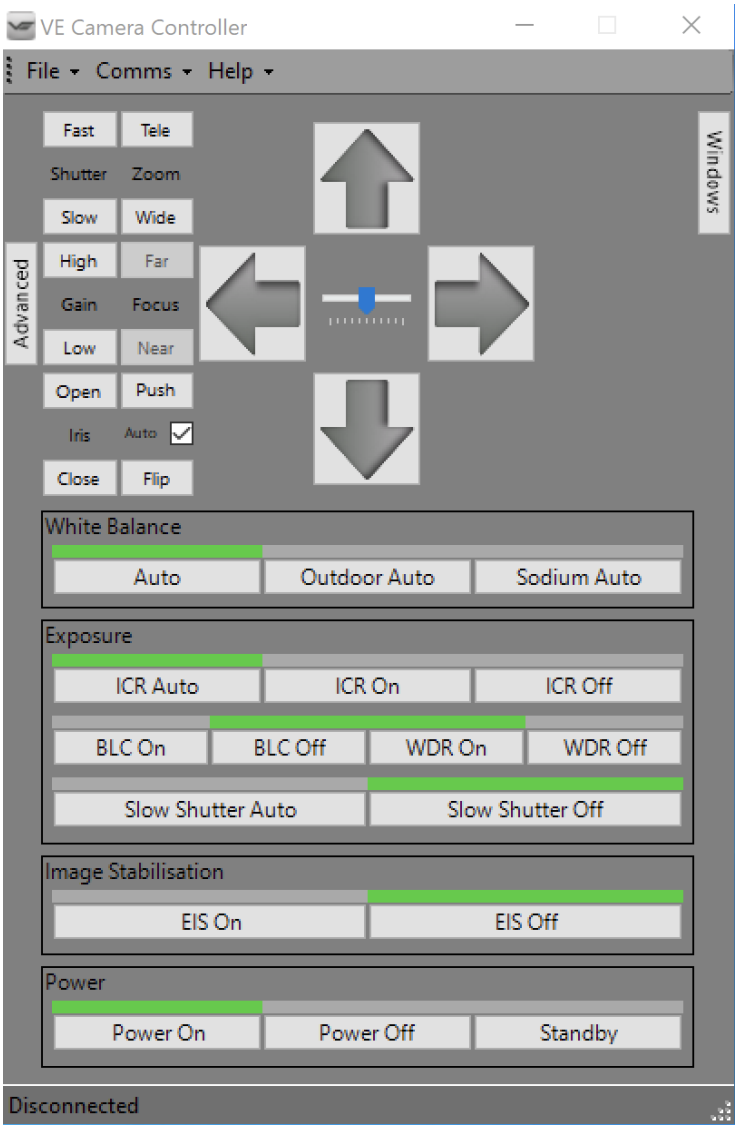


PTZ Controller

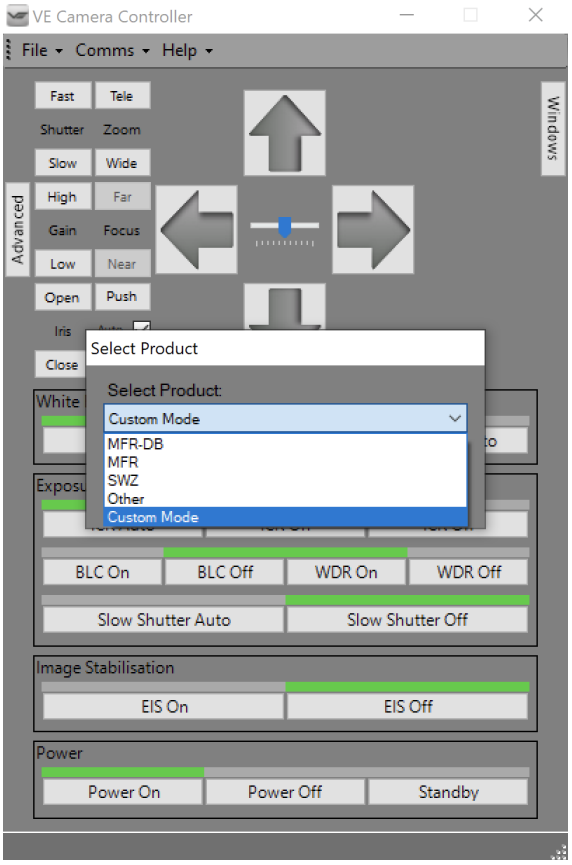
Communication to the MFR-DB-ENC camera uses the Sony VISCA protocol.

The camera can be controlled over either serial comms or TCP/IP using the VE Camera Controller software, which can be downloaded from here:

www.visualengineering.co.uk/supportdownload/9

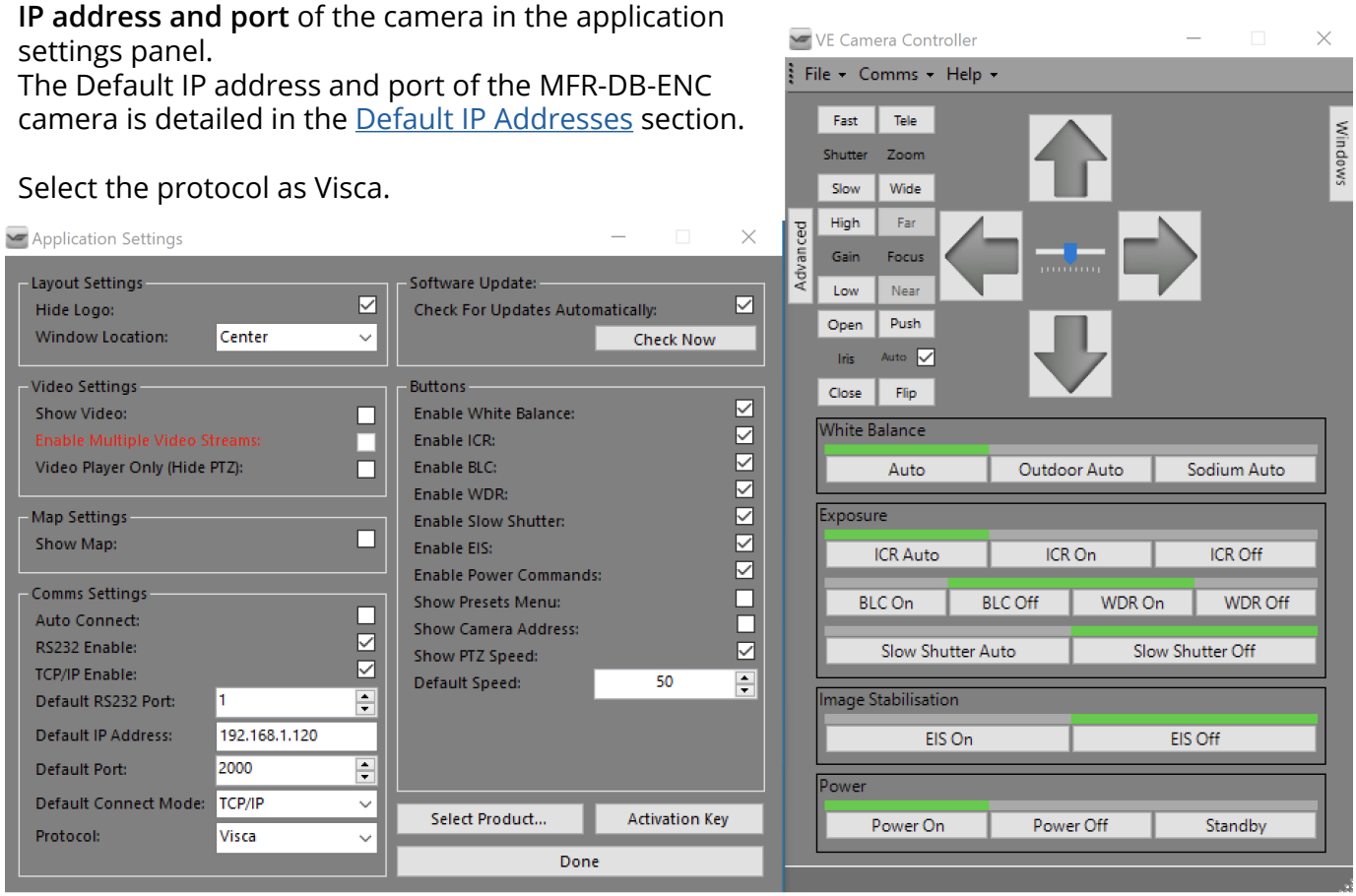


To configure the connection: **File > Select Product**, then select Custom Mode from the drop down menu.

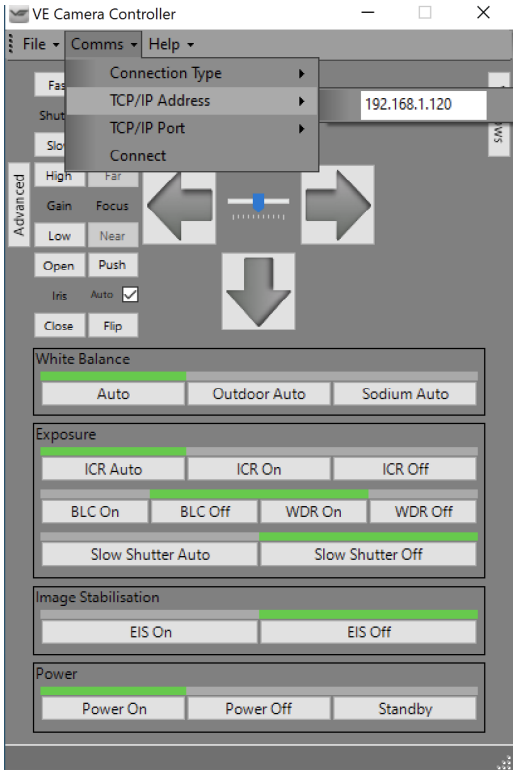


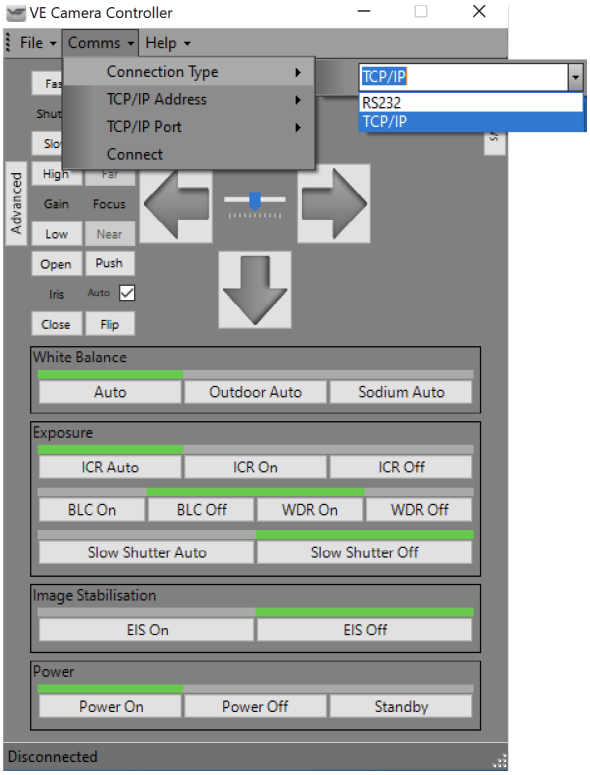
If connecting to the camera using TCP/IP enter the **IP address and port** of the camera in the application settings panel.
The Default IP address and port of the MFR-DB-ENC camera is detailed in the Default IP Addresses section.

Select the protocol as Visca.



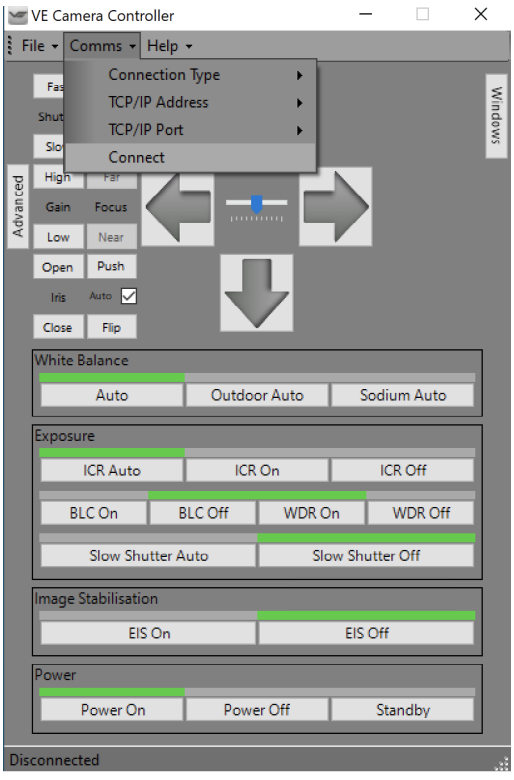
Ensure the TCP/IP Address and port are correct and select the Connection Type.
If connecting using serial RS232 comms ensure the baud rate matches the setting in Comm Port Options, the **default baud rate is 9600**.





Click to connect to the camera.

Once connected the PTZ functions of the software can be used to control the MFR-DB-ENC camera.



ONVIF

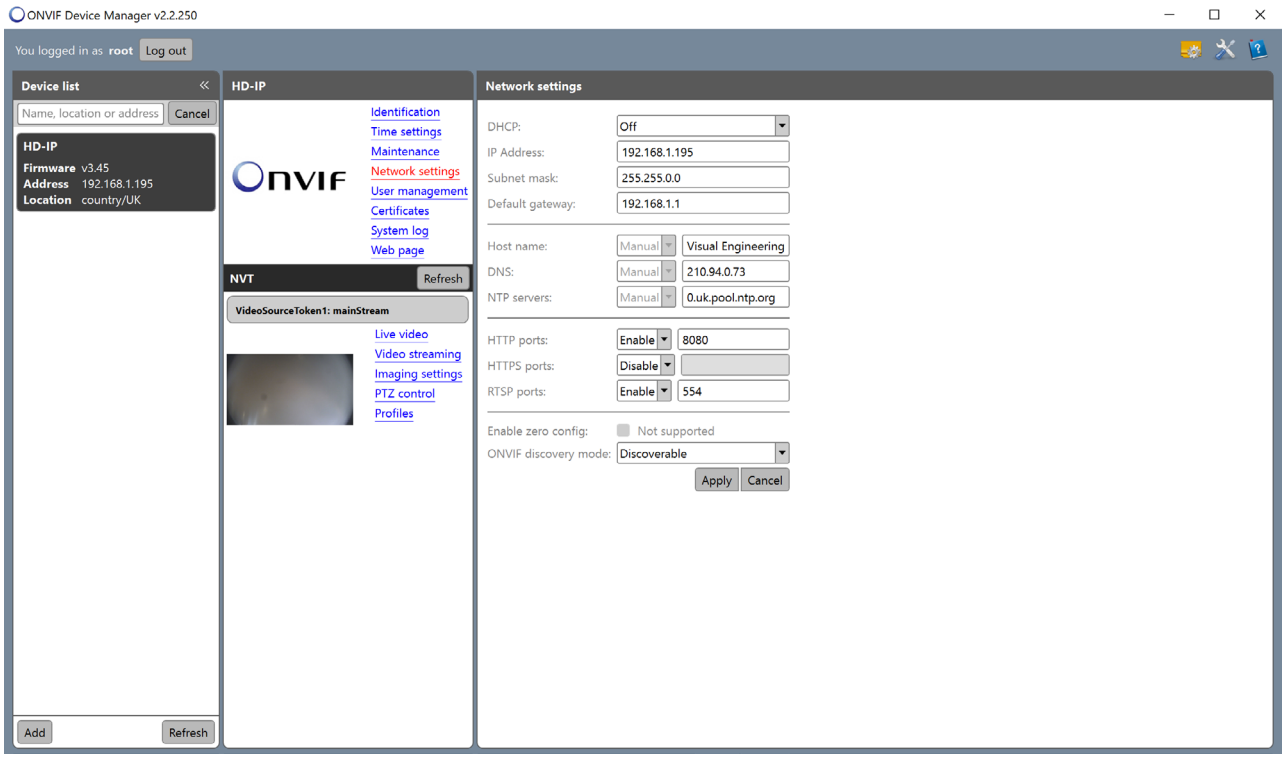
Video Management Systems

The MFR-HD-ENC camera supports the ONVIF protocol, profiles S & T. This allows the camera to be controlled and viewed on ONVIF compliant VMS platforms such as ONVIF Device Manager or Milestone.

ONVIF Device Manager is available as a free download available here:

https://sourceforge.net/projects/onvifdm/

The software will locate IP encoders on the network. Click the Network settings tab to display the port that the encoder is configured to. In the example shown below the port has been set to 8080, therefore the camera's URL is 192.168.1.195:8080



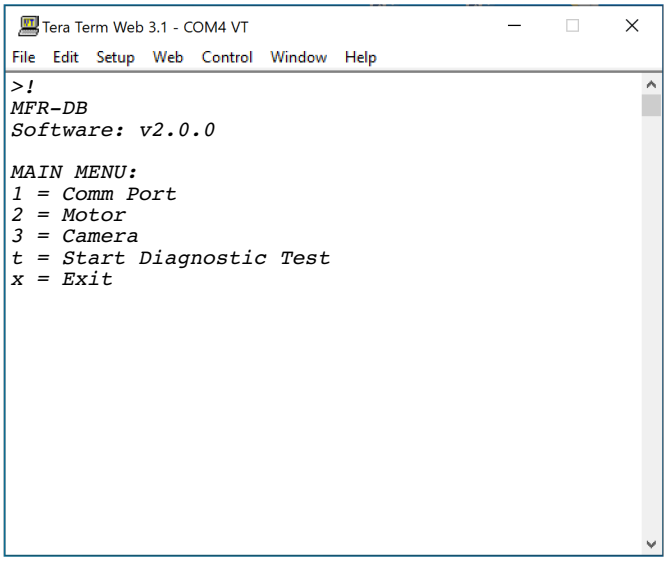
Camera Configuration

The MFR-DB-ENC can be configured for a specific user profile, to include; communication settings, motor control, and camera options. Once configured the camera will retain the settings.

The camera is configured using a menu structure on its control interface which is only accessible at power on. To access the control menu it is necessary to connect the power comms cable of the camera to a serial comms software application, such as TeraTerm set to 9600 baud 8n1.

Boot Menu

- Connect the power comms cable to a USB port on a PC.
- Open the PC serial comms application
- Power on the camera, a > character will appear and shortly after a ! character.
- As soon as the ! appears type v e in quick succession.
- The Main Menu shown on the right will then be displayed.
- Select the required option.
- The function options are described in the following tables.



Comm Port Options

Comm Port Options		
Sub Menu	**Description**	**Options**
Mode	The serial comms standard	RS485, No Parity , RS232, No Parity, RS485, Odd Parity, RS232, Odd Parity RS485, Even Parity, RS232, Even Parity
Baud Rate	The serial comms baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200
Protocol	The PTZ control protocol	Auto Detect, VISCA, PelcoD, PelcoP
Unit Address	The camera's unit address, this allows several cameras to be connected on the same comms bus	1, 2, 3, 4, 5, 6, 7

Motor Options

Motor Options		
Sub Menu	**Description**	**Options**
Auto Position Correction	Whether the camera automatically corrects its actual position if external forces act upon it	Disabled, Enabled
Stall Detection	Detects a stall in the motor drive	Disabled, Enabled
Motor Speed	The speed at which the motors are driven	High, Medium, Low
Hold Torque	The torque force which the camera uses to hold position	High, Medium, Low
Boot Confirmation	Movement of the camera head at power on indicating the initialisation status	Disabled, Enabled

Camera Options

Video Options		
Sub Menu	**Description**	**Options**
Output Mode	The output video format	PAL, NTSC, 720p/25, 720p/29.97, 720p/50, 720p/59.94, 1080i/50, 1080i/59.94, 1080p/25, 1080p/29.97, 1080p/50, 1080p/59.94
Digital Zoom	If disabled only optical zoom is allowed, applies only to the optical camera	Disabled, Enabled
On Screen Display	The OSD in the camera's video	Disabled, Enabled
Flip on Tilt	The video picture will automatically invert when the camera head it tilted over the top of its travel	Disabled, Enabled
Zoom Sync	The zoom is synchronised between the two cameras, up to the maximum FOV capability of the thermal camera	Disabled, Enabled

Boot Confirmation

This gives a clear visual confirmation at power on whether or not the MFR-DB-ENC Camera has initialised successfully the following hardware is tested during boot sequence:

- Optical Camera Module Comms
- Thermal Camera Module Comms
- Tilt Axle Encoder
- Pan Axle Encoder
- Accelerometer

The feature can be enabled/disabled in the Motor Options boot menu.

Successful Boot

The camera will emulate a head nod on a successful initialisation, the actual movement sequence is defined as follows:

- Tilt to 0° (Straight Ahead)
- Tilt Down 20°
- Tilt Up 20°
- Return to Start-Up Angle

Boot Fail

If during the boot sequence any hardware faults are detected the camera will emulate a head shake, the actual movement sequence is defined as follows:

- Pan to 0°
- Pan Left 30°
- Pan Right 60°
- Pan Left 60°
- Pan Right 30°
- Return to Start-Up Angle

Extended Camera Communications

Since the MFR-DB-ENC incorporates a Sony optical camera the adopted control protocol is Sony VISCA.
This standard is used to communicate with the Sony camera, the Flir thermal camera and for PTZ control.

The VISCA command list is used for Sony camera communications, whilst Flir camera communications uses a Flir-Pass-Through format, which incorporates standard Flir protocol commands contained within a VISCA wrapper, as described later.

Standard commands for the Sony camera are detailed in the standard VISCA commands document, available here:

https://www.visualengineering.co.uk/supportdownload/57

Additional Commands

Additional commands adopting the VISCA protocol format have been developed by Visual Engineering for use with the MFR-DB-ENC camera. These commands also allow control of a limited set of parameters in the Flir thermal camera when using standard VISCA controllers.

Commands such as unit type, video output switching, PTZ control and thermal palette switching are included. The following two tables describe these additional commands.

Additional Inquiry/Command With Response Data				
Cmd Set	**Command**	**Command Packet**	**Response Packet**	**Comments**
FLIR PASS THROUGH	Flir Cmd	8x 01 04 24 9F 01 <aa> <payload> FF	y0 51 24 9F 01 <bb> <response> FF	<aa> = Cmd Payload Length <payload> = FLIR Command <bb>=Response Payload Length <response> = FLIR Response
UNIT TYPE	Unit Type	8x 01 04 24 92 00 01 FF	Y0 51 24 92 <aa> FF	<aa> = Unit Type 0x11 = MFR-HD 0x12 = MFR-DB 0x13 = MFR-TI
PAN TILT DRIVE	Absolute Position	8x 09 06 12 FF	y0 50 0p 0p 0p 0p 0t 0t 0t 0t FF	<pppp> = Pan Position <tttt> = Tilt Position The value returned is a 16-bit signed integer, the actual angle can be calculated as below where <x> is equal to the value returned. Angle = x/20

Additional Commands			
Cmd Set	**Command**	**Command Packet**	**Comments**
PAN TILT DRIVE	Move	8x 01 06 01 <aa> <bb> <cc> <dd> FF	<aa> = Pan Speed (0x01-0x18)
			<bb> = Tilt Speed (0x01-0x14)
			<cc> = Pan Direction (0x01 = Left, 0x02 = Right, 0x03 = Stop)
			<dd> = Tilt Direction (0x01 = Up, 0x02 = Down, 0x03 = Stop)
	Absolute Position	8x 01 06 02 00 00 0p 0p 0p 0p 0t 0t 0t 0t FF	<pppp> = Pan Position <tttt> = Tilt Position The value sent is a 16-bit signed integer calculated as below where <x> is equal to the required angle (-180° to +180°) Value = x*20
	Slew To Cue	8x 01 06 04 00 00 0x 0x 0y 0y FF	<xx> = Percent Of HFOV <yy> = Percent Of VFOV
THERMAL/ OPTICAL SWITCH	Set Video Mode	8x 01 04 24 96 01 <xx> FF	<xx> = Mode 0x01 = Optical Camera 0x02 = Thermal Camera
THERMAL COLOUR PALETTE	Set Palette	81 01 04 63 <xx> 01 FF	<xx> = Palette Selection (0x00 – 0x0D)
THERMAL IMAGE FREEZE	On/Off	81 01 04 62 <xx> 01 FF	<xx> = On/Off 0x02 = On (Freeze Image) 0x03 = Off (Real-Time)

Flir-Pass-Through

Control of the Flir camera uses standard Flir protocol commands. In order to maintain a single communications protocol for MFR-DB-ENC and to also allow access to the complete Flir command set the Flir protocol is wrapped within a VISCA style packet.

Standard commands for the Flir thermal camera are detailed in the standard Flir commands document, available here:

https://www.visualengineering.co.uk/supportdownload/58

Command Packet

The Command Packet invokes a Response Acknowledge followed by a Response Packet, these are described below, all values are hexadecimal.

8[i]	0x01	0x04	0x24	0x9F	0x01	<aa>	<payload>	0xFF

[i] The Unit Address, which can be set in the Comm Port Options in the boot menu.
<aa> Command Payload Length
<payload> Standard Flir Command Payload

Response Acknowledge

[y]0	0x41	0xFF

Response Packet

[y]0	0x51	0x24	0x9F	0x01	<bb>	<response>	0xFF

[y] The Unit Address+8.
<bb> Response Payload Length
<response> Flir Response

Examples

By way of example the following illustrates how the Flir-Pass-Through mode format and standard Flir commands can be combined into a single VISCA style packet for the MFR-DB-ENC. The examples address a Unit ID of 1, all values are hexadecimal.

VIDEO_MODE - ID 15

GET
Command Packet
81-01-04-24-9F-01-0A-6E-00-00-0F-00-00-F3-8A-00-00-FF
Response Acknowledge
90-41-FF
Response Packet
90-51-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-00-66-62-FF

SET FREEZE
Command Packet
81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-01-76-43-FF
Response Acknowledge
90-41-FF
Response Packet
90-51-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-01-76-43-FF

SET REAL-TIME
Command Packet
81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-00-66-62-FF
Response Acknowledge
90-41-FF
Response Packet
90-51-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-02-00-66-62-FF

ZOOM
1 x Zoom Command Packet
81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-00-00-00-FF
2 x Zoom Command Packet
81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-04-40-84-FF
4 x Zoom Command Packet
81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-08-81-08-FF
8 x Zoom Command Packet
81-01-04-24-9F-01-0C-6E-00-00-0F-00-02-D3-C8-00-10-12-31-FF

EZOOM_CONTROL - ID 50

INCREMENT ZOOM BY 1 Command Packet
81-01-04-24-9F-01-0E-6E-00-00-32-00-04-34-FA-00-02-00-01-7E-41-FF
DECREMENT ZOOM BY 1 Command Packet
81-01-04-24-9F-01-0E-6E-00-00-32-00-04-34-FA-00-03-00-01-49-71-FF

Fischer Connector Pin-out

The Fischer connector on the base of the MFR-DB-ENC camera is the single interface to all available signals. The pin-out and part numbers of the both connector ends are described in the table below.

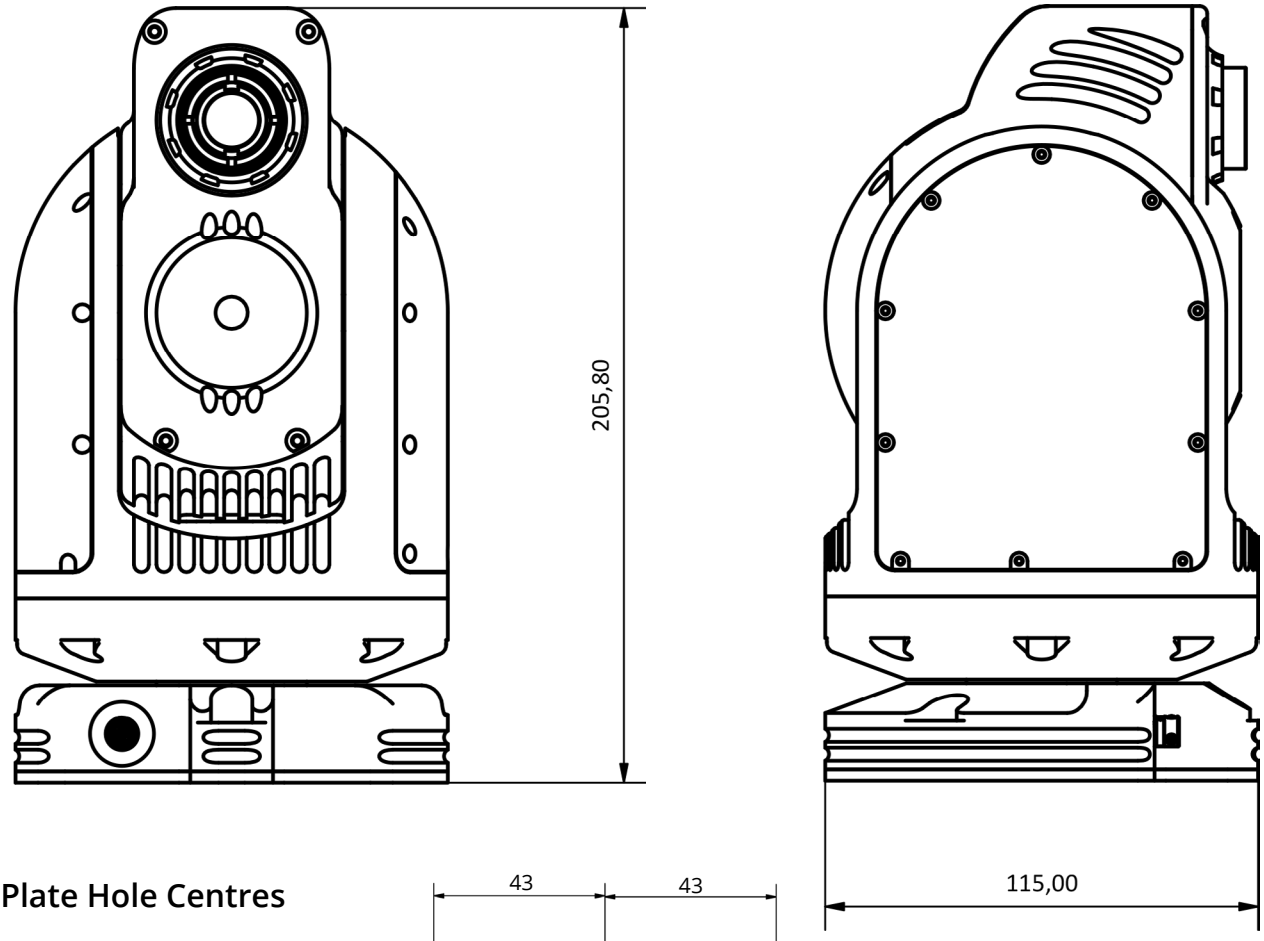
MFR-DB-ENC Unit Connector - FISCHER - MR11WL06-0210-BK2-E1AP	
Mating Half Connector - FISCHER - MP11ZL06-0210-BK2-Z1AS	
Pin	**Signal**
1	ETHERNET BI_DA-
2	ETHERNET BI_DB-
3	ETHERNET BI_DC+
4	ETHERNET BI_DD+
5	DC IN (10~18V)
6	ETHERNET BI_DA+
7	ETHERNET BI_DB+
8	RS232RX/RS485B (DATA TO CAMERA)
9	Ground
10	ETHERNET BI_DC-
11	ETHERNET BI_DD-
12	RS232TX/RS485A (DATA FROM CAMERA)

Specifications

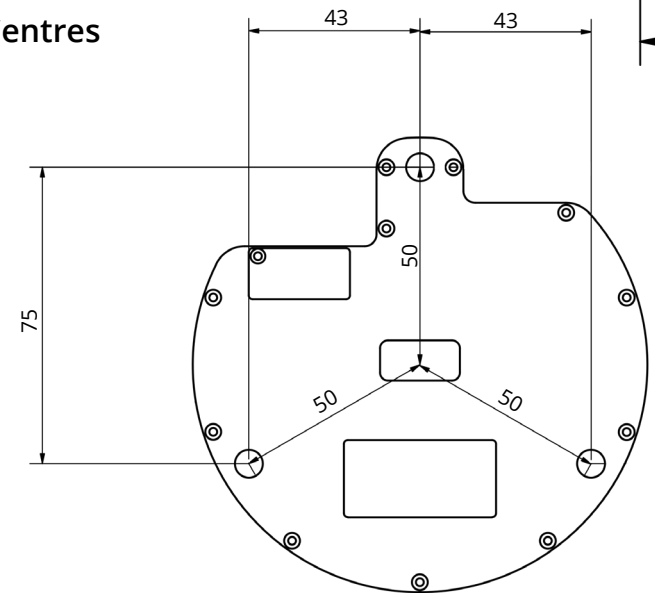
Specifications			
Optical Sensor	1/2.8" Type CMOS	**Video Streaming**	RTSP, UDP, RTP, RTMP
Optical Sensitivity	< 0.05 Lux, ICR On	**ONVIF**	Profile S & T
Optical Resolution	1920 x 1080 Pixel	**Output Resolution**	Selectable
Optical SNR	> 50dB	**H264 Video Profile**	High, Main, Baseline
Optical Field of View	63.7°	**Serial Protocol**	VISCA
Optical Zoom	30x	**Serial Comms**	USB, RS232/485
Thermal Resolution	640 x 512 Pixel	**Pan Range**	360°
Thermal Lens	9mm	**Tilt Range**	170°
Thermal Field of View	69° H, 56° V	**Connector**	Fischer MiniMax
NEdT	< 30mK	**Environmental**	IP67
Radiometric Technology	As Standard	**Weight**	2.5 kg
Thermal Spot Metering	Enabled	**Dimensions**	ø115 x 206 mm
Video Codec	H265 (HEVC) H264 (AVC), MJPEG	**Casing**	Aluminium

Dimensions

Overall Dimensions



Base Plate Hole Centres



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