ANPR LUMO

installation guide

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1 Introduction

The NEDAP ANPR LUMO License Plate Reader offers automatic number plate reading. The NEDAP ANPR LUMO is an all in one camera including camera, analyzer and IR illuminator. The ANPR has embedded processing software onboard. The License Plate Reader is default featured with RS485, Wiegand and Ethernet communication.

1.1 Typical applications

Typical applications include parking, crime prevention, toll systems, security and access control, logistics and customs. In addition the NEDAP ANPR LUMO can be applied in applications where it is difficult to issue RFID tags.

1.2 Key features

- Automatic number plate reading.
- All-in-one system including camera, analyzer, IR illuminator.
- ANPR LUMO optimal performance in range from 2 to 10 meters.
- Easy user configuration (web server).
- TCP/IP Ethernet interface.
- RS485 serial interface.
- OSDP v2 supported including secure channel protocol.
- Wiegand 26 bit/64 bit.
- Wiegand match-list with custom Wiegand format.
- Digital inputs.
- Stand-alone operation supported by digital outputs and black-, white-, ignore list features.
- Advanced access lists features through regular expressions.
- Multiple regions of interest
- Power over Ethernet
- REST API

2 Getting started

2.1 Mounting the ANPR LUMO

Determine how to mount the ANPR. The ANPR LUMO can be installed onto a pole or behind the barrier. Mount behind the barrier to ensure recognition right in front of the barrier.

Important mounting issues are:

- Best focus distance is between 2 and 10 meters [7 ... 26 ft].
- Angle between ANPR and number plate should be smaller than 25 degrees.

Mounting details are described in chapter 3.2.

2.2 Connecting the ANPR

The ANPR is delivered with 5m cables for power, I/O and network. Power supply, RS485 communication and I/O are combined in one cable. Ethernet network is a separate cable. The cables are pre-fitted to the ANPR. For installation the ANPR does not need to be opened. Connecting the power supply and network cable are required to configure the ANPR.

2.3 Assigning an IP-address

Enter the default IP-address in the address bar of your web browser.

Default IP address is:
IP address: 192.168.3.15

The login window appears where the user is asked to type the username and password.

Username: **admin**
Password: **secret**

Go to the system configuration and setup the network configuration as desired. If required, now also other configuration settings may be changed.

Note : The ANPR LUMO software interface is not compatible with Internet explorer

2.4 Testing the ANPR

Test the ANPR to check if it is aligned correctly and if it is able to read the license plates. Drive the vehicle into the position where it should be possible to read its license plate.
Connect to the ANPR using your web browser on the main page you can see the live video. On the right side of the page the text results are shown. It might be necessary to adjust the ANPR alignment.

3 Installation

3.1 Safety precautions

The following safety precautions must be observed during normal use, service and repair.

- The ANPR shall be connected to safety ground.
- Disconnect the power supply before removing any parts.
- The ANPR shall only be installed and serviced by qualified and trained personnel.
- To be sure of safety, do not modify or add anything other than mentioned in this manual or indicated by NEDAP N.V.
- CAUTION: for continued protection against risk of fire, replace fuses only with the same type and rating.
- The ANPR can be powered from a low power, Class 2 power supply, in compliance with local regulations or through POE.
- The product is to be connected only to PoE networks without routing to the outside plant.
- The ANPR is equipped with an 850nm Infrared illuminator. The human eye will not or slightly see this light coming from the illuminator. Do not look into the ANPR lens directly from close range or for more than 100 seconds. Eyes can be damaged by not taking these precautions. During normal use of the ANPR at a vehicle gate, reading plates, there is no risk to the public.

3.2 Mounting

The ANPR is intended for vehicle access control. Vehicles are identified by the number plate when approaching the gate. Because the number plate recognition is very fast, a full stop is normally not necessary. The ANPR covers a reading distance of 2 to 8 meters. The field of view is typically one lane wide. There are 2 recommended positions for the ANPR.

3.2.1 Pole mounting

The ANPR is positioned directly behind or in front of the actual barrier onto a pole. In that case the ANPR can be best positioned on a pole at maximum 2m20 height. In this position the number plate of the vehicle directly in front of the barrier cannot be read anymore. So these vehicles need to be recognized in flow. Mounting the ANPR at 2m20 height is here the best option. When overhead installation is an option, the ANPR can at best be installed in the center of the lane, above the lane. Horizontal angle will be 0° in that case, which is good.

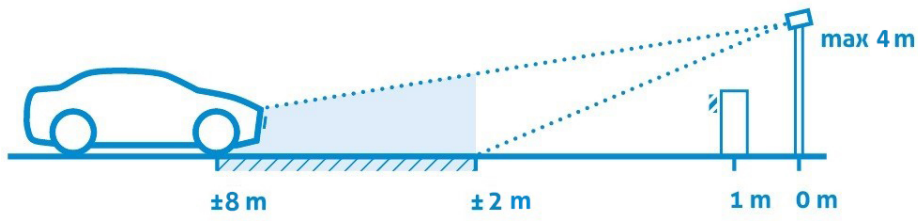


Figure 1: Pole mounting (ANPR LUMO)

3.2.2 Behind barrier mounting

The ANPR is positioned behind the barrier at bumper height.
If there is space behind the barrier and the sight is not blocked, then the best place for the ANPR is at bumper height (0.5m height) about 2 to 3 meters behind the barrier. A vehicle just in front of the barrier is still recognized in that case.

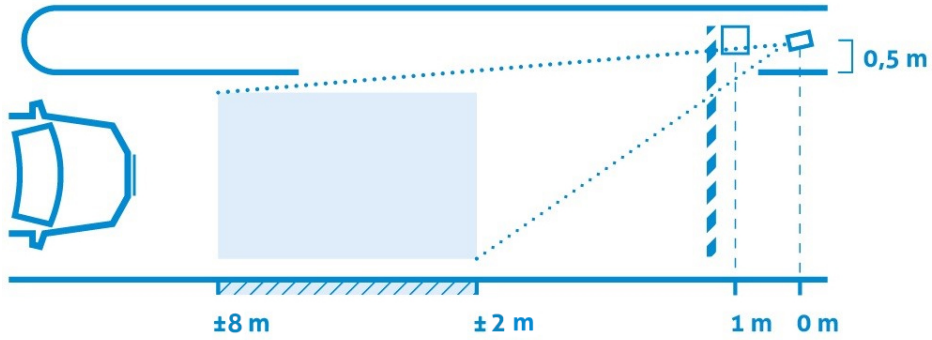


Figure 2: Behind the barrier mounting (ANPR LUMO)

3.3 Dimensions

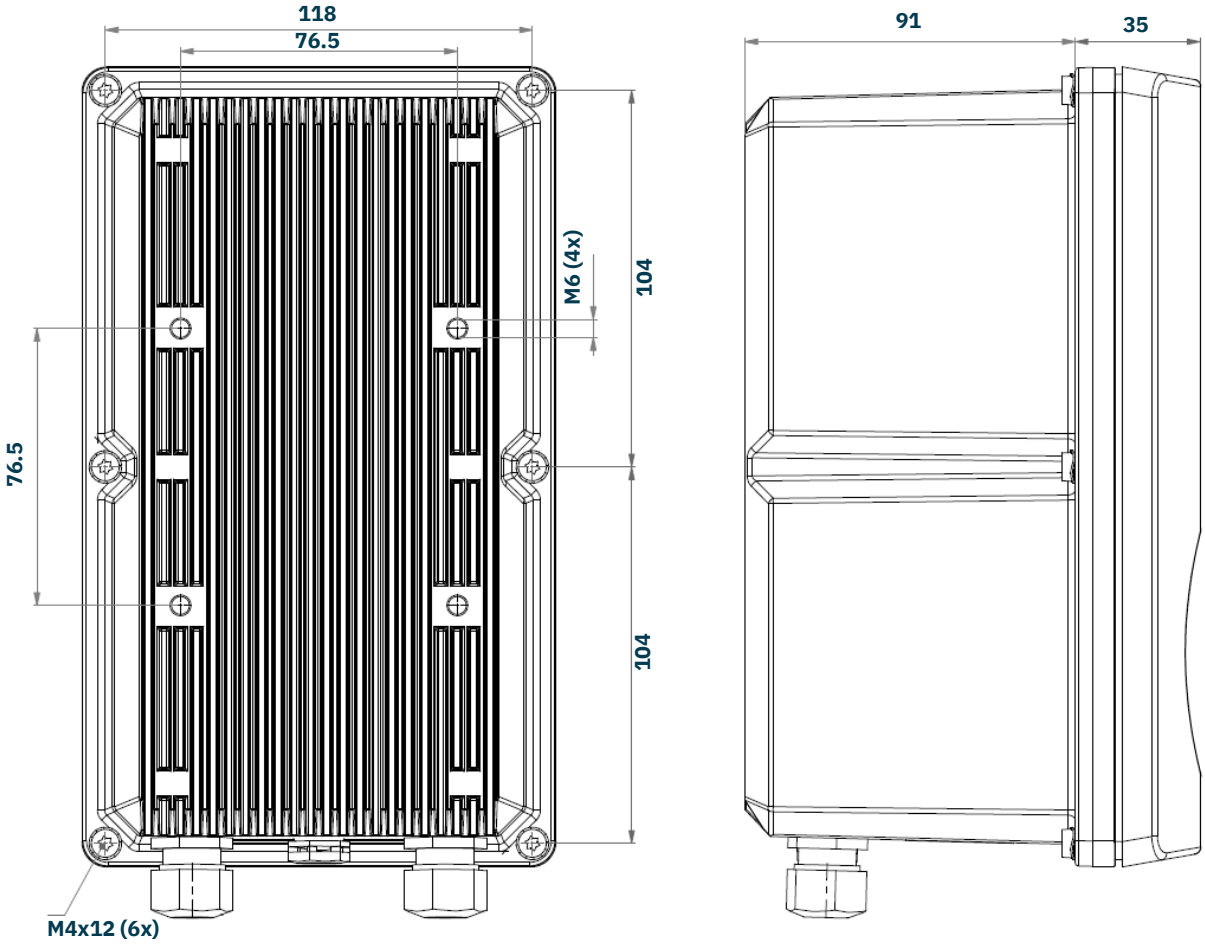


Figure 3: ANPR housing dimensions

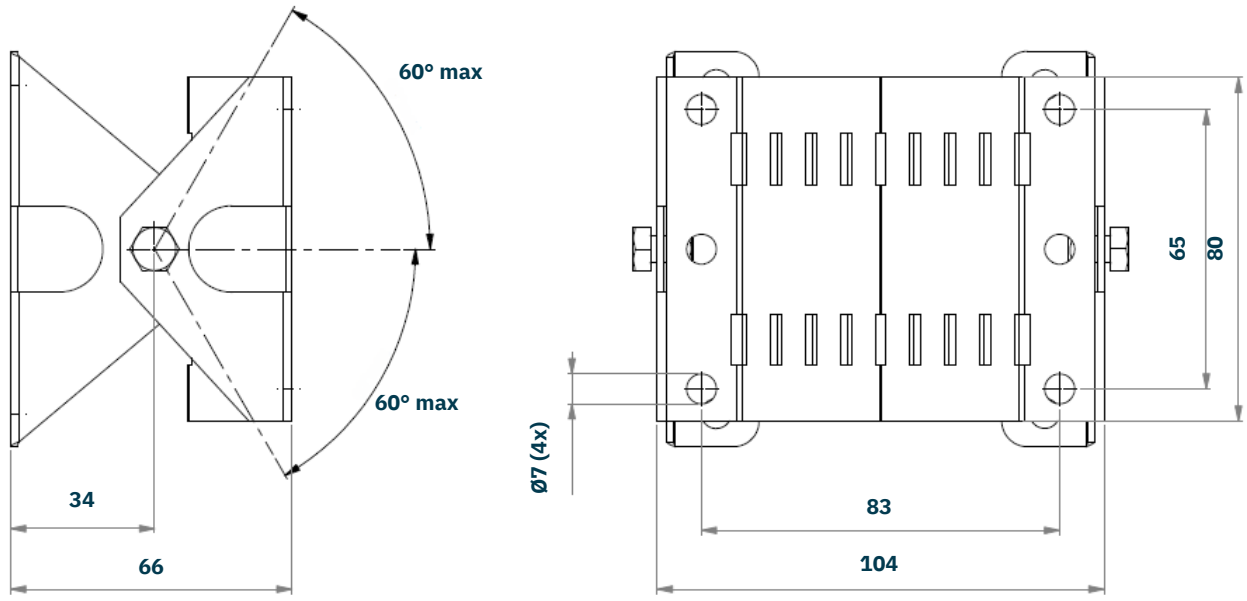


Figure 4: Mounting bracket dimensions

4 Connections

The ANPR is delivered with two 5m long cables. Power supply, RS485 communication and I/O are combined in one cable. Ethernet network is a second cable. The cables are pre-fitted to the ANPR. For installation the ANPR does not need to be opened.

4.1 Ethernet connection

The Ethernet cable is already fitted to the ANPR provided an RJ-45 connector. This Cat5e cable will be adequate for connection of the unit to a local area network. The ANPR LUMO can also be powered through Power Over Ethernet (POE).

4.2 Power supply

RED	Power supply +24VDC ~ 1A
BLUE	Ground 0V
BLACK	Ground 0V

Note: the ANPR LUMO may also be powered through POE

4.3 RS485 connection

YELLOW	RS-485 A
GREEN	RS-485 B
PURPLE	RS-485 GND

4.4 Wiegand connection

WHITE	Wiegand Data-0
BROWN	Wiegand Data-1
PURPLE	Wiegand GND

4.5 Digital I/O

PINK	Digital input IN 1 + (optocoupler positive contact, U = 5 - 24VDC)
GRAY	Digital input IN 1 -
GRAY/PINK	Digital input IN 2 + (optocoupler positive contact, U = 5 - 24VDC)
RED/BLUE	Digital input IN 2 -
WHITE/GREEN	Relay output 1 (normally open contact, U_{max} = 24VDC, I_{max} = 2A).
BROWN/GREEN	Relay output 1 (common contact).
WHITE/YELLOW	Relay output 2 (normally open contact, U_{max} = 24VDC, I_{max} = 2A).
BROWN/YELLOW	Relay output 2 (common contact).

5 OSDP

The ANPR LUMO support OSDP v2 , including the secure channel protocol.

5.1 Requirements

ANPR LUMO (art.no. 9986138) hardware revision A.05.
ANPR LUMO software v4.5.1 (or newer).

5.2 Connections

The OSDP communication is performed on the RS485 interface. See chapter 4.3 for a description of the RS485 connections. The communication can be connected in point-to-point or in multi-drop.

5.3 Configuration

Enable the OSDP communication in SYSTEM SETTINGS - SERIAL SETUP. See page 37.
Here you also set the OSDP baudrate, the OSDP device address and the secure protocol encryption key (SCBK).

5.4 Plate reading messages

Ensure that you enable a SERIAL-OSDP action upon a READ-event. See page 32.
The ANPR LUMO will send an OSDP_RAW message including the message data. The data report will be sent in response to a poll command (OSDP_POLL).

OSDP_RAW message format:

```
CMD        OSDP_RAW (fixed value 0x50)
byte 0     Reader number (fixed value 0x00)
byte 1     Format code (fixed value 0x00 = raw bit array)
byte 2/3   Bit count data length LSB first (bit count = length in bytes x 8)
byte 4/N   Message data
```

Example license plate = "HK55EVB" :

```
50 00 00 38 00 48 4B 35 35 45 56 42
```

48 4B 35 35 45 56 42 = "HK55EVB"
38 00 = Bit count 56 (56/8 = 7 bytes)

5.5 Relay outputs

Use the OSDP_OUT command to control the relay outputs.
Output #0 = Relay 1.
Output #1 = Relay 2.
See chapter 4.5 for a description of the digital IO connections.

5.6 Digital inputs

Upon status change the ANPR LUMO will send input status report message OSDP_ISTATR.
The current input status can be requested by sending the input status report request message OSDP_ISTAT.
Input #0 = Digital input 1.
Input #1 = Digital input 2.
See chapter 4.5 for a description of the digital IO connections.

5.7 OSDP capabilities

The ANPR LUMO supports the OSDP v2 including the secure channel protocol.

The OSDP control panel (CP) can request the device capabilities using the OSDP_CAP command. The ANPR LUMO will respond with the OSDP_PDCAP device capabilities report. Below an overview of the ANPR device capabilities.

	Function code	ANPR LUMO
1	Input	2x IN (no supervision)
2	Output	2x OUT (+timed)
3	Card data format	Raw array of bits
4	LED control	No user LED
5	Buzzer control	No buzzer
6	Text output	No display
7	Time keeping	The ANPR LUMO is able to locally update the time and date.
8	Check character report	CRC
9	Communication security	Yes, encrypted AES128
10	Receive buffer size	65535 bytes

6 Configuration

6.1 Using the web server

Prior to accessing the ANPR using a Browser, make sure the PC network configuration is coherent with the IP-address of the device to access. E.g.: if the ANPR IP-address is 192.168.3.15, the PC in use should have assigned an IP-address belonging to the same class (e.g. 192.168.3.10). See also chapter 8.1.1 for details about how to assign an IP-address to the ANPR.

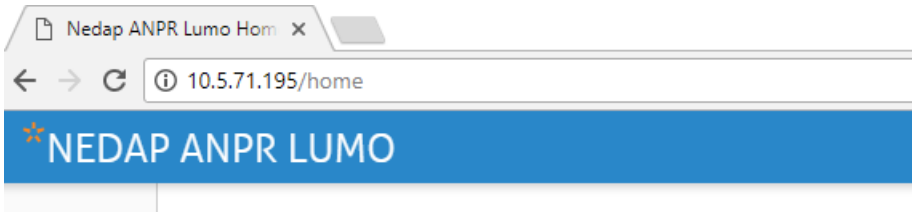


Figure 5: Using the web server

Enter the IP-address in the address bar of your web browser.
The login window appears where the user is asked to type the username and password.

Factory default username and password are:

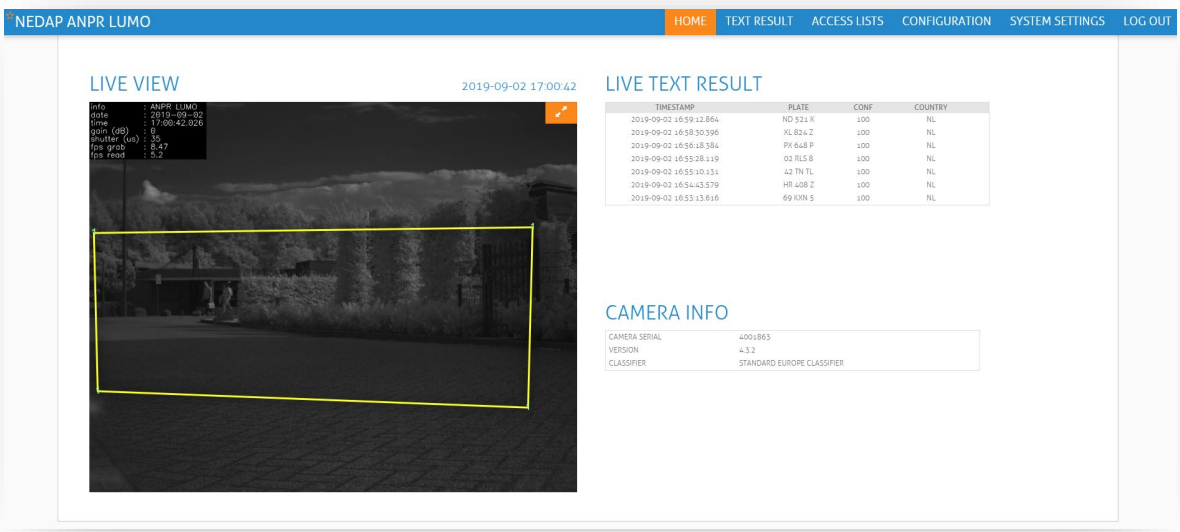
Username:	**admin**
Password:	**secret**

If the login was successful, the user is now able to access the main menu screen.

Note: This document will describe all function available in ANPR LUMO version 4.3.2

6.2 Menu Items

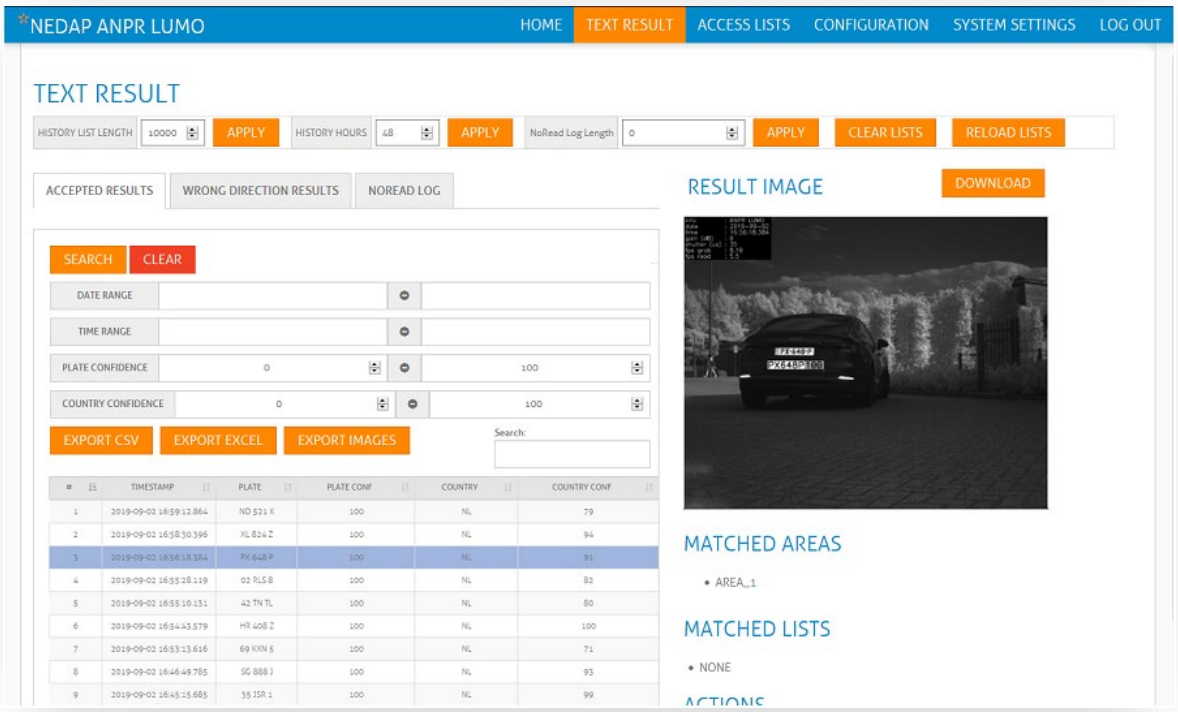
6.2.1 Home



The Home screen has 3 items, the live view, the Live text results and the camera information. At the camera info box, you can check which version of the software is currently installed in the camera.

The Yellow box within the LIVE VIEW represents the region of interest, this region of interest can be changed in the configuration menu, see chapter 7.2.

6.2.2 Text results



There are three different events that the results are listed for: *Accepted Results*, *Wrong Direction Results* and *NoRead Log*.

At the **ACCEPTED RESULTS** tab you can see all past results, the text results can be exported to a CSV file or excel file. The images can also be exported, when pressing the “EXPORT IMAGES” button, a zip file will be created containing the images. (depending on the amount of images, creating the zipfile can take a while)

The history is limited to the settings made at “HISTORY HOURS” and “HISTORY LIST LENGTH”.

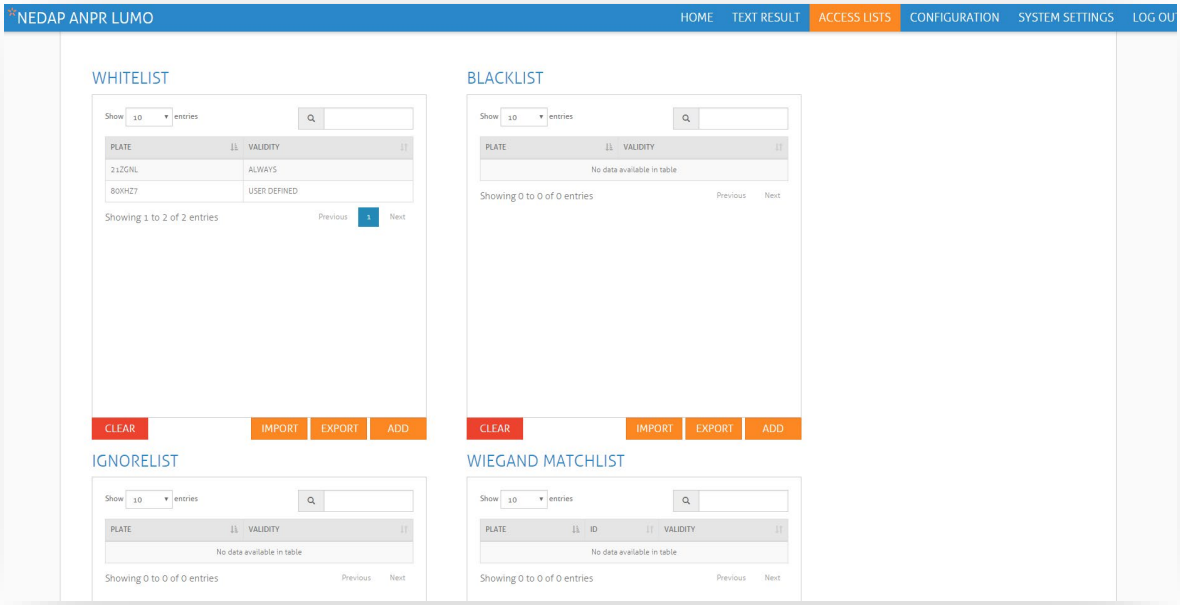
Below the image of the actual read you can find more detailed information. The details are in which area the plate is matched, if the plate was on one of the access lists, and what action where performed.

WRONG DIRECTION RESULTS tab lists all the plates that were detected, but were outside of the designated area and moving in the wrong direction.

NoRead Log tab logs all the NoRead events since the server started.

Note
By default the historical length and hours is set to zero.
When changing these values follow the local privacy regulations

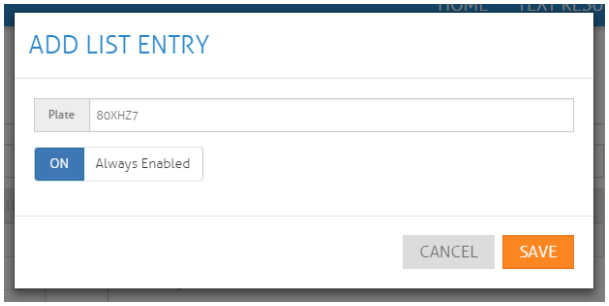
6.3 Access list



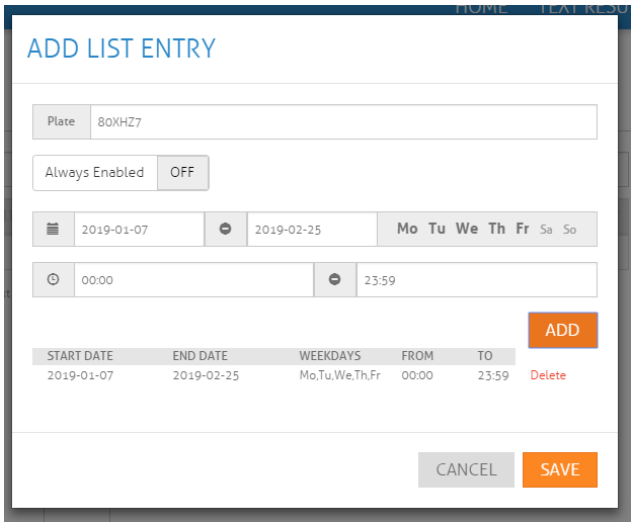
The ANPR LUMO has three “Access” lists, and one Wiegand Matchlist. The “access” lists can be used to trigger an action like activating a relay. These actions can be defined in the menu “configuration” -> “Actions” see chapter 7.3.

There are two ways to add plates to a list, you can either import a list, or manually add a plate to the list.

In the image below the license plate “80XHZ7” is always enabled, meaning that this plate is valid on this list forever.



In the example below, the plate is only valid on Monday, Tuesday, Wednesday, Thursday and Friday, in the period from 7-1-2018 until 25-2-2018 from 00:00 until 23:59



When you want to upload a file through the “IMPORT” button, follow these directives:
Open any text editor to create a file and save it any_name.txt. Only textual documents can be imported.

Enter the information according to the formatting rules and save the file. On the ACCESS configuration page click on ‚Import’ and select the newly created document from your device.

If importing was successful the content from the document will display on the screen. This list can here be edited if needed.

Note
A regular expression beginning with a * is invalid, because the * operator does not proceed any other atom! Use .* instead!

Formatting rules:

- Do not use blank spaces, everything should be written in a single line.
- Plate number, date and time must be separated with semicolons (;).
- When listing multiple dates/times separate them with a comma (,).
- Date format is: YYYYMMDD-YYYYMMDD, with no space between the numbers.
- Time format is: HH:MM-HH:MM. Time is always defined in combination with a date and a symbol (0/1) for the referred day of the week.
- Days of the week are represented with zeros and ones (0-not active, 1-active) written inside brackets starting with Sunday, ending with Saturday (0111110). In example "0111110" non-active days are Sunday and Saturday, represented with zeros (0).
- The amount of dates set must be equal to the amount of time restrictions (W223344;20170101-20170101,20170102-20170102,20170103-20170103;03:00-04:00(0111110),03:00-04:00(0111110),03:00-04:00(0111110)). If there are more dates than time restrictions (and vice versa) the command will be perceived as invalid.

	Example	**Description**
Only plate number	W223344	Always enabled
Plate number and date	W223344;20190125-20190226	Valid from 25 January 2019 until 26 February 2019
Plate number, date and time	W223344;20190125-20190225;03:00-17:00(0111110)	Valid from 25 January 2019 until 26 February 2019, between 03:00 and 17:00 on every day of the week except Saturday and Sunday (0111110)

Regular Expressions

Regular expressions are used to conveniently define patterns for license plates or groups of license plate strings.

The ANPR LUMO uses a powerful set of regular expressions, of which the most important details are described in the following paragraphs.
In the ANPR LUMO regular expressions, all characters match themselves (example: A is always A, B matches B etc.) except for some special characters:

. [] {} * + ?

The single character '.' when used outside of a character set (see below) will match any single character. E.g. the regular expression G.23456 will match G123456, or GU23456

(In the above expression, the "." is matched by 1 or U respectively)

A character range is defined by a list of characters enclosed in []. For example [A-D] will match any single character in the range 'A' to 'D'. This character range may also be defined as [ABCD].

An atom is defined as being a character or character range.

A single atom can be repeated with the * , +, ?, and {} operators.

The * operator will match the preceding atom zero or more times, for example the expression A*B will match any of the following: B AB AAAAAAAAAB or the expression A[BC]*D will match AD ABCD ACCCBBD

The + operator will match the preceding atom one or more times, for example the expression A+B will match any of the following: AB AAAAAAAAB But will not match: B

The ? operator will match the preceding atom zero or one time, for example the expression CA?B will match any of the following: CB CAB But will not match: CAAB

An atom can also be repeated with a bounded repeat, where the number of allowed repeats is defined as part of the regular expression:
A{n} Matches 'A' repeated exactly n times.
A{n,} Matches 'A' repeated n or more times.
A{n, m} Matches 'A' repeated between n and m times inclusive.

For example:
A{2,3}
Will match either of: AA AAA But neither of: A AAAA

The following paragraphs give some examples for regular expressions and use cases:

To match any license plate strings of at least length 1:
.+

Match license plate strings which consist of digits only:
[0-9]+

Match all taxis, under the assumption that taxis have a license plate string that ends with TX:
.+TX

Match all license plates that start with a letter and end with a digit:
[A-Z]+.*[0-9]+

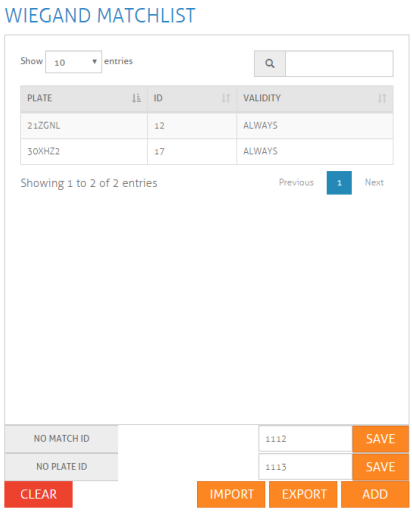
Match all license plates from the Nedap company, assuming that their license plates consist of a NEDAP string and a following 3 number digit (like NEDAP001):
NEDAP[0-9]{3}

When making a list using regular expressions, the string should always start with "!" sign.

6.3.1 Wiegand matchlist

The Wiegand matchlist makes it possible to match a license plate with a pre-defined Wiegand ID.

In the example below the license plate “21ZGNL” is matched with Wiegand ID 12, the license plate 30XHZ2 is matched with Wiegand ID 17.
A number plate which is not on the list, will be send as 1112

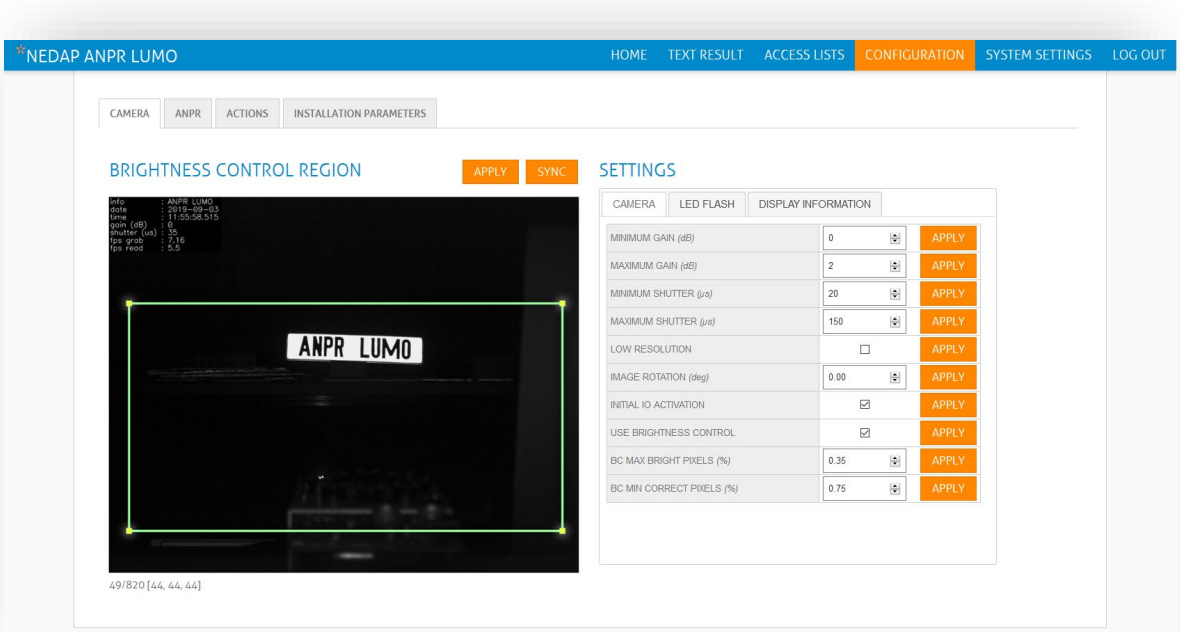


The Wiegand output format must be defined in the ACTIONS menu. See chapter 7.3.

7 Configuration menus

7.1 CAMERA

After installation camera configuration should take place. The essential segment of ANPR is image acquisition. Quality of images depends on the camera and illumination preferences.



The area within the green polygon is the brightness control region of interest (ROI). It defines the image area within which the camera measures and corrects the image brightness. With the “SYNC” button you can synchronize the Region of interest settings from the ANPR menu.

It is important to minimize this surface and limit it to the area only where plates are expected to appear. This maximizes the impacted of brightness control parameters during image acquisition, on the selected area. You have to press the “APPLY” button.

Explanation CAMERA SETTINGS:

MIMIMUM GAIN (DB): Gain controls the amplification of the signal from the cameras sensor. It boosts the signal by some amount thereby making already captured images look brighter. As a result of signal enhancement negative image blur may occur. Default 0

MAXIMUM GAIN (DB): Gain controls the amplification of the signal from the cameras sensor. It boosts the signal by some amount thereby making already captured images look brighter. As a result of signal enhancement negative image blur may occur. The reason is that the overall signal is boosted, making also noise more visible. Reasonable upper limits are typically 6-10 db. We recommend a maximum gain value of 10 for the Camera. Default 10

MINIMUM SHUTTER (µs): Minimum shutter refers to minimal exposure time in microseconds that the shutter will stay open. Default 1

	Shutter speed should be changed according to vehicle speed. If the vehicle is approaching in high speed, the exposure time should be reduced. When minimum shutter is set too high (in relation to the vehicle speed) it may cause lower reading performance because images can turn out blurry. As a general recommendation, the following exposure (shutter) times are advised: - shutter time of 0.1-3 ms on highways, for high speed vehicles - shutter time of 0.1-3 ms in urban areas, for medium speed vehicles - shutter time of 1-20 ms in parking situations, for slow vehicles
MAXIMUM SHUTTER (µs):	Maximum shutter refers to maximal exposure time (in microseconds) that the shutter will stay open. Default 150
LOW RESOLUTION:*	Camera sensor can operate in two resolutions, low resolution 640x480 pixels and high resolution, 1280x960 pixels. If Low resolution is enabled images will be captured in 640x480 pixel resolution. If it is disabled high resolution will be activated.
INITIAL IO ACTIVATION:	By enabling this option, you activate the IO output pins as soon as the server starts. Our recommendation is to leave this option enabled at all times.
USE BRIGHTNESS CONTROL:*	allows brightness control over the defined region of interest (ROI)
BC MAX BRIGHT PIXELS (%):*	Exposure control of the camera counts all good pixels within the Brightness control ROI. Good pixels are those, which are not too dark or too overexposed. Default 1,00
BC MIN BRIGHT PIXELS (%):*	All pixels with lower brightness than set in Brightness control brightness low will be considered as not enough illuminated pixels. All pixels with higher brightness value than set in Brightness control brightness high are considered overexposed. Pixels that are between low and high brightness levels are considered well lighted/correct pixels. Default 1,00

Note: items marked with a * are advanced features, and not available in the "user" role.

Explanation LED FLASH:

ENABLED FLASH:	Turn on/off the embedded IR LEDS
FLASH BRIGHTNESS:	Defines the brightness of the IR flash

Explanation DISPLAY INFORMATION:

HUD SIZE:*	The size of the HUD in the image
HUS POSITION:*	Position of the HUD in the image
TEXT INFO:	Text prefix is an optional identification name of the camera appointed by the user
DISPLAY INFO:	Present the text info in the HUD (head-up display)
DISPLAY TIME:	Present the current time info in the HUD
DISPLAY DATE:	Present the current date info in the HUD
DISPLAY SHUTTER:	Present the current shutter value in the HUD
DISPLAY GAIN:	Present the current gain value in the HUD
DISPLAY CAMERA FRAMERATE:	Present the current grabbing framerate in the HUD
DISPLAY READING FRAMERATE:	Frame rate refers to the number of individual frames (images) that are displayed in a video per second (fps)
DRAW PLATE:	When enabled, ANPR will generate an image of the read plate and overlay it on the processed images

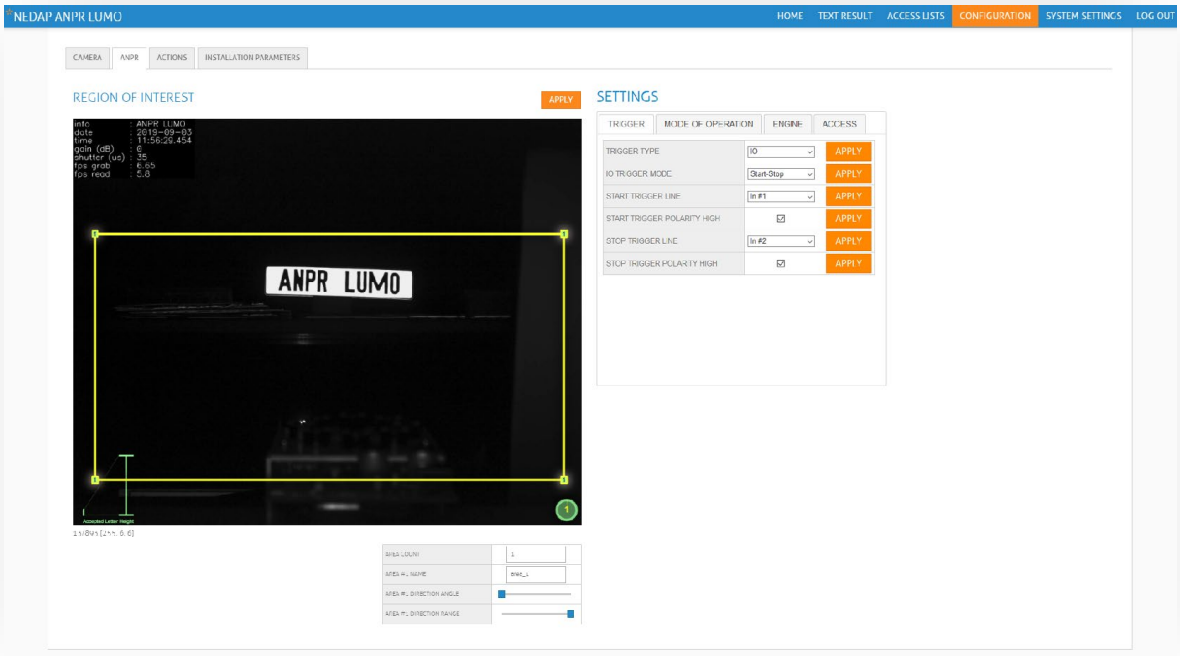
DRAW STATE: If display state is enabled state name with the percentage of reading confidence will be overlaid onto processed images

DRAW CHARACTER CONFIDENCE: Enabling Visualize character confidence, confidence of recognition for each character will be overlaid above the vehicles number plates

JPEG COMPRESSION LEVEL:* JPEG compression reduces the size of images. That results in faster ftp uploads and reduces bandwidth consumption. Default 65

7.2 ANPR

These parameters represent the operating software of the camera which takes care of reading and processing requests from the received images



On the ANPR settings tab parameters for the following features can be altered

- TRIGGER
- MODE OF OPERATION
- ENGINE
- ACCESS

The ANPR Region of Interest (ROI) is the area enclosed in the yellow rectangle shown on the live stream. The ANPR ROI defines the image region used by the camera to process the images. The ANPR engine will only search for plates within the ROI borders.

An ROI polygon can have an arbitrary number of contour points, but it must contain at least 3 points. The shape of the ROI polygon can be modified using the following actions:

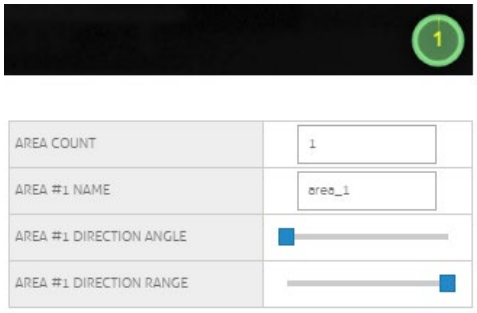
- **Reshape** the ROI by selecting one of the polygon points and dragging it to the desired location.
- **Add** more points by double clicking on an existing point, this will create a new point. You can then drag the point

to a new
image location.

- **Remove** a polygon point by right clicking on it.

Additionally, more than one region of interest can be defined by writing the number of desired regions in the Area Count field ANPR settings window.

The Area name, direction and range parameters define which motion direction of a detected license plate is accepted within the polygon area. A sector of allowed motion has a center direction in degrees and a sector with or range in degrees around the center direction.



In the example below a direction from top to bottom of the image with a range of 90 degrees is defined. This means that only license plates which move from top to bottom +-45 degrees are being accepted.

Note:
It is only possible to compute a motion direction if at least two detections of a license plate have been made. In the case that the minimum number of detections is set to 1, the situation may occur that only one instance of a license plate has been detected as valid. In this situation the license plate is accepted regardless of the direction and range specification of the ROI.

If the direction evaluation of a license plate is mandatory in your application, the minimum number of detections has to be set to, at least, 2.

Explanation TRIGGER Items:

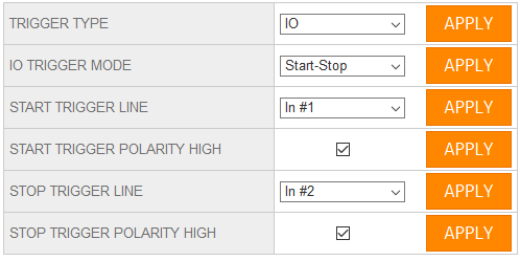
TRIGGER MODE:
Different trigger modes are described in the following pages:
The **Setup** section lists the parameters which are related to the mode and are used for its configuration
The **Start** section describes the signals which will start a session
The **Stop** section describes the condition which will end a session

After choosing the mode from the drop-down menu, press the *Apply* button to activate the trigger mode and set the parameters as needed.

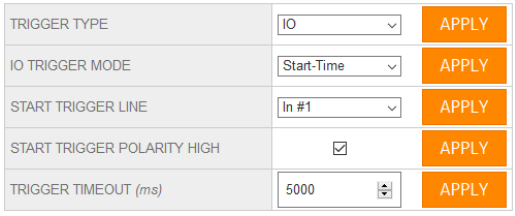
Overview of trigger modes:

Single_Line	read as long as the trigger line is active
Start_Stop	start and stop reading when the defined start signal is receved
Start_Time	start reading for a defined time upon receiving a trigger
Start_Sequence	start reading for a defined number of images after the trigger signal
Single_shot	grab an image after activating, do a reading and deactivate. Stream mode has to be set to Single to use this trigger mode.

Digital I/O Line trigger type:

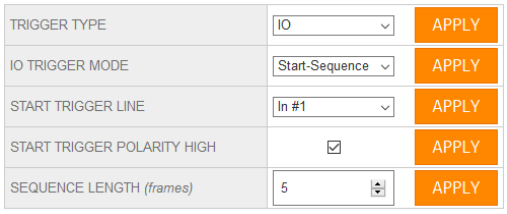


Setup: Define Start trigger line, Start trigger polarity. In addition, define Stop trigger line and Stop trigger polarity. If Start trigger polarity high is enabled, the session will start when the input signal is transitioning from low to high. If Start trigger polarity high is disabled, the session will start when the input signal is transitioning from high to low.
Start: The session will start when the signal from Start trigger line is received.
Stop: The session stops when the signal from Stop trigger line is received. In case a new trigger signal is received while the old session is still open, the camera closes the old session and opens a new session immediately.

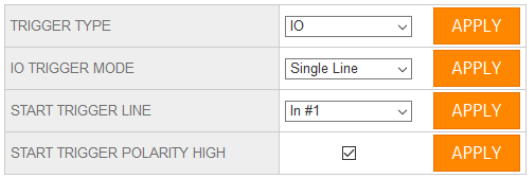


Setup: Define Start trigger line, Start trigger polarity. and Trigger timeout (ms). If Start trigger polarity high is enabled, the session will start when the input signal is transitioning from low to high. If Start trigger polarity high is disabled, the session will start when the input signal is transitioning from high to low.
Start: The session will start when the signal is received.
Stop: The session lasts for a defined time period as set in Trigger timeout. After the time passes the session is closed. In case a new trigger signal is received while the old session is still open, the old session will be extended to a new timeout period.

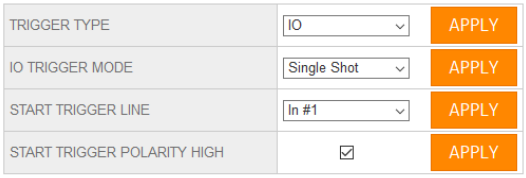
NOTE: in this case, the camera does NOT generate NoRead events for the interrupted session.



Setup: Define Start trigger line, Start trigger polarity. and Sequence length in frames. *If Start trigger polarity high is enabled, the session will start when the input signal is transitioning from low to high. If Start trigger polarity high is disabled, the session will start when the input signal is transitioning from high to low.*
Start: The session will start when the signal from Start trigger line is received.
Stop: The session lasts for the defined sequence length.

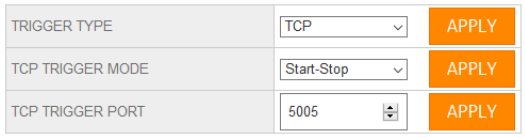


Setup: Define Start trigger line, Start trigger polarity. If Start trigger polarity high is enabled, the session will start when the input signal is transitioning from low to high. If Start trigger polarity high is disabled, the session will start when the input signal is transitioning from high to low.
Start: The session will start when the signal from Start trigger line is received.
Stop: The session is ended when the signal on the input line changes its state again.

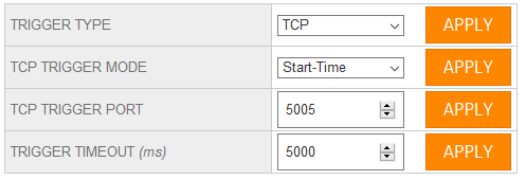


Setup: Define Start trigger line, Start trigger polarity. If Start trigger polarity high is enabled, the session will start when the input signal is transitioning from low to high. If Start trigger polarity high is disabled, the session will start when the input signal is transitioning from high to low.
Start: The session will start simultaneously with the activation of the camera.
Stop: The session ends after grabbing one shot.

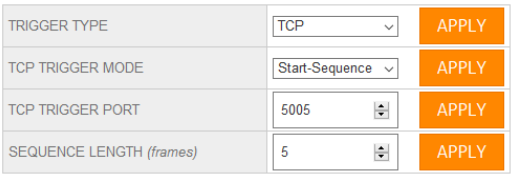
TCP trigger type:



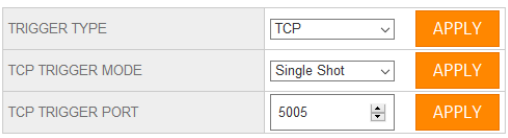
Setup: TCP Trigger Port.
TCP Trigger Port - set a port used for the TCP Trigger.
Start: when a messages with value 1 (0x01) Byte is received.
Stop: when a messages with value 0 (0x00) Byte is received.



Setup: TCP Trigger Port, Trigger Timeout (ms)
TCP Trigger Port - set a port used for the TCP Trigger. *Trigger timeout (ms)* - maximal waiting time in milliseconds for an ALPR reading after a trigger signal.
Start: when a messages with value 1 (0x01) Byte is received.
Stop: when the time defined in *Trigger timeout (ms) ends.*



Setup: TCP Trigger Port, Sequence Length (frames)
TCP Trigger Port - set a port used for the TCP Trigger. *Sequence Length (frames)* - the number of frames that will be read after a trigger signal is received.
Start: when a messages with value 1 (0x01) Byte is received.
Stop: when the number of frames defined in *Seqence Length (frames)* have been read.



Setup: TCP Trigger Port
TCP Trigger Port - set a port used for the TCP Trigger.
Start: The session will start simultaneously with the activation of the camera.
Stop: The session ends after grabbing one shot.

HTTP trigger type:

Setup: no need for setups
Start: when an HTTP GET Request gets to the endpoint: *http://camera_ip/trigger/start*
Stop: when an HTTP GET Request gets to the endpoint: *http://camera_ip/trigger/stop*

Setup: Trigger Timeout (ms)
Trigger timeout (ms) - maximal waiting time in milliseconds for an ALPR reading after a trigger signal.
Start: when an HTTP GET Request gets to the endpoint: http://camera_ip/trigger/start
Stop: when the time defined in *Trigger timeout (ms) ends.*

Setup: Sequence Length (frames)
Sequence Length (frames) - the number of frames that will be read after a trigger signal is received.
Start: when an HTTP GET Request gets to the endpoint: http://camera_ip/trigger/start
Stop: when the number of frames defined in Seqence Length (frames) have been read.

Setup: no need for setups
Start: The session will start simultaneously with the activation of the camera.
Stop: The session ends after grabbing one shot.

START TRIGGER LINE:	Define a starting trigger trough input (1 or 2)
START TRIGGER POLARITY HIGH:	Defines the state of the input (normally open or closed)
STOP TRIGGER LINE:	Define a stop trigger trough input (1 or 2)
STOP TRIGGER POLARITY HIGH:	Defines the state of the input (normally open or closed)
TRIGGER TIMEOUT (ms):	Trigger Timeout measures the delay period (in milliseconds) between the Start and Stop triggers. If a new start trigger signal occurs before the Trigger timeout passes, the time period will be reset. If set to 0 there is no delay
SEQUENCE LENGTH (frames)	The amount of frames when using the trigger mode START_SEQUENCE
NOREAD EVENT INTERVAL (frames)	This parameter specifies the interval of images without any plate readings before a NoRead event is triggered. This parameter is only used in freerun mode.

*The option will be presented depending on the selected mode

***Notes Mode**

Free_run	ANPR detects plates automatically without any triggering.
Single line	ANPR detects plates as long as the trigger input is active (used when only one input is connected)

Start_Stop	ANPR detects plates when start input is received, and stops after receiving the stop input (used when the start and stop trigger is depending on 2 different inputs)
Start_Time	ANPR detects plates when start trigger is received, and will stop after the Trigger timeout value
Start_Sequence	ANPR detects plates start when start trigger is received, and will stop when the amount of frames set at the sequence length (frames) is reached.

Explanation MODE OF OPERATION Items:

STREAM MODE:*	Presets for different operation modes, Single, Parking, Offline, Freeflow*
MINIMUM DETECTIONS:*	Minimum Detections control how many readings of the same license plate will be made until a definite result is produced. Only after this number of readings the transmission of a result will take place.
MAXIMUM CHARACTERS MISMATCH:*	Maximum plate mismatch refers to the maximum amount of characters allowed to be different between two plate strings for them to merge. Recommended to be set to 1.
SEND UTF:	When enabled the output message will be send in UTF format

Notes STREAM MODE

Single	The camera reads every single image as quickly as possible. Each input image is considered on its own and unrelated to images before and after it.
Parking	This mode is designed for access and parking control systems. Each vehicle number plate is required to be detected at least three times. The output result is available immediately afterward.
Offline	In this mode, the results are available with a delay of about 25 frames. The reading quality is the best in this mode as the engine has more frames to analyze before producing results. It is not suited for real time application where any delay is unwanted.
Free flow	This mode is designed for freeflow real-time systems. It is configured in such a way that it tries to catch all passing vehicles. The result may become available with a delay of up to 15 frames.

Explanation ENGINE Items:

READING MODE:*	Fastest, Fast, Standard, High, Best*
MIN LETTER HEIGHT (px):*	Set the minimal height of characters, in pixels. The ANPR will only accept characters larger in size than set in this parameter. The value should not be less than 8 pixels. Default 15
MAX LETTER HEIGHT (px):*	Set the maximal height of characters, in pixels, that ANPR will acknowledge. All characters bigger than the given size will not be processed and will be dismissed by the engine. Default 100
MAX PLATE ANGLE (deg):*	If vehicles can appear on images under a certain angle to the camera, ANPR can be instructed to search for plates in a wider angle relative to x-Axis. The angle can be set between 0 and 90°, but best results are recognized between 5° and 30°. Default 20
MIN PLATE CONFIDENCE (%):*	Minimum plate confidence refers to the minimum confidence level at which the ANPR will recognize a license plate as valid. Range varies between 0 and 100 percent. If minimal plate confidence is set to 70% the program will produce only results with the level of recognition certainty 70% or above. All lower readings will be ignored. Default 50
LIMIT OF LOW CONF (%):*	This parameter is used to set a limit for which the reading confidence will be considered low, but still valid. The lower confidence limit must be equal to/greater

	than the Min Plate Confidence. The typical use of this parameter in conjunction with the Low Confidence Read action is to detect and store low quality (= low confidence) readings for further analysis or retraining.
MINIMUM CONTRAST:*	Minimum contrast to differentiate characters from the license plate. Reducing this parameter can increase reading performance but can also increase processing time
SCALE WIDTH:*	When this parameters are adjusted, the input image will be modified by the given ratios before processing starts. The re-sizing values have to be provided in percent of the original size (100 = original). Default 100.
SCALE HEIGHT:*	See scale width. Default 100
SEARCH INVERTED:*	When search inverted is disabled ANPR recognizes plates with light colored background and dark colored characters (i.e. black symbols on white background). If this search is enabled inverted plates will be also searched for. ANPR will in addition to regular black-on-white plates look also for white-on-black plates. Enabling inverted search will increase processing time per image.

***Note Mode**

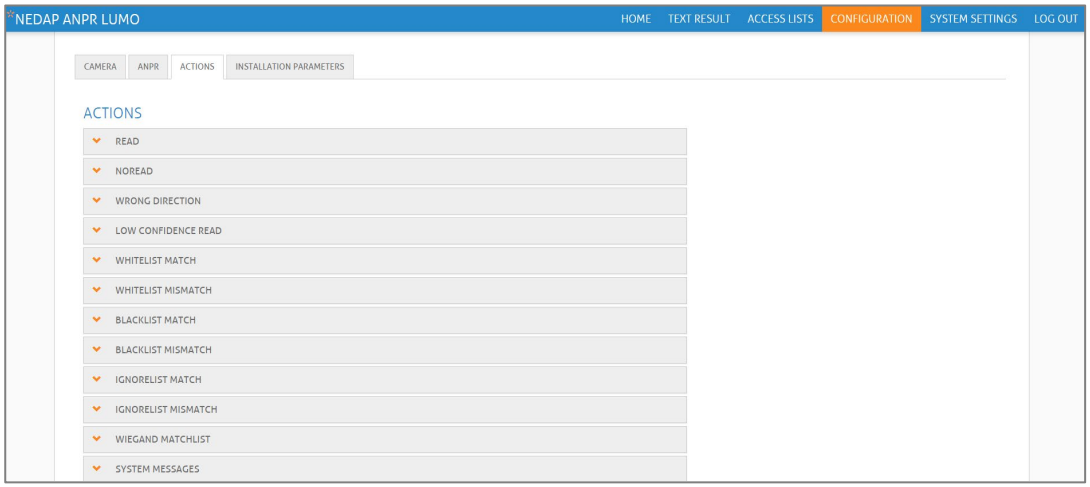
Fastest	Fastest possible processing speed with lower recognition quality as in other modes. Recommended when recognition speed has priority.
Fast	Fast processing speed with slightly better recognition quality than in freeflow. Also intended for open traffic situations.
Standard	A good compromise between speed and reading performance, recommended to be used in most situations. This mode will give best results for open traffic situations with processing speed slightly lower than in previous modes.
High	Higher possible reading quality. Can be up to one times slower than in the fast mode
Best	The best possible reading quality. Can be up to two times slower than in the fast mode. At the same time, reading confidence will be about 3-4% better.

Note: items marked with a * are advanced features, and not available in the user role.

Explanation ACCESS Items:

WHITESPACE MATCHING:*	This parameter defines whether whitespaces (' ') should be considered during list matching.

7.3 ACTIONS



In the actions menu, you can define what actions the camera should perform on certain events.
There are three types of events based on the OCR system:

READ When ANPR recognizes a plate

NOREAD When there are no plates recognized between given limitations set under ALPR Configuration-Trigger (i.e. Start and Stop trigger, or Start trigger and Trigger timeout).

WRONG DIR. Wrong Direction occur when a new license plate is detected, but it moves in a direction which is not within the allowed direction range defined for the area in which this plate is located.

LCR Low confidence read event is created when a plate is read but the confidence level is lower than set in parameter “LIMIT OF LOW CONF (%)”

For every “access list” you can define what actions the camera should perform when a plate is either matched or mismatched on the concerned list.

The following actions can be added to any of the events, you can also make combination of actions.
Ftp Upload, Ftp Database, Store, Digital out, Serial, TCP, HTTP, WIEGAND26, WIEGAND64

For all actions you can define for which Area of interest the action should be performed. E.g. ALL AREAS or just one selected AREA

7.3.1 DIGITAL OUT

This action will produce digital output for a specific time period

OUTPUT LINE Which output should be activated 0=relay1, 1=relay2

INVERT SIGNAL If enabled the output will become active

OUTPUT DURATION The time in milliseconds that the output will be activated

NON-BLOCKING if enabled other actions will not be delayed by this action

7.3.2 FTP UPLOAD

FTP upload can save image files of detected plates to a remote FTP server.
Set to “ON” for the action to be executed (as shown on the image).

HOST	Enter the Host ftp servers IP address or name, as ftp://
USER	The username of the ftp server (The user needs read/Write right)
PASSWORD	The password of the ftp server
NAMING PATTERN	Are used to include specific reading information (date, time, plate...) in the file name. How to use and format names using message placeholders. See appendix A.
IMAGE UPLOAD	Empty file - sends files with no images. This saves memory and increases the upload speed. Full image – the whole image taken by the camera License plate – only the license plate is send
IMAGE QUALITY	Refers to the compression rate, it can be set from 1 to 100%, 1 being the maximal compression level which will produce images with the lowest quality, and 99 being the minimal compression level with the highest image quality. We recommend to set this to 65-70%.

7.3.3 FTP DATABASE

FTP database will create and automatically update a text file on the FTP server, containing information about vehicle number plates recorded by the ANPR.
Set to “ON” for the action to be executed (as shown on the image).

HOST	Enter the Host FTP servers IP address or name, as ftp://
USER	The username of the FTP server (The user needs read/write rights)
PASSWORD	The password of the FTP server
FILENAME	Enter the name of the database to be updated (created) with newly recorded information.
ENTRY PATTERN	Defines the data to be recorded in the file. How to form entry patterns. See appendix A.

7.3.4 STORE

Store will save an image on the local storage. We would only recommend to use this option to collect images for testing purposes.

FOLDER	the path for example: /tmp/demo
POSTFIX	some extra info what will be added to the name of the file
MIN FREE SPACE	The amount of free space left on the device. If there is less space than defined here, files will not be stored anymore. (no fifo).

7.3.5 HTTP ACTION

With the HTTP action you can send an HTTP message with a specific Request type like Post, Put etc .

REQUEST TYPE	The request type, PUT, POST, PATCH, DELETE
URL	The URL of the server where the message should be send to
USER	The username to login on the webserver
PASSWORD	The required password credentials
MESSAGE	The composed message for the action using the message placeholders, see appendix A.

7.3.6 TCP ACTION

With this action you can send a message through the IP interface to a destination IP and port.

IP	The destination IP address where the message should be send to
PORT	The destination port
SEND ASYNC	If enabled, The transfer of asynchronous data doesn't require the coordination or timing of bits between the two endpoints
MESSAGE	The composed message for the action using the message placeholders, see appendix A.

7.3.7 SERIAL

With this action you can send a message through the RS485 port

BAUD RATE The baud rate of the serial message, default 115200
MESSAGE The composed message for the action using the message placeholders, see appendix A.

7.3.8 SERIAL OSDP

With this action you can send an OSDP message through the RS485 port.
OSDP communication mode must be enabled in SYSTEM SETTINGS - SERIAL SETUP. See page 37.

MESSAGE The composed message for the action using the message placeholders, see appendix A.

The ANPR LUMO will send the message data in raw bit array format (OSDP_RAW).
The data report will be sent in response to a poll command (OSDP_POLL).

7.3.9 WIEGAND 26

The license plate will be converted using the Wiegand 26 bit SHA-1 security hashing algorithm.

Wiegand 26-bit SHA-1 conversion procedure:

1) Receive license plate message hk 55 evb
2) Turn into upper case HK 55 EVB
3) Remove spaces HK55EVB
4) Calculate SHA-1 digest A44F633C 8A6D1581 50CCEB3E F83D9DE0 BA80CF15
5) Truncate. Keep least significant 24-bits A80CF15
6) Add parity bits according to Wiegand 26-bit format

7.3.10 WIEGAND 64

The license plate will be converted to a Wiegand 64-bit format.

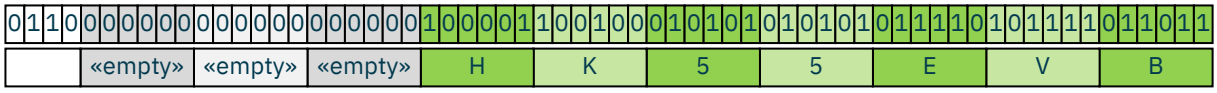
In this mode, every received license plate message is converted to a Wiegand 64-bit
The first four bits are always 0110.
Next 10 groups of 6 bits. Each 6-bit group contains a license plate character. See character conversion table below.
If the license plate string contains less than 10 characters, the first groups are « empty » (= 000000).
If a character is not found in the conversion table, then the conversion uses « other » (=111111)

CHAR	6-BIT	CHAR	6-BIT	CHAR	6-BIT	CHAR	6-BIT
'0'	010000	'A'	011010	'K'	100100	'U'	101110
'1'	010001	'B'	011011	'L'	100101	'V'	101111
'2'	010010	'C'	011100	'M'	100110	'W'	110000
'3'	010011	'D'	011101	'N'	100111	'X'	110001
'4'	010100	'E'	011110	'O'	101000	'Y'	110010

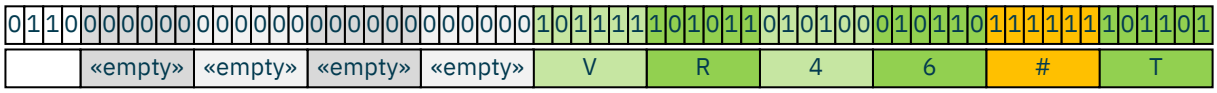
'5'	010101	'F'	011111	'P'	101001	'Z'	110011
'6'	010110	'G'	100000	'Q'	101010		
'7'	010111	'H'	100001	'R'	101011		
'8'	011000	'I'	100010	'S'	101100	« empty »	000000
'9'	011001	'J'	100011	'T'	101101	« other »	111111

Examples:

License plate 'HK55EVB':



License plate 'VR46#T':

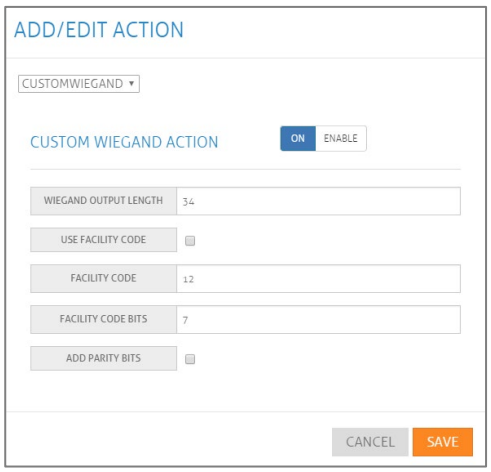


7.3.11 WIEGAND MATCHLIST

In the WIEGAND MATCHLIST ACTION you can define the Wiegand output. These settings are used to send the Wiegand ID defined in the WIEGAND MATCHLIST ACCESS LIST.

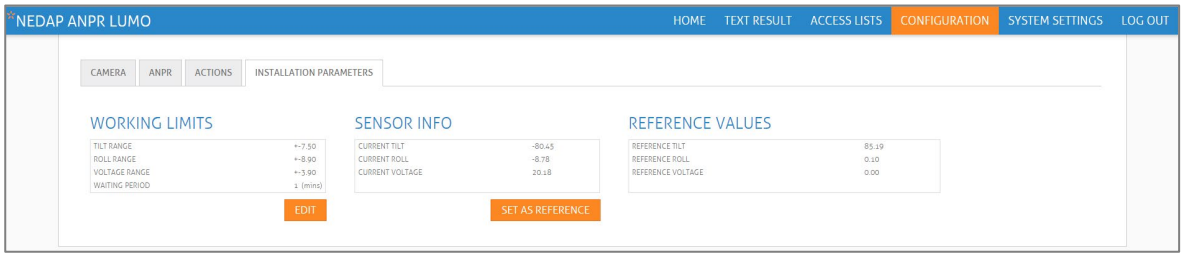
The following items can be configured:

WIEGAND OUTPUT LENGTH The length of the complete Wiegand string in bits.
USE FACILITY CODE Should the facility-code be included in the Wiegand string.
FACILITY CODE The facility code value.
FACILITYCODE BITS The amount of bits used for the facility-code.
ADD PARITY BITS Should the parity bits be included in the string.



In the example above the Wiegand length is set top 34 bits, the facility code is not send, and there are no parity bits added.

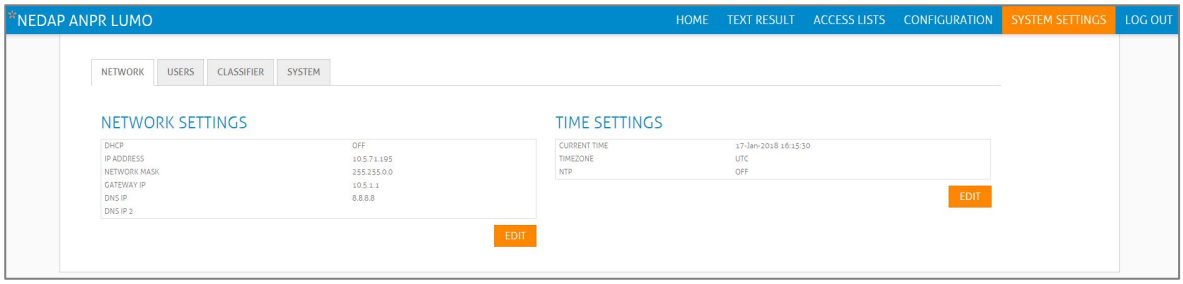
7.4 Installation parameters



The camera has tilt, roll and voltage sensor. These sensors can be used to trigger an alarm.
First you set up the working limits, these are the limitations in which the camera may work.
By pressing the “SET AS REFERENCE” button, you tell the camera that the current values are the values that are good.
As soon as a values exceeds the limits, an alarm is raised. This can be used as an action (SYSTEM MESSAGES)

8 SYSTEM SETTINGS

In the SYSTEM SETTINGS menu you can change all system related settings like Network, Users, Classifiers and do system related actions like making backups.

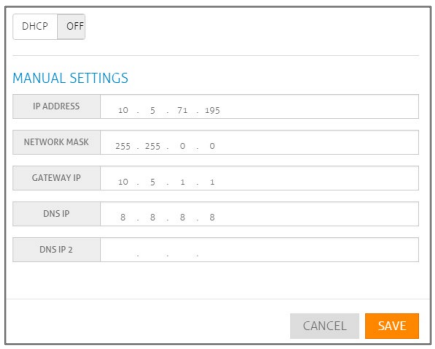


8.1 NETWORK

The NETWORK menu has two settings screens, one for the Network interface and one for the time synchronization

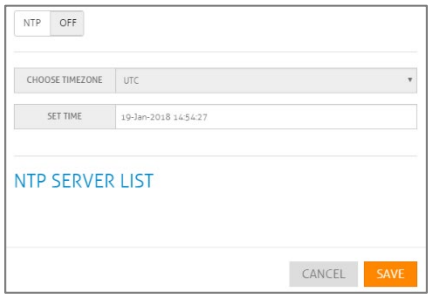
8.1.1 NETWORK SETTINGS

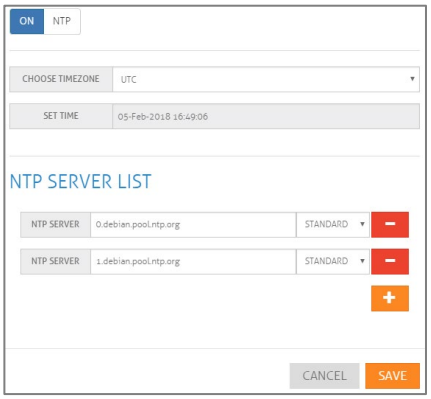
In the NETWORK SETTINGS screen you can change the network interface of the camera, you can either choose to use DHCP or setup the network settings manually.



8.1.2 TIME SETTINGS

You can setup the camera to either use a NTP server for automatic time synchronization, or you can change the time manually.





8.2 USERS

Through the USERS menu you can add/modify/remove users who have access to the web interface of the camera.

With the orange “NEW USER” button, you can create new users wo will have access to the camera. By clicking on the gray box around a username, you can modify or remove the user.

The camera has four different user-roles, these roles cannot be modified.

ADMIN	Users with the “ADMIN” role have full access to the camera, and have advanced features on the CAMERA/ANPR-CONFIGURATION tabs.
USER	Users with the “USER” role, have basically the same rights as the “ADMIN” role, but only the basic features are presented.
OPERATOR	Users with the “OPERATOR” role, can modify the access lists, and can also view the text results.
VIEWER	The “VIEWER” role, can only see the HOME and TEXT RESULT screen. This user does not have any right to modify settings.

8.3 CLASSIFIER

Through this menu Classifiers can be selected or new classifiers can be loaded.

Classifiers are files which contain state/country specific information. This information can for example be the size an font of letters and numbers, the number of rows the plate is made of, the alphabet used etc.

They will improve accuracy of plate recognition according to the country/state parameter as they support ANPR with features that make recognition easier and more reliable.

8.4 SYSTEM

Through this menu all system related items can be activated

8.4.1 SYSTEM MANAGEMENT

RESTART ANPR	This will restart the camera.
REBOOT SYSTEM	This will completely reboot the camera.
SHUTDOWN SYSTEM	This option shuts the entire system down. The system remains shut down until a manual cold start of the camera is performed.
DOWNLOAD LOGS	All log files will be downloaded, this van later be used for analytics by the Nedap support team.
SAVE CONFIGURATION	Save a backup of all configuration settings.
IMPORT CONFIGURATION	Restore a saved configuration from file. Import configuration has some limitations regarding the camera firmware versions: version 4.3.1 cannot import configurations other than 4.3.1 version 4.3.2 can import configurations of version 4.3.0 and 4.3.1.

CHANGE SYSTEM PASSWORD

Changing the system password. We recommend to change the system password.
Important note:
Make sure you store this password in a secure place. The system password cannot be recovered. In case you lose the system password, the camera must to be returned to Nedap.

CHANGE LANGUAGE

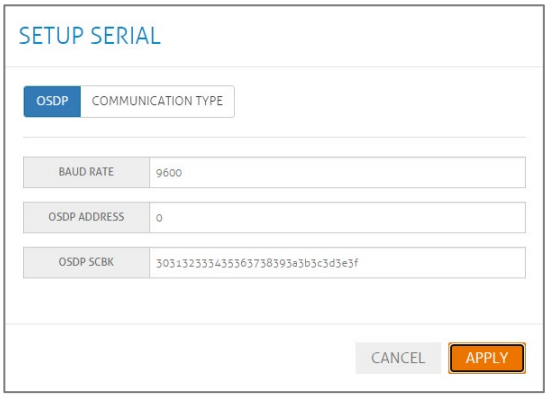
Select user interface language.

UPDATE SOFTWARE

Update ANPR system software.

SETUP SERIAL *

Setup RS485 serial parameters.



Select to use BASIC or OSDP communication protocol.
Select the baud rate.

When using OSDP communication, you may also select the OSDP device address and the OSDP secure channel base key (OSDP-SCBK). The OSDP key must be exactly 16 bytes, e.g. 303132333435363738393a3b3c3d3e3f.

* requires at least ANPR LUMO hardware revision A.05 and software v4.5.1.

FACTORY RESET

This option is used to reset the camera configuration back to factory settings.
All custom configuration data will be lost!

8.4.2 LIBRARY VERSION

In this menu you can see the current versions of all software parts of the camera, this information can be used for support reasons.

8.4.3 DIGITAL IO

In the menu you can see the current status of all inputs and outputs.
With the buttons “ACTIVATE” you can activate the Relay outputs. With these buttons it will be possible to test the outputs.

A Message placeholders

Placeholder	Description
"%LP%"	License plate value (ABC123)
"%LP_WS%"	License plate value including white spaces. (ABC 123)
"%LP_UL%"	License plate value including underscores. (ABC_123)
"%STATE%"	License plate state.
"%CONF%"	Confidence value.
"%CONF_STATE%"	State confidence value.
"%FULL_IMG%"	Base64 encoded image of the whole image sensor.
"%LP_IMG%"	Base64 encoded image of the license plate.
"%NUM_ROWS%"	Number of rows of license plate.
"%REGION%"	Region string.
"%REGION_CITY%"	City string.
"%REGION_SHORT%"	Region short value string.
"%ENDING%"	Ending value string.
"%ENDING_SHORT%"	Ending short value string.
"%COMMA%"	Comma character (,).
"%BR_ON%"	Round bracket open character ' ('.
"%BR_OFF%"	Round bracket close character ') '.
"%SQ_BR_ON%"	Square bracket open character ([ ).
"%SQ_BR_OFF%"	Square bracket close character ( ]).
"%CR%"	Carriage return character.
"%LF%"	Line feed character.
"%POS_X%"	X position in image of upper left corner of license plate.
"%POS_Y%"	Y position in image of upper left corner of license plate.
"%POS_W%"	Width of license plate in image.
"%POS_H%"	Height of license plate in image.
"%ANGLE%"	Direction angle in degrees (0..360) of the license plate.
"%YEAR%"	Year. When license plate was detected.
"%MONTH%"	Month. When license plate was detected.
"%DAY%"	Day. When license plate was detected.
"%HOUR%"	Hour. When license plate was detected.
"%MINUTE%"	Minute. When license plate was detected.
"%SECOND%"	Second. When license plate was detected.
"%FRACSEC%"	Fraction of seconds. When license plate was detected.
"%AREA_INDEXES%"	Indexes of areas in which the license plate was detected. Indexes will be comma separated.
"%AREA_NAMES%"	Names of areas in which the license plate was detected. Names will be comma separated.

B Disposal of equipment

The products will be disposed of by the end-user and discharge Nedap for any liability or responsibility thereof.

The WEEE symbol in Europe indicates that the relevant electrical product or battery should not be disposed of as general household waste in Europe. To ensure the correct waste treatment of the product and battery, please dispose them in accordance to any applicable local laws of requirement for disposal of electrical equipment or batteries. In so doing, you will help to conserve natural resources and improve standards of environmental protection in treatment and disposal of electrical waste (Waste Electrical and Electronic Equipment Directive WEEE 2012/19/EU).

C CE declaration

Hereby, Nedap N.V. declares that the subject equipment is in compliance with directives 2014/30/EU (Electromagnetic compatibility directive) and 2011/65/EU (RoHS). The full text of the EU declaration of conformity is available at the following internet address: https://portal.nedapidentification.com.

D Document revision

Version	Date	Comment
1.13	2020-01-05	Added OSDP features in version 4.5.1
1.11	2020-03-19	Added new features in version 4.4.0
1.10	2019-10-10	Added new placeholder underscore
1.09	2019-09-06	Added new features in version 4.3.2
1.08	2019-05-24	Changed trigger modes, and new placeholders
1.07	2019-03-05	New placeholders added, httpput added
1.06	2019-01-34	small updates.
1.05	2019-01-09	Added Wiegand matchlist feature and regular expressions.
1.04	2018-09-23	Small updates
1.03	2018-07-03	Added product photo
1.02	2018-07-02	Added working limits
1.01	2018-05-18	Text result features
1.0	2018-04-17	Changed wiring
0.1	2018-01-12	Initial document version