



Technical Guide

MetCam Model *A1601000X00*

Commissioning | WebUI Manual

Rev. H | Aug 2023

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1 Manual Revision History

| Revision | Date | Notes |
|----------|----------|---|
| A | Dec 2020 | <ul style="list-style-type: none"> Creation |
| B | May 2021 | <ul style="list-style-type: none"> Changes to the Network tab (separation of Ethernet and Wi-Fi settings) Removed the temperature parameter from the Settings/Parameters tab Added an explanation on MetCam logic when threat is detected (section 5.8) Addition of an interface to update operation parameters file (section 5.11) |
| C | Aug 2021 | <ul style="list-style-type: none"> Added a remark about operating system compatibility (section 3.1) Added <i>Frame rate</i> display (Section 4.2) ROI page moved to the <i>Settings</i> tab Updated Emission image (added overlay of 'Blue' pixels and the ROI cross) (Section Error! Reference source not found.) Added Hotspot option description (Section 5.6) Meteorology entry interval changed to once hourly (Section 5.20) |
| D | Feb 2022 | <ul style="list-style-type: none"> Added a <i>fail</i> message for attempt to set the ROI in an 'illegal' image area Added a note about video <i>fail to load</i> as a result of a blocked port (Section 4.2) Added note about the Wi-Fi connection during power cycle (Section 5.2) Added explanation and note about apparent temperature usage (Section 0) Added an explanation related to the new WebUI main display interface – now including the option to toggle between the two video streams (Safety and Emissions) and add/remove information layers (Sections 4.2.2 through Error! Reference source not found.) Added ability to toggle the use of ROI for inhibition in <i>Parameters</i> tab (Section 4.8.1) Added ability to set the time-period for the <i>Emissions Image</i> in the <i>Parameters</i> tab. Video text overlay was added (section 4.9.3) Added video recording/download (section 5.21) Added snapshot recording/download and registration table upload (section 5.22). Added description of special 4-20 signals (Section 5.8.1) Added information on network bandwidth usage (Section 5.1.1) Added information of setting passwords for WebUI log-in screen (Section 5.25) Added note about Movement mask although it is not yet implemented (Section 5.13) Added note about direct access to Emissions and Events (Section 5.23) |
| E | Apr 2022 | <ul style="list-style-type: none"> Updated with RC33 features Added explanation regarding calibration tab (Section 5.15) Movement mask is now implemented (Section 5.13) Soft reboot feature (Section 5.26) Calibration files download feature (Section 5.15) Added a favicon |
| F | Sep 2022 | <ul style="list-style-type: none"> Updated with RC34 and RC35 features Added a visible/thermal video stream toggle (Section 4.2.4) Added Log-in pitfall (Section 4.2.1) Added Emissions quantification (Section Error! Reference source not found.) |

- G** Jan 2023
- RC38 features
 - Added NTP server setting and time zone (Section 4.5.1.1)
 - Improved Emissions quantification (RC37.4)
 - Added 4-20 alarms for Emissions and Hotspot (Section 5.17.1)
 - Added *Skip warmup* feature (Section 4.3)
 - Added a list of 4-20 levels (Section 5.7)
 - Improved the explanation of the ROI operation (Section 4.8.1)
 - Added a display of the currently used offset/gain 4-20 values (Section 5.7)
 - Increased the time-stamp resolution in the emissions log
 - Added Motion mask sensitivity setting (Section 5.13)
-

- H** Aug 2023
- RC40 features
 - Wifi models are no longer available – added note on this.
 - Updated the list of settings for commissioning (Section 4)
 - Added explanation about user-set Safety parameters (Section 5.11.3)
 - Removed instructions referring to Wi-Fi, as this is no longer available.
 - This version includes triggered Emission – added explanation (Section 5.11.4)
 - First version with Anemometer connectivity support (Section 3)
 - Added details on the meteorology files (Section 5.20)
 - Added a timeout on 4-20 forced output and allowed all values to be output (Section 5.7)
-

2 Manual Overview

This manual covers operations related to MetCam commissioning and WebUI interface. The document describing the procedures for installing MetCam is named *MetCam Instructions for Use Manual*, available for download from <https://www.cisensing.com/>

2.1 Definitions of alert icons

NOTICE

Indicates a potentially hazardous situation which, if not avoided, could result in damage to the product or the environment.

3 Connecting an Anemometer

Anemometer (wind speed and direction) is an additional piece of hardware that may be connected directly to MetCam. A specific model of Anemometer is supported. The use of this increases the accuracy of the quantification.

4 MetCam Commissioning WebUI Operations

To complete the installation, MetCam needs to be connected to a PC so that installation-specific parameters can be set up. This is done through a web interface implemented in MetCam (MetCam includes a web server), called WebUI.

Allow for at least 30 minutes of warmup time (the counts starts when MetCam is powered up) before operating MetCam. This is the time needed to reach thermal stability.

For this operation, it is required that MetCam be connected, via an Ethernet cable, to a PC that has a browser installed.

To complete the installation, follow these steps:

- Verify alignment
- Set Date/Time
- Configure network connection
- Parameters tab
 - Input range
 - Set Motion Mask sensitivity
 - Set Safety detection parameters
 - Set Emission thresholds
- Define a HotSpot mask
- Define 4-20 mA delay and latching intervals
- Set WebUI passwords (optional)

MetCam is delivered with a fixed IP and Hostname:

- IP: 192.168.0.90
- Hostname: metcam

It is strongly advised to log out and close the WebUI once all the installation operations are completed. WebUI will log out automatically after 5 minutes without any action.

4.1 Preparing the PC

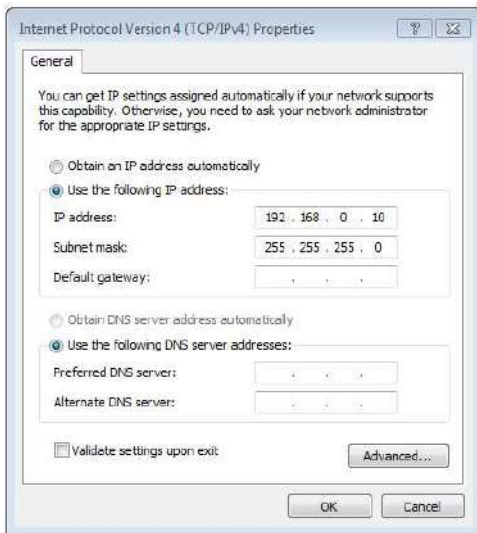
The PC/Laptop that will be used to connect to MetCam requires some setup.

- MetCam is tested only with Windows 10 Operating System PC's.
- The PC should have a web browser (Chrome or Firefox, later versions of Microsoft Edge) installed.
- JavaScript needs to be enabled in the web browser.
- The connection to the MetCam is defined as *Not Secure* (MetCam uses an HTTP connection)



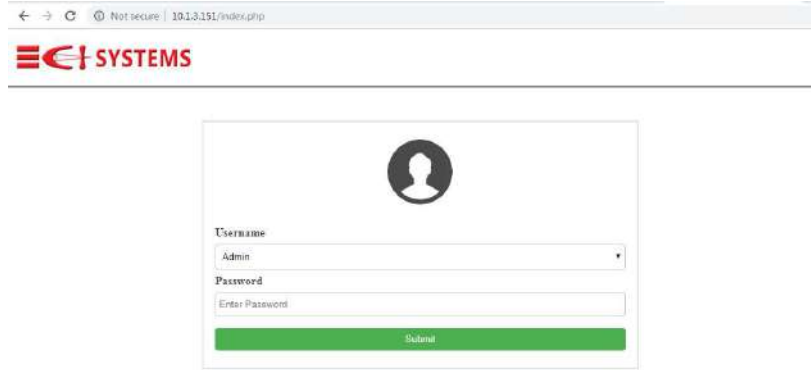
Make sure that this type of connection is allowed by the browser.

- The initial connection to MetCam is done via a direct Ethernet cable connection, therefore, the IP address of the PC/Laptop needs to be in the same gateway as the MetCam. MetCam is delivered with a static IP address of 192.168.0.90 and a Hostname metcam.
- The PC Internet Protocol Version 4 (IPv4), of the PC used to connect to it, needs to be set to static IP with the address 192.168.0.X, where X is any number other than 90.



4.2 Logging In

Allow MetCam to complete its boot (< 1 minute after power-up), open a web browser on the connected PC and enter the MetCam IP in the address line, press enter. You will see the following screen:



The Web server, in MetCam, generates an HTTP type connection (non-secure). This might result in MetCam being blocked by the PC you are using.

This is dependent on the security settings implemented on the PC. If this happens you will need to allow this site. The way to do this could change from PC to PC, here is an example:

Open your Internet Options (Internet Properties) and go to the Security tab:



Click the *Trusted sites* Icon and then the *Sites* button:

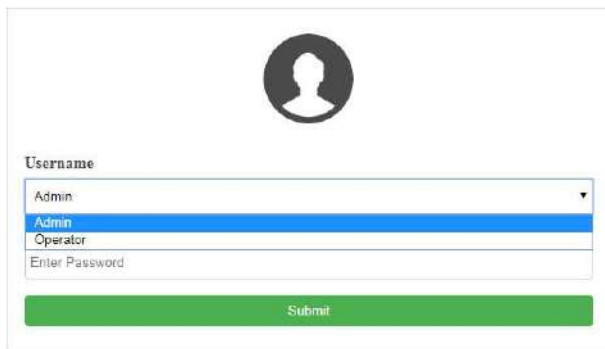


You can then add the MetCam IP address to the list of trusted sites, make sure to remove the *Check* mark on the box at the bottom (Requires server verification):



The MetCam Web server should now open and the log-in dialog appear.

A close-up of the Login dialog box:



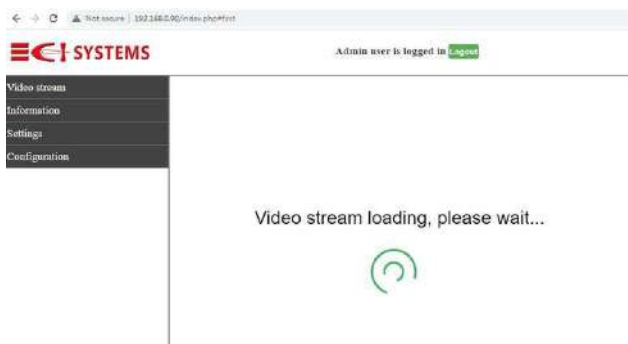
The WebUI includes two preset Usernames, *Admin* and *Operator* in a drop-down-list.

The options shown to the *Operator* user are limited, an installation and commissioning needs to be performed by an *Admin* user.

A delivered MetCam does not have any passwords associated with any of the users.

Select the *Admin* user and press the *Submit* button.

The main screen will open in the *Video stream* tab displaying a *wait* screen that will change to live video within a few seconds (<10).



4.2.1 Log in Pitfalls

If the video fails to load, it could mean that the web-socket used for the video transmission is blocked by the host PC. Contact your network administrator to verify that ports 8081 – 8085 are not blocked.

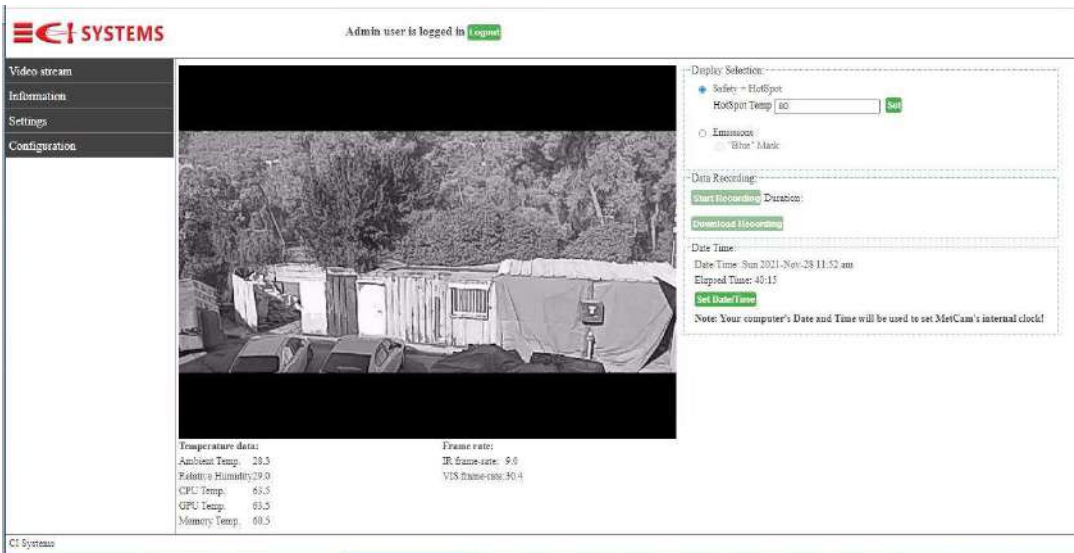
If the site loads with only the left hand menu showing, as in the following picture, you will probably need to enable JavaScript in your browser:



This is done by going to the browser settings and allowing it there (globally or for the specific site).

4.2.2 Main Display

Once the main display loads, this is what you will see:



The image displayed is the MetCam monitored field of view (B&W live video).

The data below the image includes the following information:

| Temperature data: | | Frame rate: | |
|-------------------|------|-----------------|------|
| Ambient Temp. | 34.5 | IR frame-rate: | 9.0 |
| Relative Humidity | 38.0 | VIS frame-rate: | 30.4 |
| CPU Temp. | 66.5 | | |
| GPU Temp. | 68.0 | | |
| Memory Temp. | 63.0 | | |

A few internal temperature values are displayed, as well as the reading of the ambient air temperature and relative humidity. The frame rate values on the right hand side are for debugging purposes.

During system warmup the IR frame rate will show as 0.

| Temperature data: | | Frame rate: | |
|-------------------|-------|-----------------|------|
| Ambient Temp. | 24.9 | IR frame-rate: | 0.0 |
| Relative Humidity | 100.0 | VIS frame-rate: | 30.5 |
| CPU Temp. | 37.0 | | |
| GPU Temp. | 38.5 | | |
| Memory Temp. | 33.5 | | |

To the right of the image there are a few dialog options:

Display Selection:

Safety + HotSpot

HotSpot Temp

Set

Emissions

"Blue" Mask

Toggle VIS/IR view:

Toggle

Data Recording:

Start Recording Duration: 00:00

Stop Recording & Download

Date Time:

Date/Time: Tue 2022-Jul-26 11:15 am

Elapsed Time: 12:13

Set Date/Time

Note: Your computer's Date and Time will be used to set MetCam's internal clock!

4.2.3 Display Selection

There are three simultaneous video streams coming out of MetCam, see section 4.9.4 for more information on this.

The default display is the *Safety + Hotspot* stream.

In this display, two types of overlays are shown:

- Pixels where gas is detected and exceeds the set safety thresholds are overlaid red and yellow.
- Pixels exceeding the set value for apparent temperature are overlaid magenta.

The following shows a scene where the *Hotspot* is set to 100 °C:



Same scene with *Hotspot* set to 30 °C:



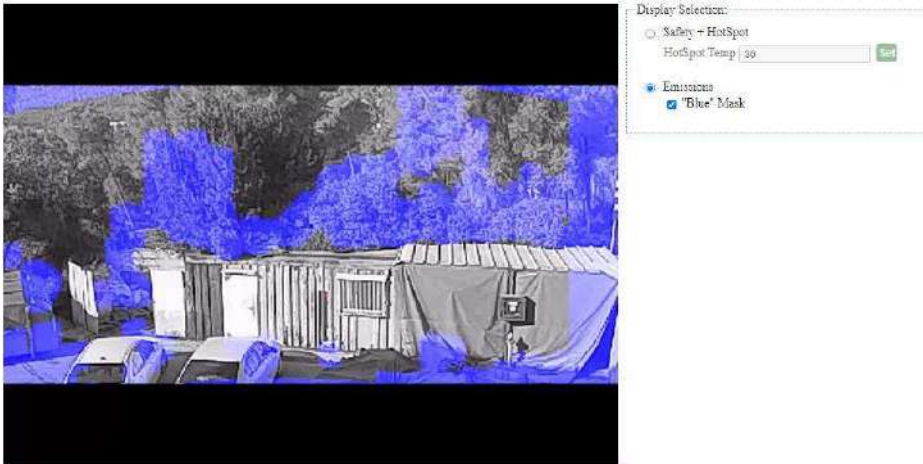
Gas detection Red/Yellow overlay precedes the magenta pixels. If both of these are detected at the same scene location at the same time, only the Red/Yellow overlay will show up.

See section **Error! Reference source not found.** for an explanation about the temperature monitoring feature.

Using the radio-button selection, you can toggle the display to the Emissions stream.

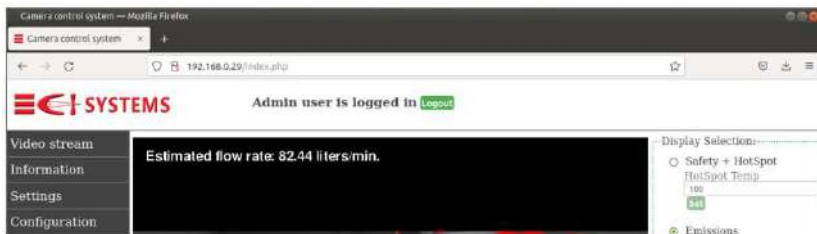
Checking the *Blue Mask* check box will use a transparent blue overlay to highlight the scene areas where detection is only

possible in the Emissions mode. Gas path-length concentration is not possible in these areas and, consequently, Safety detection is not possible in the *Blue masked* areas.



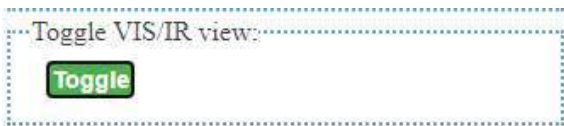
The *Blue Mask* updates at a rate of 9 Hz.
 Areas masked *Blue* are still used for Emissions detection.

In Sep 2022, the momentarily measured emissions quantification value was added into the letterhead of the Emissions image. This value is updated at a rate of 9 Hz, see following image for an example:



4.2.4 Display Toggle

The Toggle VIS/IR button allows the user to toggle the display between these two. The same overlays are used on both streams (*Gas detection, Hotspot, Blue mask*)



The default MetCam video comes from a VIS camera.
 If there is a fault with this camera, the video source is automatically changed to the Thermal camera.

Notes:

- While MetCam is in its warmup phase, there will be no video shown in thermal mode, a black screen will be presented.

- The "MetCam is Healthy" overlay will show up on either videos (VIS or IR) when using the toggle button. If MetCam switched to IR video on its own it will overlay *IR Video used*.

Overlay on IR image when using the toggle function



An automated toggle to IR when there is insufficient illumination is planned to be added shortly.

4.2.5 Data Recording

This feature is for developer testing, it allows recording of raw images for offline processing.



It will not be addressed in this manual.

4.3 WebUI Warmup Indication

The MetCam warmup period is set internally to 30 minutes.

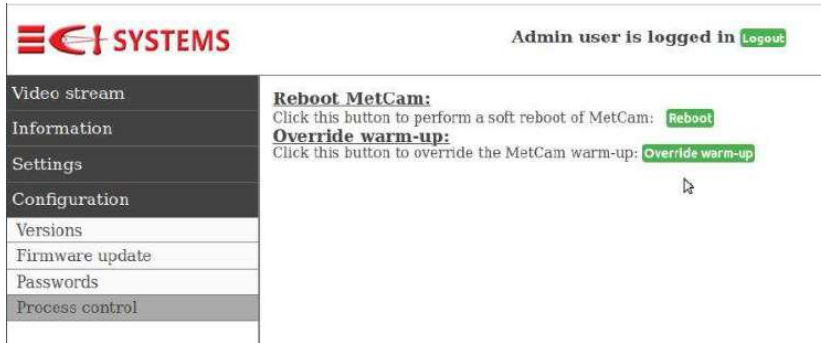
During this period no monitoring occurs, WebUI functionality is intact except for the *Set ROI* operation.

By looking at the *Elapsed Time* value, the user can tell if Warmup has completed. The IR frame rate will be 0 during warmup.

4.3.1 Warmup Override

Whenever MetCam performs a reset, the warmup timer starts counting from 0.

This could happen when the *Reboot* button is pressed or when a firmware upgrade is performed. In these cases, the warmup is not needed and can be skipped by pressing the Warmup Override button in the *Process control* tab.



Do not skip the warmup in cases where the system is powered up – allow it to complete its 30 min.

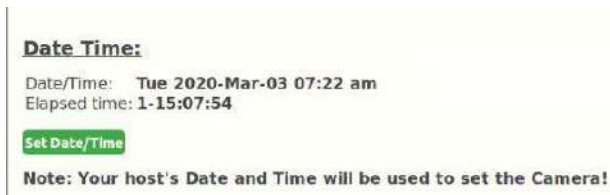
4.4 WebUI Logout and Timeout

If a user logs into the WebUI and does not perform any actions within it for 5 minutes, the WebUI will timeout and log out. The display will revert to the login screen.

The WebUI restricts connection to a single user. If a second user tries to connect, during an active session, a warning message will appear

4.5 Set Date/Time

MetCam does not have an internal battery and so, does not keep track of world time. Click the *Set Date/Time* button to set the MetCam clock to that of the connected PC. This needs to be done every time MetCam is disconnected from power. MetCam default date/time is Jan 1st 2000, 00:00 hours.



The *Elapsed time* counts the time since last power up. The *Elapsed time* starts counting from the moment the main MetCam process loads up (this takes <1 minute and is indicated the by LED changing from blinking green to constant green).

The format of the elapsed time counter is Days-Hours:Min:Sec

4.5.1.1 Using NTP for Time Setting

The MetCam operating system (Linux) includes a list of trusted network time protocol (NTP) servers. If a MetCam has access to the Internet, and one of these servers is available, MetCam will use it to set its clock.

Normally, this is not the case – MetCam is not connected to the Internet.

For cases where MetCam is connected to an internal network, that includes a local NTP server, a function is built in to allow it to retrieve date/time settings from it.

See section 5.14 for more information on this

4.6 Verify Alignment

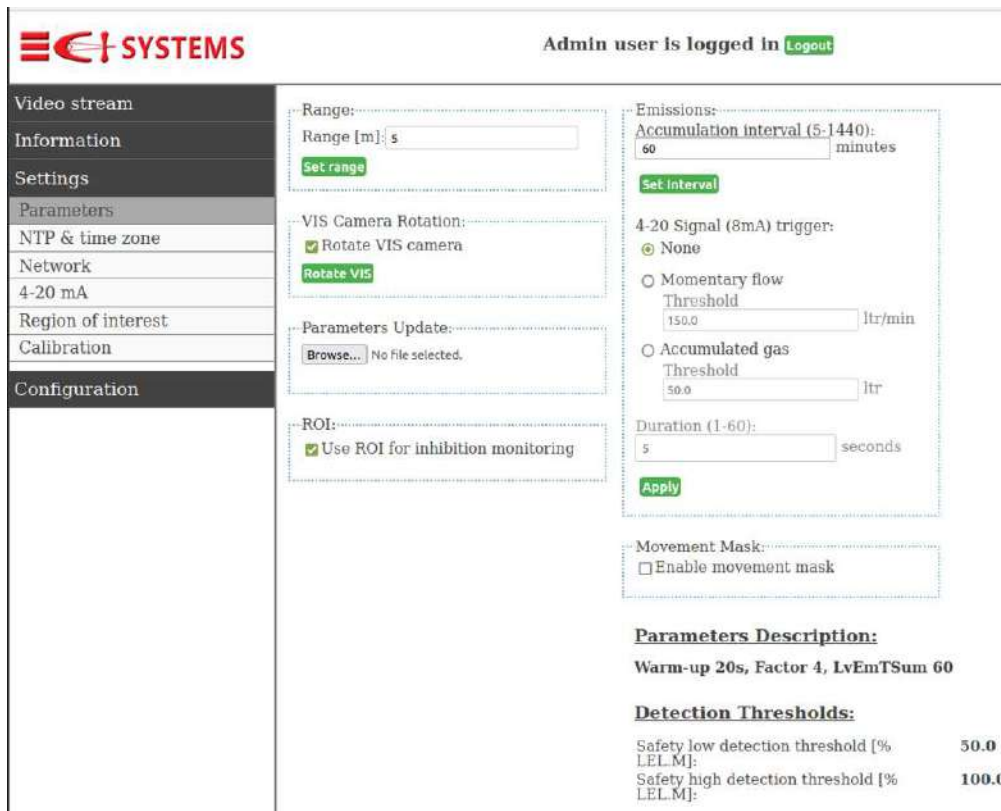
Use the live video display to optimize MetCam alignment. It is recommended to place the main monitored object in the center of the lower 1/3 part of the image.

Avoid, as much as possible, having short range objects included in the FOV.

Try to avoid including objects that are less than 5 meters range inside the monitored field of view. Close range objects obscure a considerable part of the FOV and can lead to false alarms.

4.7 Setting Range

Go to the *Settings* tab and click on the *Parameters* sub-tab. The following will display:



| Detection Thresholds: | |
|--|-------|
| Safety low detection threshold [% LEL.M]: | 50.0 |
| Safety high detection threshold [% LEL.M]: | 100.0 |

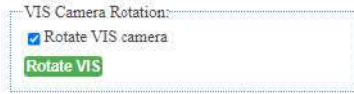
Insert the range, in meters, to the main monitored object/area. This data will be used to calculate gas cloud size.

The accuracy does not need to be better than +/- 2 meter.

Click the *Set range* button to apply.

Use the *Rotate VIS* checkbox and button in cases where MetCam is installed *upside-down*. Checking the box and pressing the *Rotate VIS* button will rotate the video output to the WebUI and to the ONVIF by 180 deg so that the image is displayed erect.

A newly supplied MetCam will arrive with the *Rotate VIS* checkbox checked.



The *Detection Thresholds* section displays the internal thresholds.

From RC39 and on, the user can edit these values.

The name of the parameters file installed appears under the *Parameters description* heading.

4.8 Define ROI

Use this feature only if MetCam is part of a Safety system!

The Region of Interest (ROI) is used by MetCam to monitor ambient conditions.

If the radiometric contrast, in the defined ROI is low, MetCam will warn on the 4-20 mA and on the Safety stream.

For further discussion of radiometric contrast please see an animated explanation at the following link:

https://www.youtube.com/watch?v=I9yiJNb_3Tk&t=3s

ROI monitoring applies only to the Safety stream, the operation of the Emissions detection is not effected and does not cease when contrast is low in the defined ROI.

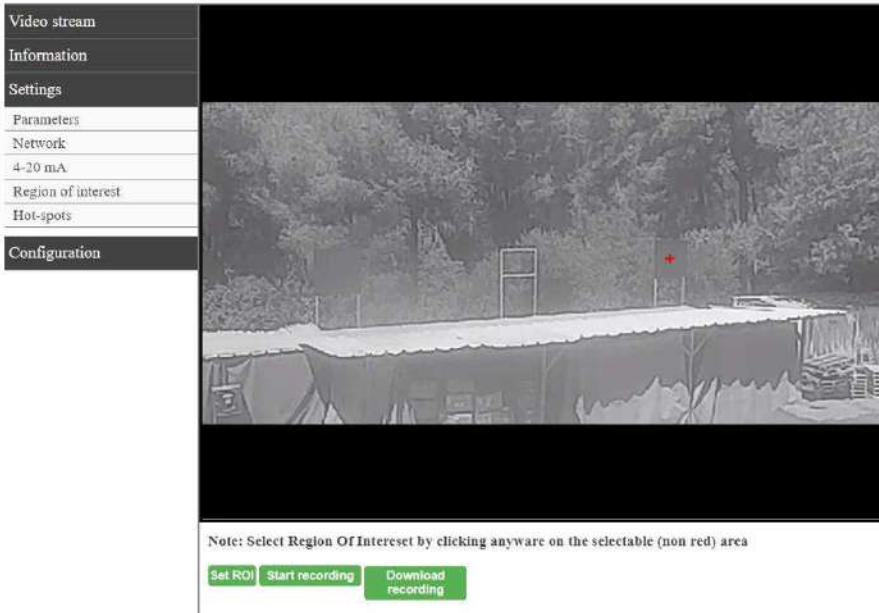
The ROI should be defined on a manmade object close to the main monitored area.

This operation can only be done once warmup has completed.

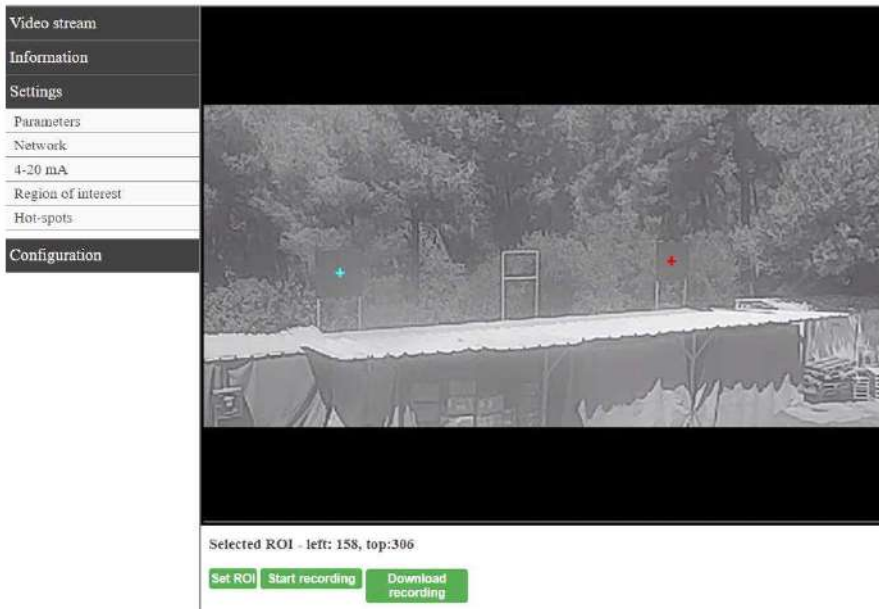
Trying to set the ROI during warmup will return a message that *MetCam is in Warmup*.

Go to the *Settings/Region of interest* tab, an image is displayed.

Notice: the image displayed has a low refresh rate.



A red cross marks the position of the current ROI; click the mouse in the location where you want to set the new ROI. A small white crosshair will mark the spot clicked. You can perform multiple clicks, the mark will move with each *click*.



Once satisfied with the selection, press the *Set ROI* green button at the bottom. Pressing the *Set ROI* button will fix the position of the ROI to the selected location; the white cross will become red.

Video stream

Information

Settings

Parameters

Network

4-20 mA

Region of interest

Hot-spots

Configuration

Selected ROI - left: 158, top:306
* ROI Avg. temp, [°C]: 51.1
* Ambient temp. [°C]: 35.1
* RH [%]: 34

[Set ROI](#) [Start recording](#) [Download recording](#)

ROI center was set successfully!

A success message will appear:

[Set ROI](#) [Start recording](#) [Download recording](#)

ROI center was set successfully!

Trying to set the ROI outside the image area is prohibited by the system and will return a fail message:

[Set ROI](#) [Start recording](#) [Download recording](#)

update ROI status indicates failure

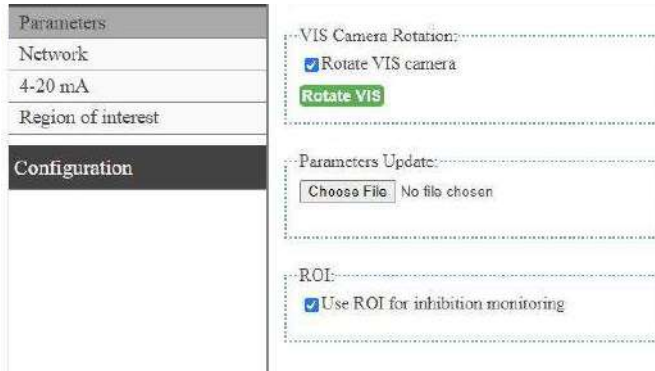
The ROI Avg. temp value is the average apparent temperature of a small area around the cross.
The Ambient temperature and RH values are read from the integrated MetCam sensors.

ROI set position will survive MetCam power cycles.

The ROI recording feature is for manufacturer testing, it has no use in normal operation – we will not document it here.

4.8.1 Using the ROI for Inhibition Monitoring

The following checkbox in the *Parameters* tab allows the user to define whether the ROI is used for inhibition monitoring or not. The default is that it is **not** used.



Inhibition in MetCam means that 4-20 mA alarm signals, related to Safety, are disabled. 4-20 mA signals of Emission and Hotspot alarms continue to operate normally. This feature can be turned off and on by the user at any time through the WebUI.

4.9 Connect to ONVIF client or VMS system

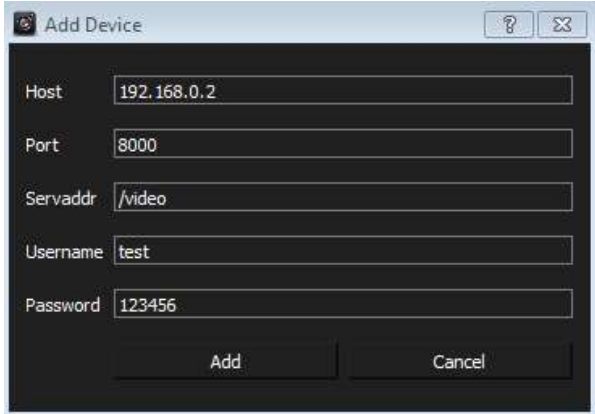
The most informative MetCam output is the gas overlay on live video display, as in the following picture:



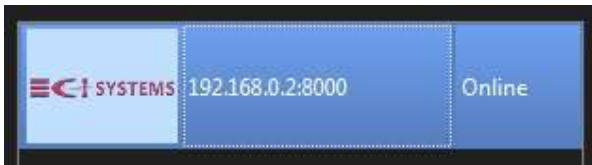
MetCam output video (RTSP) can be viewed and recorded by a Video Management System (VMS) or by an ONVIF client application.

4.9.1 ONVIF

An ONVIF client is third-party software. The example shown here uses a freeware version by *Happytime*. Usually, the first step is to perform is to add a device in the ONVIF client:



An example of how the MetCam device shows up in the Happytime ONVIF client available device list:



The MetCam ONVIF device has three channels:

- Channel 1 is a live color video used for situational awareness applications. The field of view of this camera is larger than the gas detection field of view.
- Channel 2 is a live B&W video used for Safety applications. Gas leaks will be overlaid on this video in yellow (low threshold) and red (high threshold).
- Channel 3 is a live B&W video used for Emissions applications. Gas leaks will be overlaid on this video in red. The intensity of the red color is correlated with the persistence of the gas leak at any specific image area.

All of these channels stream in parallel, the user may choose which channels he wants to see on his ONVIF client.

4.9.2 ONVIF Events

The ONVIF protocol enables an *Event* service.

Whenever an *Event* is declared by MetCam it is simultaneously generated by the ONVIF server. Since the ONVIF client is a third party product, CI cannot predict how exactly it will respond to the Event as this is configurable on the client side of things.

In general, the Event service needs to be enabled on the client side (for example; in the *Happytime* ONVIF Client this is called *subscribe*).

As a minimum, an ONVIF client can record the time and type of the event. Further options include taking automatic actions upon the arrival of an event (for example; in the *Happytime* ONVIF Client this is called *Event action settings*) but these options will differ from one ONVIF client to another.

Refer to your ONVIF client manual to see how to configure this service.

Note: It is important to verify that ONVIF events are not blocked by the network firewall.

4.9.3 RTSP Text Overlay

From software version RC31 and onwards we added text overlay in the letterhead of the video stream output. This overlay is placed at the top-left corner of the letterhead and is related to MetCam health.



When no issues with MetCam, the overlay will read *MetCam is healthy* in Green color (as seen above).

The following hardware is monitored, and will be reported in Red text, if a problem is found:

- Issue detected: SoM temperature is high.
- Issue detected: Environment temperature is abnormal.
- Issue detected: Missing information regarding SD Card.
- Issue detected: SD Card is not available.
- Issue detected: SD Card is marked read-only.
- Issue detected: VIS camera is stuck.

4.9.4 Connecting MetCam RTSP video streams into a VMS system

In case the user prefers using a visual management system (VMS) that does not implement an ONVIF protocol, MetCam output videos can be connected as RTSP streams:

- The *Awareness* video stream is accessed by using the address `rtsp://IP_of_MetCam:8554/video`
- The *Safety* video stream is accessed by using the address `rtsp://IP_of_MetCam:9554/video`
- The *Emissions* video stream is accessed by using the address `rtsp://IP_of_MetCam:10554/video`

Alternatively, this can be done using the Hostname (instead of the IP address):

- The *Awareness* video stream is accessed by using the address `rtsp://Hostname.of.MetCam:8554/video`
- The *Safety* video stream is accessed by using the address `rtsp://Hostname.of.MetCam:9554/video`
- The *Emissions* video stream is accessed by using the address `rtsp://Hostname.of.MetCam:10554/video`

5 Post Installation WebUI Operations

Additional WebUI functionality is described in this chapter.

5.1 Connect to Site Ethernet Network

This section covers connection in a cable-based infrastructure.

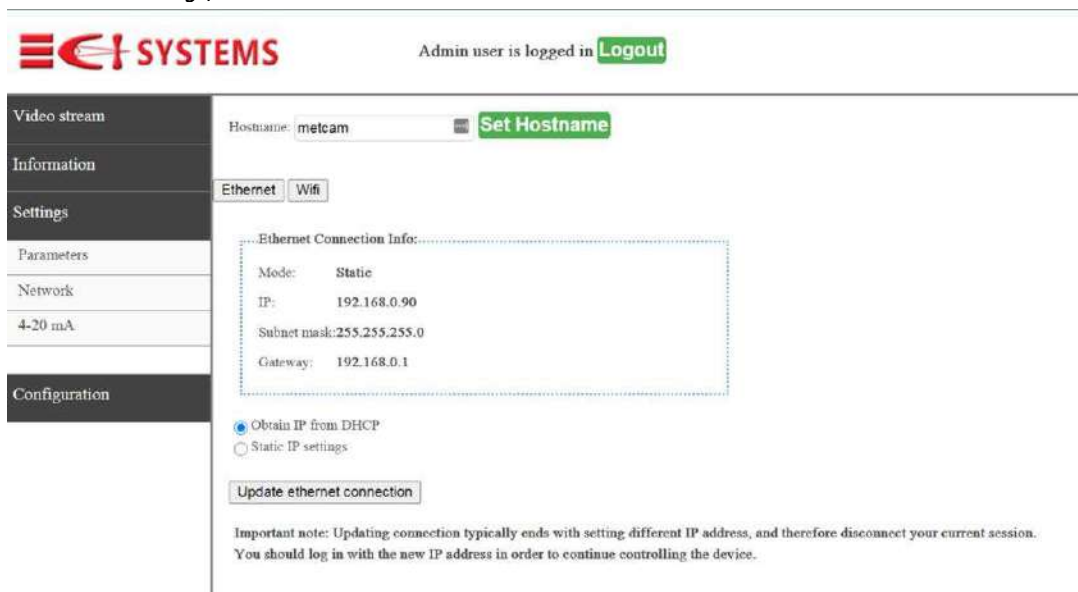
With this type of infrastructure, MetCam can be used with a static IP or (in case a network exists) with a dynamic IP address.

NOTICE

Make sure to carefully monitor any changes in the MetCam IP.

Changing the static IP, and not keeping track of what it was changed to, may lead to inability to re-connect to the unit.

Go to the *Settings/Network* tab.



This is the default view the Network tab will open up with.

The Network tab has two inner tabs, Ethernet and Wi-Fi. These two connection types can be used in parallel.

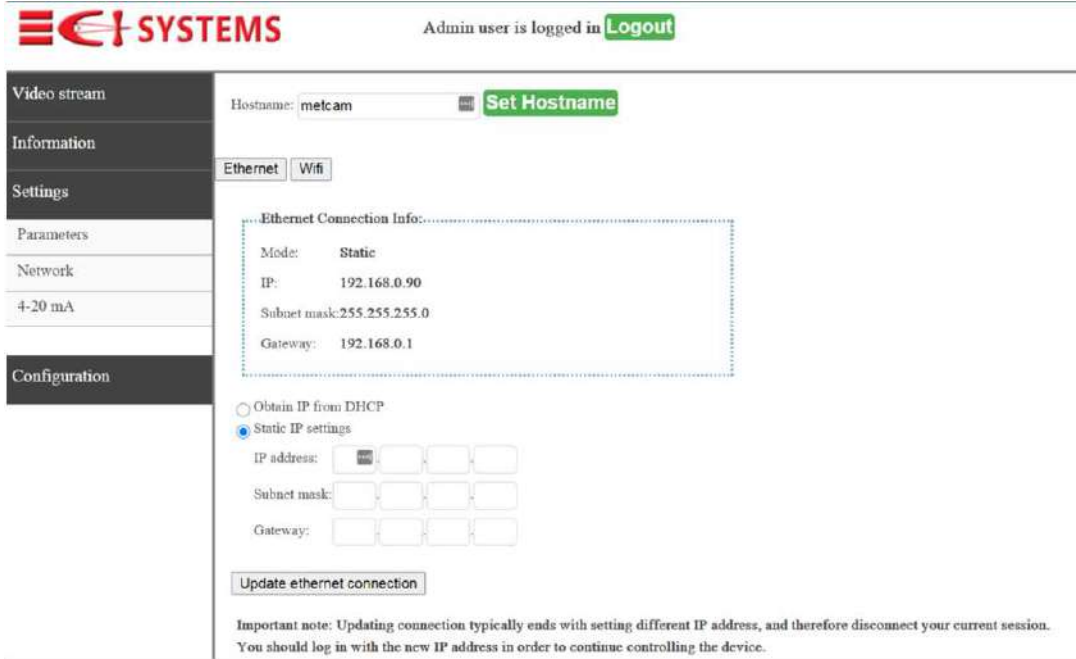
5.1.1 Bandwidth

MetCam uses a network bandwidth of ~860 Kbps (fixed bit-rate), per each one of the 3 available video streams.

The total bandwidth used depends on which streams are requested by the client application.

If a stream is not requested it does not transmit and does not use up bandwidth.

Current connection information is shown in the *Connection Info* box, to edit the static IP (MetCam is delivered with a static IP 192.168.0.90) check the *Static IP settings* radio button the page will show the following:



Change to the IP you to the one you want to use and click the *Update connection* button. You will then need to close the browser and reconnect using the new IP. Make sure to insert a valid IP.

5.1.2 Description

An IP address is a set of numbers that identify your computer on a network. IPV4, the traditional numbering scheme, uses four integers ranging from zero to 255 and set apart by periods. For example, *204.120.0.15* is a valid IPV4 address.

- A leading zero may not be used so *204.120.0.015* is not a valid IPV4 address.

5.1.3 Reserved Addresses

Networks set aside certain combinations for housekeeping and testing, such as the extreme values, *0.0.0.0* and *255.255.255.255*. Another number, *127.0.0.1* is called the *localhost*; every computer on a network refers to itself as this address. Because these numbers have special meanings, the network does not assign them to PCs; such addresses would be invalid.

5.1.4 Address Conflicts

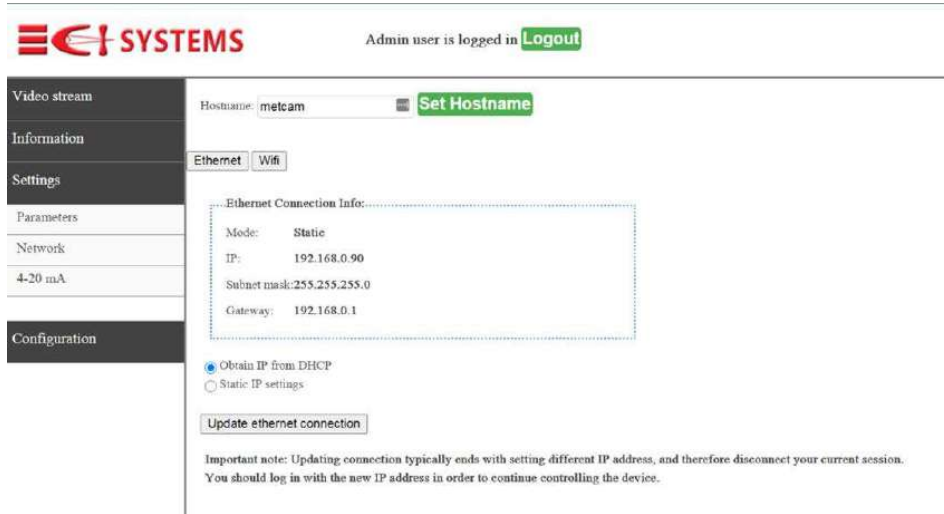
On a given network, every IP address must be unique. For example, two computers cannot both have the address *192.168.0.110*. Although the address itself is valid, attempting to assign the same number to two machines creates a conflict and generates an error message.

5.1.5 Address Range Problems

Local networks, such as those used in schools, homes and offices, have a restricted range of addresses determined by the network administrator or the factory default settings of the network router. For example, a home office network might

use addresses in the range of 192.168.1.1 to 192.168.1.50. The address 101.5.40.1 is out of the network's range and would be an invalid address.

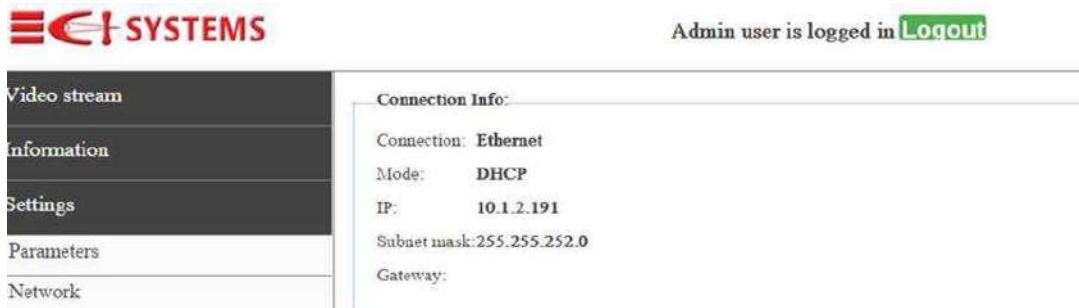
To use a dynamic IP, check the *Obtain IP from DHCP* radio button and click the *Update Ethernet connection* button.



Close the WebUI and reconnect using the new IP.

You should be able to obtain the new IP by interrogating the DHCP server, alternatively, connect using the hostname (see below).

Once connected with a dynamic IP the connection info box will show:



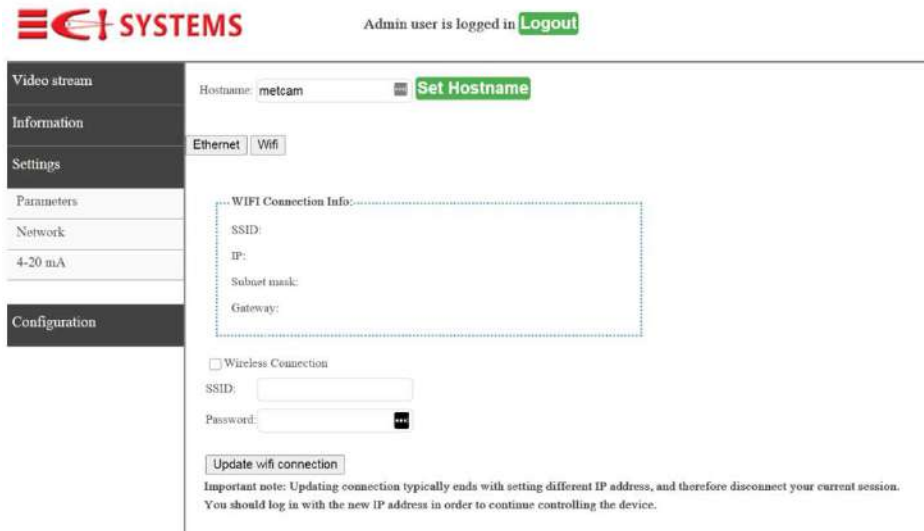
5.2 Wi-Fi Connection

Starting April 2023, wifi enabled MetCam units are no longer available. This chapter is relevant only for older units with this option.

In case Wi-Fi is used, the network settings need to be configured via Ethernet connection before the local installation PC is disconnected and Wi-Fi is used.

A MetCam with Wi-Fi capability has an additional antenna adaptor/isolator installed as in the picture below:

Go to the *Settings/Network* tab, press the inner Wi-Fi tab.
The current connection parameters are shown in the *Connection Info* box.



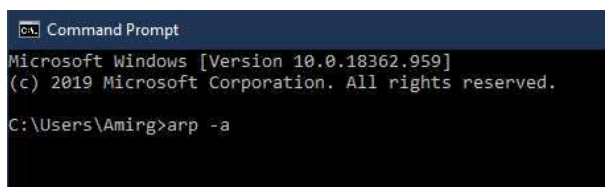
- Check the Wireless connection box to enable Wi-Fi (Wi-Fi is available on select MetCam models).
- Enter the SSID and Password.
- Click the *Update connection* button.

The Wi-Fi connection will survive power cycles, it may take up to a minute after boot completion for the MetCam unit to restore this connection, be patient.

5.3 Discovering MetCam IP

In case MetCam IP is, for some reason lost, there is a Windows tool you can use to discover it (with some restrictions).

Open the Windows Command Prompt, type the command `arp -a`



Press the *Enter* button, a list of all the IP addresses connected to your PC will be listed in the window.

One of these will be the MetCam unit.

Even IP addresses outside your subnet will be discovered.

This method of discovery will work in most cases. If there are many network routers between the PC and the MetCam it may fail to discover it.

5.4 Set Host Name

MetCam host name can be edited by the user, to change the default name (metcam) enter a new one in the box and press the *Set Hostname* button.

5.5 Connecting to WebUI using Hostname

An alternative way to connect to the MetCam WebUI is via the hostname. This can replace the connection through the IP address. It works in case of using a dynamic IP setting on MetCam (does not work with a static IP setting).

For this method to work, the network should have a DNS (Domain Name System) server.

Connection is done by typing the hostname directly into the web browser address bar.

For example; if the host name is *metcam* (this is the default host name), type `http://metcam` in the browser address bar.

5.6 Hotspot

This feature is used by customers wishing to be notified when the apparent temperature of a scene object rises above a set value. It is based on MetCam ability to measure apparent temperature.

NOTICE

The apparent temperature is not, and cannot be considered as, thermometric temperature since it depends on the emissivity of scene objects as well as their thermometric temperature.

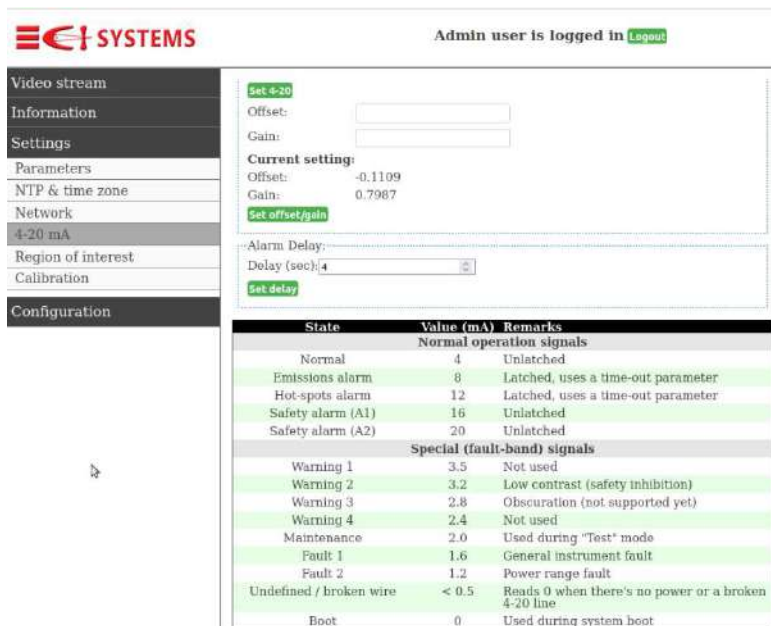
5.7 4-20 mA

The WebUI allows the user to set a specific 4-20 output value, to set a gain and offset values and to add an alarm delay on the 4-20 mA output.

The delay only applies to the Warning and Alarm signals (16 & 20 mA), it does not apply to the Emissions and Hotspot signals (8 & 12 mA).

Go to the Settings/4-20 tab to adjust any of these.

The currently used *offset/gain* values are displayed for convenience.



CI SYSTEMS Admin user is logged in [Logout](#)

Video stream
Information
Settings
Parameters
NTP & time zone
Network
4-20 mA
Region of interest
Calibration
Configuration

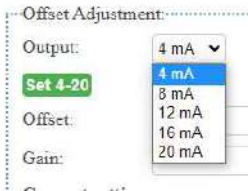
Set 4-20
Offset:
Gain:
Current setting:
Offset: -0.1109
Gain: 0.7987
Set offset/gain

Alarm Delay:
Delay (sec):
Set delay

| State | Value (mA) | Remarks |
|-------------------------------------|------------|---|
| Normal operation signals | | |
| Normal | 4 | Unlatched |
| Emissions alarm | 8 | Latched, uses a time-out parameter |
| Hot-spots alarm | 12 | Latched, uses a time-out parameter |
| Safety alarm (A1) | 16 | Unlatched |
| Safety alarm (A2) | 20 | Unlatched |
| Special (fault-band) signals | | |
| Warning 1 | 3.5 | Not used |
| Warning 2 | 3.2 | Low contrast (safety inhibition) |
| Warning 3 | 2.8 | Obscuration (not supported yet) |
| Warning 4 | 2.4 | Not used |
| Maintenance | 2.0 | Used during "Test" mode |
| Fault 1 | 1.6 | General instrument fault |
| Fault 2 | 1.2 | Power range fault |
| Undefined / broken wire | < 0.5 | Reads 0 when there's no power or a broken 4-20 line |
| Boot | 0 | Used during system boot |

A table with the different 4-20 levels, used by MetCam, is displayed here for convenience.

Select the 4-20 value you want to enforce as output and press the “Set 4-20” button.



A window will pop up requesting you to approve.



Click on OK.

The selected value will be transmitted for 10 seconds.

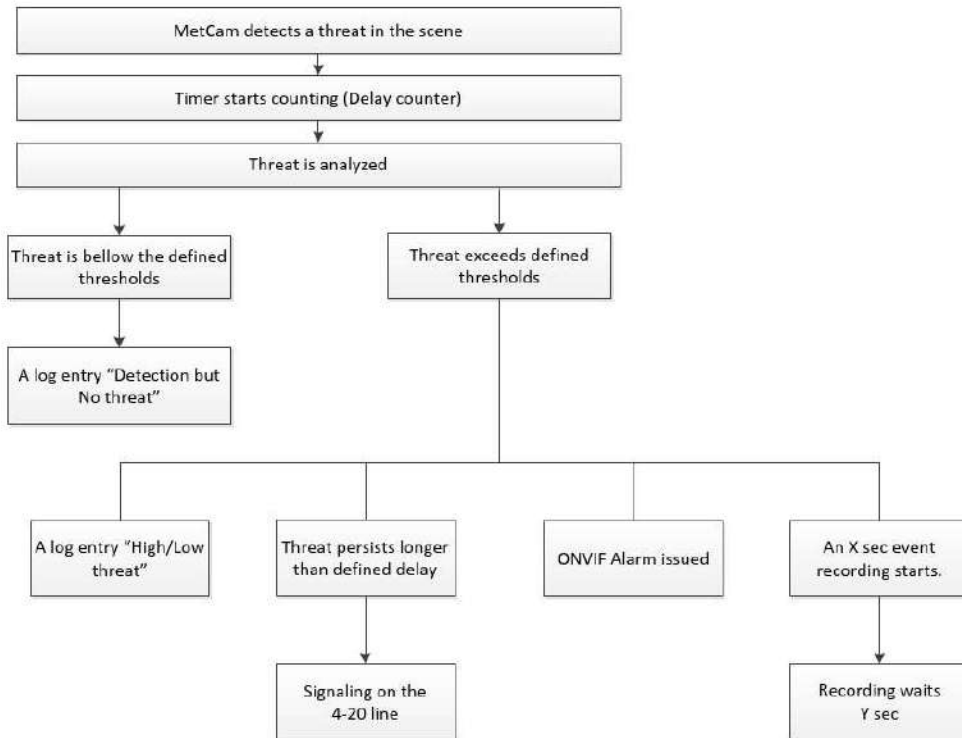
This feature works regardless of the MetCam operation state, warmup, normal operation, alarm, etc.

5.8 Safety Alarms and Signaling in MetCam

The logic of MetCam signaling and output, as part of its Safety application, is explained in the following flowchart. MetCam is designed as a hierarchical state machine (HSM).

The default basic state is *Normal Operation*.

Once a threat is detected the following logical process is executed:



The process goes back to *Normal* mode once the threat disappears.

The above process is applicable for threats related to the *Safety* mode, it does not describe the logic used in the *Emissions* mode alarm.

5.8.1 Standard Signals

These include:

| <i>State Name</i> | <i>4-20 mA Value</i> | <i>Remarks</i> |
|-------------------|----------------------|--|
| Normal | 4 mA | Un-latched |
| Emissions Alarm | 8 mA | Latched, uses a timeout duration parameter |
| Hotspot Alarm | 12 mA | Latched, uses a timeout duration parameter |
| Safety Alarm (A1) | 16 mA | Un-latched |
| Safety Alarm (A2) | 20 mA | Un-latched |

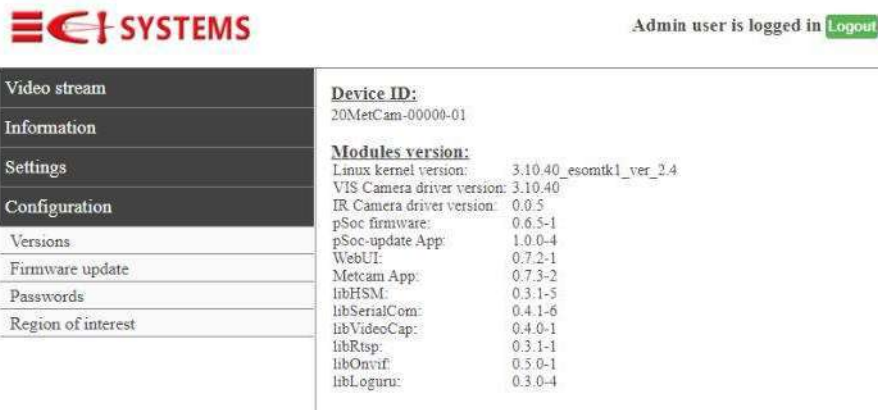
5.8.2 Special Signals

Special (fault band) 4-20 mA signals:

| Name | 4-20 mA output | Remarks |
|-------------------------|----------------|--|
| Warning 1 | 3.5 mA | Not in use |
| Warning 2 | 3.2 mA | Low of Contrast (Safety Inhibition) |
| Warning 3 | 2.8 mA | Obscuration – not implemented |
| Warning 4 | 2.4 mA | Not in use |
| Maintenance | 2.0 mA | Used during <i>Test</i> mode – not implemented |
| Fault 1 | 1.6 mA | General Instrument Fault |
| Fault 2 | 1.2 mA | Power range fault |
| Undefined / broken wire | < 0.5 mA | Reads 0 when there is no power or when there is a broken 4-20 line |
| Boot | 0 mA | During system boot |

5.9 Versions

The tab lists the versions of the different software modules running in MetCam.



The *Device ID* is the unique serial number of the specific MetCam unit. It has the following format: YYMetCam-XXXXX-ZZ

- YY is the production year
- XXXXX is the CI order number
- ZZ is the unit identifier number, in a multi-device order

This number is given to the unit during production.

The *Modules version* is a list of the different software modules that make up the MetCam operating system and software. The main application is the *Metcam App*.

5.10 Firmware Update

This tab allows an Admin user to update the firmware software. The process of upgrading the software is:

- Download an upgrade file from CI Sensing website <https://www.cisensing.com/metcam-continuous-optical-gas-imaging-camera>
- Connect the PC containing the file to a MetCam and open the WebUI (logging on as an Administrator)



Click the Browse button and select the update file. This file has the format *Metcam-20200303-14.tar.gz*. It is a compressed archive file type. Its name includes the date of its creation and its version.

When an update file is uploaded, MetCam compares the module versions in it to the ones installed. Only more recent modules will be updated, the MetCam process will not allow going back to older versions than the ones already installed. The user may override this by checking the *Force Install* option.



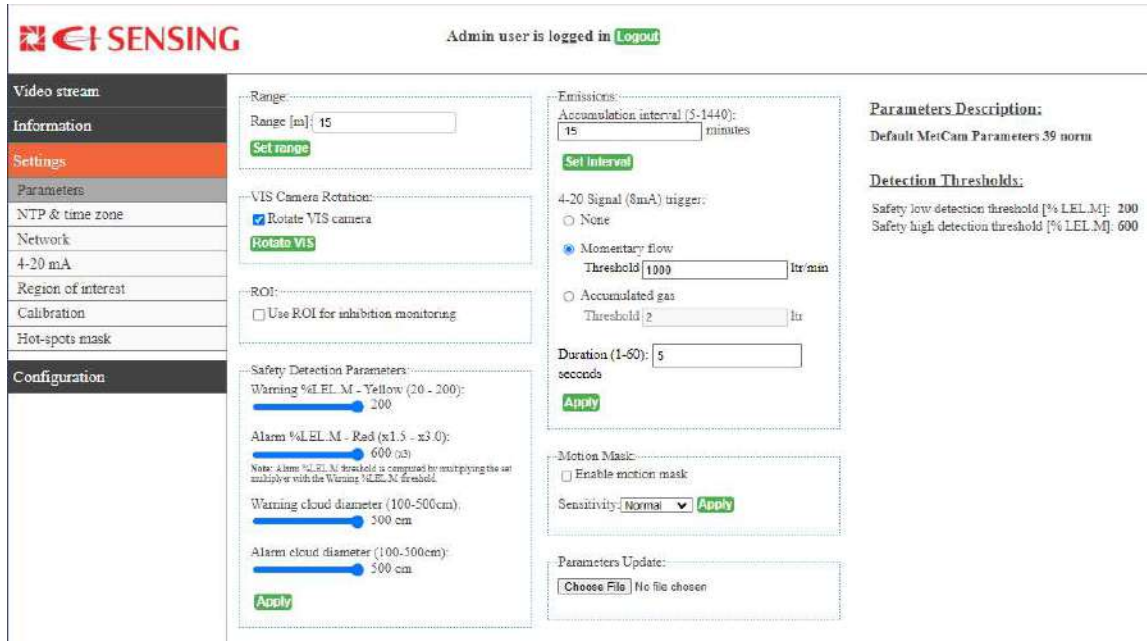
Click the *Update* button to start the firmware update – this could take 30 sec, a success message will appear when it is completed.

MetCam will automatically perform a reset after each update.



5.11 Parameters Tab

The Parameters tab includes user access to a number of system parameters. Some of these are explained in other sections of this manual. This section explains all the parameters appearing in this tab.



5.11.1 Range

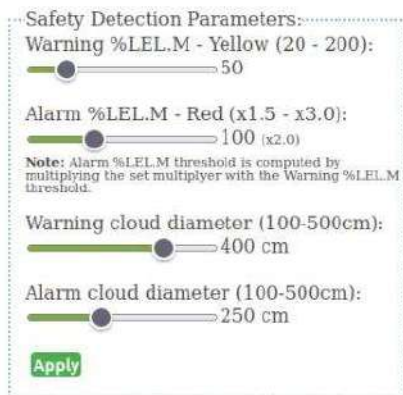
See section 4.7

5.11.2 Vis Camera Rotation

See section 4.7

5.11.3 Safety Detection Parameters

This feature was added in May 2023. Up to this date, the Safety parameters were coded into the parameters file. From this version they are exposed for the user to adjust.



For a Warning or Alarm signal to be produced (16 or 20 mA), a gas cloud needs to be both denser and larger than the set values

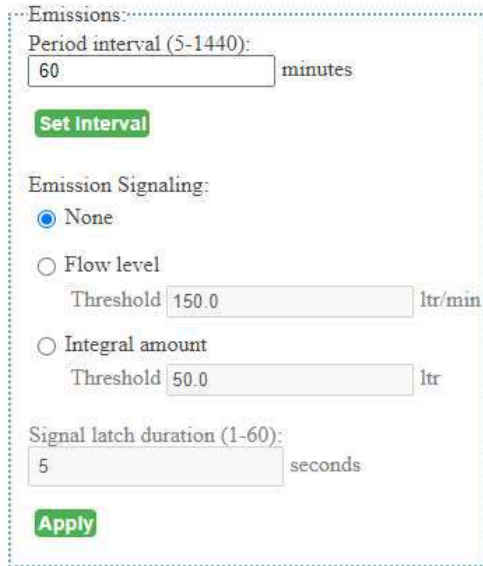
The allowable ranges are specified at the heading of each parameter slider.

- Warning level can be set in the range 20 to 200 %LEL.M
- Alarm level is always higher than the Warning level by a factor that can be set in the range X1.5 to X3.0
- The respective cloud size, defined by the diameter, is independent, there is no constraint between the cloud sizes of the two levels (Warning and Alarm).

Press the Apply button once the parameters are set. These values take effect immediately, no need to reboot MetCam.

5.11.4 Emission Alarm Setting

Alarming based on Emissions was first added in RC38 (Jan 2023) and was optimized in RC39 (Jul 2023). The interface now allows the user to define the alarm logic.



Period Interval – this parameter defines the emission log file period, it will reset once the period is over and start anew.

None – selecting this option results in an Emission image and log file created periodically with no alarming or signaling. The images are a synopsis of the Emissions observed during the period and are meant to highlight scene areas where gas was present. If this option is selected, it makes sense to use long period intervals (1440 = once daily, would be a good setting) to decrease the amount of data the user would need to review.

Flow Level – selecting this option will trigger the 4-20 mA signaling and event saving if the set flow threshold is exceeded. A short video clip of the gas cloud will be saved to memory. An emissions log is written and saved to memory. An emissions log is also saved periodically, according to the defined interval.

Integral Amount – selecting this option will trigger the 4-20 mA signaling and saving if the set threshold is exceeded, within the defined Period Interval.

Once the threshold is exceeded, an Emissions image and log are saved.

The Period Interval counter will then reset.

If the threshold is not exceeded, an emissions log is written and saved, according to the defined interval. No image is generated.

The signal latch duration defines the duration of the 8 mA signal in case of alarm (on Flow or on Integral Amount).

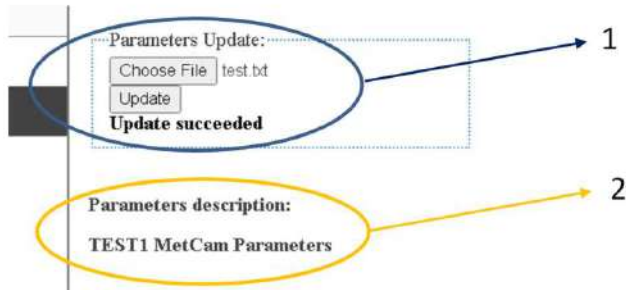
5.11.5 Parameters Update

MetCam operation and detection algorithms are based on a set of parameters. These include (for example) a definition of the warm-up time, detection thresholds and so forth. These parameters are independent of the software version running MetCam and an interface is available to change them.

The parameters file is created by CI Sensing, according to requirements of specific installations, and is sent to the local technician in charge of updating the unit. This txt file needs to be stored on the PC that will be used to connect to MetCam using the WebUI.

Go to the Settings/Parameter tab and browse to the updated parameters file location. Once selected, press the *Update* button.

An *Update succeeded* message should appear.



Zooming into the dialog we see 3 dialogs:

#1 is an interface to select a file (using the *Choose File* button) and upload it into the system (using the *Update* button). A successful upload will be indicated by the *Update succeeded* notice.

#2 is a text display of a header line that is part of the parameters file. This line serves as a description of the parameters file.

The Safety high and low thresholds set by the parameters file show up on the right hand side

5.12 Region of Interest (ROI)

See section 4.8.

5.13 Motion Mask

Motion Mask sensitivity setting through WebUI was added in Jan 2023, as part of RC38.

Previous software versions allowed the user to turn the motion mask on/off and did not allow any tuning.



Tuning is required to optimize the performance of motion masking.

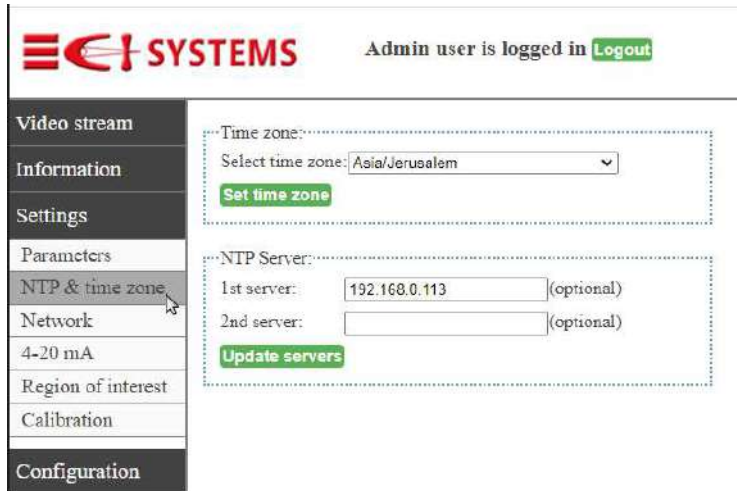
- In installations where there is frequent motion with MetCam’s field of view, use the Normal or High sensitivity setting.
- In sites where birds/bats are frequent use the Extra High sensitivity setting.
- In sites where moving objects are rare, or where the monitored gas mixture contains significant amounts of other-than-Methane components, use the Low sensitivity setting.

The motion mask will mask out moving objects in both the *Safety* and *Emissions* detection algorithm. Motion Mask should be turned off when using the Simulation Target.

Hit the *Apply* button once the selection is made.
The setting survives MetCam power cycle.

5.14 NTP and Time Zone

Since Rev RC36 (Oct 2022), MetCam firmware has an added feature of using a local NTP server.



This interface allows a user to define the address of a local network NTP server. This setting survives power cycles and so will keep MetCam time correct even in the event of one.

The added interface also allows the user to select the time zone, this is required for receiving correct time setting when working with an NTP sever.

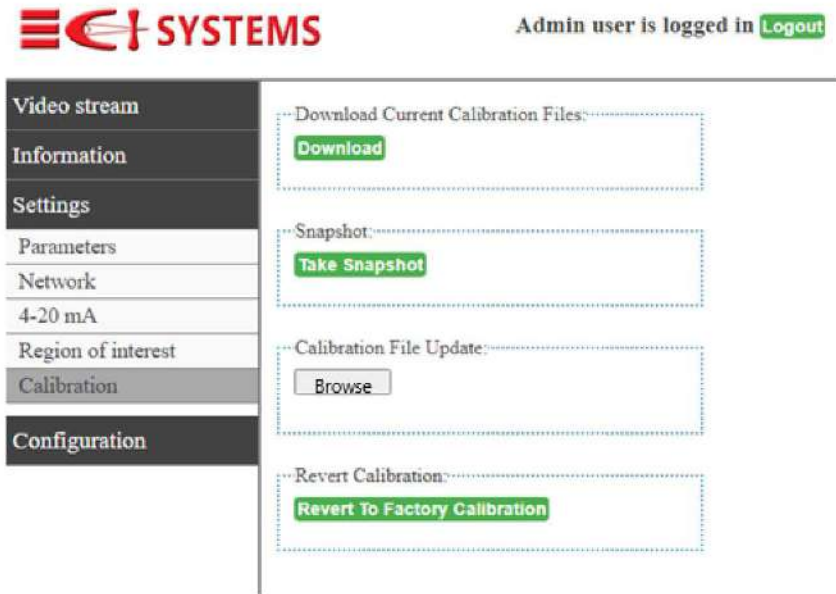
Daylight saving is not implemented at this point.

Select the correct time zone for your site using the drop-down list.

You will need to Reboot MetCam (See section 5.26) for this change to take effect.

5.15 Calibration Tab

The *Calibration* tab (under *Settings*) was introduced in RC33. This tab is used to modify the stored unit calibration parameters.



Download Calibration Files – pressing this button will download all calibration files to the connected PC. This operation is needed when a change to any existing file is needed due to specific installation conditions.

Snapshot – explained in section 5.22

Calibration File Update – allows uploading new calibration files (one at a time).

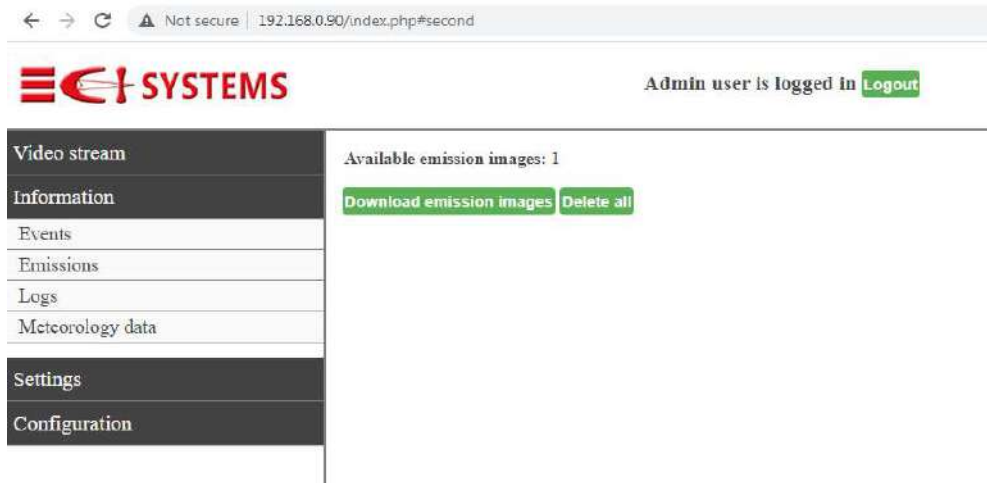
Revert Calibration – This option reverts the calibration files to the original files created in factory.

5.16 Safety Events

Whenever MetCam detects a threat, a cloud that exceeds the set density and size thresholds, it saves ~10 sec of video prior the event, and 20 sec of post-event onto its on-board non-volatile memory. These videos can be downloaded and deleted through the WebUI (by an Admin user). The Events memory buffer saves the last 20 Events recorded by MetCam (FIFO).

Once an event is recorded, the internal recording device goes into a 60 sec pause. This is done to limit the number of recordings in the case of continuous threat.

5.17 Emission Data



Emissions images can be erased from memory when an Administrator is logged on. The allocated buffer allows saving ~ 2400 files.

The download includes Emission images and files.

A log file example:

```
File created on: 2023-07-03_15-44-23
Time, Wind Speed, wind Direction, Temporary Flow (liters/min), Overall Flow (liters)
2023-07-03_15-44-23-658, 0.10, 270.00, 18.27, 0.03
2023-07-03_15-44-23-761, 0.10, 270.00, 17.37, 0.07
2023-07-03_15-44-23-881, 0.10, 270.00, 16.42, 0.10
2023-07-03_15-44-23-977, 0.10, 270.00, 15.47, 0.13
2023-07-03_15-44-24-124, 0.10, 270.00, 14.84, 0.15
2023-07-03_15-44-24-257, 0.10, 270.00, 14.18, 0.18
2023-07-03_15-44-24-348, 0.10, 270.00, 13.49, 0.20
2023-07-03_15-44-24-448, 0.20, 270.00, 12.78, 0.23
2023-07-03_15-44-24-560, 0.20, 270.00, 12.06, 0.25
2023-07-03_15-44-24-663, 0.20, 270.00, 11.37, 0.27
2023-07-03_15-44-24-786, 0.20, 270.00, 10.66, 0.29
```

Entries into this log are written at a rate of 9Hz when an emission is detected.

No data is written when there is no emission detected.

This is done to keep the size of these logs reasonable.

This log format includes wind direction and speed values.

In case an Anemometer is not connected, -nan will be written in these columns.

5.17.1 Emissions Alarms

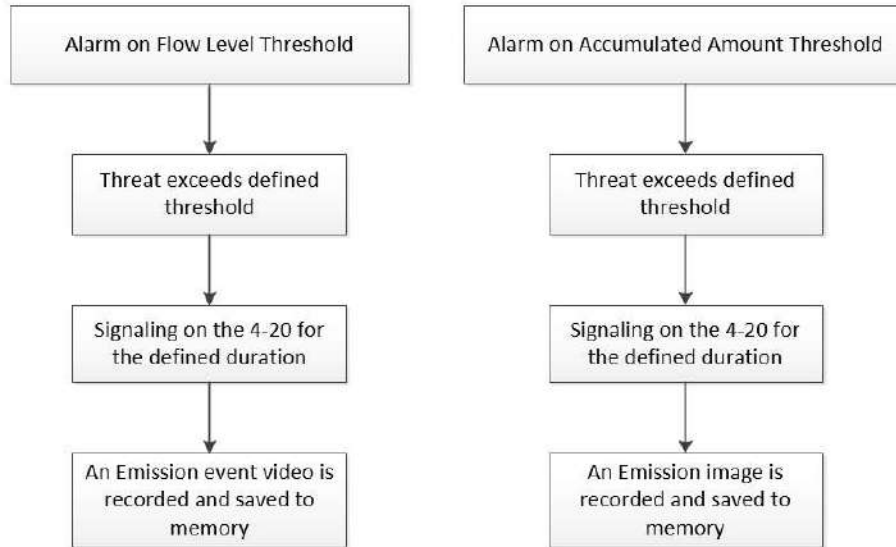
A 4-20 mA alarm, based on the emissions quantification, is added to the firmware in the update package called RC38 (Jan 2023).

The alarm level has an interface in the Parameters tab.

The user may select between two types of alarms:

- An alarm based on a momentary flow value (in units of liter/min).
- An alarm based on an accumulated emission value (in units of liter).

The logic and output of each of the alarm methods is explained in the following flowchart:



5.18 Operational States

MetCam is implemented as a *State Machine*. Any change in the state is documented (using a time-stamp) in the log. The following is a list of the MetCam states, the related 4-20 mA value, the LED status and implementation in this version:

| State Name | 4-20 mA Value | LED Status | Implementation |
|-----------------------------------|---------------|-------------|-----------------|
| Normal Operation | 4 mA | PWR | Implemented |
| Emissions Alarm | 8 mA | PWR | Implemented |
| Hotspot Alarm | 12 mA | PWR | Implemented |
| Safety Alarm (A1) | 16 mA | PWR | Implemented |
| Safety Alarm (A2) | 20 mA | PWR | Implemented |
| Warning 1 | N/A | N/A | Not in use |
| Warning 2 – Safety Inhibition | 3.2 mA | PWR | Implemented |
| Warning 3 - Obscuration | 2.8 mA | CHK | Not implemented |
| Warning 4 - Warmup | 2.4 mA | PWR | Implemented |
| Maintenance | 2.0 mA | PWR | Not implemented |
| Fault 1 – General fault | 1.6 mA | ERR | Implemented |
| Fault 2 – Input power range fault | 1.2 mA | ERR | Implemented |
| Undefined / broken wire | < 0.5 mA | ERR or Null | Implemented |
| MetCam Boot | 0 mA | BOOT | Implemented |

The standard sequence, when a MetCam unit is powered up:

- Boot (State 12) – usually lasts < 1 Min
- Warmup (State 7) – this is a configurable period, minimum is 30 min
- Normal operation (State 1)

The following table provides the log entries during the different states of the *State Machine*:

| State Name | Meaning | Log Entries |
|-------------------|--|---|
| Normal | MetCam is in normal operation – no gas detected in the scene | - <i>MetCam has entered routine operational state!</i> |
| Alarm (A1) | MetCam has detected the presence of gas, above the defined thresholds | - <i>MetCam has detected a safety event!</i> - <i>Threat level: LOW</i> |
| Alarm (A2) | MetCam has detected the presence of gas, above the defined thresholds | - <i>MetCam has detected a safety event!</i> - <i>Threat level: HIGH</i> |
| Warning 2 | MetCam has entered Inhibition state due to loss of contrast | - <i>MetCam operation is inhibited!</i> |
| Warning 4 | MetCam has powered up and is now waiting for the warmup period to complete | - <i>MetCam has entered Warmup operational state!</i> |
| Fault 1 | MetCam has detected a general instrument fault | - <i>MetCam encountered a critical error!</i> |
| MetCam Boot | MetCam software is loading, multiple log entries during this process | - <i>Logging to '/media/sdcard/operation.log', mode: 'a', verbosity: 0</i> - <i>pSoC FW version: 0.5.0.1</i> - <i>WebUIServer is listening to connections</i> - <i>Activating MetCam state-machine</i> - <i>MetCam is initialing...</i> - <i>MetCam initialization completed successfully!</i> |

5.19 Logs

- Log entries are shown in the Log tab and can also be downloaded as a file.
- New log entries are added at the bottom of the list; scroll down to see the latest entries.
- The log entries are written onto the MetCam on-board non-volatile memory.
- The log file is backed up and saved every day at 00:05. MetCam then starts a new log file
- Old files are kept for 10 days and then deleted; MetCam keeps a 10 day log history.
- Pressing the *Download log file* button will download all saved log files as a compressed zip file.

The following shows how the log files will look when downloaded from MetCam and saved onto a PC:

Also indicated in the log are WebUI user interactions.

Some of the interactions generate multiple log entry options, dependent on the success of the interaction:

| Operation | Status of command | Log entry |
|------------------|--|---|
| Set Range | WebUI request received by the main process | <i>Received request to set target range to %f</i> |
| | Request failed | <i>Target range failed to update!</i> |
| | Request succeeded | <i>Target range updated successfully!</i> |
| 4-20 Set Value | WebUI request received by the main process | <i>Received request to set 4-20 value to %f</i> |
| | Request failed | <i>Internal error during request from WebUI</i> |
| | Failed to set the 4-20 driver | <i>Unable to set 4-20 value</i> |
| | Request succeeded | <i>4-20 value was set correctly</i> |
| Set ROI | WebUI request received by the main process | <i>Received request to update ROI to <%d, %d></i> |

| | | |
|----------------------------------|---|--|
| | Request failed | Unable to set ROI during request from WebUI. ROI failed to update! |
| | Request succeeded | ROI updated successfully! |
| | Temperature and humidity query received by the main process | Received request for meteorology data |
| | Average temp of the ROI could not be calculated | ROI temp data unavailable during request from WebUI |
| | Temp and RH data could not be read from the sensors | Sensor data unavailable during request from WebUI |
| Set VIS Image rotation direction | WebUI request received by the main process | Received request to set VIS orientation to %s. (%s = rotated 180 degrees / native) |
| | Main process could not perform the request | Unable to set VIS rotation during request from WebUI |
| | Request failed | VIS rotation failed to update! |
| | Request succeeded | VIS rotation updated successfully! |

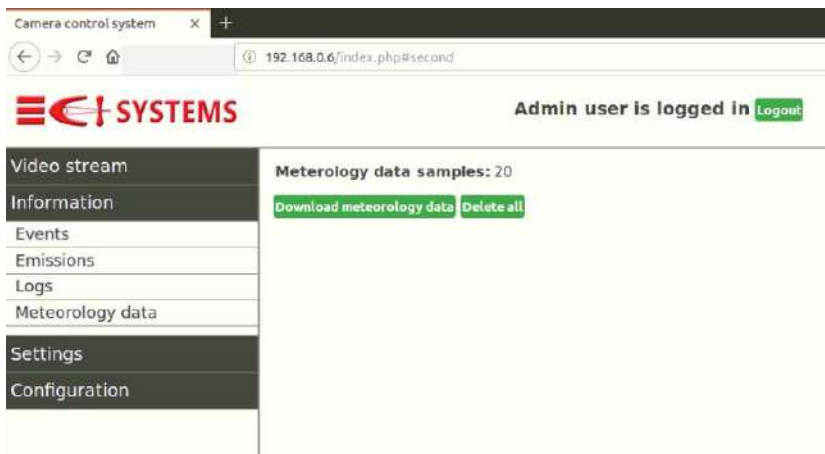
5.20 Meteorology Logs

This data is used to track the distribution and temporal changes in temperatures observed in the scene.

A log entry is made once every hour including sensor data and a temperature image of the scene.

This data is used to optimize the location of the installation.

The memory is FIFO, allows saving 2400 folders ~ 100 days of continuous operation data.



- Meteorology_2023-06-12_17-04-01
- Meteorology_2023-06-12_18-04-02
- Meteorology_2023-06-12_19-04-02
- Meteorology_2023-06-12_20-04-02
- Meteorology_2023-06-12_21-04-02
- Meteorology_2023-06-12_22-04-02
- Meteorology_2023-06-12_23-04-02
- Meteorology_2023-06-13_00-04-02
- Meteorology_2023-06-13_01-04-02
- Meteorology_2023-06-13_02-04-02
- Meteorology_2023-06-13_03-04-02

A folder is created once-hourly, the name is the time-stamp.

Each folder contains two files

| Name | Compressed size |
|---------------|-----------------|
| met.bin | 1 KB |
| obTempMap.bin | 73 KB |

5.21 Recording

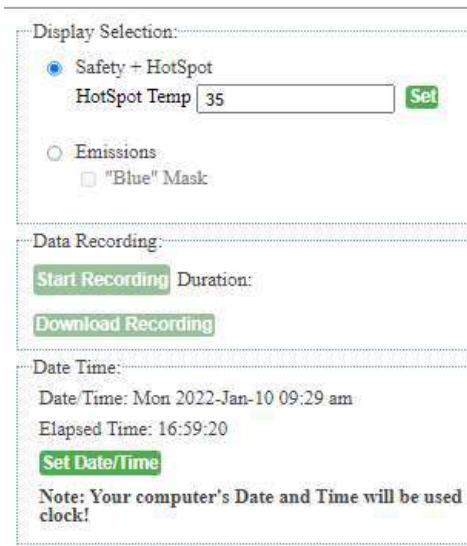
Recording is a feature used for development testing. It does not directly benefit a MetCam user. It allows saving data for offline analysis for improving MetCam performance.

Recording feature is usable once warmup has completed.

Trying to record before warmup completes will result in a failure message:



The *Recording/Download* dialog is on the right hand side of the main WebUI tab (Video stream tab). Recording length is limited to 5 minutes.



The IR frames are recorded at a rate of ~ 9 Hz while the Vis images are recorded at a rate of 10 Hz. The format used for the IR frames is raw, Vis images are jpg format.

Once a recording is stopped, or times out, the saved images automatically download to the connected PC.

Each new recording started will delete the previous one in the MetCam on-board memory.

The following pop-up window asks the user to confirm this deletion after pressing the *Start Recording* button:

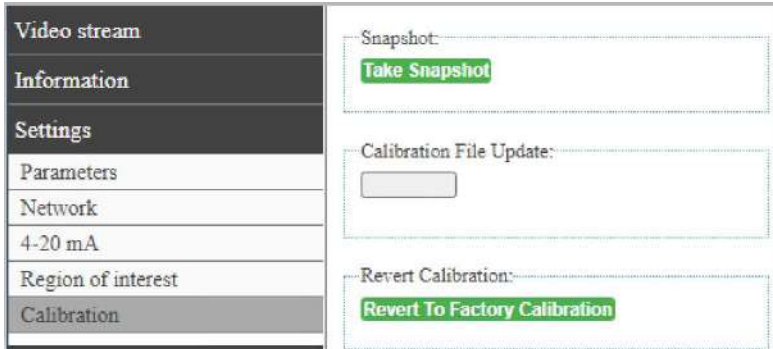
192.168.0.91

Starting a new recording will erase the previous one. Proceed?

Note: pressing the recording button will stop the creation of the accumulated emissions image. All other MetCam functions (Safety video stream, Emissions video stream, etc.) will continue normally.

5.22 Snapshot Recording

This feature records and downloads a single IR and Vis image. It is operated from the *Calibration* tab



Pressing the *Take Snapshot* button will capture and download to the connected PC, a zip file containing these two images. These images can then be used to improve image registration, especially in cases where the monitored area distance is less than 5 meters or in cases where the monitored area includes objects at a large diversity of ranges.

5.23 Direct Access to Emission logs, videos and Images, Meteorology files and Events

Data stored in the MetCam memory can be accessed directly, without the need to go through the WebUI.

For a MetCam with IP address *192.168.0.90*:

- Emission data (logs, images and videos) are accessed at address *http://192.168.0.90/emissions*
- Events are at address *http://192.168.0.90/events*
- Historical log files (the log is zipped every day at midnight and saved) the address is *http://192.168.0.90/logs*
- The currently used log file is at address *http://192.168.0.90/cisystems.log*
- Meteorology files (one file per hour) are at *http://192.168.0.90/meteorology*

Screenshot of direct access to the Emissions folder using Chrome



Since Sep 2022, this folder also contains the emission logs.


5.24 Saved Data Download and Delete Permissions

The following table provides an overview of the user-specific permissions, concerning data saved by MetCam.

| Operation | Admin | Operator |
|---------------------------|-------|----------|
| Download Events | √ | √ |
| Delete Events from Memory | √ | - |
| Download Emissions images | √ | √ |
| Delete Emissions images | √ | - |
| Download Log | √ | √ |
| Download Meteorology log | √ | √ |
| Delete Meteorology log | √ | - |

5.25 Setting Passwords

The WebUI login page can be password protected. To set password go to the *Configuration/Password* page after logging in as an Admin user (when logging in as an *Operator* this page will not be accessible).

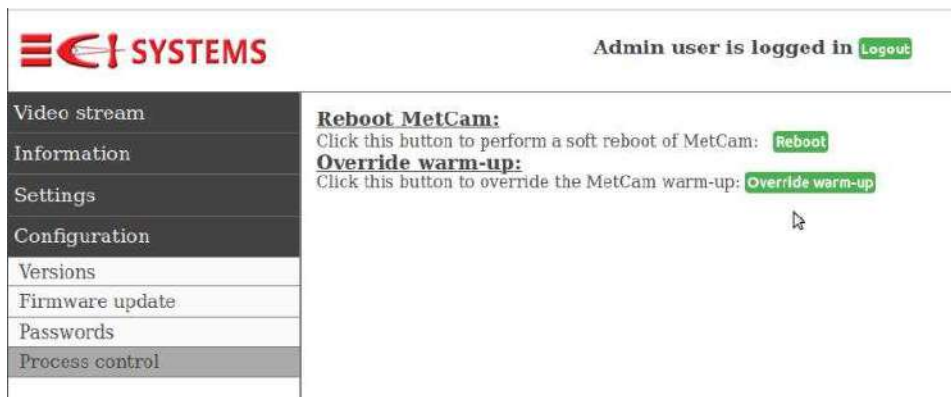


The screenshot shows the 'Passwords' page in the WebUI. On the left is a navigation menu with 'Passwords' selected. The main content area is divided into two sections: 'Admin user:' and 'Operator user:'. Each section contains input fields for 'Old password', 'New password', and 'Repeat new password', followed by a green 'Change password' button. Below these sections is an 'Important note: password change applies only to the system you are logged into.'

Type in and repeat the password for the user account. Password must be at least 8 characters long. Click the *Change password* button to apply, the WebUI will logout and you would need to login using the new password.

5.26 Reboot

This feature allows the user to initiate a soft reboot of MetCam.



The screenshot shows the 'Process control' page in the WebUI. At the top left is the 'CI SYSTEMS' logo. At the top right, it says 'Admin user is logged in' with a 'Logout' button. The left navigation menu has 'Process control' selected. The main content area has two sections: 'Reboot MetCam:' with a 'Reboot' button, and 'Override warm-up:' with an 'Override warm-up' button.

After pressing the *Reboot* button a confirmation window will pop up:

This will reboot MetCam. After reboot, please wait about 2 minutes to log back into WebUI. Proceed?

Press the *Confirm* button to start the reboot, MetCam will revert to the Login page, allow for 2 minutes before trying to log in again.

Note that after the reboot MetCam will enter its Warmup phase (see Section 4.3 for instructions on skipping the warmup in this case).

5.27 Logging in as an Operator

When logging into the WebUI as an *Operator* the list of displayed menu items is decreased.

It includes the *Video Stream* and *Information* tabs.

The *Settings* and *Configuration* and tabs are not visible to this user.

The following shows the menus available to an *Operator* type of user:

