

# ANPR LUMO<sup>★</sup>

## 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 8 meters.
- Easy user configuration (web server).
- TCP/IP Ethernet interface.
- RS485 serial interface.
- Wiegand 26 bit/64 bit.
- Wiegand Matchlist 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.
- 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 8 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.

### 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.

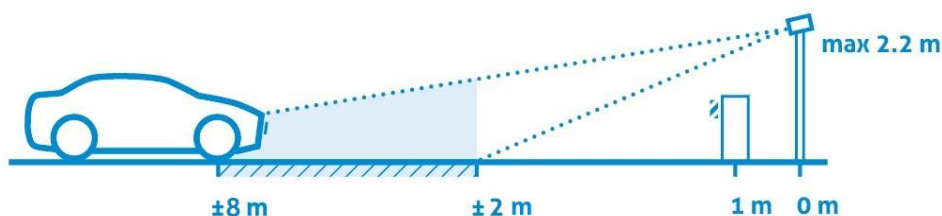


Figure 1: Pole mounting (ANPR Access LUMO)

##### 3.2.2 BEHIND BARRIER MOUNTING

The ANPR is positioned behind the barrier at bumper height.

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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.

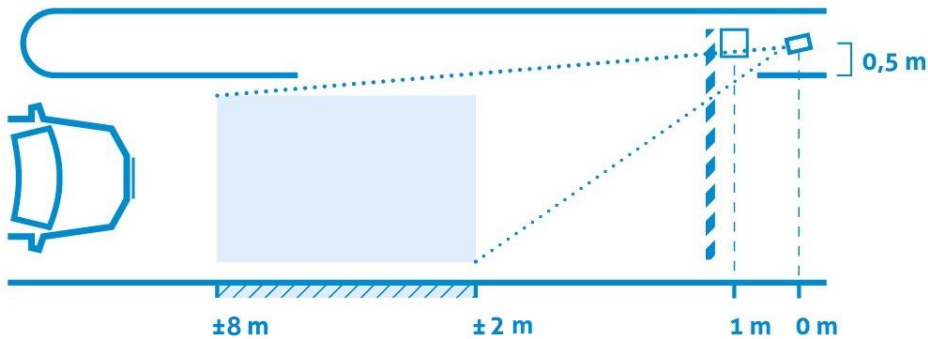


Figure 2: Behind the barrier mounting (ANPR Access LUMO)

### 3.3 DIMENSIONS

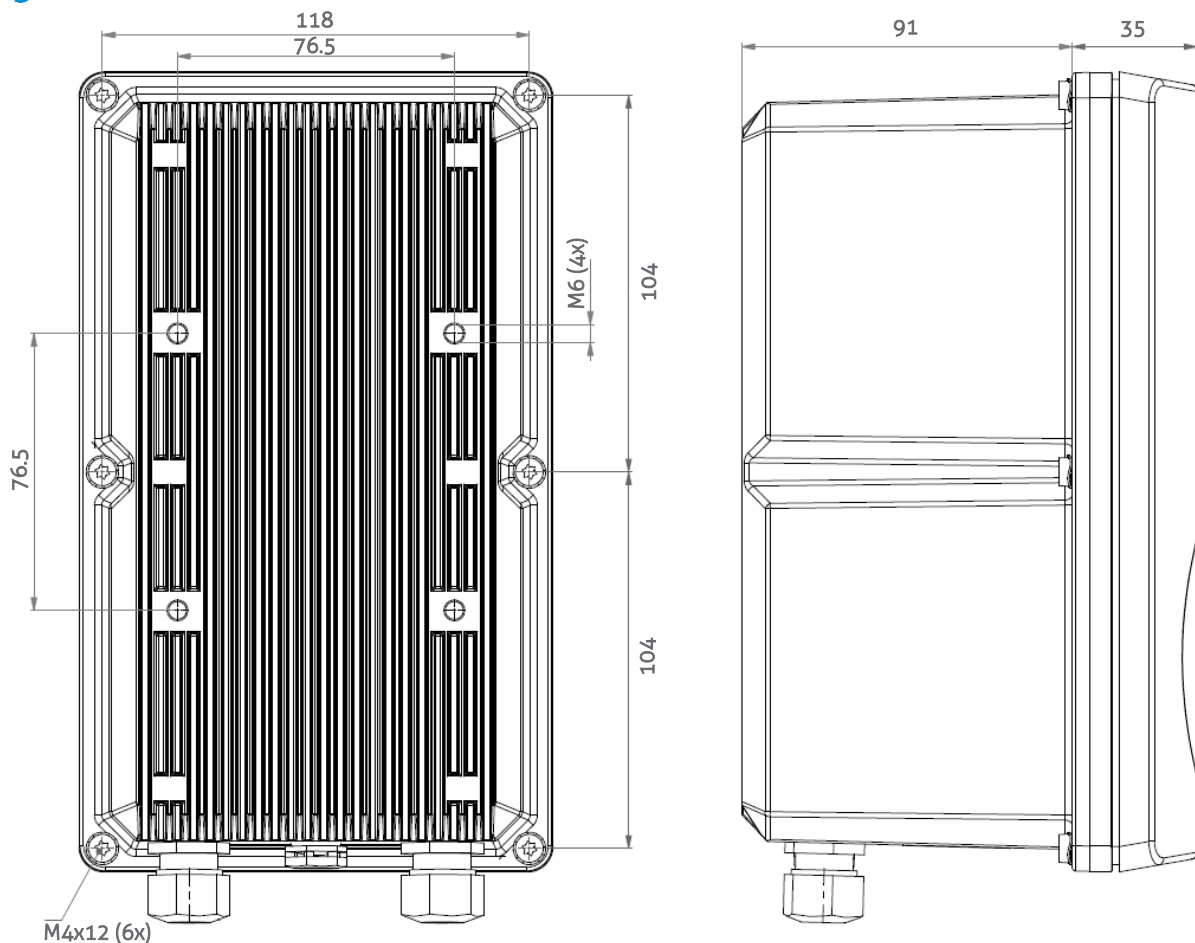


Figure 3: ANPR housing dimensions

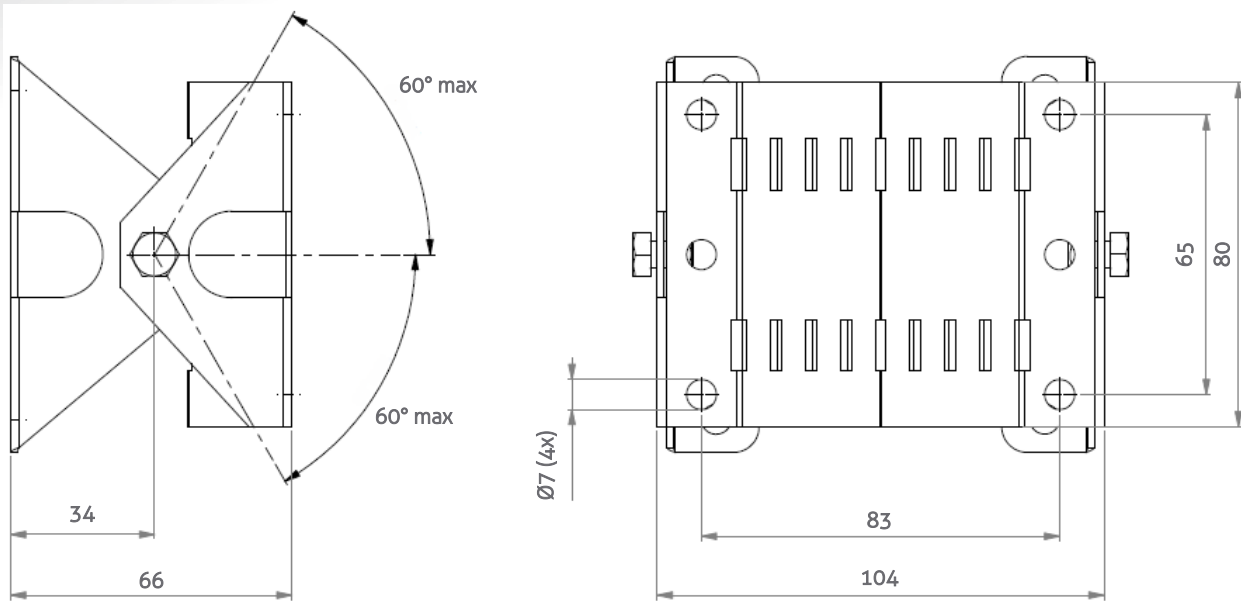


Figure 4: Mounting bracket dimensions

## 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 ACCESS 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/Wiegand GND

### 4.4 WIEGAND CONNECTION

WHITE	Wiegand Data-0
BROWN	Wiegand Data-1

### 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 -



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WHITE/GREEN Relay output 1 (normally open contact,  $U_{\max} = 24\text{VDC}$ ,  $I_{\max} = 2\text{A}$ ).  
BROWN/GREEN Relay output 1 (common contact).  
WHITE/YELLOW Relay output 2 (normally open contact,  $U_{\max} = 24\text{VDC}$ ,  $I_{\max} = 2\text{A}$ ).  
BROWN/YELLOW Relay output 2 (common contact).

## 5 CONFIGURATION

### 5.1 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 7.1.1 for details about how to assign an IP-address to the ANPR.

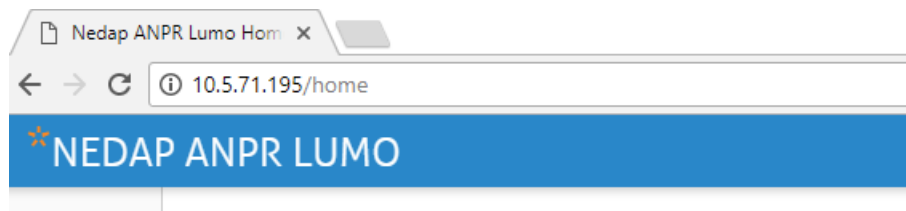


Figure 5: Using the web server

Enter the IP-address (or NetBiosName) 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:	<b>admin</b>
Password:	<b>secret</b>

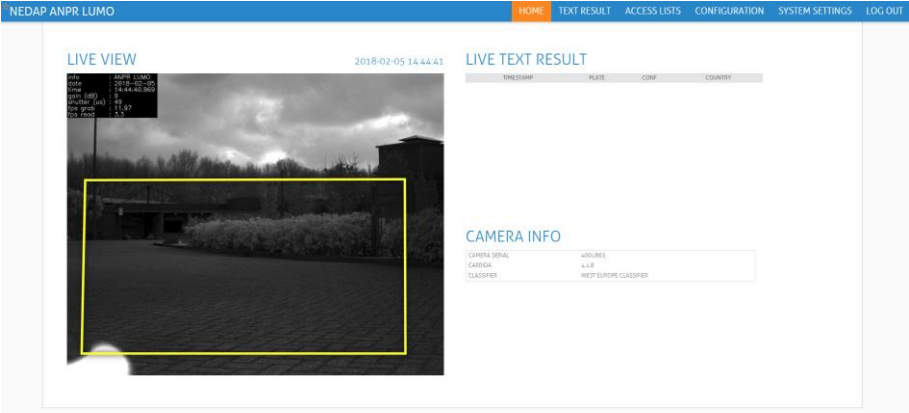
If the login was successful, the user is now able to access the main menu screen.

#### Note

It is recommended, to change the factory default username and password after installation.

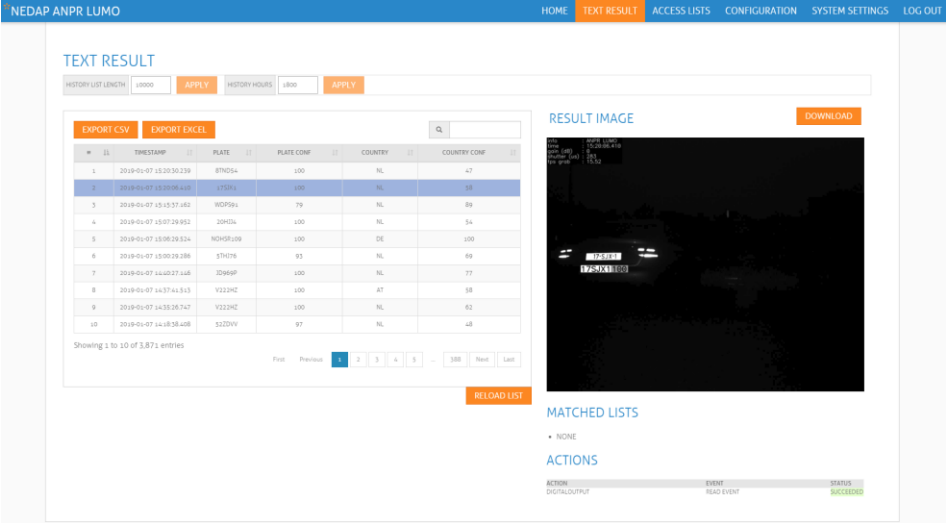
5.2 MENU ITEMS

5.2.1 HOME



The Home screen has 3 items, the live view, the Live text results and the camera information.  
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 6.2.

5.2.2 TEXT RESULTS



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

At the Text result you can see all past results, the results can be exported to a CSV file or excel file.  
The history is limited to the settings made at "HISTORY HOURS" and "HISTORY LIST LENGTH".  
On the bottom right you can see if the number plate was on one of the match lists and the actions that are performed on each result.

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## CONFIGURATION

### 5.2.3 ACCESS LIST

The screenshot displays the 'ACCESS LISTS' section of the ANPR LUMO configuration interface. It features four panels, each representing a different type of access list:

- WHITELIST:** Shows a table with columns 'PLATE', 'ID', and 'VALIDITY'. It contains two entries: '212GAL' with 'ALWAYS' validity, and '80XHZ7' with 'USER DEFINED' validity. Below the table, it indicates 'Showing 1 to 2 of 2 entries'.
- BLACKLIST:** Shows a table with columns 'PLATE', 'ID', and 'VALIDITY'. It is currently empty, with the message 'No data available in table' and 'Showing 0 to 0 of 0 entries'.
- IGNORELIST:** Shows a table with columns 'PLATE', 'ID', and 'VALIDITY'. It is currently empty, with the message 'No data available in table' and 'Showing 0 to 0 of 0 entries'.
- WIEGAND MATCHLIST:** Shows a table with columns 'PLATE', 'ID', and 'VALIDITY'. It is currently empty, with the message 'No data available in table' and 'Showing 0 to 0 of 0 entries'.

Each panel includes a search bar at the top and a set of action buttons (CLEAR, IMPORT, EXPORT, ADD) at the bottom.

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 menu 6.3.

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.

The screenshot shows the 'ADD LIST ENTRY' form. The 'Plate' field contains '80XHZ7'. Below it, the 'ON' toggle is set to 'Always Enabled'. At the bottom, there are 'CANCEL' and 'SAVE' buttons.

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

The screenshot shows the 'ADD LIST ENTRY' form with the 'Plate' field set to '80XHZ7'. The 'Always Enabled' toggle is set to 'OFF'. Below this, there is a date range selector showing '2019-01-07' to '2019-02-25' and a time selector showing '00:00' to '23:59'. The days of the week 'Mo Tu We Th Fr Sa So' are displayed, with 'Mo Tu We Th Fr' highlighted. At the bottom, there is an 'ADD' button and a table with the following data:

START DATE	END DATE	WEEKDAYS	FROM	TO	
2019-01-07	2019-02-25	Mo,Tu,We,Th,Fr	00:00	23:59	Delete

At the bottom of the form, there are 'CANCEL' and 'SAVE' buttons.

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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.

#### 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].

#### Note

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

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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 AAAAAAAB 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 AAAAAAAB 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.

#### Note

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

### 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.

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A number plate which is not on the list, will be send as 1112

WIEGAND MATCHLIST

Show 10 entries

Q

PLATE	ID	VALIDITY
21ZGNL	12	ALWAYS
30XHZ2	17	ALWAYS

Showing 1 to 2 of 2 entries

Previous1Next

NO MATCH ID

1112

SAVE

NO PLATE ID

1113

SAVE

CLEAR

IMPORT

EXPORT

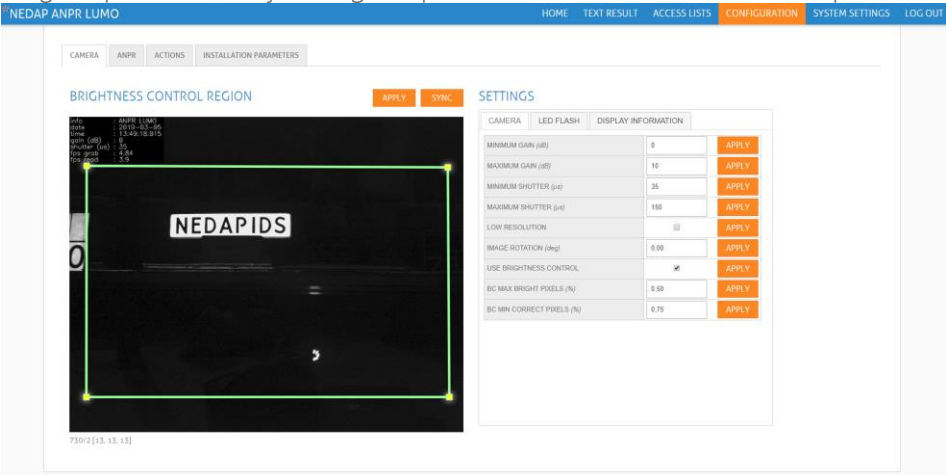
ADD

The Wiegand output format must be defined in the ACTIONS menu. See 6.3.

## 6 CONFIGURATION MENUS

### 6.1 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:

**MINIMUM 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

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

<b>LOW RESOLUTION:*</b>	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.
<b>USE BRIGHTNESS CONTROL:*</b>	allows brightness control over the defined region of interest (ROI)
<b>BC MAX BRIGHT PIXELS (%):*</b>	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
<b>BC MIN BRIGHT PIXELS (%):*</b>	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:

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

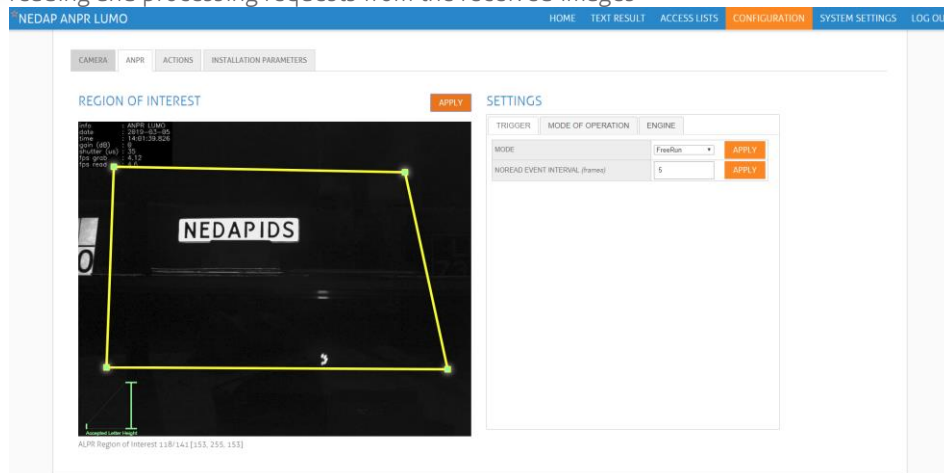
### Explanation DISPLAY INFORMATION:

<b>HUD SIZE:*</b>	The size of the HUD in the image
<b>HUS POSITION:*</b>	Position of the HUD in the image
<b>TEXT INFO:</b>	Text prefix is an optional identification name of the camera appointed by the user
<b>DISPLAY INFO:</b>	Present the text info in the HUD (head-up display)
<b>DISPLAY TIME:</b>	Present the current time info in the HUD
<b>DISPLAY DATE:</b>	Present the current date info in the HUD
<b>DISPLAY SHUTTER:</b>	Present the current shutter value in the HUD
<b>DISPLAY GAIN:</b>	Present the current gain value in the HUD
<b>DISPLAY CAMERA FRAMERATE:</b>	Present the current grabbing framerate in the HUD
<b>DISPLAY READING FRAMERATE:</b>	Frame rate refers to the number of individual frames (images) that are displayed in a video per second (fps)
<b>DRAW PLATE:</b>	When enabled, ANPR will generate an image of the read plate and overlay it on the processed images
<b>DRAW STATE:</b>	If display state is enabled state name with the percentage of reading confidence will be overlaid onto processed images
<b>DRAW CHARACTER CONFIDENCE:</b>	Enabling Visualize character confidence, confidence of recognition for each character will be overlaid above the vehicles number plates
<b>JPEG COMPRESSION LEVEL:*</b>	JPEG compression reduces the size of images. That results in faster ftp uploads and reduces bandwidth consumption. Default 65



### 6.2 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

The area within the yellow polygon is the region of interest. The ANPR will read plates only within these borders.

#### Explanation TRIGGER Items:

<b>MODE:</b>	FREE-RUN, SINGLE LINE, START_STOP, START_TIME, START_SEQUENCE *
<b>START TRIGGER LINE:</b>	Define a starting trigger trough input (1 or 2)
<b>START TRIGGER POLARITY HIGH:</b>	Defines the state of the input (normally open or closed)
<b>STOP TRIGGER LINE:</b>	Define a stop trigger trough input (1 or 2)
<b>STOP TRIGGER POLARITY HIGH:</b>	Defines the state of the input (normally open or closed)
<b>TRIGGER TIMEOUT (ms):</b>	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
<b>SEQUENCE LENGTH (frames)</b>	The amount of frames when using the trigger mode START_SEQUENCE

The option will be presented depending on the selected mode

#### \*Notes Mode

<b>Free_run</b>	ANPR detects plates automatically without any triggering.
<b>Single line</b>	ANPR detects plates as long as the trigger input is active (used when only one input is connected)
<b>Start_Stop</b>	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)
<b>Start_Time</b>	ANPR detects plates when start trigger is received, and will stop after the Trigger timeout value
<b>Start_Sequence</b>	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:

<b>STREAM MODE:*</b>	Presets for different operation modes, Single, Parking, Offline, Freeflow*
<b>MINIMUM DETECTIONS:*</b>	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

<b>Single</b>	Streaming parameters are configured in such a way that each input image is considered not to be related to adjacent images.
<b>Parking</b>	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.
<b>Offline</b>	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.
<b>Free flow</b>	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:

<b>READING MODE:*</b>	Fastest, Fast, Standard, High, Best*
<b>MIN LETTER HEIGHT (px):*</b>	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
<b>MAX LETTER HEIGHT (px):*</b>	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
<b>MAX PLATE ANGLE (deg):*</b>	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
<b>MIN PLATE CONFIDENCE (%):*</b>	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
<b>MINIMUM CONTRAST:*</b>	Minimum contrast to differentiate characters from the license plate. Reducing this parameter can increase reading performance but can also increase processing time
<b>SCALE WIDTH:*</b>	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
<b>SCALE HEIGHT:*</b>	See Scale Width. Default 100
<b>SEARCH INVERTED:*</b>	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.

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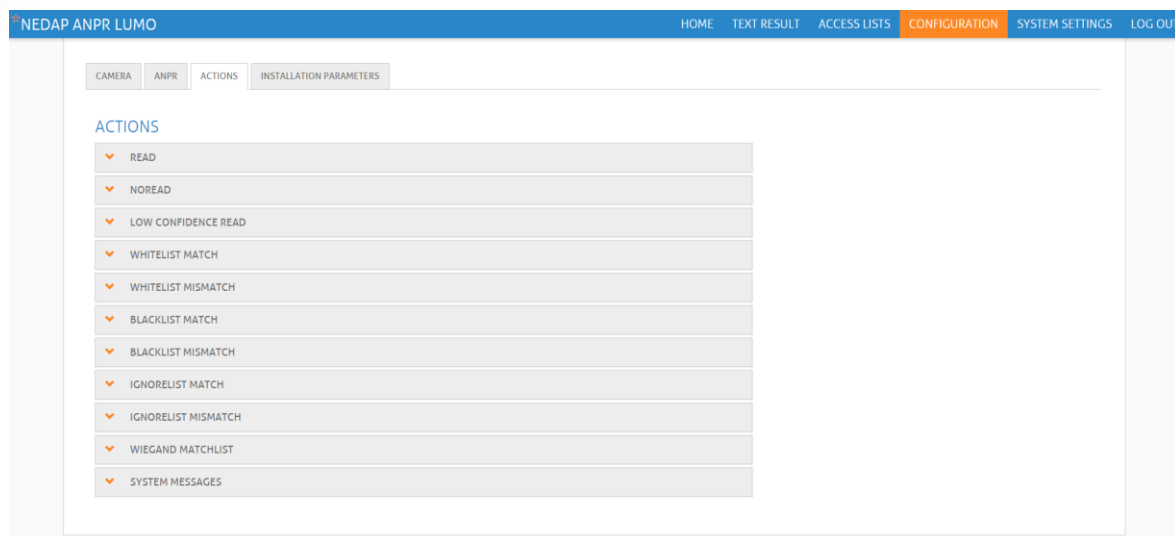
CONFIGURATION MENUS

**\*Note Mode**

<b>Fastest</b>	Fastest possible processing speed with lower recognition quality as in other modes. Recommended when recognition speed has priority.
<b>Fast</b>	Fast processing speed with slightly better recognition quality than in freeflow. Also intended for open traffic situations.
<b>standard</b>	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.
<b>High</b>	a higher possible reading quality. Can be up to one times slower than in the fast mode
<b>Best</b>	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.

### 6.3 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:

<b>READ</b>	When ANPR recognizes a plate
<b>NOREAD</b>	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).
<b>LCR</b>	Low confidence read event is created when a plate is read but the confidence level is lower than set in parameter 'Min Plate confidence'

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, Notification, Serial, TCP

#### 6.3.1 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).

<b>HOST</b>	Enter the Host ftp servers IP address or name, as ftp://
<b>USER</b>	The username of the ftp server (The user needs read/Write right)
<b>PASSWORD</b>	The password of the ftp server
<b>NAMING PATTERN</b>	Are used to include specific reading information (date, time, plate...) in the file name. How to use and format names using patterns read Appendix
<b>IMAGE UPLOAD</b>	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
<b>IMAGE QUALITY</b>	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%.

#### 6.3.2 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).

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

#### 6.3.3 STORE

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

<b>FOLDER</b>	the path for example: /tmp/demo
<b>POSTFIX</b>	some extra info what will be added to the name of the file
<b>MIN FREE SPACE</b>	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)

#### 6.3.4 DIGITALOUT

This action will produce digital output for a specific time period

<b>OUTPUT LINE</b>	Which output should be activated 0=relay1, 1=relay2
<b>INVERT SIGNAL</b>	If enabled the output will become active
<b>OUTPUT DURATION</b>	The time in milliseconds that the output will be activated
<b>NON-BLOCKING</b>	if enabled other actions will not be delayed by this action

#### 6.3.5 SERIAL

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

<b>BAUD RATE</b>	The baud rate of the serial message, default 115200
<b>MESSAGE</b>	The composed message for the action using the naming pattern, see appendix A

#### 6.3.6 TCP ACTION

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

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

#### 6.3.7 HTTPPUT ACTION

The PUT method puts a file or resource at a specific URL. If there is already a file or resource at that URL, PUT will replace that file or resource. If there is no file or resource there, PUT creates one.

<b>URL</b>	the destination url address where the message should be send to
<b>USER</b>	The required user credentials
<b>PASSWORD</b>	The required password credentials
<b>MESSAGE</b>	The composed message for the action using the naming pattern, see appendix A

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

- 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

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

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

License plate 'HK55EVB':

[illegible][illegible]

## 22/29

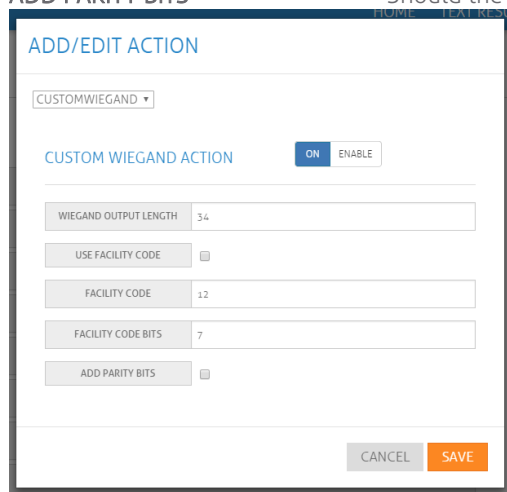
## ANPR LUMO | INSTALLATION GUIDE

### SYSTEM SETTINGS

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:

<b>WIEGAND OUTPUT LENGTH</b>	The length of the complete Wiegand string in bits
<b>USE FACILITY CODE</b>	Should the facility code be included in the Wiegand string
<b>FACILITY CODE</b>	The facility code
<b>FACILITYCODE BITS</b>	The amount of bits used for the facilitycode
<b>ADD PARITY BITS</b>	Should the parity bits be included in the string



ADD/EDIT ACTION

CUSTOMWIEGAND

CUSTOM WIEGAND ACTION

WIEGAND OUTPUT LENGTH 34

USE FACILITY CODE ☐

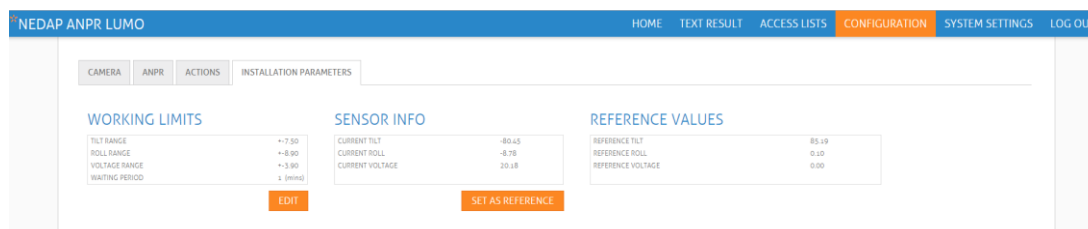
FACILITY CODE 12

FACILITY CODE BITS 7

ADD PARITY BITS ☐

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.

## 6.4 INSTALLATION PARAMETERS



NEDAP ANPR LUMO

HOME TEXT RESULT ACCESS LISTS **CONFIGURATION** SYSTEM SETTINGS LOG OUT

CAMERA ANPR ACTIONS **INSTALLATION PARAMETERS**

**WORKING LIMITS**

TILT RANGE	+/-7.50
ROLL RANGE	+/-8.90
VOLTAGE RANGE	+/-3.90
WAITING PERIOD	1 (min)

**SENSOR INFO**

CURRENT TILT	-80.45
CURRENT ROLL	-8.76
CURRENT VOLTAGE	20.18

**REFERENCE VALUES**

REFERENCE TILT	80.19
REFERENCE ROLL	0.10
REFERENCE VOLTAGE	0.00

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.

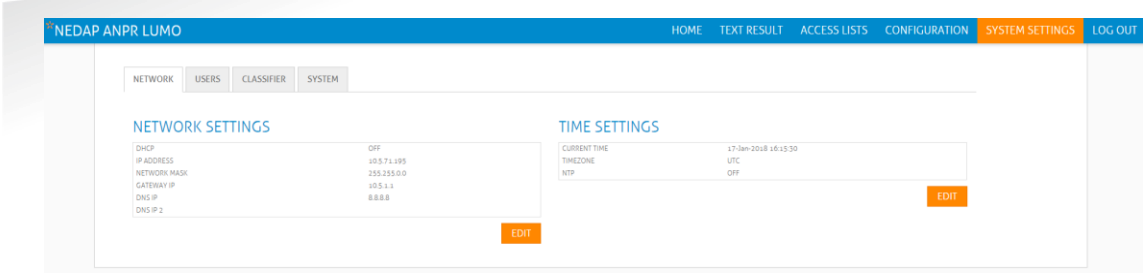
By pressing the "SET AS REFERENCE" button, you tell the camera that the current values are the values that are good. As soon as a values exceeds the limits, an alarm is raised. This can be used as an action (SYSTEM MESSAGES)

## 7 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.

# ANPR LUMO | INSTALLATION GUIDE

## SYSTEM SETTINGS





## 7.1 NETWORK

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

### 7.1.1 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.

DHCP

OFF

---

MANUAL SETTINGS

IP ADDRESS	10 . 5 . 71 . 195
NETWORK MASK	255 . 255 . 0 . 0
GATEWAY IP	10 . 5 . 1 . 1
DNS IP	8 . 8 . 8 . 8
DNS IP 2	.

---

CANCEL

SAVE

### 7.1.2 TIME SETTINGS

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

NTP

OFF

---

CHOOSE TIMEZONE

UTC

SET TIME

19-Jan-2018 14:54:27

---

NTP SERVER LIST

NTP SERVER	0.debian.pool.ntp.org	STANDARD	-
NTP SERVER	1.debian.pool.ntp.org	STANDARD	-

+

---

CANCEL

SAVE

ON

NTP

CHOOSE TIMEZONE

UTC

SET TIME

05-Feb-2018 16:49:06

+

CANCEL

SAVE

## 7.2 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 who 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.

- |                 |   |
|-----------------|---|
| <b>ADMIN</b>    | Users with the "ADMIN" role have full access to the camera, and have advanced features on the CAMERA/ANPR-CONFIGURATION tabs. |
| <b>USER</b>     | Users with the "USER" role, have basically the same rights as the "ADMIN" role, but only the basic features are presented.    |
| <b>OPERATOR</b> | Users with the "OPERATOR" role, can modify the accesslists, 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.

### 7.3 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 and 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.

### 7.4 SYSTEM

Through this menu all system related items can be activated

#### 7.4.1 SYSTEM MANAGEMENT

RESTART ANPR	This will restart the ANPR software
REBOOT SYSTEM	This will completely reboot the camera
DOWNLOAD LOGS	All log files will be downloaded, this can later be used for analytics by the Nedap support team.
SAVE CONFIGURATION	Make a backup of all the settings made
IMPORT CONFIGURATION	Restore a saved configuration from file
CHANGE SYSTEM PASSWORD	Changing the system's ROOT password

We recommend to change the system password, make sure you store this password in a secure place.

#### 7.4.2 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.

#### 7.4.3 DIGITAL IO

In the menu you can see the current status of all inputs and outputs.

#### Important note

When changing the system password be aware that, the system password cannot be recovered. When you lose the system password, the camera needs to be returned to Nedap

## A NAMING PATTERN

Placeholder	Description
"%LP%"	This keyword will be replaced by the license plate value string.
"%LP_WS%"	This keyword will be replaced by the license plate value string including white spaces.
"%STATE%"	This keyword will be replaced by the state string.
"%CONF%"	This keyword will be replaced by the confidence value string.
"%CONF_STATE%"	This keyword will be replaced by the state confidence value string.
"%FULL_IMG%"	This keyword will be replaced by a base64 encoded image of the whole image sensor.
"%LP_IMG%"	This keyword will be replaced by a base64 encoded image of the License plate.
"%NUM_ROWS%"	This keyword will be replaced by the count of rows of license plate as string.
"%REGION%"	This keyword will be replaced by the region string.
"%REGION_CITY%"	This keyword will be replaced by the city string.
"%REGION_SHORT%"	This keyword will be replaced by the region short value string.
"%ENDING%"	This keyword will be replaced by the state value string.
"%ENDING_SHORT%"	This keyword will be replaced by the state value string.
"%COMMA%"	This keyword will be replaced by a comma (,).
"%BR_ON%"	This keyword will be replaced by '('.
"%BR_OFF%"	This keyword will be replaced by ')'
"%SQ_BR_ON%"	This keyword will be replaced with an open bracket ([).
"%SQ_BR_OFF%"	This keyword will be replaced with an closed bracket (]).
"%CR%"	This keyword represents the carriage return option.
"%LF%"	This keyword represents the line feed option.
"%POS_X%"	This keyword will be replaced by x position in image of left upper corner of license plate as string.
"%POS_Y%"	This keyword will be replaced by y position in image of left upper corner of license plate as string.
"%POS_W%"	This keyword will be replaced by width of license plate in image as string.
"%POS_H%"	This keyword will be replaced by height of license plate in image as string.
"%YEAR%"	This keyword will be replaced by year string. (When license plate was detected)
"%MONTH%"	This keyword will be replaced by month string. (When license plate was detected)
"%DAY%"	This keyword will be replaced by day string. (When license plate was detected)
"%HOUR%"	This keyword will be replaced by hour string. (When license plate was detected).
"%MINUTE%"	This keyword will be replaced by minute string. (When license plate was detected).
"%SECOND%"	This keyword will be replaced by seconds string. (When license plate was detected).
"%FRACSEC%"	This keyword will be replaced by fraction of seconds string. (When license plate was detected).

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## C DOCUMENT REVISION

Version	Date	Comment
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