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Luminoscope® SAM 2035

User manual

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Considerations

Copyright, disclaimer and notes clarification

Copyright

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Notes clarification

LET Automotive products are manufactured for use according to proper procedures by a qualified operator and only for the purposes described in this manual.

The following icons are displayed to indicate additional information that may have added value to the specific topic or is qualified as a precaution measure. Always pay attention to the included information.

Warning: Indicates a potential hazardous situation which, if not taken into account, could result in damage or problematic functioning of the device. In some cases it could also lead to physical injuries.

Attention: Indicates important information of particular interest for an efficient and convenient operation of the product. Not taking into account this information could result in damage on problematic functioning of the device or it intended use.

Note: Indicates information of interest for efficient and convenient operation of the product or indicates just additional information on the topic.

Table of Contents

1 Regulations

Please read the following regulations before using the system and setting it on a powered status.

1.1 Safety regulations

This headlamp tester complies with the necessary safety regulations.

- Improper use or handling of the appliance can compromise the safety of the operator and the environment, as well as the reliability of the measurement.
- Repairs may only be done by the Service engineers of *LET Automotive*. Inexpert repairs can result in danger to the operator and environment.
- Repairs and/or spare parts exchange may only be done with units which are delivered by *LET Automotive*.

Besides the above mentioned safety regulations, the following must also be observed:

- Damaged electrical cables of the appliance interconnections must immediately be replaced.
- Do not put or hang objects on the appliance (tools, clothes, …).
- Make sure the wheels of the base are always clean. Obstructions on the rails or wheels can bring the system off-balance during a movement.
- The appliance automatically starts-up, moves and stops. Pay attention not to get stuck between the appliance and object (e.g. vehicle or gantry) during the system movements. Keep hands and loose clothing clear of moving parts while operation.
- In case the appliance is equipped with a safety package, including an emergency stop button: Press the emergency stop button on the appliance in case of a dangerous situation. This operation will stop all movements of the headlamp tester. The emergency stop button may only be released after recovery of the dangerous situation.
- In case the appliance is not equipped with a safety package, including an emergency stop button: Switch off the main power cabinet of the headlamp tester in case of a dangerous situation. The power supply may only be restored after recovery of the dangerous situation.
- Follow the instructions and guidelines as shown on the interface screen.
- The appliance is not water-proof. Keep it safely out from water spills, soaking or submersion into water and any other liquid.
- The appliance is not shock-proof. Protect it against heavy shocks or impacts. Do not drop or let it fall.

1.2 Danger of localized heating

Warning:

- During the seasons of the year when the sun is very low in the sky, there is a risk of the sun shining directly into the collecting lens of the Luminoscope®, so that the focusing effect which is used to complete the headlights tests may cause focalized overheating inside the machine.
- The generated heating may in extreme cases severely damage the Luminoscope®!
- To avoid any possible damage, it is strongly recommended that the dust/sun cover is used whenever the Luminoscope® is not operational.

1.3 Environmental regulations

Warning:

- Be aware of the consequences of incorrect waste disposal.
- Incorrect disposal of recoverable materials may negatively impact the environment.
- When the service life of the Luminoscope® expires, the appliance should not be discarded with normal household waste. It should be offered for recycling according to the local currently valid regulations instead.

The following materials are used for the main parts of the Luminoscope® SAM 2035:

Part	Material
Fresnel lens	Polymethyl methacrylate (PMMA)
Stand	Aluminium
Optical block	Polystyrene (PS) with high resistance
Base	Steel
Battery in optical block	Nickel-metal-hydride (NiMH) technology based

2 Basic Principles

What follows is a general explanation of the principles involved in the design and use of Luminoscope® devices and their environment.

2.1 Headlamp criteria

During an international conference in Vienna in 1958 was agreed that the headlamps on vehicles should comply with the following criteria:

- A high beam should illuminate the road in front of the vehicle for at least 100 m (300 ft).
- A low beam should illuminate the road in front of the vehicle for at least 40 m (120 ft) without blinding the oncoming vehicles.

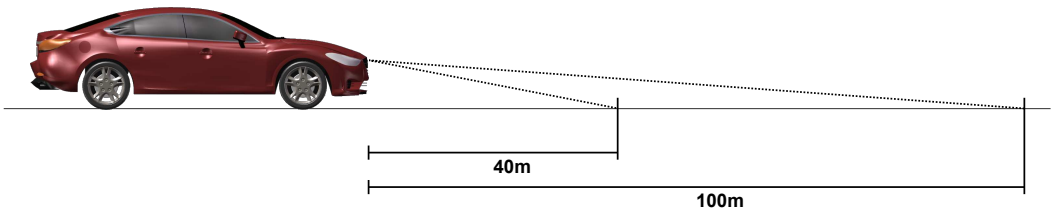


Figure 1: Headlamp criteria

These fundamental criteria don't describe the intensity values, any measuring procedure or how to prevent blinding the oncoming traffic. Therefore, different countries have developed their own standards and technical requirements.

The definition of a headlamp is determined by those standards. In Europe for instance the low beam is described by a “cut off” line which distributes the light beam in a sharp divided light and dark zone, while a low beam in America has to have minimal and maximal intensities in a number of predefined points.

2.2 Adjusting headlamps

The beam from a headlamp is normally directed towards the ground ahead of the vehicle for a low beam (approximately 40 m), and straight ahead for a high beam (approximately 100 m).

In order to better determine beam orientation, a perpendicular screen is placed in front of the vehicle at a somewhat shorter distance (a minimum of 10 m). On this screen, at the same height, and relative to the vehicle axis, the position of the headlamps are indicated.

The lamps can thus be adjusted and checked, taking in account the required inclination settings.

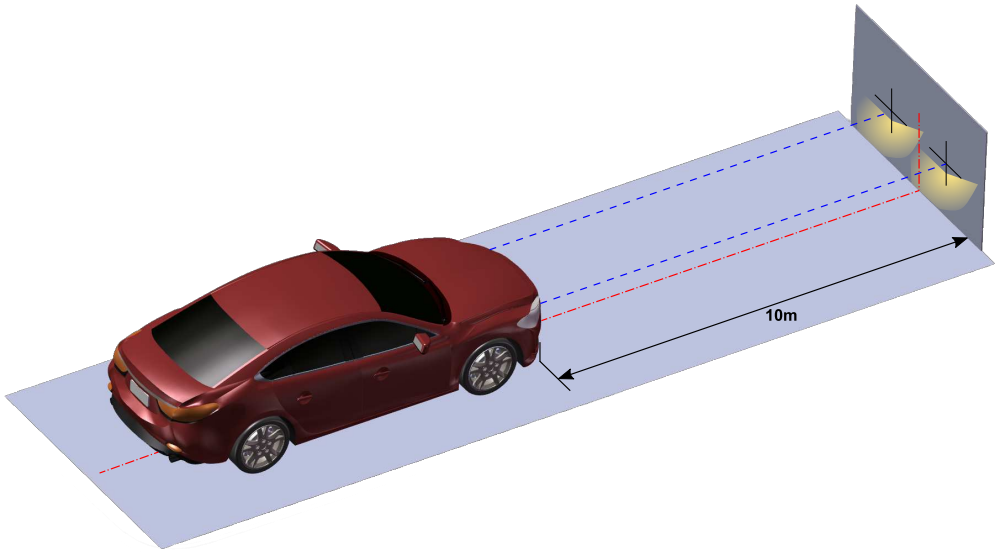


Figure 2: Basic principle of headlamp aiming on a 10m wall

If a white screen is placed at a distance of 10m in front of the headlamp, the inclination angle (slope) of the headlamp under test can be determined and expressed in *cm/10m* or *%*. This kind of projection screen is also called a *10m wall*.

L is the distance between the headlamp and the projection screen and is equal to 10 m. The horizontal blue dotted line in the image below indicates the *mounting height* of the headlamp. This height should be marked on the *10m wall*. The slopped dotted line represents the beam projection of the *cut-off line* of the low beam. The inclination angle (slope) of the headlamp is indicated as **α** and can be expressed in degrees.

H represents the distance between the *mounting height* of the headlamp and the beam projection of the *cutoff line*, measured on the *10m wall*. If L=10 m and H=10 cm, the headlamp inclination is equal to 10 cm/10m, or 1%.

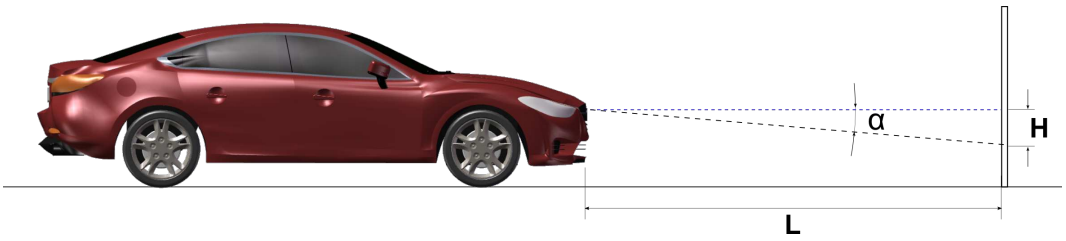


Figure 3: Beam slope

The following table provides the eventually needed conversion between the different units.

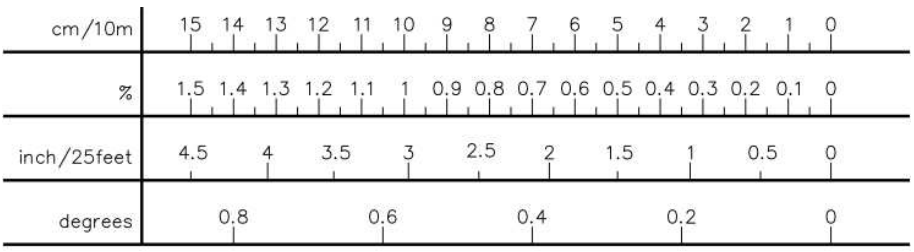


Figure 4: Unit conversion

This method has some disadvantages:

- It requires an indoor open area, over 10 meters long.
- The illumination level of that area has to be constant, mainly dimmed and not subject to the varying conditions of natural light.
- The axes must be meticulously specified for each and every different vehicle and for any new vehicle alignment process.
- The method is purely visual and highly dependent on the operator skills and interpretation.

2.3 Lens Principle

The use of a converging lens placed at the focal length reduces the distance to the screen dramatically and eliminates the need of a dark room.

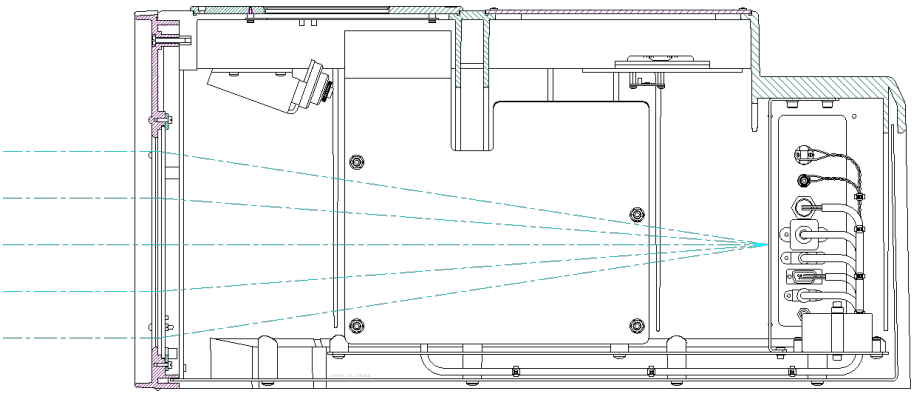


Figure 5: Parallel light rays entering the lens

All parallel rays from the same direction are concentrated in one point on the white projection screen inside the Luminoscope®.

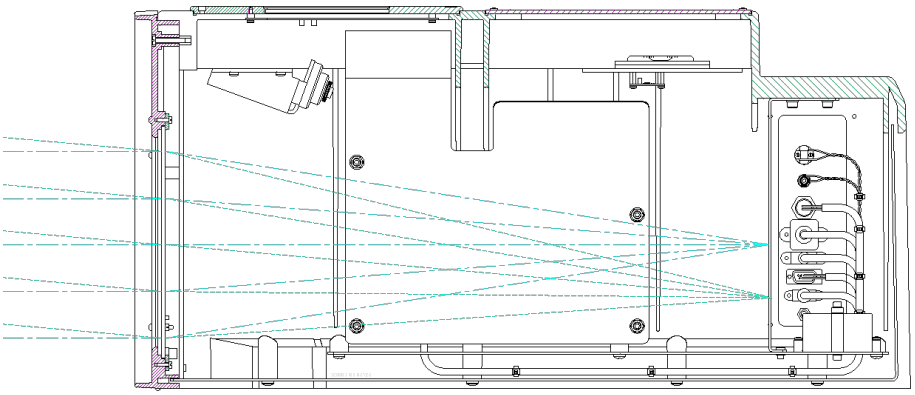


Figure 6: Parallel light rays from different angles entering the lens

Every point on the screen represents a collection of rays from the same direction.

2.4 Advantages of optical block with lens

The use of a collecting lens has advantages over the *10m wall* projection method.

- The distance to the screen is dramatically reduced: from 10 m to 0.5 m.
- The beam intensity is much higher, dimming or cancelling the ambient light is no longer necessary.
- The white projection screen is positioned at the focal distance of the lens. All parallel rays from the same direction are concentrated in one point. Consequently, the relative position of the system in relationship to the lamp becomes less important as the beam projection of the screen remains identical, independent of the place where the rays enter the lens.

Actually, each point on the screen is thus representing the light emitted in the corresponding direction. This is the *candela meter principle*. The luminance ***E*** of a point on the screen (in lumen/meter² = Lux, or lumen/foot² = foot candle) represents the luminous intensity ***I*** (in lumen/steradian = candela) of the source in the corresponding direction.

It can be mathematically demonstrated that $I = F^2 x E$, where ***F*** is the focal length of the lens.

Luminous intensity measurements in candela can thus easily be made. The result is the same, regardless of the place where the rays enter the lens, at the top or at the bottom.

Care should be taken, nevertheless, to capture a maximum of the light from the beam, since any light from the beam not entering the Luminoscope® will not be available for measurements and pattern building. To achieve it, the Luminoscope® is equipped with an electronic *Position Check* system which continuously monitors the position in front of the headlamp and guides the operator to determine the ideal position of the optical block lens in front of the headlamp.

2.5 Image processing

A CMOS camera points to the internal white projection screen and acquires the reflected image for further process.

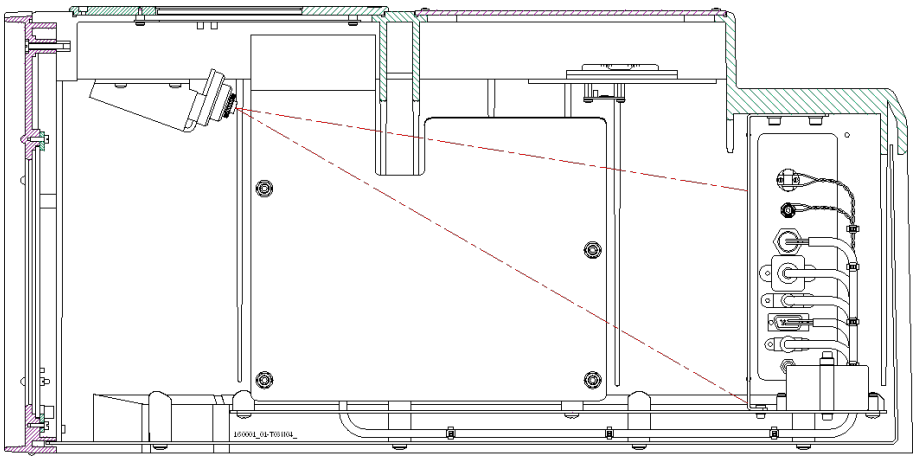


Figure 7: CMOS camera pointing at white projection screen

The horizontal and vertical lamp projection range is ±100 cm/10m.

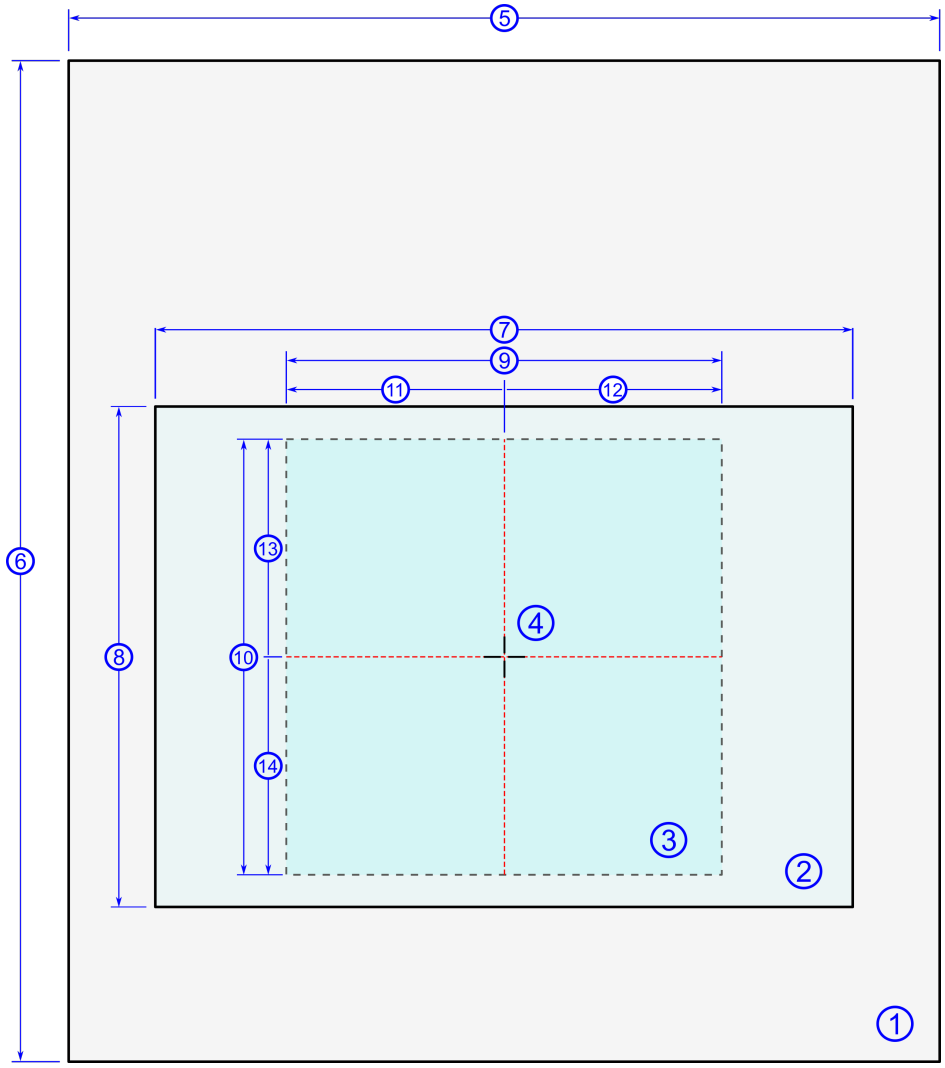


Figure 8: Projection screen with areas identification

1	Projection screen area		2	Camera viewing area	
3	Lamp testing area		4	Absolute zero reference	
5	Horizontal projection screen range		6	Vertical projection screen range	
7	Horizontal viewing range	340 cm/10m	8	Vertical viewing range	270 cm/10m
9	Horizontal lamp testing range	200 cm/10m	10	Vertical lamp testing range	200 cm/10m
11	Leftwards testing range	-100 cm/10m	12	Rightwards testing range	+100 cm/10m
13	Upwards testing range	+100 cm/10m	14	Downwards testing range	-100 cm/10m

The shutter setting of the camera is automatically controlled to provide an unclipped image under any circumstance. This allows absolute intensity measurements in kCd.

Camera data is analyzed by powerful algorithms to determine the position of the beam and to obtain other relevant data.

2.6 Alignment with the vehicle

In order to obtain a reliable measurement of the headlamp, it is necessary to achieve a good alignment of the Luminoscope® with the slope of the vehicle standing area and the longitudinal axis of the vehicle.

In the horizontal plane

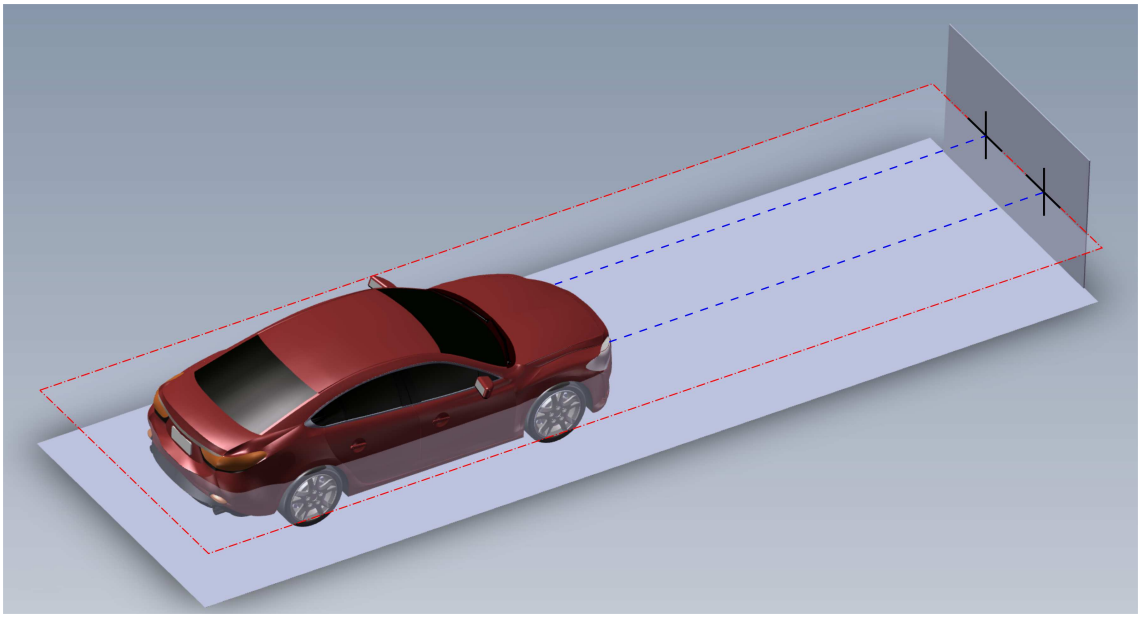


Figure 9: Horizontal plane alignment

The easiest way to achieve a good horizontal alignment with the vehicle is to place the vehicle on a horizontal floor and set the optical block also horizontal with the aid of the spirit level. In practice not so many floors are perfectly horizontal. There are two practical methods to achieve it:

- Measure the floor slope (check corresponding manual) and tilt the optical block in the same direction with the same slope.
- Measure the floor slope and add or subtract that value (depending on the direction of the floor slope) to the computed value of the beam position by the optical block.

In the vertical plane

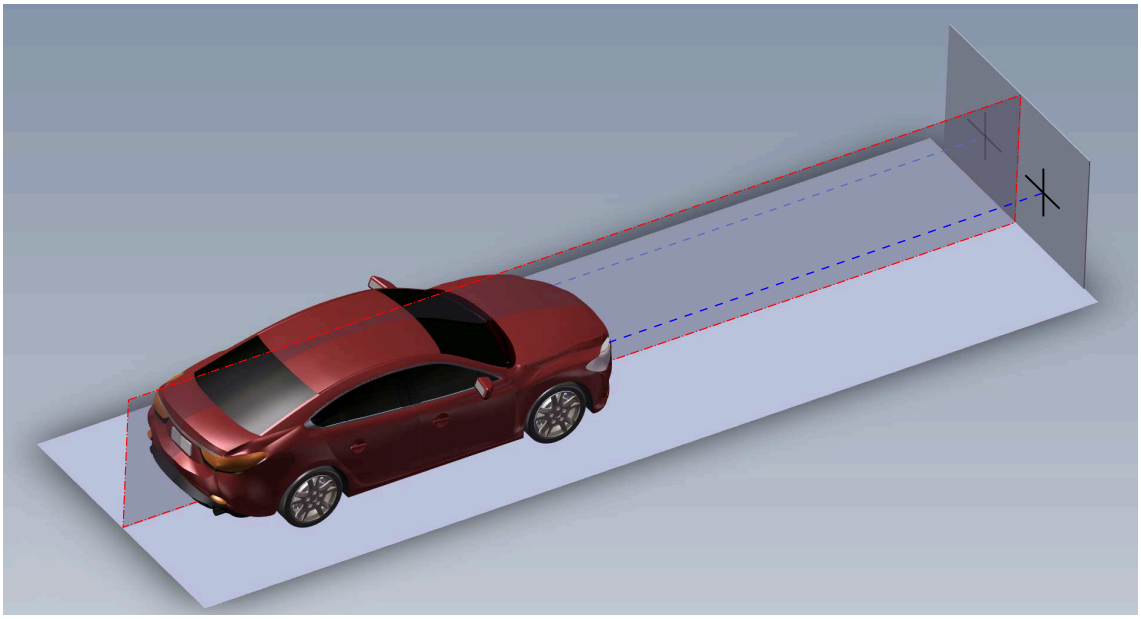


Figure 10: Vertical plane alignment

The precision of the measurement of the L/R position of the beam depends mainly on the vertical alignment of the vehicle towards the optical block. As an example, a simple misalignment of 5 mm on a wheelbase of 2 m will give an error of 5 x 5 mm = 2.5 cm/10m in the L/R measurement of the beam.

The vertical plane is also called the *longitudinal direction* of the vehicle.

The trolley base of the Luminoscope® system is equipped with an alignment device with two bolts for adjusting and locking the mast rotation. This is used for correctly aligning the optical axis of the Luminoscope® with the longitudinal direction of the vehicle standing area. The rotational position of the mast should be set once during the calibration procedure of the Luminoscope®. It should be locked at the position where the optical axis of the Luminoscope® corresponds with the longitudinal direction of the vehicle standing area.

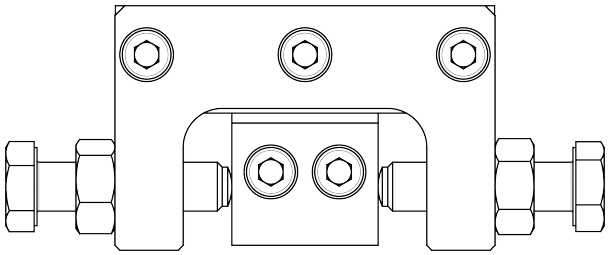


Figure 11: Alignment device for adjusting and locking mast rotation

The longitudinal direction of the vehicle should be aligned parallel with the longitudinal direction of the vehicle standing area. To achieve a good alignment of each vehicle, a drive in guidance system can force the vehicles to the correct longitudinal position in front of the Luminoscope®.

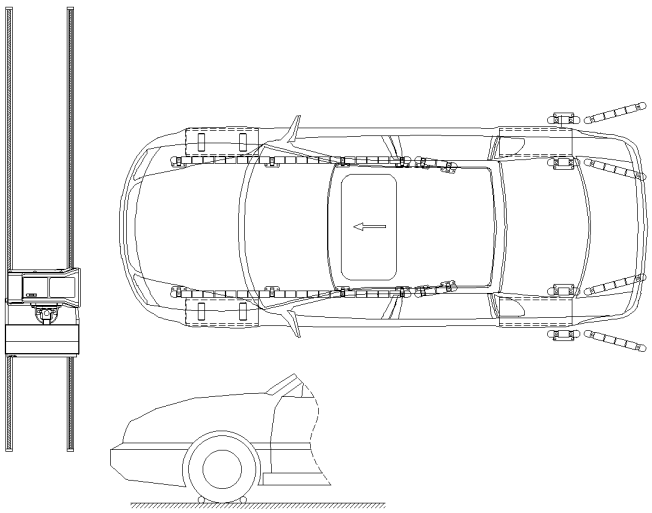


Figure 12: Drive-in guiding system on vehicle installed area

Note: The set-up may have a different appearance depending on customer specific implementation.

Several systems are applicable to ensure the correct alignment of the vehicle in the vertical plane, such as painted guiding lines on floor, a wheel aligner system, a centralizer system, a vehicle alignment measurement system (VAM), etc.

This procedure ensures the longitudinal alignment between the Luminoscope® and the vehicle longitudinal axis.

2.7 Positioning in front of the headlamp

It is of great importance that the lens of the Luminoscope® is correctly positioned in front of the headlamp to ensure that as many light rays as possible enter the lens.

This guarantees that the beam image is displayed realistically on the white projection screen inside the Luminoscope® to be able to perform a correct headlamp measurement.

With this purpose, the Luminoscope® system is provided with the electronic *Position Check* system that uses twelve photocells around the lens 1.

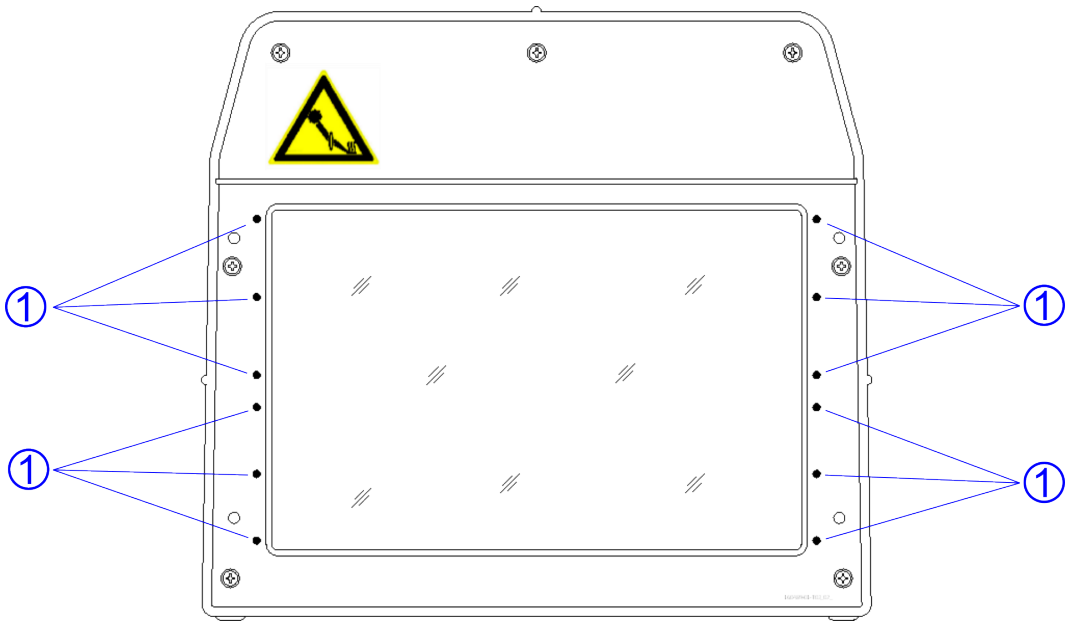


Figure 13: Position Check cells around the lens

3 Headlamps

This is a review of the illumination patterns that different headlamps produce.

3.1 ECE or European low beam

Note: The terms *low beam* and *dipped beam* also refer to the same type of headlamp and are used interchangeably.

The purpose of the low beam is to illuminate the road ahead of the vehicle and traffic signs up to a distance of approximately 40 m without blinding oncoming traffic. The asymmetrical low beam must be adjusted on a predefined inclination value. In Europe e.g. it's an inclination between -1% (or -10 cm/10m) and -1.5% (or -15 cm/10m). The reference point of the beam is the intersection of the horizontal part with the sloped part and is referred to as *V-point*. It is also called *kink point* and *elbow point*.

There exist two types of ECE low beams, depending on which side of the road the vehicle is driving:

LHD (Left Hand Drive)

The steering wheel is positioned on the left side of the vehicle and the driver uses the right side of the road. Some examples of countries on which this driving type is implemented include (but are not limited to) Belgium, France and Germany, among many others.

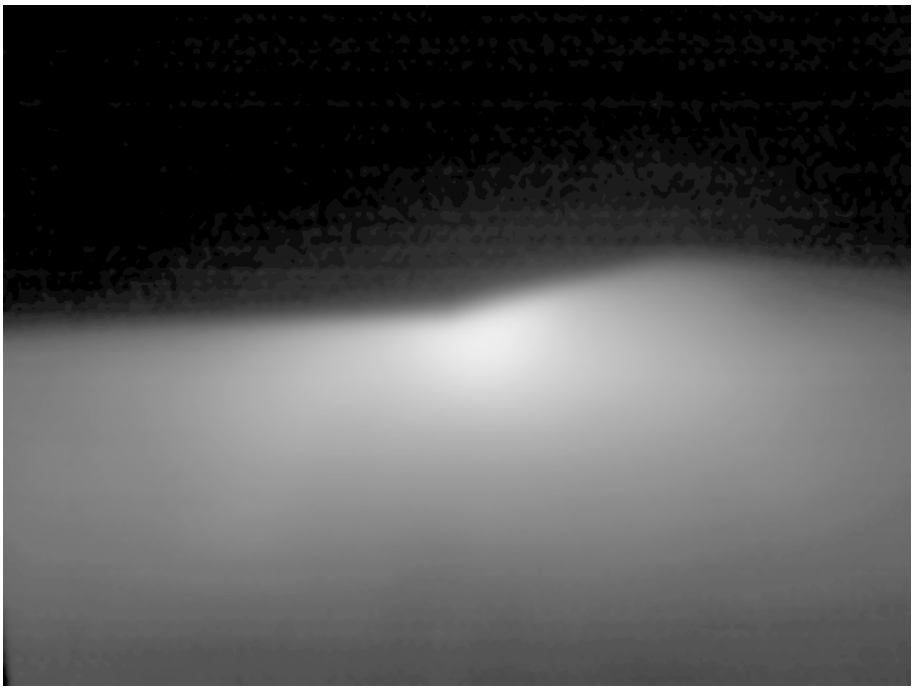


Figure 14: Low beam LHD

RHD (Right Hand Drive)

The steering wheel is positioned on the right side of the vehicle and the driver uses the left side of the road. Some examples of countries on which this driving type is implemented include Great

Britain, Ireland, Japan, Thailand, Malaysia, Indonesia, New Zealand, Australia, India, South Africa, among many others.

Figure 15: Low beam RHD

The world map below shows the implemented driving types for each country.

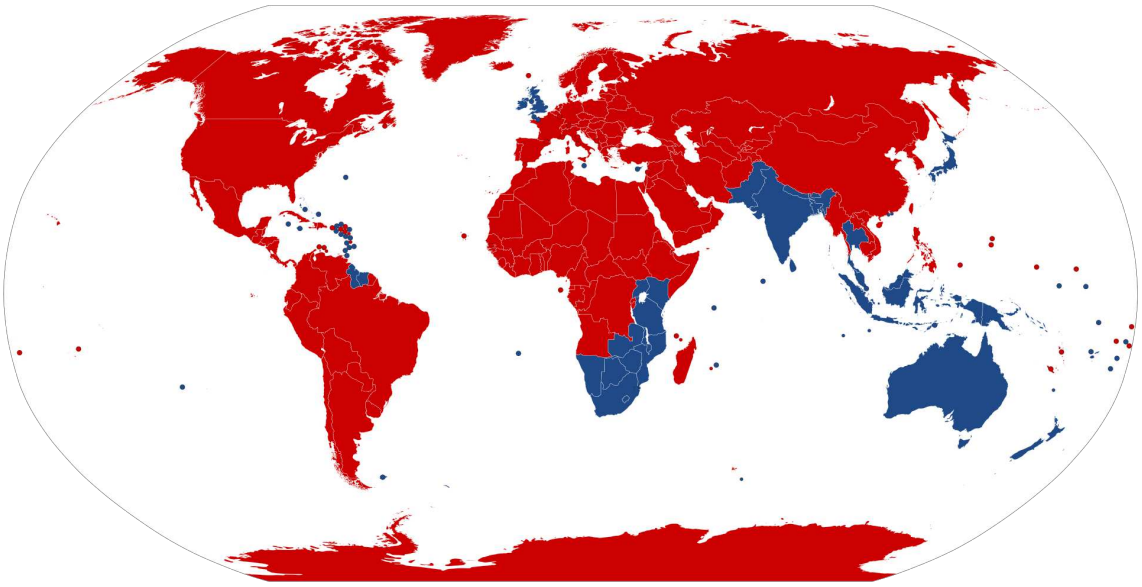


Figure 16: Implementation of LHD and RHD driving types across the world

3.2 High beam

Note: The terms *high beam* and *main beam* refer to the same type of headlamp and are used interchangeably.

The purpose of the high beam is to illuminate the road ahead of the vehicle at a further distance of approximately 100 m. The form of the beam is rather oval. The reference point is the point with the highest intensity (hotspot).

There are two different ways of construction:

- The high beam is integrated in the same housing of the low beam. So it is not possible to separately adjust high and low beam. In most countries, the low beam is adjusted because this is the driving beam. Due to the construction of the headlamp, the high beam will be at an inclination value that is 1% or 10 cm/10m higher than the low beam value.
- The high beam is a standalone headlamp so both beams can be separately adjusted with their own adjusting screws. Adjustment of the high beam is done at a value of 1% or 10 cm/10m higher than the low beam value.

Figure 17: High beam

3.3 Fog beam

Fog beams are mounted at the front bottom of the vehicle and illuminate the road as far as possible under fog, heavy rain or snow conditions.

The form of the beam is a broad band of light, where the reference is the flat horizontal top line (*cut-off line*) which is normally adjusted at 1% or 10 cm/10m below the low beam value. A fog beam only has one adjusting screw controlling the inclination.

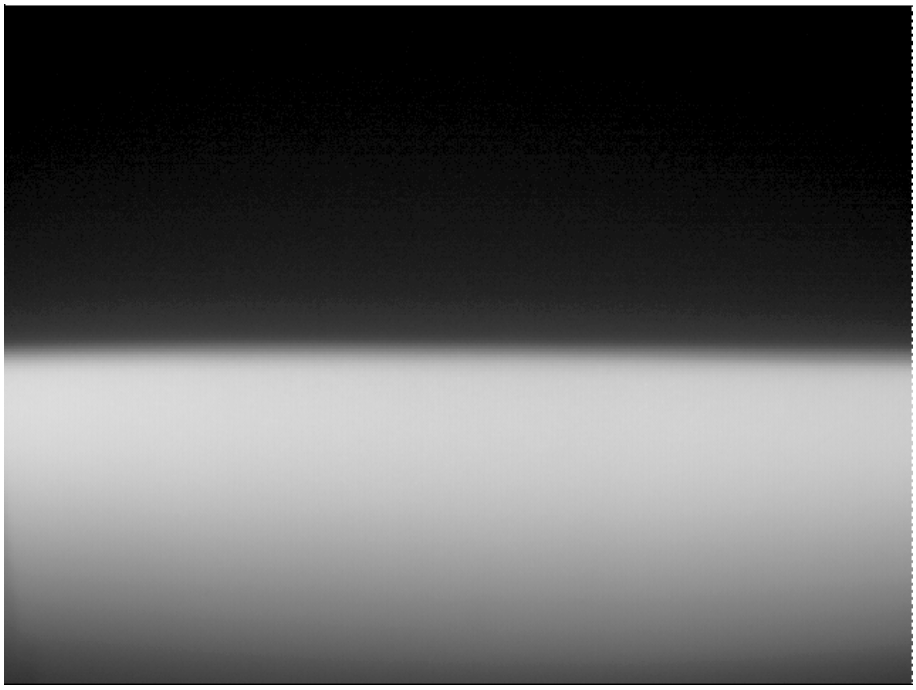


Figure 18: Fog beam

3.4 SAE or American low beam

Note: The terms *low beam* and *dipped beam* also refer to the same type of headlamp and are used interchangeably.

SAE (Society of Automotive Engineers)/ American low beams have an LHD shaped *cut-off line* with a small step and a zone of high intensity (*hotspot*) on the right side of the small step.

American low beams must be aimed – according to the marking on the glass – referring to the left or right side of the *cut-off line*.

There are two types of American low beams, requiring different adjustment methods:

VOL - Visually Optical Left	The left part of the *cut-off line* should be aimed at an inclination of -0,7%.
VOR - Visually Optical Right	The right part of the *cut-off line* should be aimed at an inclination of 0%.

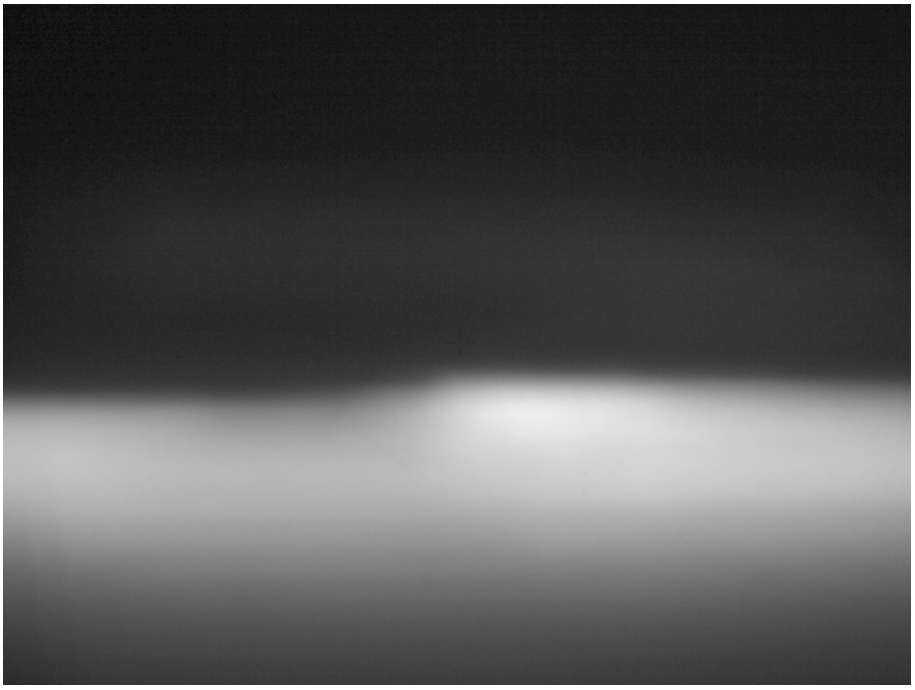


Figure 19: SAE low beam VOL or VOR

3.5 Japanese low beam

Note: The terms *low beam* and *dipped beam* also refer to the same type of headlamp and are used interchangeably.

The Japanese low beam has some similarities with a mirrored image of the SAE low beam, because the Japanese driver uses the left side of the road (RHD). However there are subtle details regarding the different heights of the zones at both sides of the step which make them different.

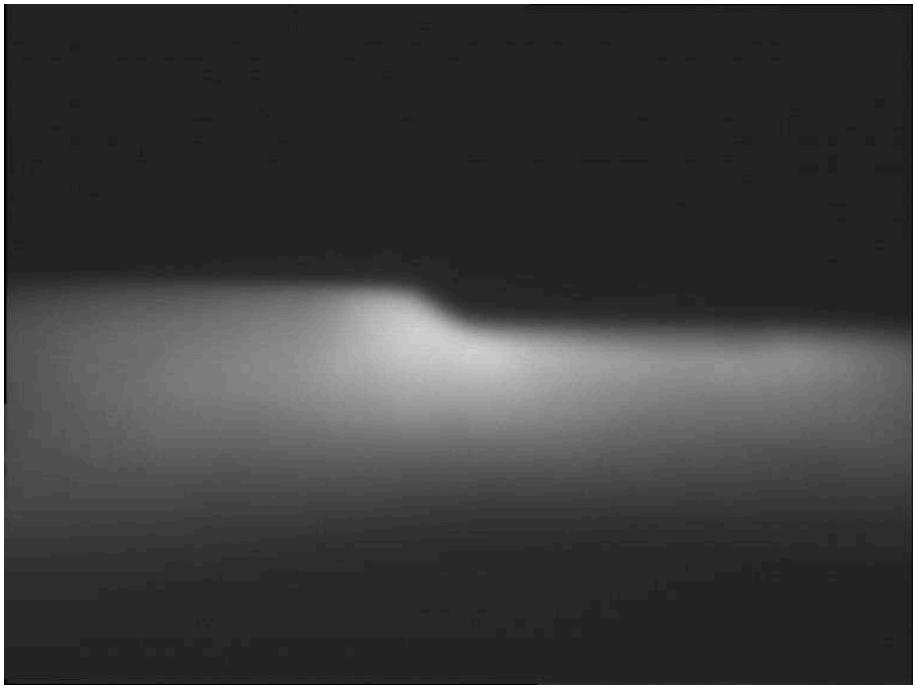


Figure 20: Japanese low beam

3.6 Dynamic headlamps and intelligent lighting systems

In order to improve road safety, sophisticated technologies are introduced to make lighting systems more intelligent.

These new technologies include *adaptive front lighting*, *variable intelligent lighting*, *dynamic bending lights*, *dynamic light spots*, *glare free high beam*, etc.

Most of these headlamps are controlled by other electronic systems of the car, such as intelligent cameras, radars, steering angle detection, etc. These kind of headlamps need special adjustment sequences and mostly require a calibration set-up of the vehicle (through vehicle specific diagnosis link). The calibration values should be stored afterwards in the electronic control unit (*ECU*) of the vehicle.

3.6.1 Glare free high beam with beam motorisation

Note: The terms *high beam* and *main beam* refer to the same type of headlamp and are used interchangeably.

An intelligent camera, fitted behind the windscreen, detects both vehicles in front of the car and oncoming vehicles. The high beam zone that might cause glare is darkened by adjusting the light image (by means of a servomotor). The beam images underneath can be moved horizontally in order to avoid glare at one specific zone on the road.

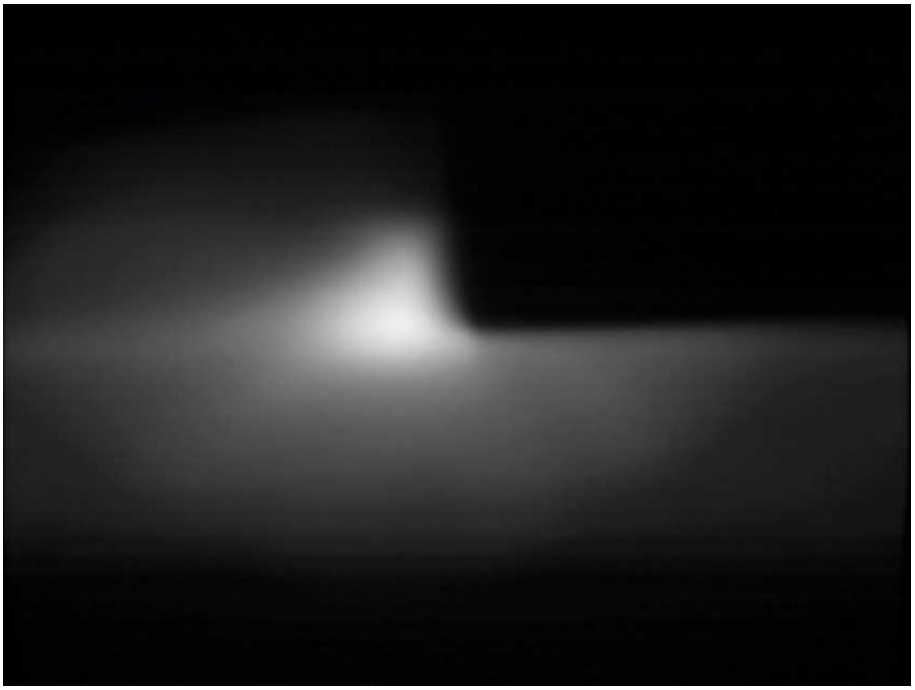


Figure 21: Left glare free high beam

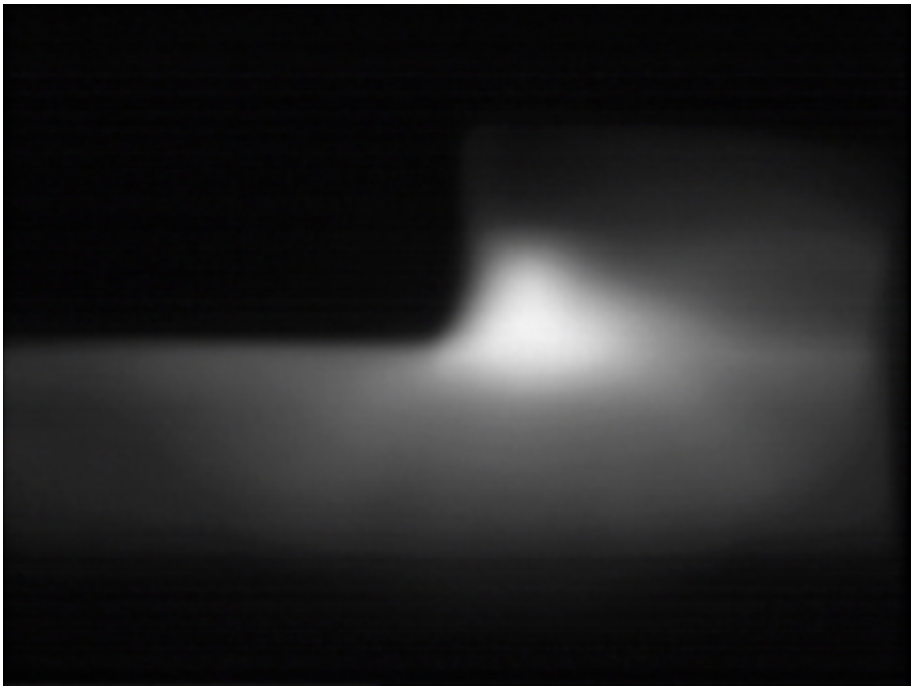


Figure 22: Right glare free high beam

An example of this headlamp principle is the *MDF (Maskiertes Dauerfernlicht)* high beam.

3.6.2 Glare free high beam with multiple static LED sources

An intelligent camera, fitted behind the windscreen, detects both vehicles in front of the vehicle and oncoming vehicles. The high beam zones that might cause glare are darkened by dimming or switching off one or more *LED* sources. So the overall high beam image is electronically controlled in order to avoid glare at multiple zones on the road.

Figure 23: Matrix high beam simulation scene

Calibrating a *Matrix* high beam with a headlight tester requires in most cases a calibration set-up of the vehicle (through vehicle specific diagnosis link) to switch on one of the *LED* sources as a reference.

The horizontal position of the reference spot should be mechanically adjusted or in other cases its position should be measured. The position is stored afterwards in the electronic control unit (*ECU*) of the vehicle.

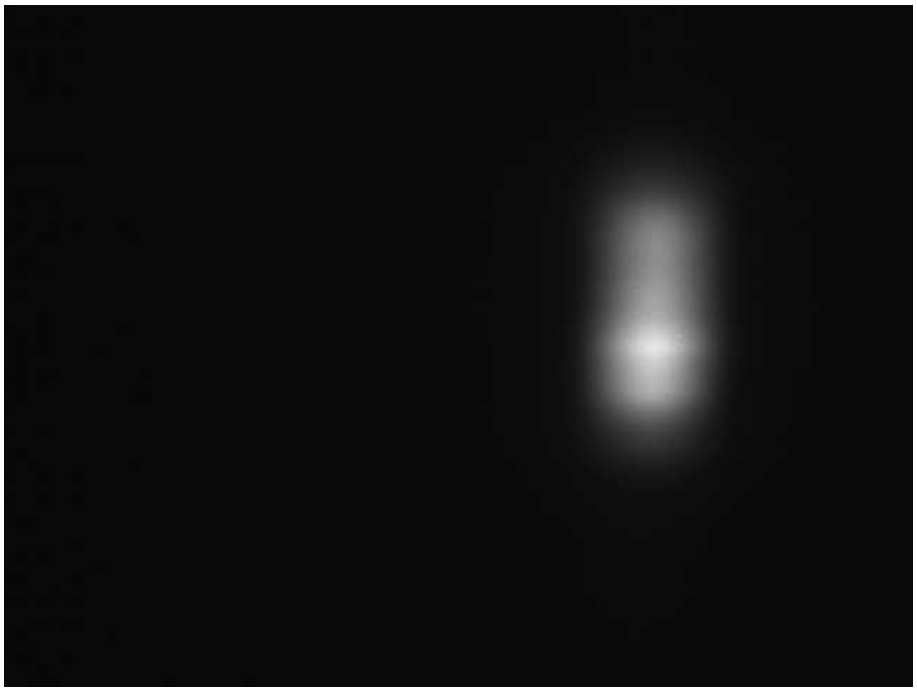


Figure 24: Reference spot of matrix high beam

An example of this headlamp principle is the *Matrix* high beam.

3.6.3 Dynamic low beam

Note: The terms *low beam* and *dipped beam* also refer to the same type of headlamp and are used interchangeably.

With a dynamic low beam, the horizontal position of the beam can be controlled by the steering angle, to achieve the most optimal light distribution on the road in all conditions (e.g. when the vehicle takes a turn). There are different technologies available for this purpose.

By means of a servo motor the horizontal *cut-off line* position could be automatically adapted during driving. In addition, there are also systems available with multiple *LED* sources as in the image underneath. It shows an LHD low beam *cut-off line* with a step of 90°. The upper part of the *cut-off line* (horizontal bar with the highest intensity at the right side of the image) can be made wider or smaller, depending on the steering angle of the vehicle. This is done by controlling the *LED* sources in order to have the most optimal road illumination for all steering angles when driving in low beam mode.

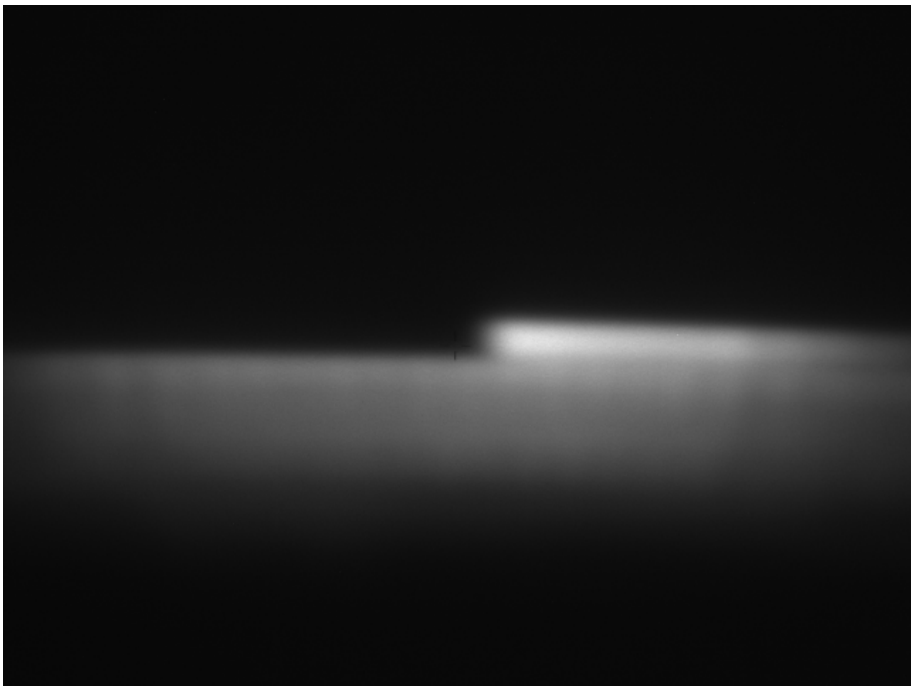


Figure 25: Dynamic low beam projection

4 Prerequisites for checking or adjusting

In order to achieve an accurate and stable headlamp measurement or adjustment, a number of prerequisites must be taken care of.

4.1 Prerequisites for the vehicle

- The front wheels must be in the straight-line travel position.
- The tires should be inflated to manufacturer specified pressures.
- The vehicle should be empty, with the hand-brake released.
- The springs and the shock-absorbers should be in their equilibrium positions. For vehicles with hydro-pneumatic suspension, the motor should be running.
- Where the vehicle is equipped with a manual control to adjust the low beam, it should be checked that it is in its rest position.

4.2 Prerequisites for the headlamps

- Check that the headlamps are rigidly connected to the vehicle.
- Check whether the two lamp glasses are identical, whether they are in their correct angular position and that they are not cracked.
- Check that the lamp glasses are clean and whether the reflectors are in a satisfactory state.
- Check that the headlamp units neither contain any water, or are misted up.

4.3 Positioning the system

- Locate the vehicle approximately 20-60 cm from the lens of the headlamp tester.
- Check regularly that the air bubble in the spirit level is centered at the lamps' test place.

5 Technical characteristics

5.1 SAM 2035 models

There is a single Luminoscope® SAM 2035 model available with different options.

Luminoscope® SAM 2035

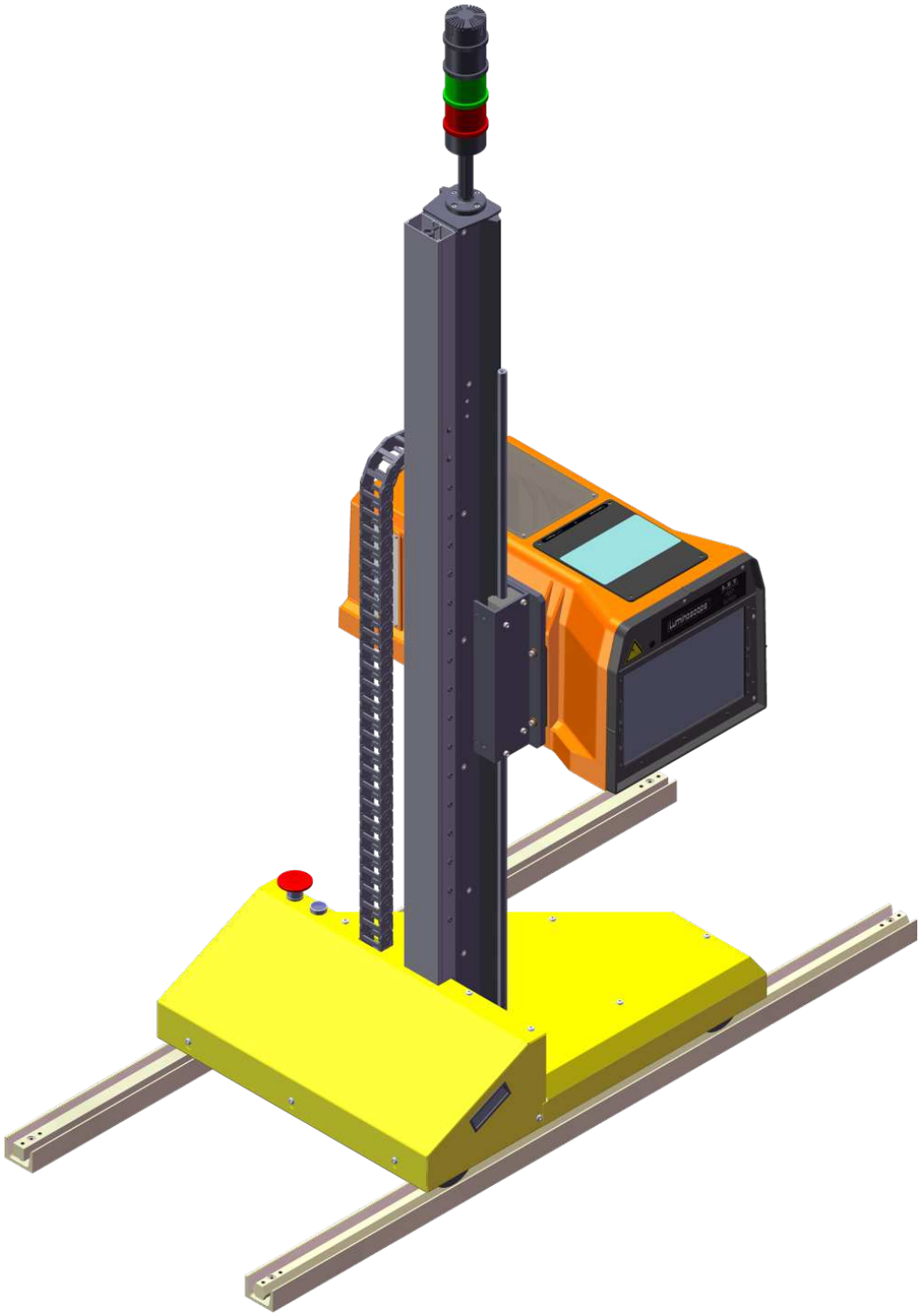


Figure 26: General view of SAM 2035 model

Note:

- The layout may have a different appearance depending on the customer's specific implementation.
- The safety package (including the **Emergency stop** button, **Start** button and signal tower) is optional.
- A mechanical intermediate plate fixed between the vertical sliding table and the optical block is optional. It raises the entire vertical positioning range of the optical block with 10 cm and is typically used for countries with higher positioning requirements for the optical block (e.g. Thailand).

5.2 Guiding system

Guiding the Luminoscope® SAM 2035 on rails ensures an accurate parallel displacement of the system. The rails are adjustable so the Luminoscope® remains horizontally along the whole range of the rails.

The two V-shaped front wheels 1 on the trolley base are guided on a hexagonal rail 2. The simple flat rear wheel 3 runs on the square rail 4. The uniform levelling of the rails can be easily adjusted to obtain a perfect horizontal movement of the Luminoscope® over the whole length of the rails.

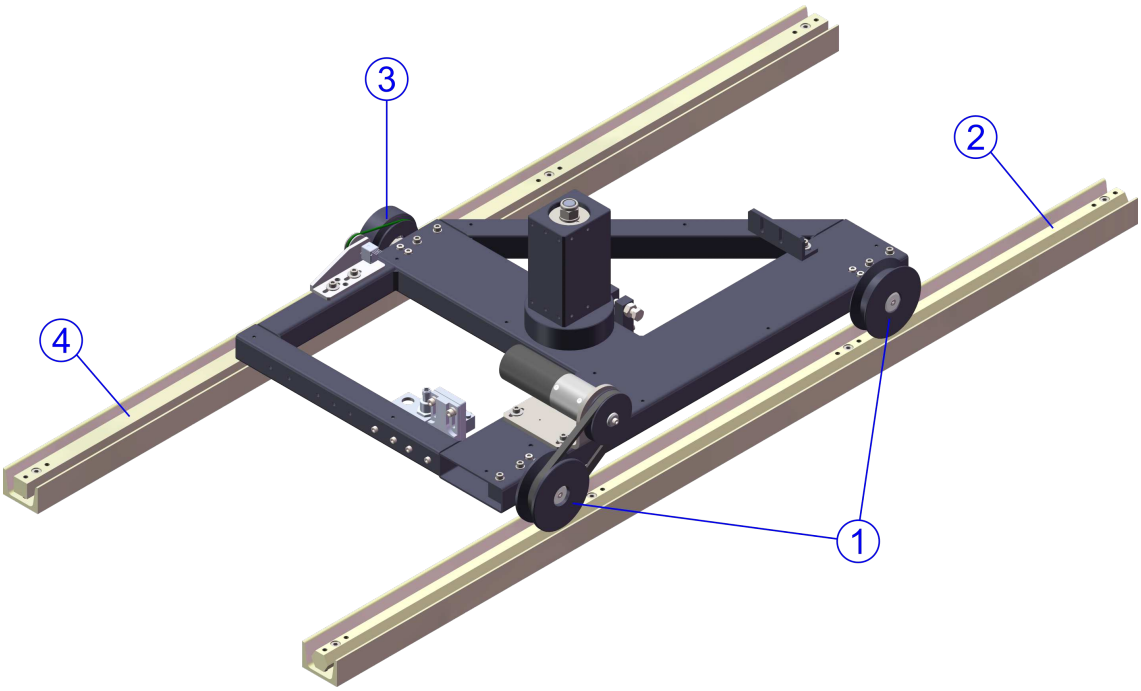


Figure 27: Trolley base on rails

5.3 Layout

The following sections include detailed graphics and callouts of the Luminoscope® which lead to an easier identification of the different parts.

Note: Depending on the ordered options, the supplied unit may look slightly different from the following drawings.

5.3.1 Front view

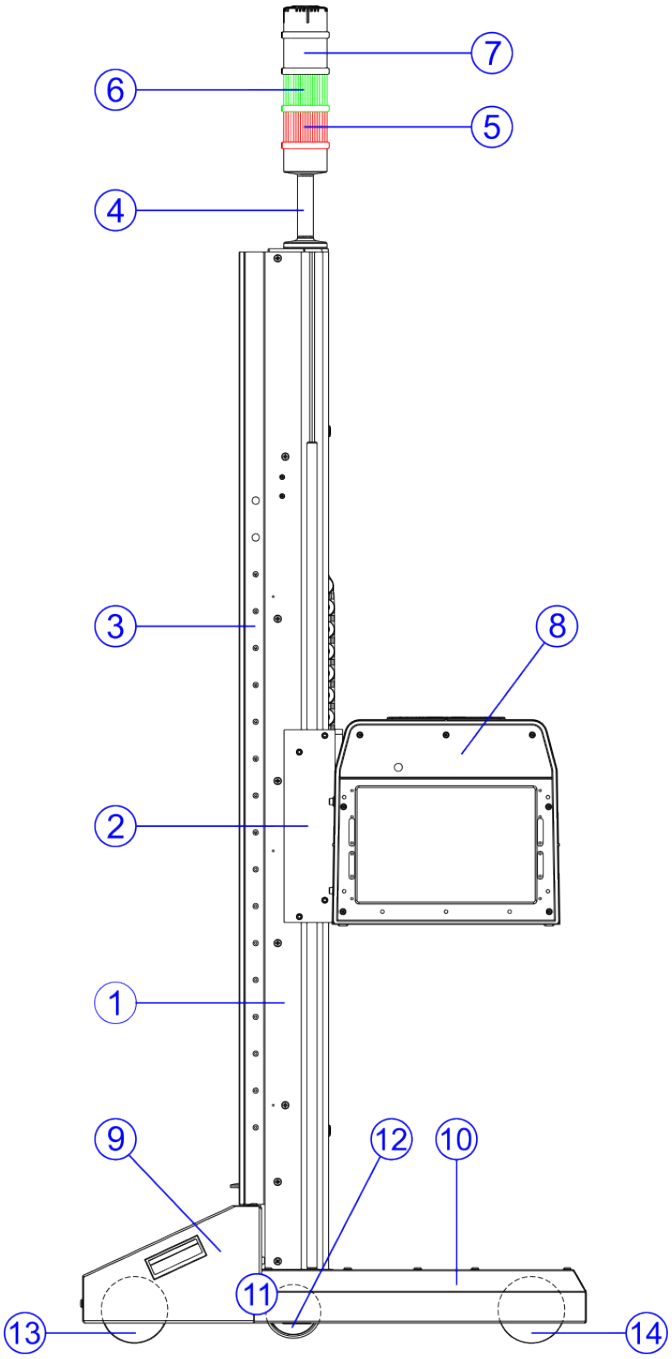


Figure 28: Front view of the Luminoscope® *SAM 2035*

#	Part	Description
1	Stand	The optical block is attached to the vertical sliding table of the stand. The stand has some electrical components (e.g. electric motor with brake and encoder; hardware limit switches; zero proximity switch) and some mechanical components (e.g. spindle; actuator) inside for controlling the vertical displacement of the optical block.

[1] Part of the optional safety circuit.

#	Part	Description
2	Vertical sliding table	Carries the optical block and can be electrically displaced in the vertical direction by means of three linear bearings. The bearings are guided on two linear guiding axis on the stand. The vertical displacement is provided by the electric motor inside the stand that drives a long spindle.
3	Height detection bar	The height detection bar has sixteen light sensitive photo cells (with a spacing of 58 mm) for scanning the rough position of the beam source. The photo cells are directly connected to the *APS* circuit board.
4	Signal tower[1]	Signal tower to inform and/or warn the operator and its environment.
5	Red light[1]	On in case the **Emergency stop** button is active or any of the hardware limit switches are active. Flashing in case the **Emergency stop** button has just been released or just after recovering from a hardware limit situation. Also flashing while the system is moving.
6	Green light[1]	On the system is in its park position and ready for the next test cycle.
7	Buzzer[1]	Generates a modulated warning sound while the system is moving.
8	Optical block	The optical block includes a lens, a white projection screen, a digital camera, a control panel and a connector plate. Captures, processes and analizes the headlight beam projection.
9	Yellow *APS* cover	Yellow cover hood on the electrical compartment of the trolley base. Dismantling the cover hood enables access to some electrical components (e.g. connection terminals; *APS* circuit board; electric motor + encoder + hardware limit switch + zero proximity switch for the horizontal movement) and some mechanical components (e.g. front V-wheel that is driven by the motor; rear flat wheel) on the trolley base.
10	Yellow trolley cover	Yellow cover hood on the trolley base. Dismantling the cover hood enables access to some mechanical components (e.g. front V-wheel; alignment device for adjusting and locking the mast rotation) on the trolley base.
11	Trolley base	The trolley base on wheels ensures the stability and the perpendicularity of the system and its horizontal displacement. It has two yellow cover hoods that can be dismantled to reach the electrical and mechanical components on the trolley base for calibration; diagnostic or maintenance purposes.
12	Flat wheel coupled to encoder	Flat wheel running on the square rail and coupled to the encoder for the horizontal movement by means of a round transmission belt. Provided with an eccentrical axis which allows the vertical adjustment of the stand.

#	Part	Description
13	V-wheel driven by motor	Front wheel guides the system on the hexagonal rail and is driven by an electronic motor by means of a transmission belt.
14	V-wheel with eccentric axle	Front wheel guides the system on the hexagonal rail. Provided with an eccentrical axis which allows the vertical adjustment of the stand.

5.3.2 Top view

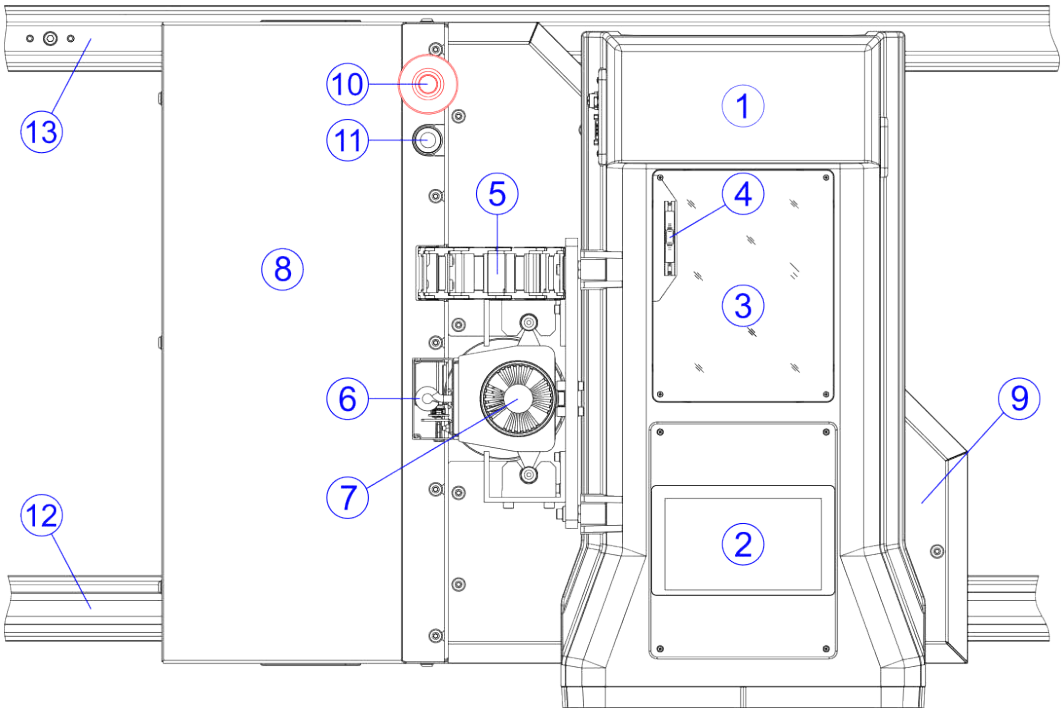


Figure 29: Top view Luminoscope® *SAM 2035*

#	Part	Description
1	Optical block	The optical block includes a lens, a white projection screen, a digital camera, a control panel and a connector plate. Captures, processes and analizes the headlight beam projection.
2	Control panel	Control panel with 7" colour touch screen to operate the system and to visualize the headlight image.
3	Perspex window	The headlight image on the projection screen inside the optical block is visible through this window.
4	Reference spirit level	The reference spirit level is used as a tool to verify the calibration status of the optical block. The Luminoscope® is initially calibrated at the factory to a point on which the optical axis of the optical block is horizontal.

[1] Part of the optional safety circuit.

#	Part	Description
5	Cable drag chain	Holds all electrical cables that run from the optical block to the trolley base.
6	Strain relief eye bolt	Eye bolt for strain relief purposes. The power cable between the Luminoscope® system and the power cabinet can be attached to it.
7	Signal tower[1]	Signal tower to inform and/or warn the operator and its environment.
8	Yellow *APS* cover	Yellow cover hood on the electrical compartment of the trolley base. Dismantling the cover hood enables access to some electrical components (e.g. connection terminals; *APS* circuit board; electric motor + encoder + hardware limit switch + zero proximity switch for the horizontal movement) and some mechanical components (e.g. front V-wheel that is driven by the motor; rear flat wheel) on the trolley base.
9	Yellow trolley cover	Yellow cover hood on the trolley base. Dismantling the cover hood enables access to some mechanical components (e.g. front V-wheel; alignment device for adjusting and locking the mast rotation) on the trolley base.
10	**Emergency stop** button[1]	Button to be pushed in case of an emergency situation for immediately stopping all movements of the system.
11	**Start** button[1]	Button to reset the safety circuit (e.g. during a cold start or after recovering from an emergency situation) and for confirmation purposes after clearance of a failure situation.
12	Adjustable hexagonal rail profile	Adjustable rail profile embedded in the floor, which guides the two front V-wheels of the trolley base.
13	Adjustable square rail profile	Adjustable square rail profile embedded in the floor, on which the rear flat wheels of the trolley base runs.

5.3.3 Left side view

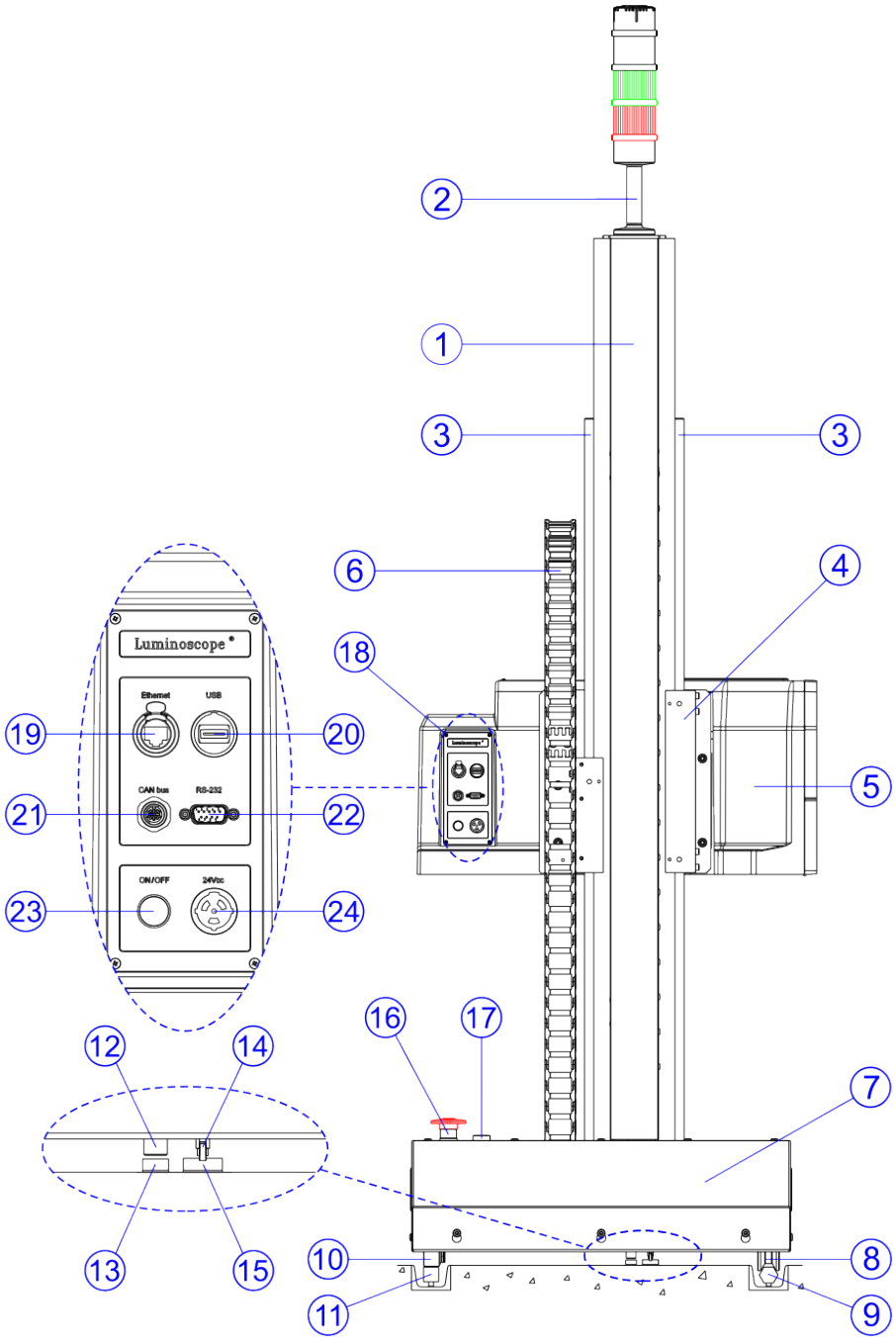


Figure 30: Left side view Luminoscope® *SAM 2035*

#	Part	Description
1	Stand	The optical block is attached to the vertical sliding table of the stand. The stand has some electrical components (e.g. electric motor with brake and encoder; hardware limit switches; zero proximity switch) and some mechanical components (e.g. spindle; actuator) inside for controlling the vertical displacement of the optical block.

[1] Part of the optional safety circuit.

#	Part	Description
2	Signal tower[1]	Signal tower to inform and/or warn the operator and its environment.
3	Linear guiding axis	The three linear bearings of the vertical sliding table are guided on the two linear guiding axis that are attached to the stand. They ensure an accurate parallel displacement of the optical block along the stand.
4	Vertical sliding table	Carries the optical block and can be electrically displaced in the vertical direction by means of three linear bearings. The bearings are guided on two linear guiding axis on the stand. The vertical displacement is provided by the electric motor inside the stand that drives a long spindle.
5	Optical block	The optical block includes a lens, a white projection screen, a digital camera, a control panel and a connector plate. Captures, processes and analizes the headlight beam projection.
6	Cable drag chain	Holds all electrical cables that run from the optical block to the trolley base.
7	Yellow *APS* cover	Yellow cover hood on the electrical compartment of the trolley base. Dismantling the cover hood enables access to some electrical components (e.g. connection terminals; *APS* circuit board; electric motor + encoder + hardware limit switch + zero proximity switch for the horizontal movement) and some mechanical components (e.g. front V-wheel that is driven by the motor; rear flat wheel) on the trolley base.
8	V-wheel driven by motor	Front wheel guides the system on the hexagonal rail and is driven by an electronic motor by means of a transmission belt.
9	Adjustable hexagonal rail profile	Adjustable rail profile embedded in the floor, which guides the two front V-wheels of the trolley base.
10	Flat wheel coupled to encoder	Flat wheel running on the square rail and coupled to the encoder for the horizontal movement by means of a round transmission belt. Provided with an eccentrical axis which allows the vertical adjustment of the stand.
11	Adjustable square rail profile	Adjustable square rail profile embedded in the floor, on which the rear flat wheels of the trolley base runs.
12	Zero proximity switch	Zero proximity switch for resetting the digital counter for the horizontal movement during the zero routine.
13	Detection bar	Detection bar on the floor for activation of the zero proximity switch for the horizontal movement. Depending on the physical layout of the test line, the detection bar can be on the left side or on the right side of the test line.

#	Part	Description
14	Hardware limit switch	Hardware limit switch for the horizontal movement that should be activated in case of an anomaly where the Luminoscope® system reaches one of the end positions of the rails. In this exceptional situation, the power of the electric motors is turned off immediately and the system cannot move any further.
15	Detection bar	Detection bar on the floor for activation of the hardware limit switch for the horizontal movement (one at each end position of the rails).
16	**Emergency stop** button[1]	Button to be pushed in case of an emergency situation for immediately stopping all movements of the system.
17	**Start** button[1]	Button to reset the safety circuit (e.g. during a cold start or after recovering from an emergency situation) and for confirmation purposes after clearance of a failure situation.
18	Connectors plate	Provides all the power and signal connectors of the optical block.
19	Ethernet port	Connector for LAN communication.
20	USB connector	Multipurpose USB port: system backup and upgrade, USB keyboard or USB barcode scanner.
21	CAN port	For communication with CAN (Controller Area Network) modules.
22	RS232 connector	Serial line for communication purposes.
23	Power button with control light	Switches the optical block ON and OFF. Press the button 1 second to switch on the system or to recover from stand-by mode. Press the button 4 seconds to reset the system (cold start). The control light blinks to indicate the charging status of the battery.
24	Power connector	24VDC power input for the optical block.

5.3.4 Right side view

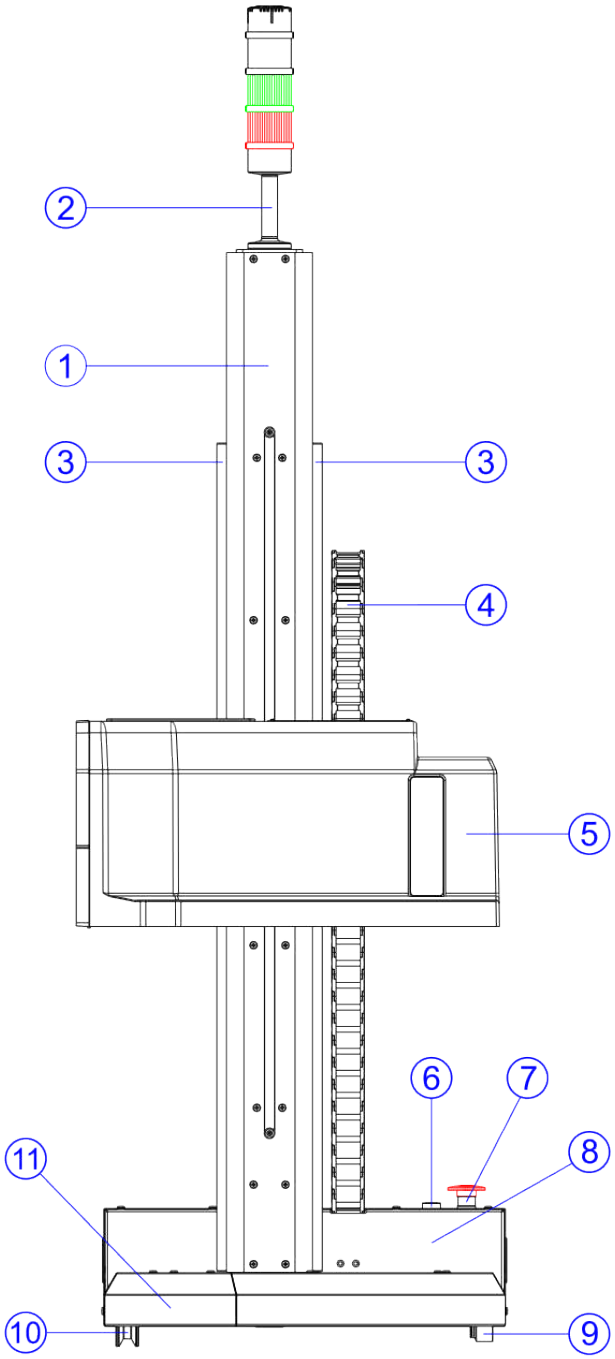


Figure 31: Right view Luminoscope® *SAM 2035*

#	Part	Description
1	Stand	The optical block is attached to the vertical sliding table of the stand. The stand has some electrical components (e.g. electric motor with brake and encoder; hardware limit switches; zero proximity switch) and some mechanical components (e.g. spindle; actuator) inside for controlling the vertical displacement of the optical block.

[1] Part of the optional safety circuit.

#	Part	Description
2	Signal tower[1]	Signal tower to inform and/or warn the operator and its environment.
3	Linear guiding axis	The three linear bearings of the vertical sliding table are guided on the two linear guiding axis that are attached to the stand. They ensure an accurate parallel displacement of the optical block along the stand.
4	Cable drag chain	Holds all electrical cables that run from the optical block to the trolley base.
5	Optical block	The optical block includes a lens, a white projection screen, a digital camera, a control panel and a connector plate. Captures, processes and analizes the headlight beam projection.
6	**Start** button[1]	Button to reset the safety circuit (e.g. during a cold start or after recovering from an emergency situation) and for confirmation purposes after clearance of a failure situation.
7	**Emergency stop** button[1]	Button to be pushed in case of an emergency situation for immediately stopping all movements of the system.
8	Trolley base	The trolley base on wheels ensures the stability and the perpendicularity of the system and its horizontal displacement. It has two yellow cover hoods that can be dismantled to reach the electrical and mechanical components on the trolley base for calibration; diagnostic or maintenance purposes.
9	Flat wheel coupled to encoder	Flat wheel running on the square rail and coupled to the encoder for the horizontal movement by means of a round transmission belt. Provided with an eccentrical axis which allows the vertical adjustment of the stand.
10	V-wheel with eccentric axle	Front wheel guides the system on the hexagonal rail. Provided with an eccentrical axis which allows the vertical adjustment of the stand.
11	Yellow trolley cover	Yellow cover hood on the trolley base. Dismantling the cover hood enables access to some mechanical components (e.g. front V-wheel; alignment device for adjusting and locking the mast rotation) on the trolley base.

5.4 Dimensions

Luminoscope® SAM 2035 with safety package

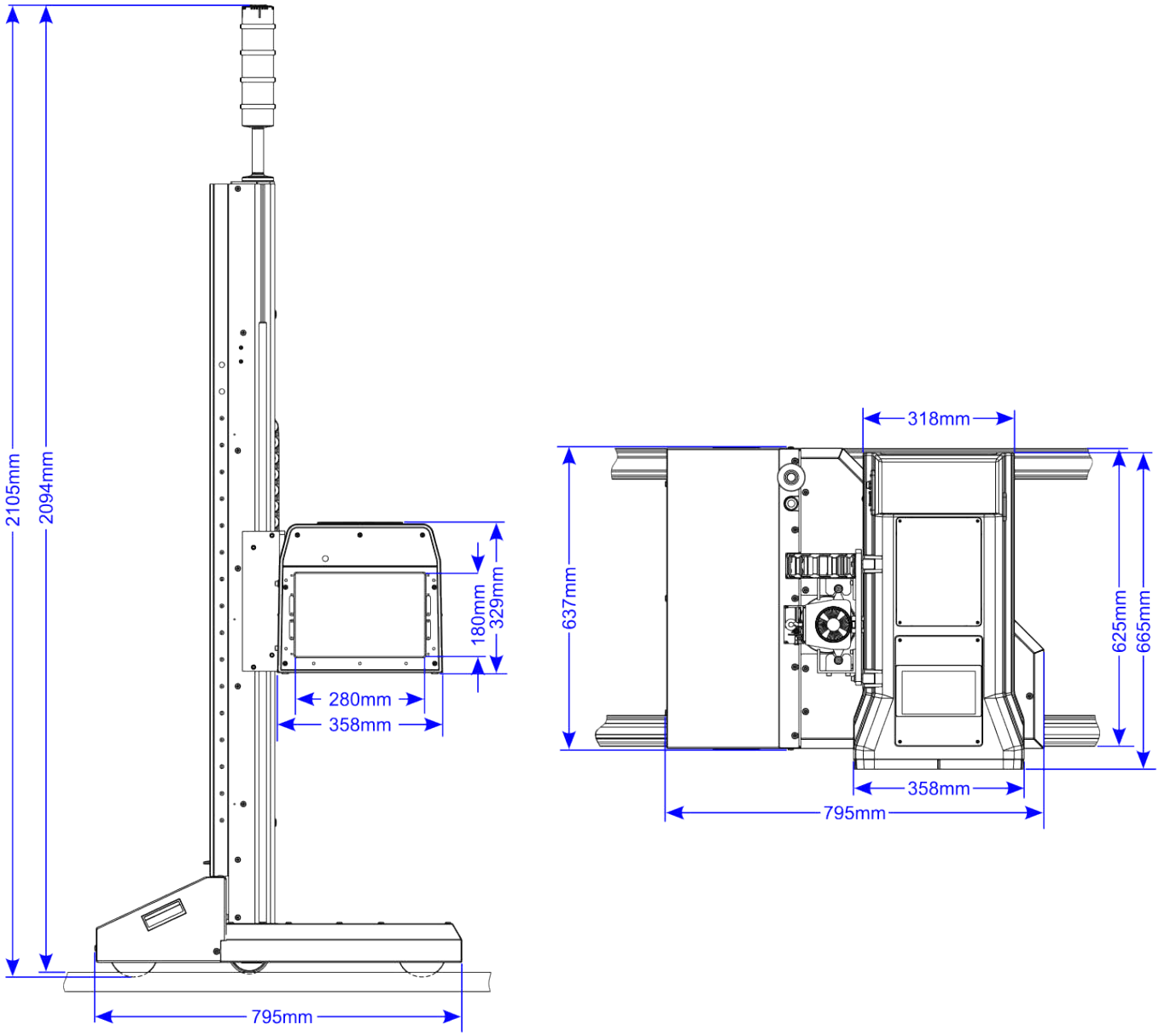


Figure 32: SAM 2035 with safety package: front and top views

Luminoscope® SAM 2035 without safety package

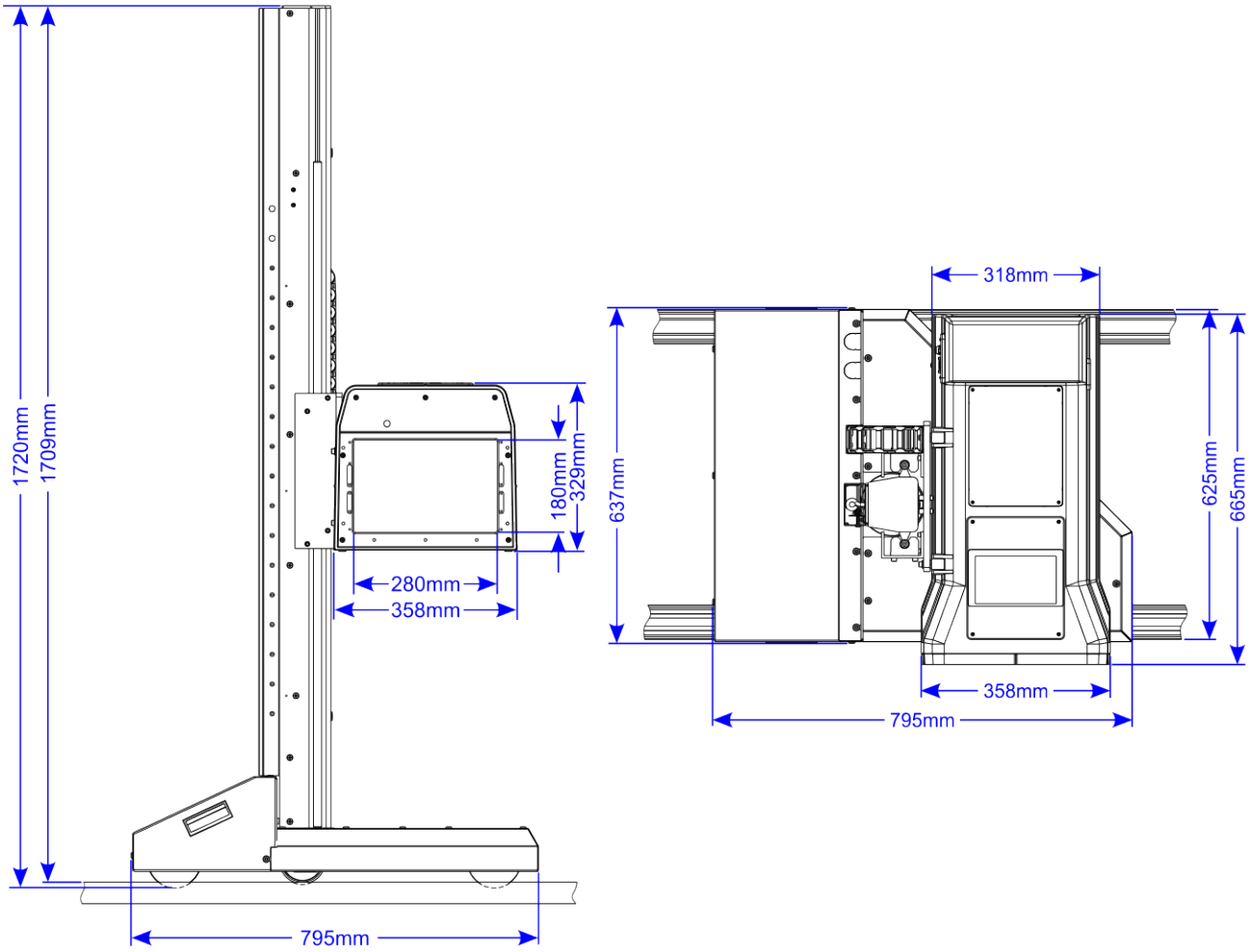


Figure 33: SAM 2035 without safety package: front and top views

5.5 Datasheet

Headlamp assessment type		Digital (CMOS camera)	
System movement control		Automatic Positioning System (APS) with electric motors; sensors and actuators	
Optional safety package		Relay circuit with start and emergency stop button + signal tower (green light; red light; buzzer)	
Physical beam position location device		Light detection bar with 16 photo cells on the stand	
Number of units		Single system; Dual (twin) master/ slave system	
Testing range	Up	0 - 10	%
	Down	0 - 10	%
	Left	0 - 10	%
	Right	0 - 10	%
	Luminous intensity	0 - 125	kCd
Measurement tolerance		±1	cm/10m
		±0,1	%

Measurement resolution		1	mm/10m
		0,01	%
Measuring distance between headlamp and Luminoscope® lens		200 - 600	mm
Vertical positioning range, measured from lens center to ground	Standard configuration	300 - 1200	mm
	Thailand configuration	400 - 1300	mm
Vertical measuring range	Standard configuration	200 - 1300	mm
	Thailand configuration	300 - 1400	mm
	Track distance	560	mm
Dimensions without safety package	Height / Width / Depth	1720 / 795 / 665	mm
Dimensions with safety package	Height / Width / Depth	2105 / 795 / 665	mm
Weight		≈ 75	kg
Operating voltage range		24 (±10%)	VDC
Maximum operating current consumption		10	A
Operating temperature range		-10 to +35	°C
Relative humidity		< 80	%
Optical block internal battery (used as UPS)	Technology	NiMH	
	Voltage	7,2	VDC
	Capacity	3,5	Ah
	Continuous operating time	3	h
	Charging cycle	5	h
Color LCD touch screen	Size	7	Inch
	Resolution	1024 x 600	px
Interfaces	LAN	1	Gbps
	WLAN	WPA2 / 802.11bgn	
	Bluetooth	v4.0	
	Serial	RS232	
	USB	v2	
	CAN	250	kbps

6 Power management

This chapter explains the details on the power-on and off cycle, showing how to switch the Luminoscope® on for normal use and how to switch it off when required.

It also explains the *standby mode* and how to wake the system up after inactivity.

Finally the *auto power-off* feature and the *system reset* are explained.

6.1 Switching the Luminoscope® ON and OFF

Note: The default behaviour for the SAM 2035 is to automatically start upon power connection (e.g. switching on the Luminoscope® power supply cabinet). The power on behaviour is configurable via parameter **IoSys ► SpiAuxFcns ► *PowerOnBehaviour***.

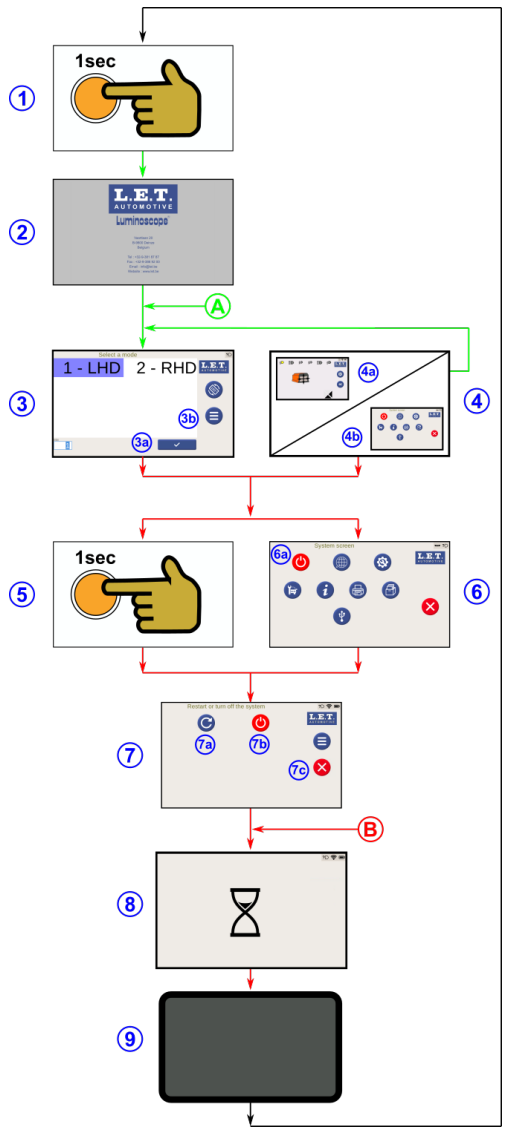
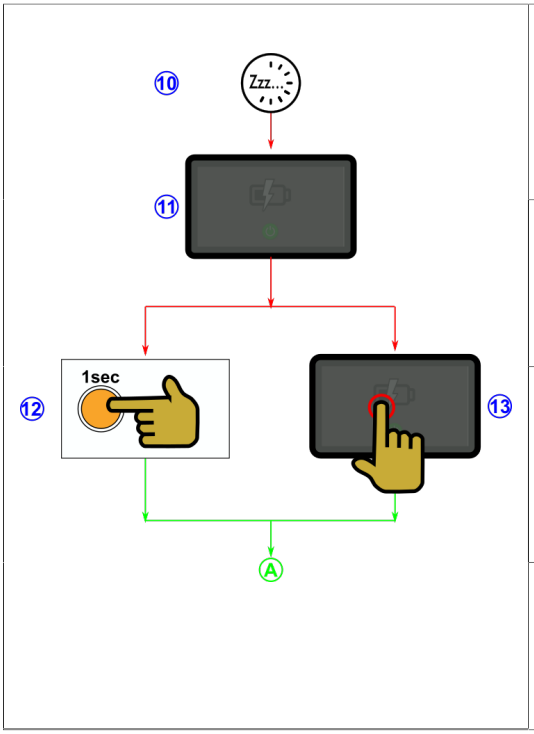


Figure 34: Switching the Luminoscope® ON and OFF

1	**Power** button on the *Optical block*	Turn the Luminoscope® on by pushing the **Power** button on the *Optical block* for 1 second.
2	**Start** screen	Info *LET Automotive NV*. The unit starts up and is initializing.
3	**Program selection** screen	Screen with choice to confirm a selected program 3a or to open the **System** screen 3b.
4	Operational mode	Cycle screens 4a, system screens 4b, configuration screens, etc.
5	**Power** button on the *Optical block*	Push the **Power** button on the *Optical block* for 1 second to switch the Luminoscope® off.
6	**Power** button on the touch screen	Tap on step 3 on the **System** button 3b and the **Power** button 6a appears on the **System** screen 6. This button has the same function as the **Power** button on the *Optical block* 5.
7	Restart or switch-off	This screen contains three options: 7a - Restart the Luminoscope®. 7b - Switch the Luminoscope® off completely. 7c - Leave this screen. The Luminoscope® stays on.
8	**Hourglass** screen	Displayed during some seconds while the Luminoscope® turns off completely.
9	Luminoscope® switched off	The unit is turned off.

6.2 Power standby



10	Standby timer	When the Luminoscope® is turned on but not used for a while (no button pressed, no lamp measured, etc), it will switch to *standby* mode after a configurable time.
11	Standby mode	When the Luminoscope® enters the *standby* mode, the LCD screen turns dark instantaneously, but the unit is not switched off.
12	**Power** button on the *Optical block*	Wake the Luminoscope® up by pushing the **Power** button on the *Optical block* for 1 second. The **Program selection** screen 3 pops up immediately.
13	Touch the screen	Wake the Luminoscope® up by pushing a random place on the LCD screen. The **Program selection** screen 3 pops up immediately.

6.3 Inactivity timer

In addition to the *standby mode* discussed in previous chapter, there is also an integrated timer feature that fully turns the unit off after a configurable longer inactivity period (*auto switch off* function).

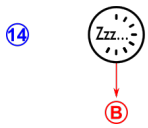
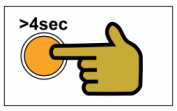


Figure 35: Automatically switching the Luminoscope® *OFF*

14	Inactivity timer	If the Luminoscope® is turned on but not used for a while (no button pressed, no lamp measured, etc.), it automatically switches to *standby mode*, darkening the LCD screen. If the inactivity period extends for a longer time, the Luminoscope® will be switched off completely. The Luminoscope® can be switched on again by pushing the **Power** button on the *Optical block* 1 on the connector panel of the optical block.

6.4 Forced shut down of the Luminoscope®

This function provides a hardware power-off to be used only in cases of an unexpected operation.

	15	Forced shutdown	Pressing the **Power** button on the *Optical block* for a time longer than 4 seconds will switch off the system immediately. This should only be used in case the system is blocked as a result of an unexpected operation.

7 Operation

The main purpose of the Luminoscope® is to measure specific headlamp beam characteristics such as horizontal beam position, vertical beam position, beam intensity, etc. There are different headlamp algorithms available for measuring the headlamp characteristics of different headlamp types. Based on the chosen algorithm, a number of the headlamp beam characteristics will be measured.

Most of the headlamp algorithms can be used either for adjusting the headlamp beam position or for checking the headlamp beam position. This means there are two different approaches for a test cycle:

- Headlamp aiming cycle: The position of the headlamp beam should be aimed (adjusted) to a pre-defined target position. An *aiming tolerance zone* around the target position allows the operator to adjust the headlamp correctly.
- Headlamp audit cycle: The position of the headlamp beam should be evaluated to check whether it is within the pre-defined *audit tolerance zone*.

The audit tolerance zone is in most cases determined by the government regulations. The *aiming tolerance zone* should always be smaller than the *audit tolerance zone*. This to ensure that a correctly aimed headlamp in a workshop (using the smaller *aiming tolerance zone*) will pass the test in a government inspection station (using the larger *audit tolerance zone*).

Note: A Luminoscope® SAM 2035 typically uses a headlamp audit cycle as the device is intended for inspection station purposes only.

7.1 Test cycle references

There is a number of topics related with the test sequence which apply to many of its steps. They are collected below and will be used as a reference along the explanation of the test cycle.

7.1.1 Beam icons

Each low beam, high beam and fog beam has its specific beam icon on the cycle screens. Next table explains the meaning of the icons and the different statuses.

Icon	Beam	Status description
	Low beam	Headlamp under test (test not yet started).
	High beam	
	Fog beam	
	Low beam	Headlamp position inside tolerance. The tolerance overlay on the headlamp image is green-colored.
	High beam	
	Fog beam	
	Low beam	Headlamp position outside tolerance. The tolerance overlay on the headlamp image is red-colored.
	High beam	

Icon	Beam	Status description
	Fog beam	

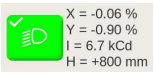
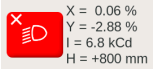
Similarly, each low beam, high beam and fog beam has its specific beam icon on the **Beam results** screen.

Note: Depending on the configuration of the Luminoscope®, the **Beam results** screen is displayed.

Next table explains the meaning of the icons and the different statuses.

Icon	Beam	Status description
	Low beam	Headlamp not yet tested.
	High beam	
	Fog beam	
	Low beam	Headlamp position inside tolerance.
	High beam	
	Fog beam	
	Low beam	Headlamp position outside tolerance.
	High beam	
	Fog beam	

After the test, the system displays a datablock including the test results next to the corresponding beam icon on the **Beam results** screen, regardless of the positive or negative test results.

Icon	Status description
	Approved headlamp with measurement results
	Rejected headlamp with measurement results

The datablocks for the results of each tested beam include the following information:

Value	Description
X	Horizontal beam measurement position (Left/Right)
Y	Vertical beam measurement position (Up/Down)
I	Intensity

Value	Description
H	Mounting height of the headlamp

Note: Depending on the chosen algorithm and configuration of the system, the number of results so as the units may vary.

7.1.2 Left / right vehicle side definition

The left and right sides of the vehicle are always defined from the driver's point of view.

Headlamps which are located on the left side (as seen from the driver's point of view) are called the *left headlamps*, and those on the right side are called the *right headlamps*.

The touch screen of the Luminoscope® SAM 2035 optical block can be rotated 180° by pressing the **Rotate screen** button.

Consequently there are two possible screen orientations. One is better suited for checking headlamps and the other is preferred for adjusting headlamps.

Screen orientation mode	Description
Checking headlamps	The operator is standing behind the Luminoscope® system, looking towards the front of the vehicle and the touch screen.
Adjusting headlamps	The operator is standing nearby the zone between the Luminoscope® system and the front of the vehicle and is looking towards the lens of the Luminoscope® and the touch screen.

Rotating the screen position affects to the position of the beam icons and the beam selection buttons on the screen. The intelligence of the Luminoscope® automatically places the beam icons and beam selection buttons on the correct side of the vehicle. For both screen orientation modes, the beam icons and beam selection buttons which are closer to the left side of the vehicle are applicable for the headlamps on the left side. Those closer to the right side of the vehicle are applicable for the headlamps on the right side.

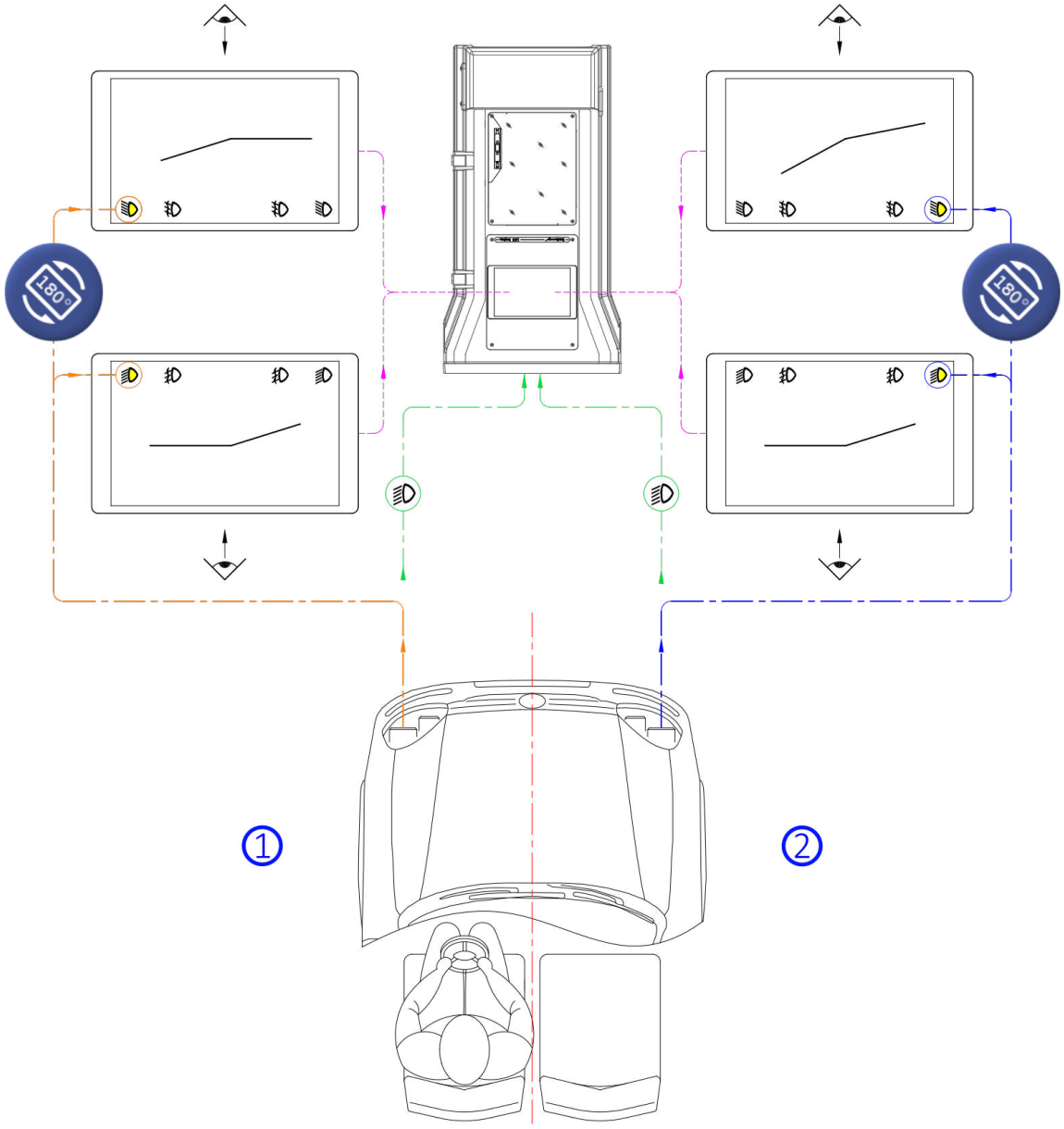


Figure 36: Left / right vehicle side definition

#	Description
1	Left side of the vehicle
2	Right side of the vehicle

7.1.3 Alignment with the vehicle

Before each test cycle starts, it is necessary to align the longitudinal direction of the vehicle with the longitudinal direction of the vehicle standing area, as the longitudinal axis of the headlamp tester is calibrated parallel with the longitudinal direction of the vehicle standing area. For the vehicle alignment either use a drive in guiding system, painted guiding lines on the floor, a wheel aligner system, a centraliser system, a vehicle alignment measurement (VAM) system, etc.

7.1.4 Positioning in front of the headlamp

It is of great importance that the lens of the Luminoscope® is correctly positioned in front of the headlamp to ensure that as many light rays as possible enter the lens.

This guarantees that the beam image is displayed realistically on the white projection screen inside the Luminoscope® to be able to perform a correct headlamp measurement.

With this purpose, the Luminoscope® system is provided with the electronic *Position Check* system that uses twelve photocells around the lens 1.

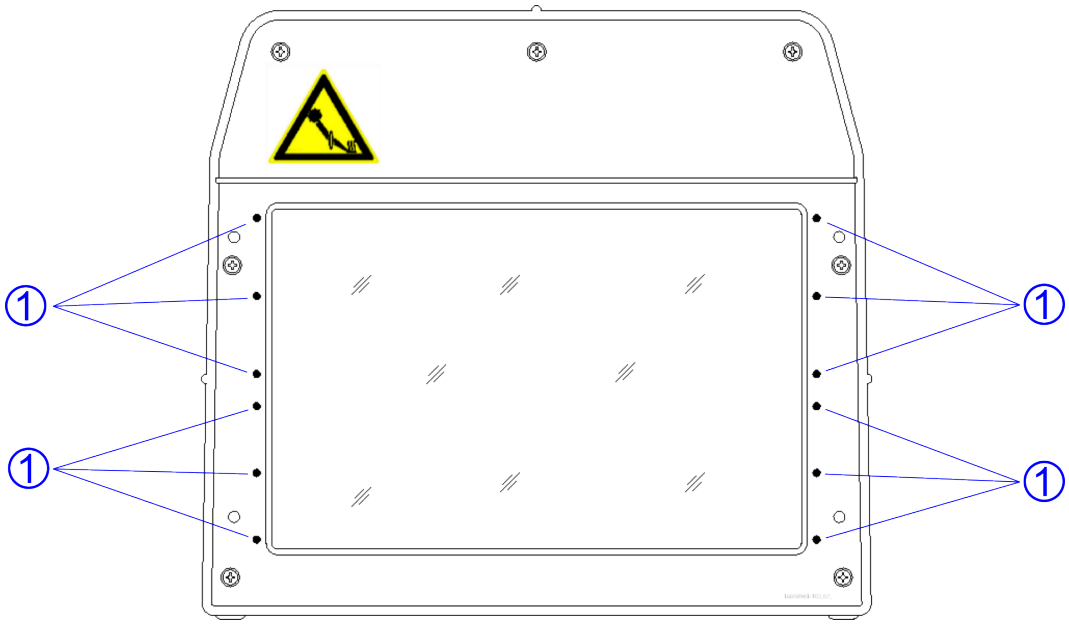


Figure 37: Position Check cells around the lens

The electronic *Position Check* gives input to the *APS* for moving the optical block towards the optimal position in front of the headlamp. The movement directions are shown by four *Position Check* arrows 2. Once the optimal position is reached, all *Position Check* arrows 2 disappear and the headlamp measurement starts automatically.

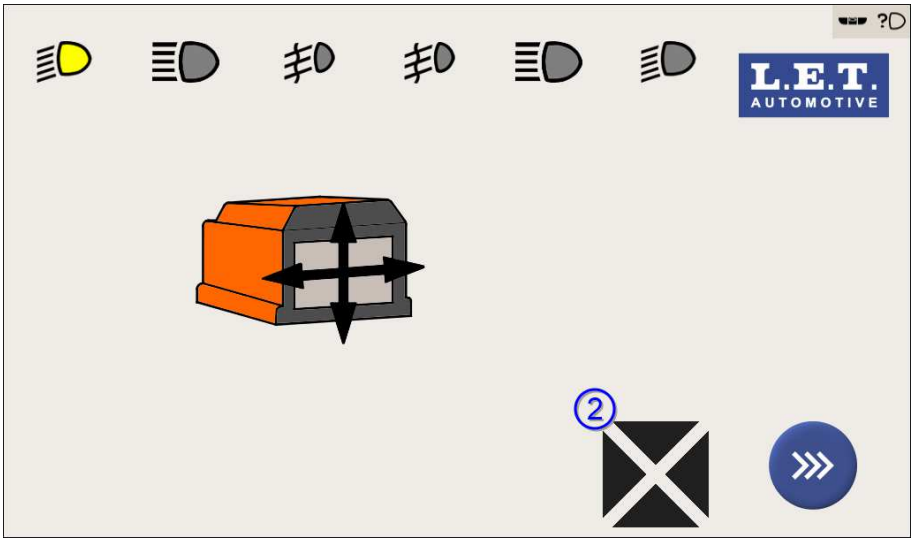


Figure 38: Position Check Arrows on control panel screen

7.2 Test cycle sequence

Note: Different sequences can be implemented in the SAM 2035. What follows is a description of the most standard sequence.

This chapter explains the different steps that should be followed in a test cycle.

Note: The test cycle could look slightly different depending on the Luminoscope® configuration or selected program which could be based on different regulations.

Step number	Step description	Comments
1	Switching on the Luminoscope®	The Luminoscope® should be properly switched on and initialised.
2	Alignment with the vehicle	The longitudinal axis (driving direction) of the vehicle should be properly aligned with the Luminoscope® .
3	Program selection	The **Program selection** screen displays different selectable test modes, which allow the operator to select among a number of pre-configured test cycles.
4	Beam position searching	The *Height detection bar* on the SAM 2035 scans for the rough physical position of the headlamp (or headlamp groups).
5	Positioning in front of the headlamp	Before the headlamp measurement can start, it is required that the Luminoscope® is correctly positioned in front of the headlamp by means of the electronic *Position Check* system.
6	Beam measurement	The digital camera inside the Luminoscope® captures, processes and analyses the headlamp beam projection.
7	Overview beam measurement results	When all tests are completed, the **Beam results** screen displays all beam measurement results.
8	Test cycle reports and data transmission	Depending on the configuration of the Luminoscope®, the measurement results can be stored on the system (*PDF* format), printed on a paper ticket or transmitted to an external device using one of the communication protocols.

7.2.1 Switching on the Luminoscope®

The Luminoscope® should be properly switched on and initialised.

Power-on (cold start)

1. Switch on the Luminoscope® power supply cabinet.
   The Luminoscope® optical block will turn on and start the initialization routine.

   Attention: The default behaviour of the SAM 2035 is to automatically start upon power connection (e.g. switching on the Luminoscope® power supply cabinet). The power on behaviour is configurable via parameter **IoSys ► SpiAuxFcns ► *PowerOnBehaviour***.

   The following screen is now displayed:

*Figure 39: **Start** screen*

Safety circuit

The following screen is displayed in case the **Emergency stop** button is pressed:

*Figure 40: **Emergency stop** button pressed.*

2. Check the system for any obstruction/dangerous situation and release the **Emergency stop** button.

   The following screen is now displayed:

*Figure 41: Press **Start** button.*

3. Press the **Start** button.

Warning: The system will now start to move.

The zero routine will be followed by the park routine.

Zero routine

At the initial start-up phase of the system (also called a cold start), the absolute zero position of both movement directions need to be determined. This is done during the automatic zero routine. For this purpose there are two zero proximity switches with their own actuators available.

The system will move slowly towards its zero position on the rails. This can be to the left or to the right depending on the customer's specific configuration. The system will also move slowly upwards to its zero position. In both positions, the digital counter of the respective movement direction will be set to zero.

The following screen is displayed during the zero routine:

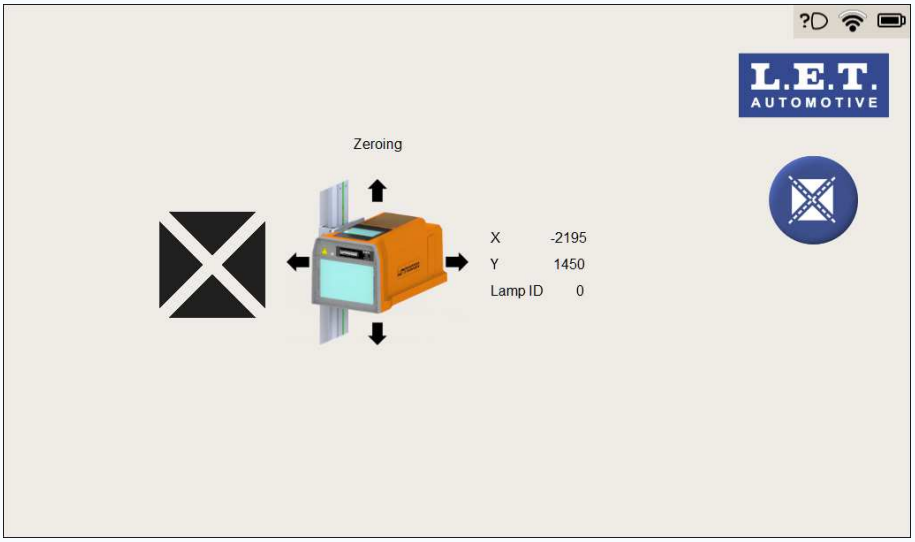


*Figure 42: **Zero routine** screen*

Park routine

After the zero routine, the system will move to the park position during the park routine.

The park position is where the system and the optical block is positioned after the zero routine and before starting the actual test cycle. After each test cycle the system returns to its park position.

The following screen is displayed during the park routine:

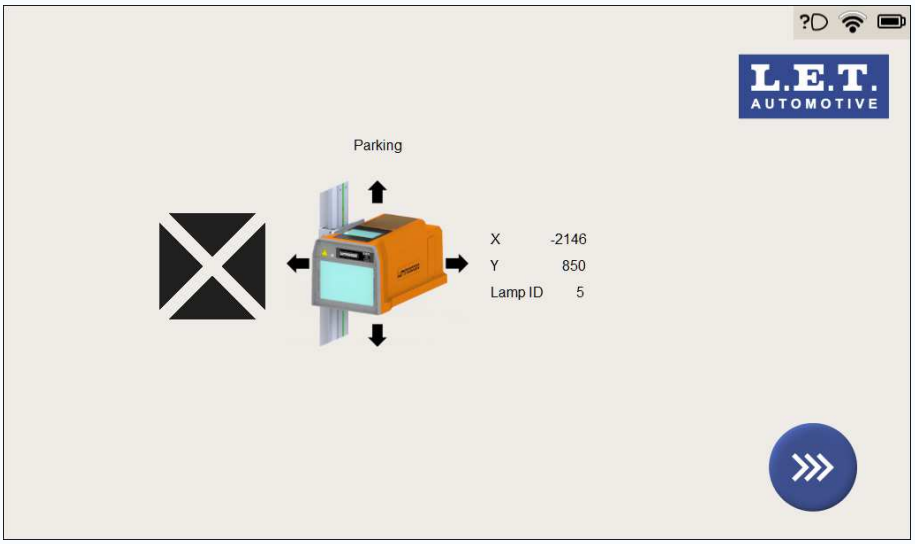


*Figure 43: **Park routine** screen*

Hardware limit situation

The *APS* is equipped with some hardware limit switches to stop the horizontal and vertical movement immediately in case of an anomaly, where the system would reach an end-of-range position. For this purpose there are some hardware limit switches with their own activators available.

In the event at least one hardware limit switch is activated during the power-on procedure or during a normal test cycle, the power of the electric motors is turned off immediately and the system cannot move any further. This is an emergency stop situation which should be resolved as explained underneath.

The following screen is displayed if at least one hardware limit switch is activated:

Figure 44: Hardware limit switch activated

4. Push the **Emergency stop** button.

   The following screen is now displayed:

Figure 45: Emergency stop active

5. Check the system for any obstruction/dangerous situation and release the **Emergency stop** button.

   The following screen is now displayed:

Figure 46: Emergency resolved

6. Press the **Start** button.

The following screen is displayed in case the hardware limit switch is active at the highest position for the vertical movement:

Figure 47: Hardware limit switch active at the highest position for the vertical movement.

The following screen is displayed in case the hardware limit switch is active at the lowest position for the vertical movement:

Figure 48: Hardware limit switch active at the lowest position for the vertical movement.

The following screen is displayed in case the hardware limit switch for the horizontal movement is active:

Figure 49: Hardware limit switch active for the horizontal movement

Note: There is only one hardware limit switch for the horizontal movement. There are no separate hardware limit switches for the left hardware limit position and the right hardware limit position. Consequently, there are two error messages displayed at the same time on the screen.

Note: The **Limits active** screen can list more than one active hardware limit switch at the same time.

7. Check the system for any obstruction/dangerous situation and resolve the hardware limit situation by means of the corresponding measure in the table below.

Hardware limit error message	Active hardware limit switch	Corrective measure
`Limit_UP.Main`	Hardware limit switch at the highest position for the vertical movement.	Move the optical block a little upwards until the lower hardware limit switch in the stand is no longer active. This can be done by means of the corresponding push button on the *APS* board.
`Limit_DOWN.Main`	Hardware limit switch at the lowest position for the vertical movement.	Move the optical block a little downwards until the lower hardware limit switch in the stand is no longer active. This can be done by means of the corresponding push button on the *APS* board.
`Limit_RIGHT.Main` `Limit_LEFT.Main`	Hardware limit switch for the horizontal movement.	Gently push the system manually towards the center of the test bay until the hardware limit switch for the horizontal movement is no longer active.

The following screen is displayed as soon as all hardware limit situations are resolved:

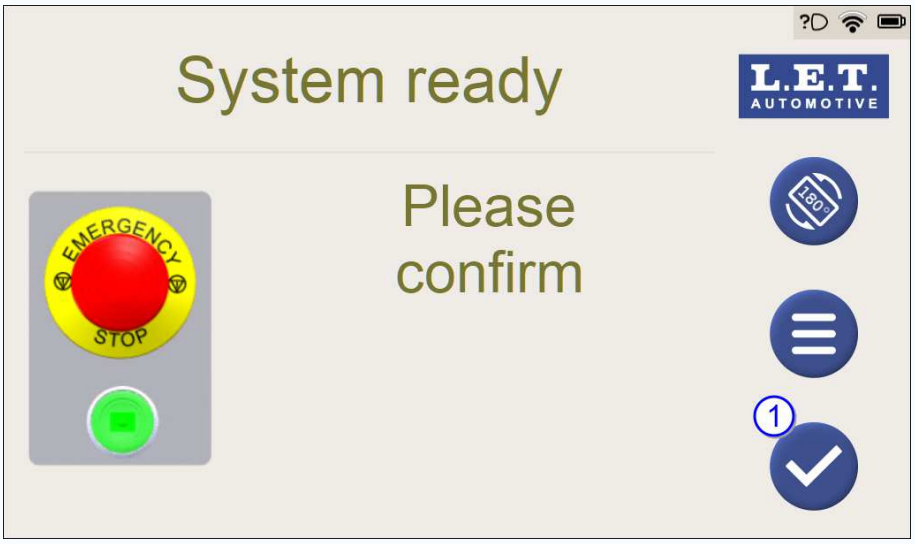


Figure 50: Confirm for system ready.

8. Press the **Start** button or tap the **Validation** button on the screen `1`.

   Warning: The system will now start to move.

   The zero routine will be followed by the park routine.

9. Make sure the Luminoscope® is properly charged for offline use.

   Look at the battery status icon in the top right corner of the screen.

Power supply		Battery status description
Connected	Disconnected	
		Fully charged.
		Charge level between 100% and 75%.
		Charge level between 75% and 50%.
		Charge level between 50% and 25%.
		Charge level below 25%.
		Very low charge level.
		Battery disconnected.
		Charge too low for operation.

Attention: Do not connect the power supply in case of a disconnected or broken rechargeable battery.

Related information

APS (Automatic Positioning System) (pg. 129)

7.2.2 Alignment with the vehicle

The longitudinal direction (driving direction) of the vehicle should be properly aligned with the longitudinal axis of the Luminoscope®. For the vehicle alignment either use a drive in guiding system, painted guiding lines on the floor, a wheel aligner system, a centraliser system, a vehicle alignment measurement (VAM) system, etc.

Related information

Alignment with the vehicle (pg. 54)

7.2.3 Program selection

The **Program selection** screen displays different selectable test modes, which allow the operator to select among a number of pre-configured test cycles.

Note: The screen may have a different appearance depending on the customer's specific implementation.

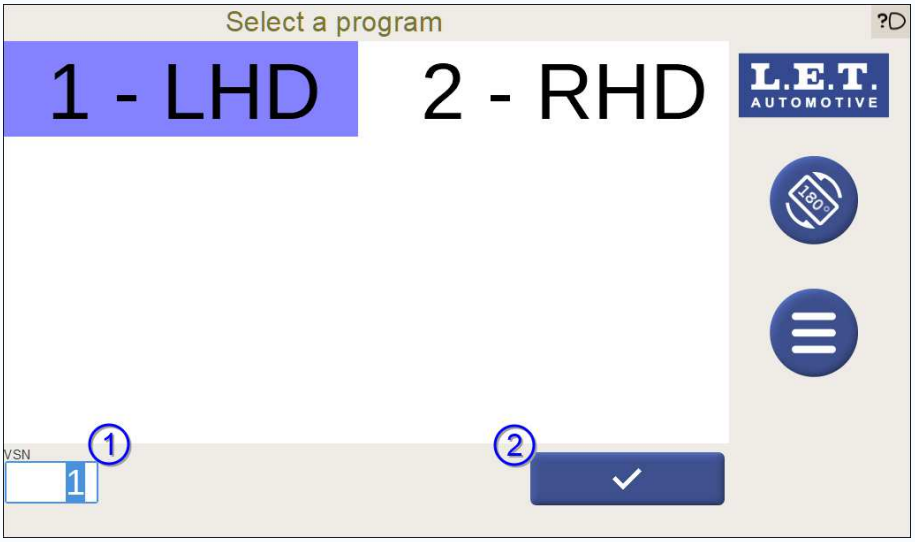


*Figure 51: **Program selection** screen*

1. Select the requested program by tapping on the **Program name** with the corresponding **Program number**.

   Note that the selected program number appears on the left bottom corner of the screen in the *VSN* (Vehicle Selection Number) field 1.

2. Tap on the **Select program** button 2.

Note: Alternatively the program selection can also be initiated by a host computer, to start a test cycle by means of a specific communication protocol.

7.2.4 Beam position searching

The *Height detection bar* on the SAM 2035 scans for the rough physical position of the headlamp (or headlamp groups).

As the position of the beam of a random vehicle in an inspection station is unknown, the *APS* first makes a rough scan in the zone where the beam should be approximately located. This zone is called the search zone. The stand moves from one side of the search zone to the other side and enables the *Height detection bar* to scan for any light of the beam. If the scan sequence has finished, the *APS* drives the optical block towards the rough beam position.

The following screen is displays during the beam position searching:

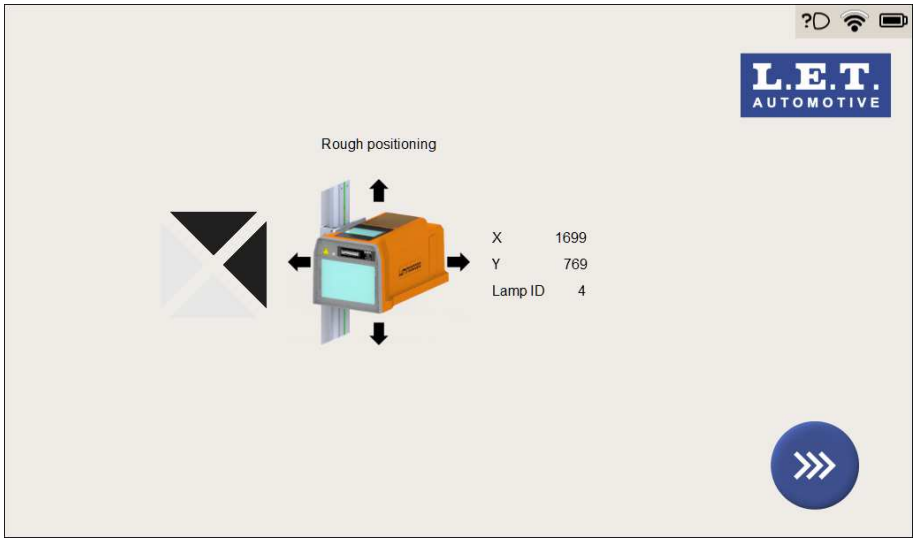


*Figure 52: **Searching** screen*

7.2.5 Positioning in front of the headlamp

Before the headlamp measurement can start, it is required that the Luminoscope® is correctly positioned in front of the headlamp. For this purpose, the electronic *Position Check* system gives input to the *APS* (Automatic Positioning System).

Attention: A correct positioning of the Luminoscope® in front of the headlamp is necessary for an accurate headlamp measurement.

Once the optimal position is reached, all *Position Check* arrows 2 disappear and the headlamp measurement starts automatically.

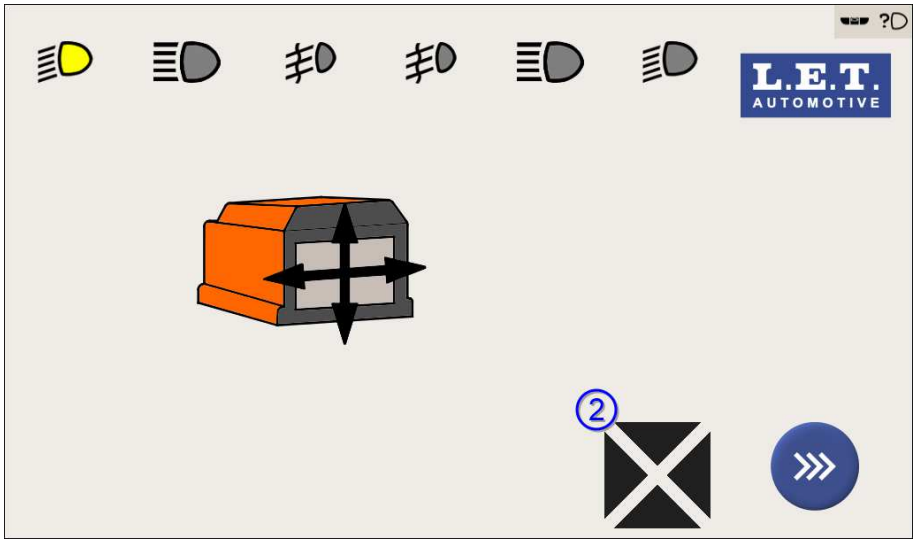


*Figure 53: **Position Check** screen*

Related information

Positioning in front of the headlamp (pg. 66)

7.2.6 Beam measurement

The digital camera inside the Luminoscope® captures, processes and analyses the headlamp beam projection.

Note: A Luminoscope® SAM 2035 typically uses a headlamp audit cycle as the device is intended for inspection station purposes only.

The following sections explain the headlamp test procedure for a common and complete set of headlamps including:

- two ECE low beams,
- two high beams and
- two fog beams.

Note: The test sequence could look slightly different depending on the Luminoscope® configuration or selected program, which could be based on different regulations.

Related information

Headlamps (pg. 21)
Headlamp icons (pg. 51)

7.2.6.1 Low beam test

The next screen is displayed as soon as the first ECE low beam test starts.

Note: The screen is identical for the second low beam (except for the indication of the beam icons on top of the screen).

In case of an ECE LHD (Left Hand Drive) low beam:

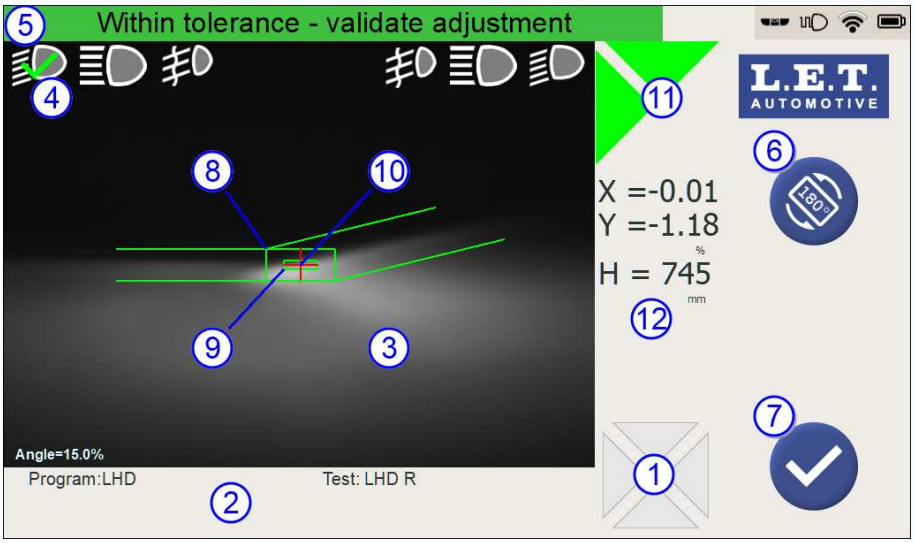


Figure 54: Example of an LHD low beam

In case of an ECE RHD (Right Hand Drive) low beam:

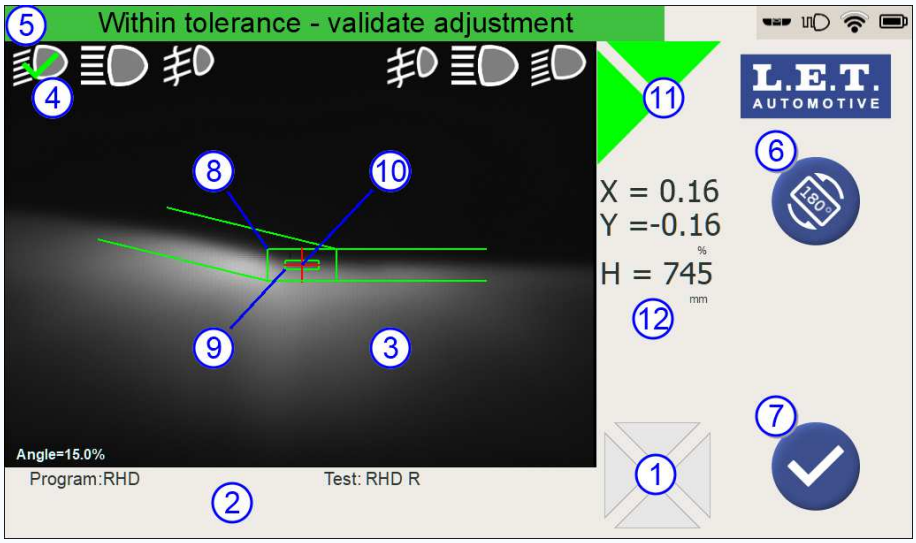


Figure 55: Example of an RHD low beam

#	Name	Description
1	*Position Check Arrows*	Indicates the direction(s) on which the optical block should be moved to achieve the optimal position in front of the headlamp. This position can change when adjusting the headlamp.
2	Information field	Depending on the Luminoscope® configuration, some related information such as the name of the selected program (Vehicle), the name of the test (Beam), license plate, etc. will be displayed.
3	Live headlamp beam image	Real time image of the headlamp beam including overlays for tolerance zone(s), algorithm measurement position, etc.
4	First low beam icon	First low beam icon indicating the status of the beam. The meaning of the icon depends on its shape and colour: • **Yellow** mark means *Test in progress*. • **Green** V-sign means *Within tolerance*. • **Red** cross means *Out of tolerance*.
5	Information banner	The information banner shows different status messages such as: **Test in progress**, **Within tolerance**, **Out of tolerance**, etc. Status, error or warning messages can also be displayed over there.
6	**Rotate screen** button	Rotate the screen position.
7	**Validation** button	If the *live validation* function is activated, tapping on this button will store the beam measurement result. The result is unconditionally stored whether the algorithm measurement position is *Within tolerance* or *Out of tolerance*.
8	Audit tolerance zone	The *audit tolerance zone* allows the operator to check if the headlamp is within the audit tolerances that are applicable in a government inspection station.

#	Name	Description
9	Aiming tolerance zone	The aiming tolerance zone allows the operator to adjust the headlamp correctly. Note that the aiming tolerance zone should always be smaller than the audit tolerance zone. This is to ensure that a correctly aimed headlamp at a workshop (*using the smaller aiming tolerance zone*) will pass the test in a government inspection station (*using the larger audit tolerance zone*). **Note:** A Luminoscope® SAM 2035 typically uses a headlamp audit cycle as the device is intended for inspection station purposes only.
10	Algorithm measurement position	The algorithm overlay (red cross) represents the algorithm measurement position on the headlamp beam image. In case of an aiming cycle, the red cross position should be aimed towards the centre of the aiming tolerance zone. In case of an audit cycle, the red cross position is evaluated. The actual position is displayed on the headlamp measurement result field.
11	Beam direction arrows	The beam direction arrows indicate the direction(s) in which the headlamp should be moved to reach the target position inside the tolerance zone. The colour of the arrows indicates the live status of the aiming: • **Green** means the result is *inside* the tolerance zone. • **Yellow** means the result is *close* to the tolerance zone. • **Red** means the result is *far away* from the tolerance zone.
12	Headlamp measurement results field	Depending on the chosen algorithm and Luminoscope® configuration, headlamp measurement results such as horizontal beam position (X), vertical beam position (Y), headlamp mounting height (H), etc are displayed here.

The algorithm measurement position of the headlamp beam image is unconditionally stored whether the position is *Within tolerance* or *Out of tolerance*.

Note: Depending on some Luminoscope® configuration parameters, the *headlamp intensity* may be automatically measured.

Related information

Positioning in front of the headlamp (pg. 66)

7.2.6.2 High beam test

The next screen is displayed as soon as the first high beam test starts.

Note: The screen is identical for the second high beam (except for the indication of the beam icons on top of the screen).

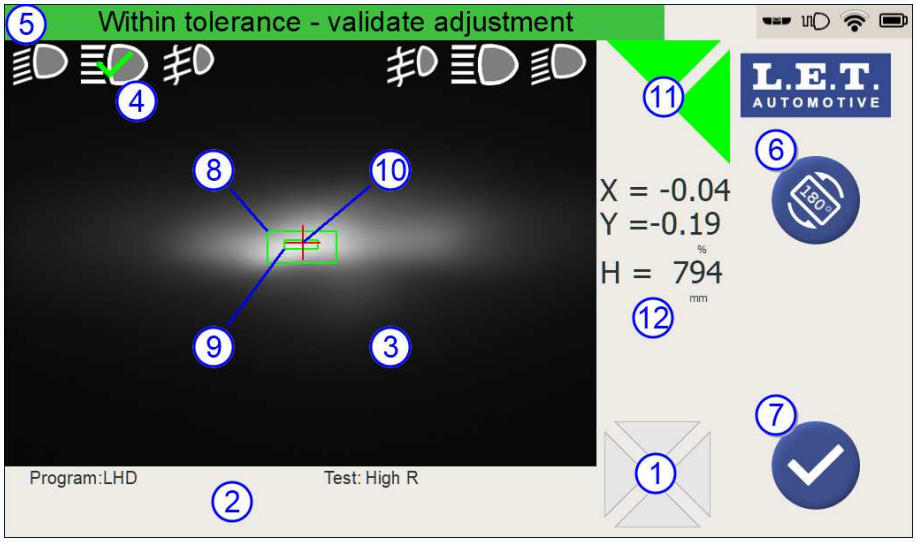


Figure 56: Example of a high beam

#	Name	Description
1	*Position Check Arrows*	Indicates the direction(s) on which the optical block should be moved to achieve the optimal position in front of the headlamp. This position can change when adjusting the headlamp.
2	Information field	Depending on the Luminoscope® configuration, some related information such as the name of the selected program (Vehicle), the name of the test (Beam), license plate, etc. will be displayed.
3	Live headlamp beam image	Real time image of the headlamp beam including overlays for tolerance zone(s), algorithm measurement position, etc.
4	First high beam icon	First high beam icon indicating the status of the beam. The meaning of the icon depends on its shape and colour: • **Yellow** mark means *Test in progress*. • **Green** V-sign means *Within tolerance*. • **Red** cross means *Out of tolerance*.
5	Information banner	The information banner shows different status messages such as: **Test in progress**, **Within tolerance**, **Out of tolerance**, etc. Status, error or warning messages can also be displayed over there.
6	**Rotate screen** button	Rotate the screen position.
7	**Validation** button	If the *live validation* function is activated, tapping on this button will store the beam measurement result. The result is unconditionally stored whether the algorithm measurement position is *Within tolerance* or *Out of tolerance*.
8	Audit tolerance zone	The *audit tolerance zone* allows the operator to check if the headlamp is within the audit tolerances that are applicable in a government inspection station.

#	Name	Description
9	Aiming tolerance zone	The aiming tolerance zone allows the operator to adjust the headlamp correctly. Note that the aiming tolerance zone should always be smaller than the audit tolerance zone. This is to ensure that a correctly aimed headlamp at a workshop (*using the smaller aiming tolerance zone*) will pass the test in a government inspection station (*using the larger audit tolerance zone*). **Note:** A Luminoscope® SAM 2035 typically uses a headlamp audit cycle as the device is intended for inspection station purposes only.
10	Algorithm measurement position	The algorithm overlay (red cross) represents the algorithm measurement position on the headlamp beam image. In case of an aiming cycle, the red cross position should be aimed towards the centre of the aiming tolerance zone. In case of an audit cycle, the red cross position is evaluated. The actual position is displayed on the headlamp measurement result field.
11	Beam direction arrows	The beam direction arrows indicate the direction(s) in which the headlamp should be moved to reach the target position inside the tolerance zone. The colour of the arrows indicates the live status of the aiming: • **Green** means the result is *inside* the tolerance zone. • **Yellow** means the result is *close* to the tolerance zone. • **Red** means the result is *far away* from the tolerance zone.
12	Headlamp measurement results field	Depending on the chosen algorithm and Luminoscope® configuration, headlamp measurement results such as horizontal beam position (X), vertical beam position (Y), headlamp mounting height (H), etc are displayed here.

The algorithm measurement position of the headlamp beam image is unconditionally stored whether the position is *Within tolerance* or *Out of tolerance*.

Note: Depending on some Luminoscope® configuration parameters, the *headlamp intensity* may be automatically measured.

Related information

Positioning in front of the headlamp (pg. 66)

7.2.6.3 Fog beam test

The next screen is displayed as soon as the first fog beam test starts.

Note: The screen is identical for the second fog beam (except the indication of the beam icons on top of the screen).

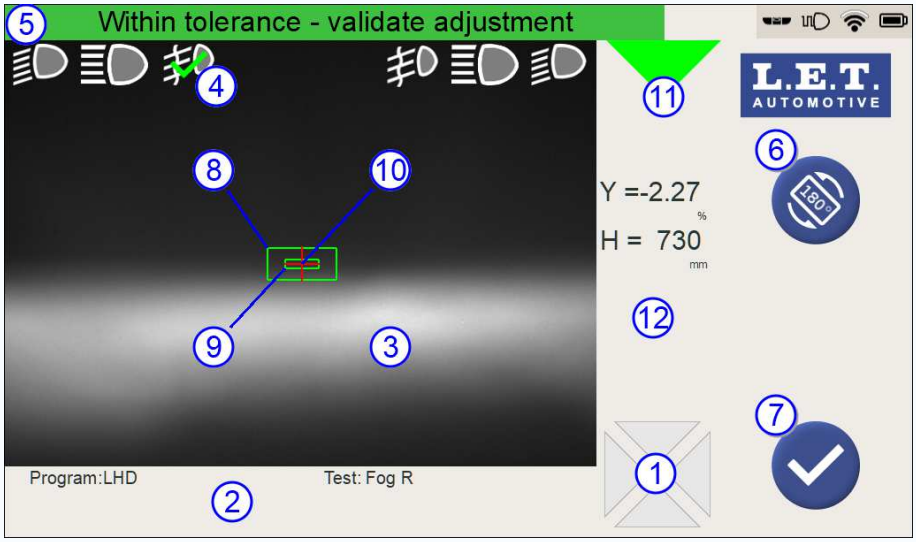


Figure 57: Example of a fog beam

#	Name	Description
1	*Position Check Arrows*	Indicates the direction(s) on which the optical block should be moved to achieve the optimal position in front of the headlamp. This position can change when adjusting the headlamp.
2	Information field	Depending on the Luminoscope® configuration, some related information such as the name of the selected program (Vehicle), the name of the test (Beam), license plate, etc. will be displayed.
3	Live headlamp beam image	Real time image of the headlamp beam including overlays for tolerance zone(s), algorithm measurement position, etc.
4	First fog beam icon	First fog beam icon indicating the status of the beam. The meaning of the icon depends on its shape and colour: • **Yellow** mark means *Test in progress*. • **Green** V-sign means *Within tolerance*. • **Red** cross means *Out of tolerance*.
5	Information banner	The information banner shows different status messages such as: **Test in progress**, **Within tolerance**, **Out of tolerance**, etc. Status, error or warning messages can also be displayed over there.
6	**Rotate screen** button	Rotate the screen position.
7	**Validation** button	If the *live validation* function is activated, tapping on this button will store the beam measurement result. The result is unconditionally stored whether the algorithm measurement position is *Within tolerance* or *Out of tolerance*.
8	Audit tolerance zone	The *audit tolerance zone* allows the operator to check if the headlamp is within the audit tolerances that are applicable in a government inspection station.

#	Name	Description
9	Aiming tolerance zone	The aiming tolerance zone allows the operator to adjust the headlamp correctly. Note that the aiming tolerance zone should always be smaller than the audit tolerance zone. This is to ensure that a correctly aimed headlamp at a workshop (*using the smaller aiming tolerance zone*) will pass the test in a government inspection station (*using the larger audit tolerance zone*). **Note:** A Luminoscope® SAM 2035 typically uses a headlamp audit cycle as the device is intended for inspection station purposes only.
10	Algorithm measurement position	The algorithm overlay (red cross) represents the algorithm measurement position on the headlamp beam image. In case of an aiming cycle, the red cross position should be aimed towards the centre of the aiming tolerance zone. In case of an audit cycle, the red cross position is evaluated. The actual position is displayed on the headlamp measurement result field.
11	Beam direction arrows	The beam direction arrows indicate the direction(s) in which the headlamp should be moved to reach the target position inside the tolerance zone. The colour of the arrows indicates the live status of the aiming: • **Green** means the result is *inside* the tolerance zone. • **Yellow** means the result is *close* to the tolerance zone. • **Red** means the result is *far away* from the tolerance zone.
12	Headlamp measurement results field	Depending on the chosen algorithm and Luminoscope® configuration, headlamp measurement results such as horizontal beam position (X), vertical beam position (Y), headlamp mounting height (H), etc are displayed here.

The algorithm measurement position of the headlamp beam image is unconditionally stored whether the position is *Within tolerance* or *Out of tolerance*.

Note: Depending on some Luminoscope® configuration parameters, the *headlamp intensity* may be automatically measured.

Related information

Positioning in front of the headlamp (pg. 66)

7.2.7 Beam measurement results

When all tests are completed, the **Beam results** screen displays all beam measurement results.

Note: Depending on the configuration of the Luminoscope®, the **Beam results** screen is displayed.

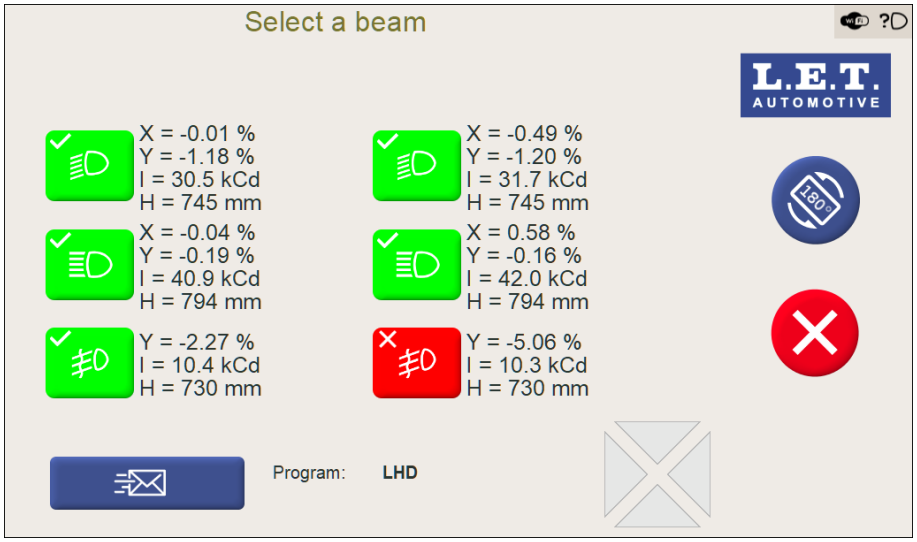


Figure 58: Overview of beam measurement results

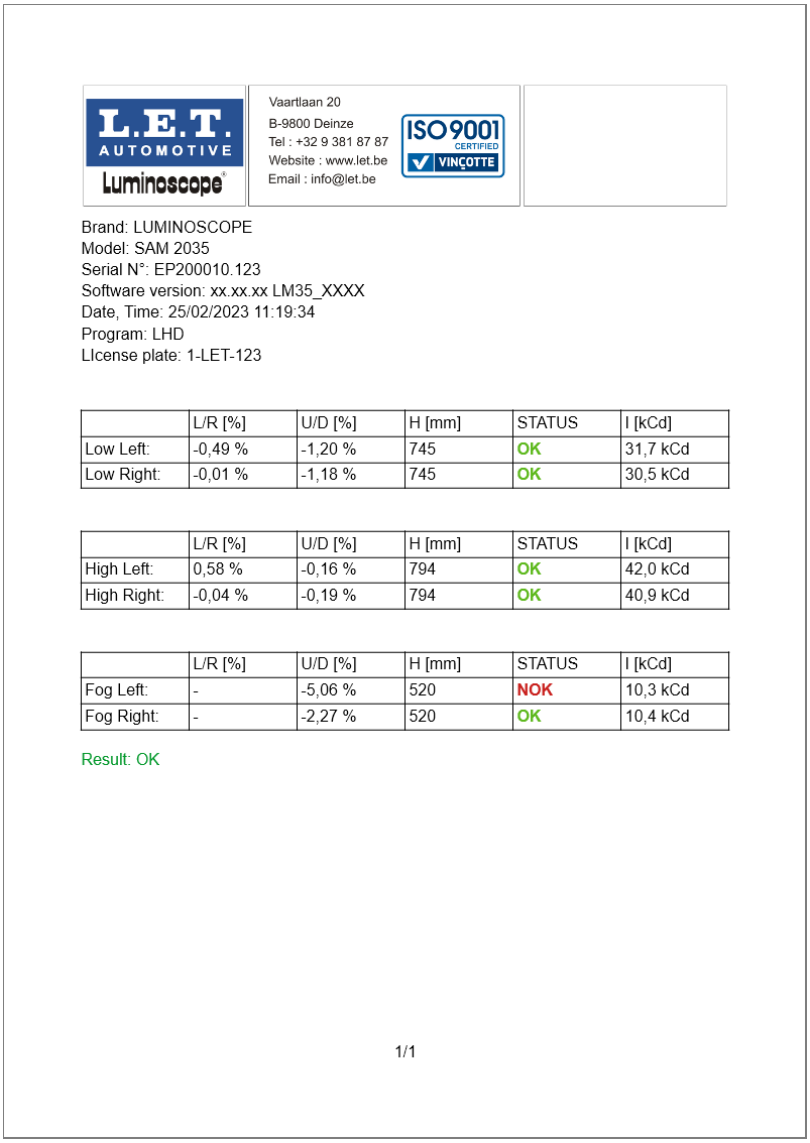
7.2.8 Test cycle reports and data transmission

Depending on the configuration of the Luminoscope®, the measurement results can be stored on the system (*PDF* format), printed on a paper ticket or transmitted to an external device using one of the communication protocols.

7.2.8.1 Test report as a PDF file

In the case the Luminoscope® is configured to store the measurement results on the system (*PDF* format), the generated reports can be exported afterwards to a USB stick via the Export functionality.

Note: The report layout depends on the Luminoscope® configuration and on the selected program, and consequently the format of the report below may differ.



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ISO 9001 CERTIFIED VINÇOTTE

Brand: LUMINOSCOPE
Model: SAM 2035
Serial N°: EP200010.123
Software version: xx.xx.xx LM35_XXXX
Date, Time: 25/02/2023 11:19:34
Program: LHD
LIcense plate: 1-LET-123

	L/R [%]	U/D [%]	H [mm]	STATUS	I [kCd]
Low Left:	-0,49 %	-1,20 %	745	OK	31,7 kCd
Low Right:	-0,01 %	-1,18 %	745	OK	30,5 kCd

	L/R [%]	U/D [%]	H [mm]	STATUS	I [kCd]
High Left:	0,58 %	-0,16 %	794	OK	42,0 kCd
High Right:	-0,04 %	-0,19 %	794	OK	40,9 kCd

	L/R [%]	U/D [%]	H [mm]	STATUS	I [kCd]
Fog Left:	-	-5,06 %	520	NOK	10,3 kCd
Fog Right:	-	-2,27 %	520	OK	10,4 kCd

Result: OK

1/1

Figure 59: Example of a test report

Parameter	Description
Brand	Luminoscope®.
Model	Model of Luminoscope®.
Serial number	Serial number of the Luminoscope® optical block.
Software version	Software version of the Luminoscope®.
Date, time	Date and time of the test.
Program	Selected program.
License plate	License plate number of the vehicle.
Low Left	Measurement results of the left low beam in the specified units: Horizontal beam position (L/R), vertical beam position (U/D), headlamp mounting height (H), Status (OK or NOK) and intensity (I).
Low Right	Measurement results of the right low beam in the specified units: Horizontal beam position (L/R), vertical beam position (U/D), headlamp mounting height (H), Status (OK or NOK) and intensity (I).

Parameter	Description
High Left	Measurement results of the left high beam in the specified units: Horizontal beam position (L/R), vertical beam position (U/D), headlamp mounting height (H), Status (OK or NOK) and intensity (I).
High Right	Measurement results of the right high beam in the specified units: Horizontal beam position (L/R), vertical beam position (U/D), headlamp mounting height (H), Status (OK or NOK) and intensity (I).
Fog Left	Measurement results of the left fog beam in the specified units: Horizontal beam position (L/R), vertical beam position (U/D), headlamp mounting height (H), Status (OK or NOK) and intensity (I).
Fog Right	Measurement results of the right fog beam in the specified units: Horizontal beam position (L/R), vertical beam position (U/D), headlamp mounting height (H), Status (OK or NOK) and intensity (I).

Related tasks

Exporting test results to a *USB* stick (pg. 93)

7.2.8.2 Test report as printed ticket

Depending on the configuration of the Luminoscope®, the measurement results can be printed on a ticket printer.

This ticket printer may be connected to the Luminoscope® either via a serial line or over a *Bluetooth* link.

Note: The ticket layout depends on the Luminoscope® configuration and on the selected program, and consequently the format of the ticket below may differ.

```
Customer: xxxxxxx

Type: Luminoscope SAM 2035

Serial number: EP200010.123

Date, time: 11/03/2023 08: 11: 37

Program: LHD

License plate: 1-LET-123
-----------------------------------
Results:
  L/R(%): U/D(%): H(%): Status: I(kCd)


LOW L:  -0,49; -1,20; 745; P; 31,7
LOW R:  -0,01  -1,18; 745; P; 30,5

HIGH L:  0,58; -0,16; 794; P; 42,0
HIGH R: -0,04; -0,19; 794; P; 40,9

FOG L:   0,00; -5,06; 520; F; 10,3
FOG R:   0,00; -2,27; 520; P; 10,4
```

Figure 60: Example of measurement results on ticket

Parameter	Description
Customer	Customer name.
Type	Model of Luminoscope®.
Serial number	Serial number of the Luminoscope® optical block.
Date, time	Date and time of the test.
Program	Selected program.
License plate	License plate number of the vehicle.
Results	Arranged in columns with the following structure: • **L/R**: (Left/Right) horizontal beam position, expressed in the specified units. • **O/N**: (Up/Down) vertical beam position, expressed in the specified units. • **Status**: summarized result of the test, can be either **P** (Passed), or **F** (Failed). • **I**: (Intensity), expressed in kCd.
Low L	Measurement results of the left low beam in the specified units.
Low R	Measurement results of the right low beam in the specified units.
High L	Measurement results of the left high beam in the specified units.
High R	Measurement results of the right high beam in the specified units.
Fog L	Measurement results of the left fog beam in the specified units.
Fog R	Measurement results of the right fog beam in the specified units.

7.2.8.3 Test results transfer to the host computer (communication protocols)

Depending on the configuration of the Luminoscope®, the test results can be transferred to a host computer by means of a specific communication protocol.

In addition, the program selection can also be initiated by a host computer, to start a test cycle by means of a specific communication protocol.

Finally, there are some other communication protocols available for customer specific purposes.

Note:

- Depending on the customer specific implementation and configuration, the communication can be done via an RS232 serial line connection, wired *ethernet* connection, *Wi-Fi* connection or *Bluetooth* connection.
- The protocol descriptions are available on request.

Depending on their purpose, the communication protocols can be categorised in different groups.

Communication between the **Luminoscope®** and a host computer

Protocol group	Description
Lamp data protocols	A telegram is issued by the Luminoscope® at the end of each beam measurement and acknowledged by the host computer. It includes, among other data, the headlamp beam characteristics of a single headlamp (e.g. horizontal beam position, vertical beam position, beam intensity...).
Vehicle data protocols	A telegram is issued by the Luminoscope® at the end of each test cycle and acknowledged by the host computer. It includes, among other data, the headlamp beam characteristics of all tested headlamps (e.g. horizontal beam position, vertical beam position, beam intensity...).
Program selection protocols	A telegram is issued by the host computer at the start of the test cycle and acknowledged by the Luminoscope®. It includes, among other data, the *VSN* (Vehicle Selection Number) for choosing one of the selectable programs on the program selection screen and starting the corresponding test cycle.
Info telegrams protocols	A telegram is issued by the Luminoscope® at specific moments during the test cycle. Data includes, among other information, status of the Luminoscope® system (e.g. system reaches *park position* at the end of the cycle, system starts the zeroing procedure, cycle was finished, system error appeared…).

Communication between the **Luminoscope®** and a host computer or a 2-line display

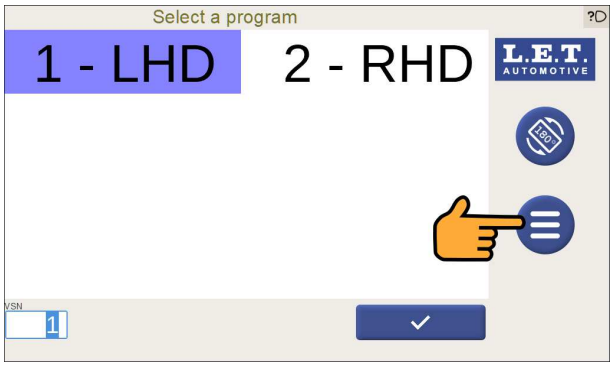
Protocol group	Description
Info display protocols	A telegram is issued by the Luminoscope® at specific moments during the test cycle. It includes, among other data, information about what the Luminoscope® system is currently doing (e.g. select row 1, select row 2, initialisation started, test pass, test fail, switch low beam on, ready for next vehicle…).

8 Navigation map

This navigation map shows the most important screens on the Luminoscope® system and how to get there, including a reference to the corresponding chapter in the manual.

Program selection screen

Note: The screen may have a different appearance depending on the customer's specific implementation.



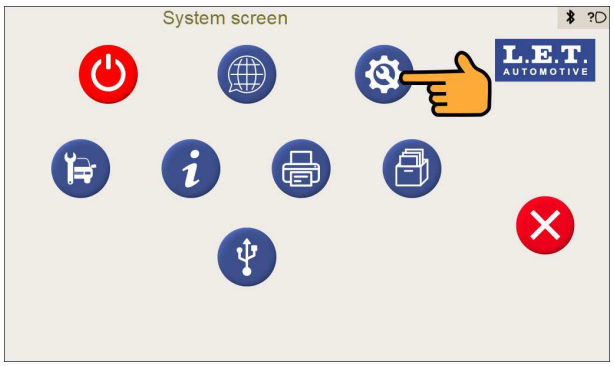
The **Program selection** screen is displayed after starting up the system and offers different programs. This allows the operator to select a preconfigured test cycle sequence. There's also a **System** button to access the **System** screen.

Tap on the button above to enter the **System** screen.

Related tasks

Program selection screen (pg. 64)

System screen



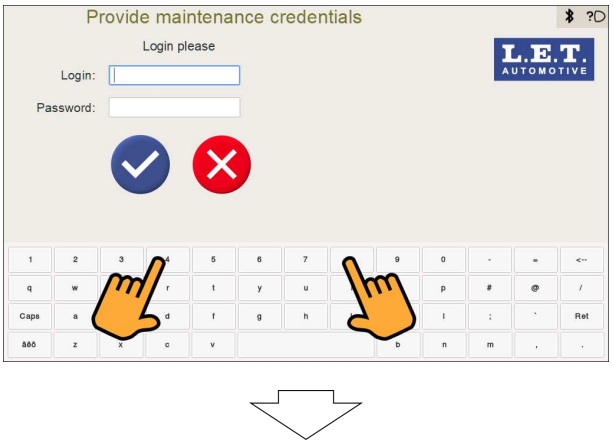
The **System** screen displays different system items.

Tap on the button above to enter the **Setup login** screen.

Related tasks

System screen (pg. 83)

Setup login screen

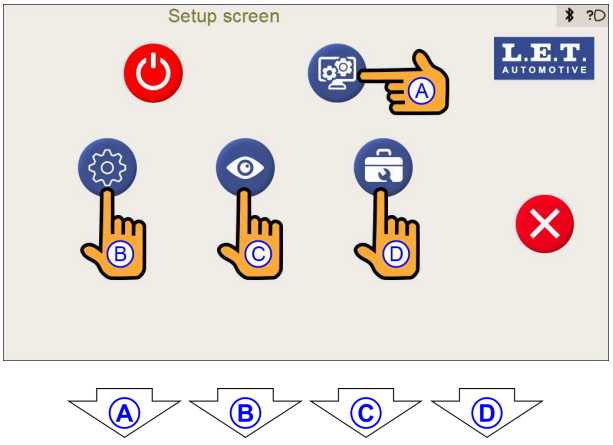


The **Setup login** screen allows the operator to enter the **Setup** screen.

Enter your credentials and tap on the **Validation** button.

Setup screen

Note: The access rights to the different menus on the screen are hierarchical and depend on the applied login level, which is password protected.



The **Setup** screen allows the operator to enter the **Computer configuration** screen Ⓐ, **Settings program** screen Ⓑ, **Verification** screen Ⓒ, **Calibration** screen Ⓓ and the **Power** screen.

Tap on the Ⓐ button above to enter the **Computer configuration** screen.

Tap on the Ⓑ button above to enter the **Settings program** screen.

Tap on the Ⓒ button above to enter the **Verification** screen.

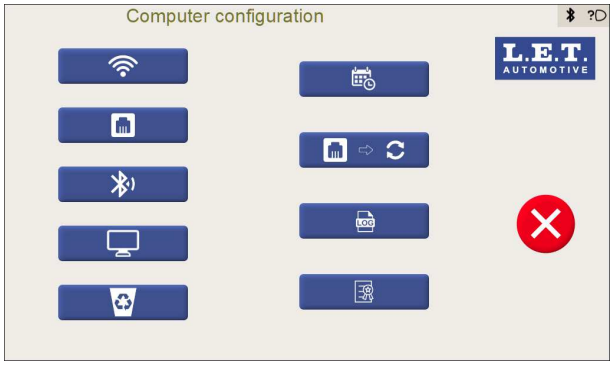
Tap on the Ⓓ button above to enter the **Calibration** screen.

Related tasks

Setup screen (pg. 105)

Computer configuration screen

Note: The screen may have a different appearance depending on the customer's specific implementation. The access rights to the different menus on the screen are hierarchical and depend on the applied login level, which is password protected.



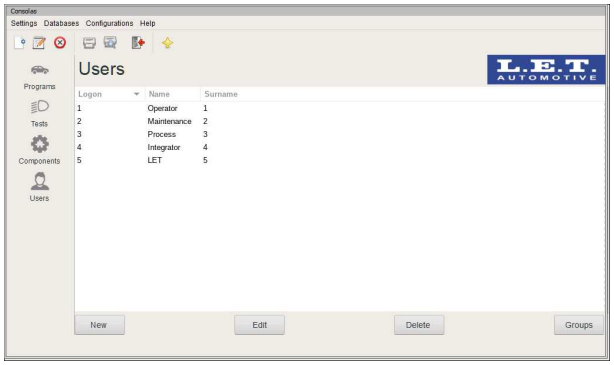
The **Computer configuration** screen allows the operator to access date/time settings, licensing information and communication related parameters.

Related tasks

Computer configuration screen (pg. 111)

Settings program screen

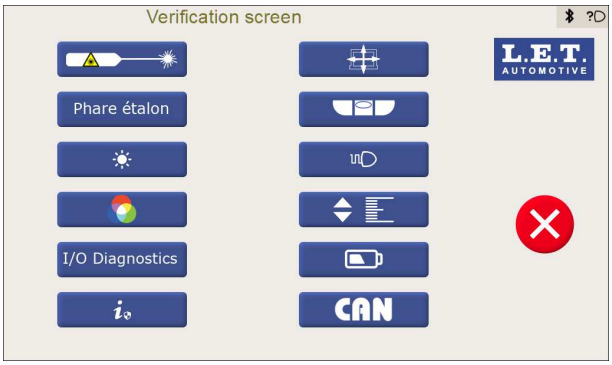
Note: The screen may have a different appearance depending on the customer's specific implementation. The access rights to the different menus on the screen are hierarchical and depend on the applied login level, which is password protected.



The **Settings program** screen allows the operator to edit the Luminoscope® databases. The settings program contains a collection of parameters used in the Luminoscope®. These parameters define the vehicles (also called programs), headlamps (also called tests), components and users.

Verification screen

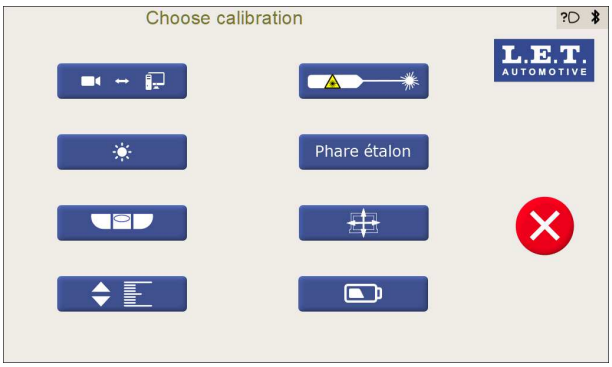
Note: The screen may have a different appearance depending on the customer's specific implementation. The access rights to the different menus on the screen are hierarchical and depend on the applied login level, which is password protected.



The **Verification** screen allows the operator to access tools for verification of the calibration and operations of the Luminoscope®.

Calibration screen

Note: The screen may have a different appearance depending on the customer's specific implementation. The access rights to the different menus on the screen are hierarchical and depend on the applied login level, which is password protected.



The **Calibration** screen allows the operator to access tools for calibration of different components of the Luminoscope®.

9 System screen

The **System** screen acts as a hub for a number of functions. Among others, it gives access to the following functions which are thoroughly explained in the upcoming chapters:

- Turn off or restart the Luminoscope®.
- Language selection.
- Setup menu.
- Overview of technical data of the Luminoscope®.
- Reprint the last test result.
- Recall the recent test results.
- Data import and export using a *USB* stick.

When powered-up, the Luminoscope® displays the **Program selection** screen. Follow the navigation sequence below to reach the **System** screen.

1. Tap on the **System** button 1 on the **Program selection** screen.

Note: The screen may have a different appearance depending on the customer's specific implementation.

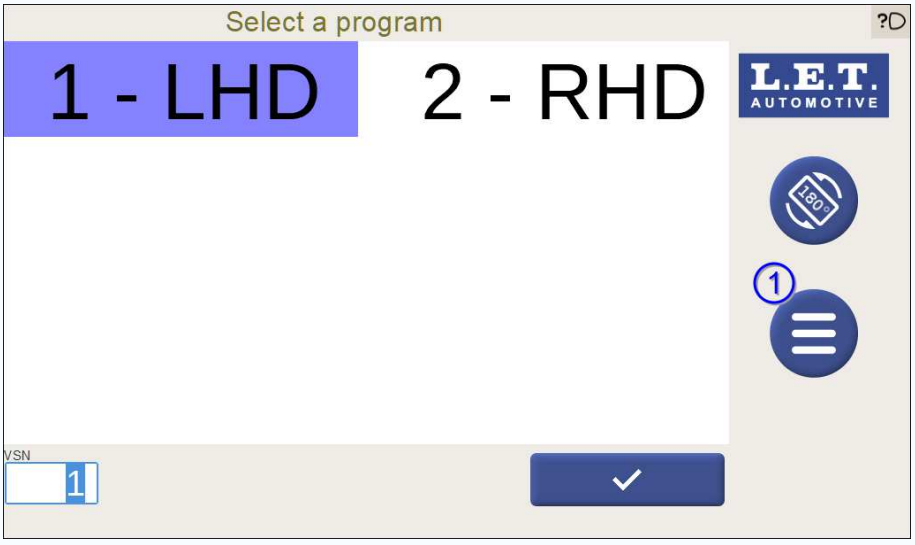


*Figure 61: **Program selection** screen with **System** button*

The **System** screen is now displayed.

2. Choose one of the options on the **System** screen and tap on the corresponding button.

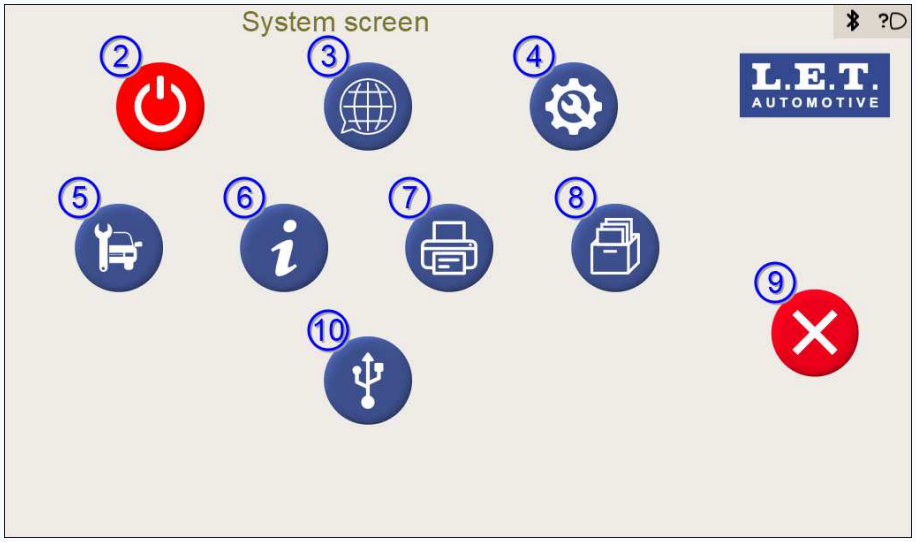


*Figure 62: **System** screen*

#	Button	Description
2	**Power** button	Turn off or restart the Luminoscope®
3	**Language** button	Select the language for the user interface.
4	**Setup** button	Enter the **Setup login** screen.
5	**Test program** button	Enter the **Beam results** screen to execute a test cycle without communication (if applicable).
6	**System information** button	Overview of technical data of the Luminoscope®.
7	**Print last result** button	Reprint the last test result.
8	**Recall recent results** button	Query the most recent test results and reprint if needed.
9	**Abort** button	Return to the **Program selection** screen.
10	***USB*** button	Import/export data using a USB stick.

Note:

- Button 7 is only functional when a ticket printer is connected to the Luminoscope®.
- The ***USB*** button 10 appears when an *USB* stick is inserted in the connector plate of the Luminoscope®.

9.1 Luminoscope® turn off or restart

The **Power** button on the **System** screen gives access to the menu to turn off or restart the Luminoscope®.

1. Tap on the **Power** button 1 on the **System** screen.

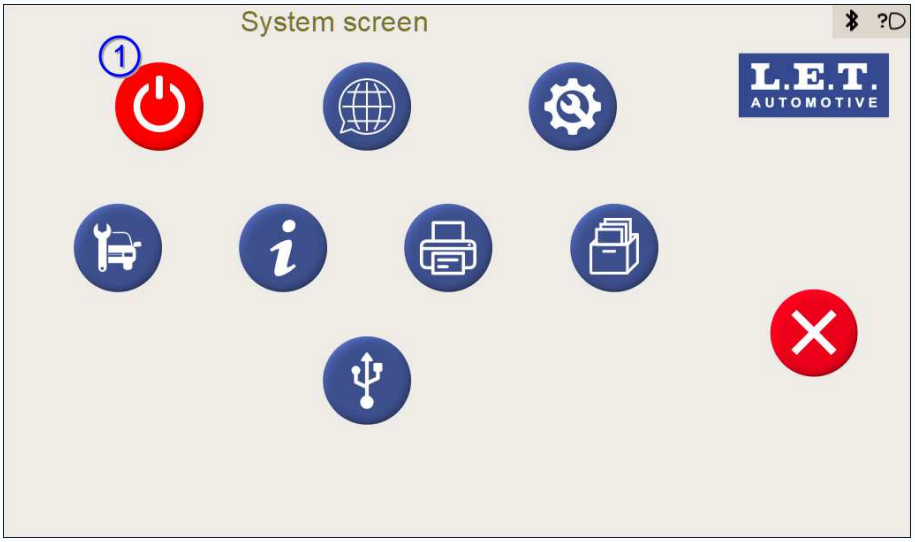


*Figure 63: **System** screen with **Power** button*

The **Power** screen is now displayed.

2. Choose one of the options on the **Power** screen and tap on the corresponding button.

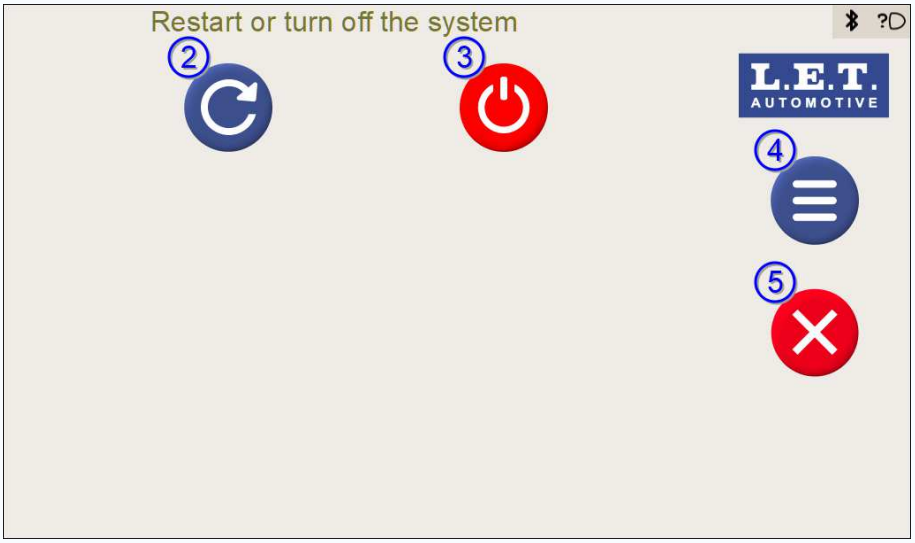


*Figure 64: **Power** screen*

#	Button	Description
2	**Restart** button	Restart the Luminoscope®.
3	**Turn Off** button	Turn off the Luminoscope®.
4	**System** button	Access the **System** screen.
5	**Abort** button	Return to the **Program selection** screen.

Related information

Power management (pg. 47)

9.2 Language selection

The **Language** button on the **System** screen gives access to the menu to choose the language of the user interface of the Luminoscope®.

1. Tap on the **Language** button 1 on the **System** screen.

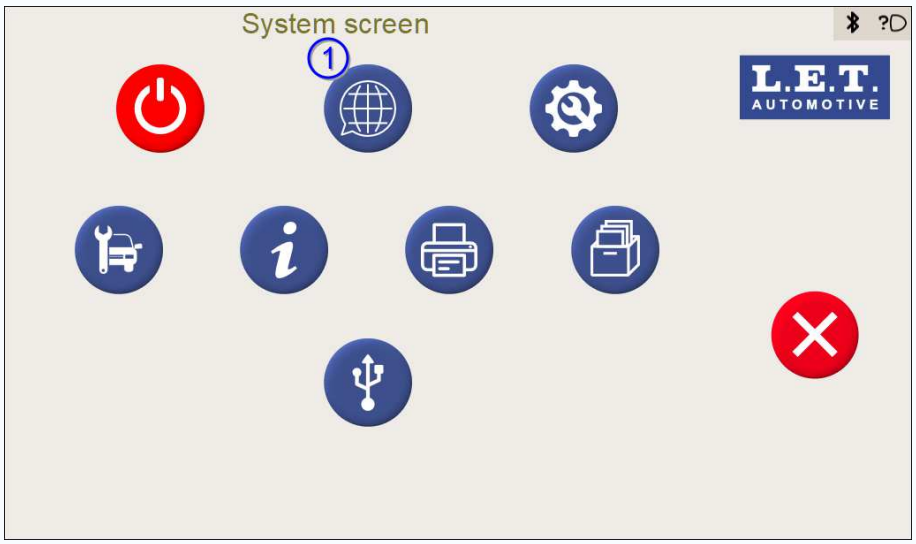


*Figure 65: **System** screen with **Language** button*

The **Language selection** screen is now displayed.

2. Choose one of the options on the **Language selection** screen and tap on the corresponding button.

Note: The screen may have a different appearance depending on the customer's specific implementation.

*Figure 66: **Language selection** screen*

#	Button	Description
2	**Language selection** button	Select a language for the user interface.
3	**Abort** button	Return to the **System** screen.

3. Reboot the Luminoscope® to ensure that all the system components display the newly selected language.

Related tasks

Luminoscope® turn off or restart (pg. 84)

9.3 System information of the Luminoscope®

The **System information** button on the **System** screen provides access to technical data of the current setup of the Luminoscope® and can be useful for consult details about the configuration and status of the Luminoscope®.

1. Tap on the **System information** button 1 on the **System** screen.

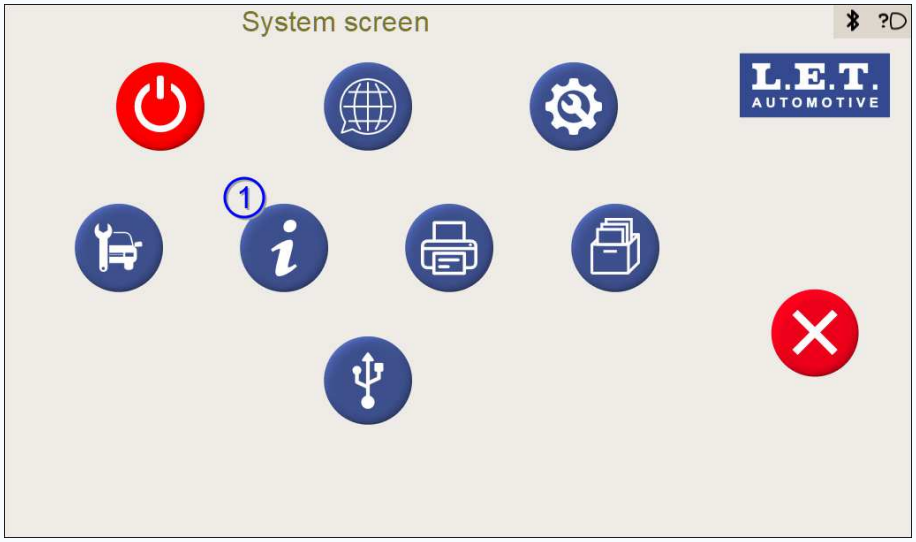


*Figure 67: **System** screen with **System information** button*

The **System information** screen is now displayed.

2. Consult the information on the **System information** screen or tap on the **Abort** button.

Note: The screen may have a different appearance depending on the customer's specific implementation.

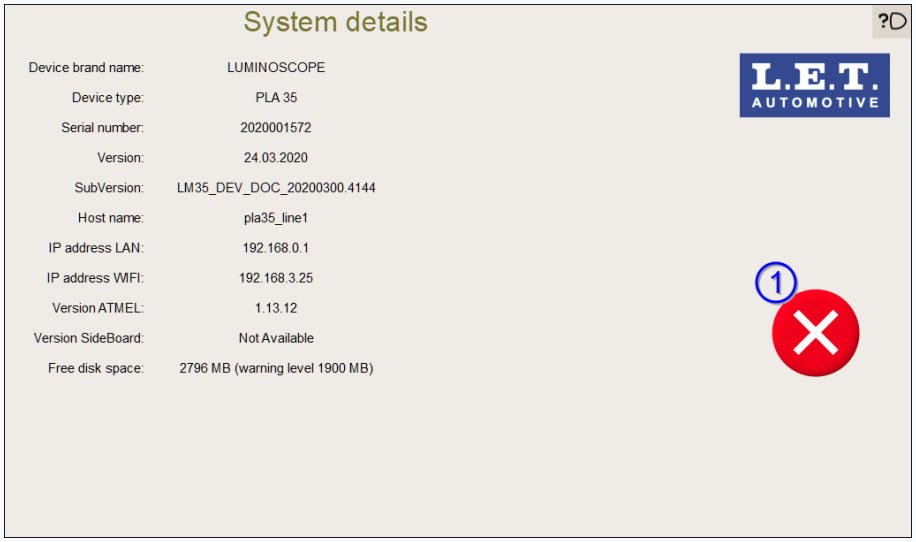


*Figure 68: **System information** screen*

#	Button	Description
1	**Abort** button	Return to the **System** screen.

9.4 Reprint last test result

The **Print last result** button on the **System** screen enables the user to reprint the last test result of the Luminoscope®.

Note: The **Print last result** button only has an associated function when a ticket printer is connected to the Luminoscope®.

Tap on the **Print last result** button 1 on the **System** screen.

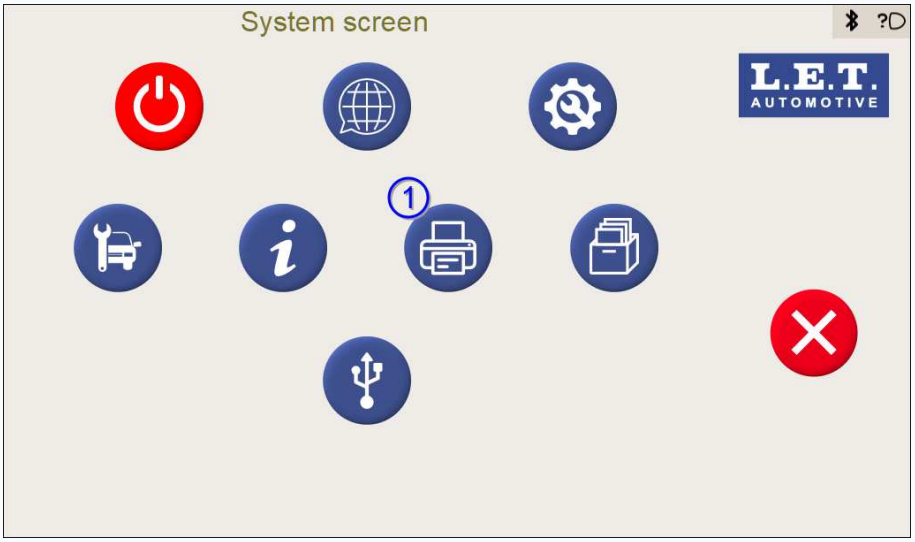


*Figure 69: **System** screen with **Print last result** button*

A duplicate of the last test result is printed on the ticket printer.

Related information

Test report as printed ticket (pg. 76)

9.5 Recall recent test results

The **Recall recent results** button on the **System** screen enables the user to scroll through the recent test results of the Luminoscope® and to reprint the ticket of the selected test result.

1. Tap on the **Recall recent results** button 1 on the **System** screen.

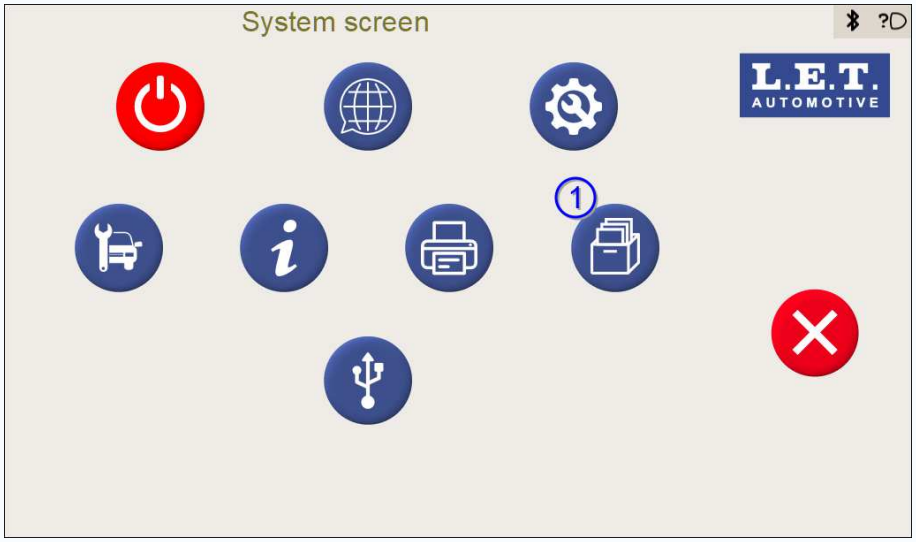


*Figure 70: **System** screen with **Recall recent results** button*

The **Recent results** screen is now displayed.

2. Choose one of the options on the **Recent results** screen and tap on the corresponding button.

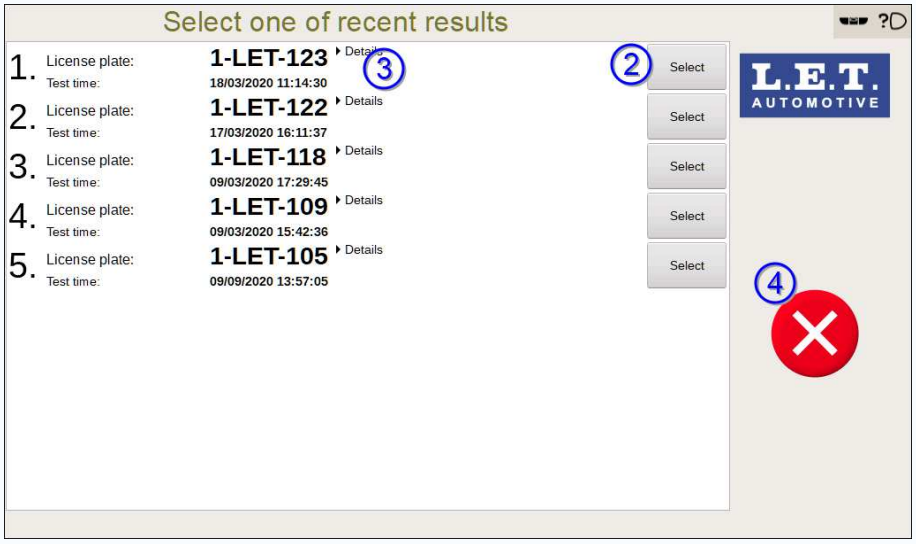


*Figure 71: **Recent results** screen*

#	Button	Description
2	**Select** button	Select one of the results to be reprinted. A duplicate of the selected test result is printed on the ticket printer.
3	**Details** button	Show or hide the measured values of the selected result.
4	**Abort** button	Return to the **System** screen.

Note: Button 2 is only functional when a ticket printer is connected to the Luminoscope®.

Related information

Test report as printed ticket (pg. 76)

9.6 Import / export of data via *USB* stick

The ***USB*** button on the **System** screen gives access to the **USB** screen.

Note: The ***USB*** button on the **System** screen appears when an *USB* stick is inserted in the connector plate of theLuminoscope®.

Attention: Only *FAT-32*-formatted *USB* sticks are recognized. Specifically, *NTFS* format is not supported.

The **USB** screen acts as a hub for a number of functions. Among others, it gives access to the following functions which are thoroughly explained in the upcoming chapters:

- Export of a configuration file from the Luminoscope® to an *USB* stick.
- Export of test result files from the Luminoscope® to an *USB* stick.
- Export of log files from the Luminoscope® to an *USB* stick.
- Export of the configuration of vehicles (programs) and headlamps (tests) to an *USB* stick.
- Import of configuration files from an *USB* stick to the Luminoscope®.
- Import of a software update from an *USB* stick to the Luminoscope®.
- Import of a new license token configuration from an *USB* stick to the Luminoscope®.
- Import of the configuration of vehicles (programs) and headlamps (tests) from an *USB* stick to the Luminoscope®.

1. Insert a *USB* stick in the connector plate of the Luminoscope®.

   Note: If a *USB* stick is inserted but is not accepted, the screen becomes blank with a single **Abort** button available. In such a case, remove the *USB* stick and press the **Abort** button.

2. Tap on the ***USB*** button 1 on the **System** screen.

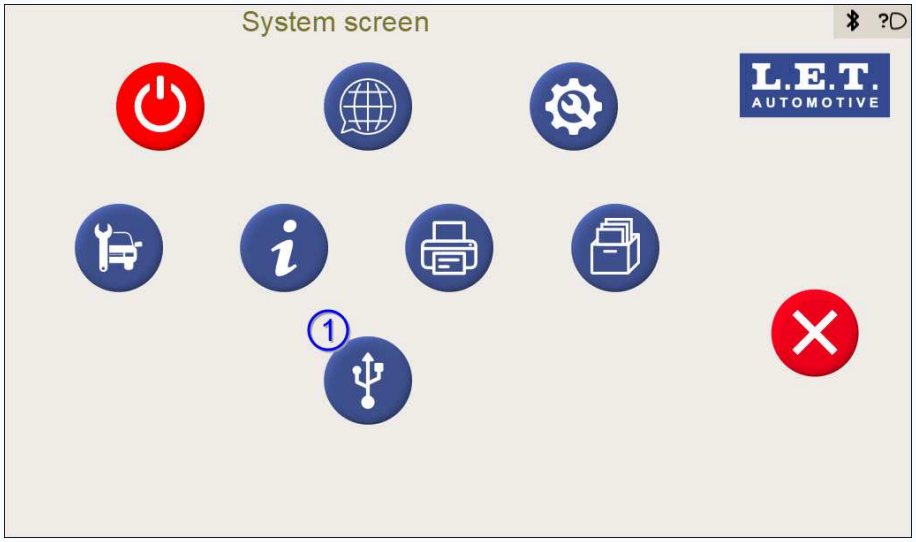


*Figure 72: **System** screen with **USB** button*

The **USB** screen is now displayed.

Note: The screen may have a different appearance depending on the customer's specific implementation.

3. Choose one of the options on the **USB** screen and tap the corresponding button.

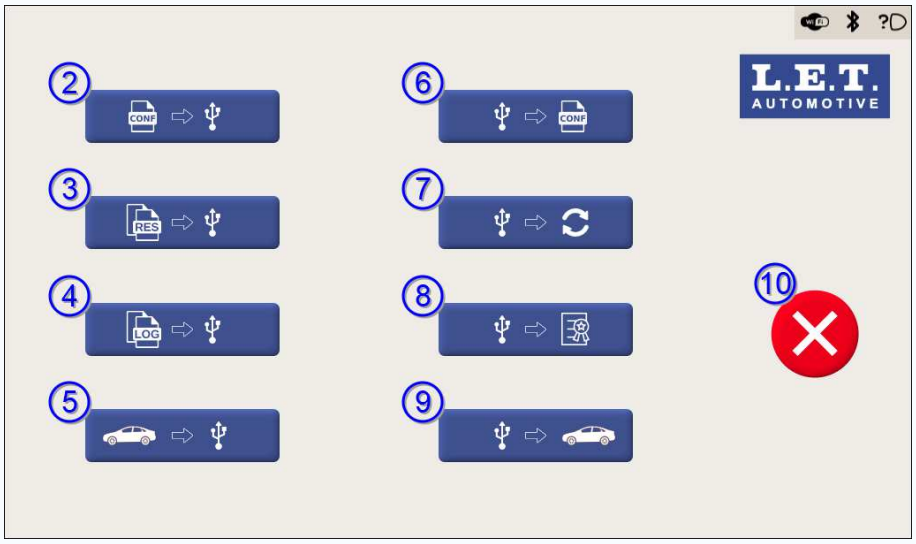


*Figure 73: **USB** screen*

#	Button	Description
2	**Export configuration** button	Export of a configuration file from the Luminoscope® to an *USB* stick.
3	**Export results** button	Export of test result files from the Luminoscope® to an *USB* stick.
4	**Export logs** button	Export of log files from the Luminoscope® to an *USB* stick.

#	Button	Description
5	**Export vehicles and headlamps** button	Export of the configuration of vehicles (programs) and headlamps (tests) to an *USB* stick.
6	**Import configuration** button	Import of the configuration files from an *USB* stick to the Luminoscope®.
7	**Import update** button	Import of a software update from an *USB* stick to the Luminoscope®.
8	**Import license token** button	Import of a new licence token configuration from an *USB* stick to the Luminoscope®.
9	**Import vehicles and headlamps** button	Import of the configuration of vehicles (programs) and headlamps (tests) from an *USB* stick to the Luminoscope®.
10	**Abort** button	Return to the **System** screen.

9.6.1 Export operations: Luminoscope® to *USB* stick

All the following operations export different data from the Luminoscope® and write them to an *USB* stick.

9.6.1.1 Export of a configuration file

The **Export configuration** button on the **USB** screen can be used to export the Luminoscope® configuration to an *USB* stick.

Attention: This feature is not available for the current access level. Please refer to a user who has the necessary permissions if the feature is required.

9.6.1.2 Export of test result files

The **Export results** button on the **USB** screen can be used to export the Luminoscope® test result files to an *USB* stick.

After the Luminoscope® has stored the test result files on the *USB* stick, the user is offered with the option of completely deleting the exported test results from the Luminoscope® memory. This means they are no longer available for any other use in the Luminoscope®.

Starting from the **USB** screen.

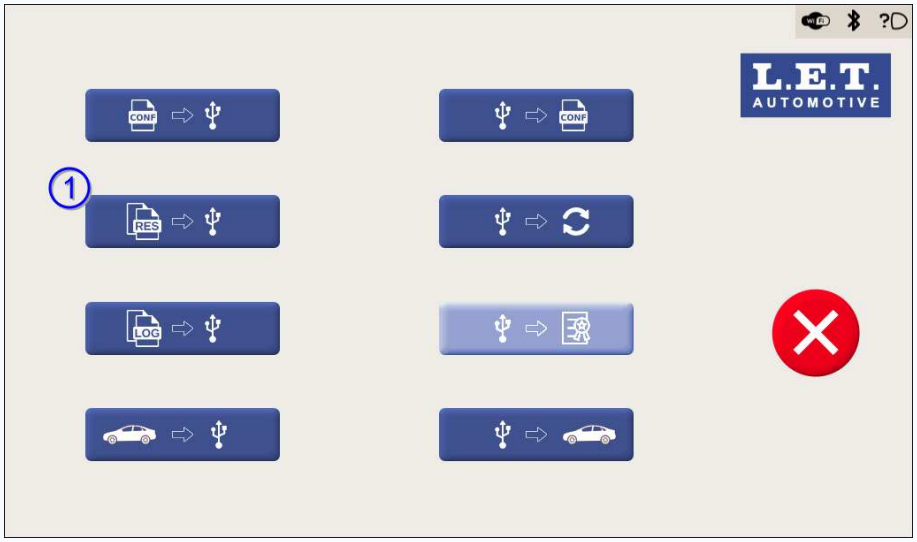


*Figure 74: **USB** screen with **Export results** button*

1. Tap on the **Export results** button 1 on the **USB** screen.

   The test result files are immediately exported to the *USB* stick. During the operation the following screen is displayed:

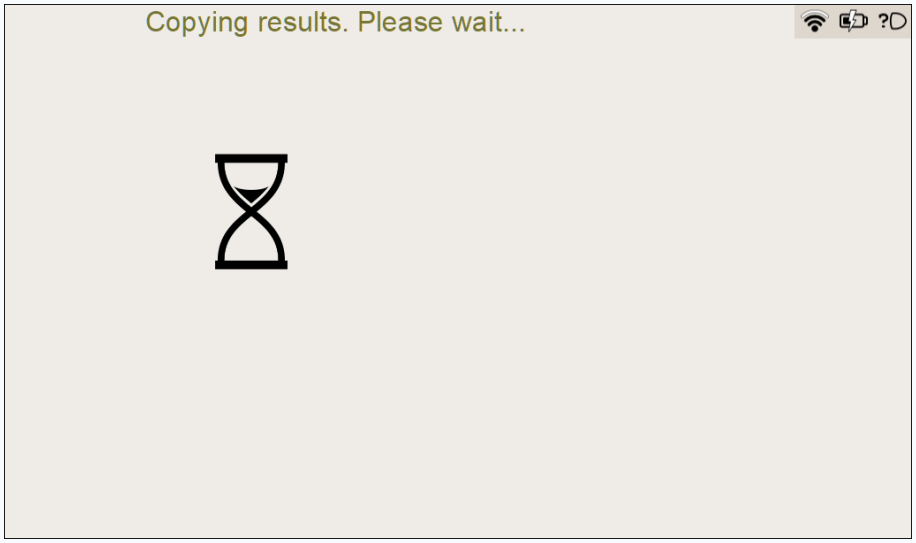


*Figure 75: **Export results** operation progress*

   Once the **Export results** operation has finished, the *USB* stick can be safely removed and the following screen appears:

Figure 76: Removing test result file

After the Luminoscope® has stored the test result files on the *USB* stick, the user is offered with the option of completely deleting the exported test results from the Luminoscope® memory. This means they are no longer available for any other use in the Luminoscope®.

Note: If there were no remaining test result files to export in the Luminoscope® memory, an informative screen is displayed. After pressing the **Abort** button, the screen displays the **USB** screen again.

2. Tap on the **Validation** button 3 to remove the test result files from the Luminoscope® memory or tap on the **Abort** button 2 in case the result files should be kept.

   When removed, the result files will not be available anymore and the Luminoscope® displays the **USB** screen.

3. Remove the *USB* stick from the socket of the Luminoscope® connector panel and connect it to a PC.

4. Browse the *USB* stick and open its root folder.

   The **Export results** operation has created a main Luminoscope® folder on the *USB* stick, if it didn't exist yet.

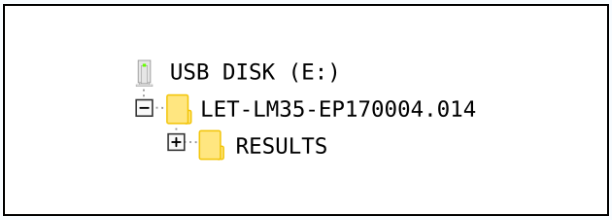


Figure 77: Main Luminoscope® *folder on the USB stick*

The syntax of the main Luminoscope® folder name follows the format `LET-LM35-EPxxxxxx.xxx` where the section `EPxxxxxx.xxx` represents the unique serial number of the optical block.

The **Export results** operation has also created a RESULTS folder under the main Luminoscope® folder, if it didn't exist yet. Each **Export results** operation creates a *ZIP* file in the RESULTS folder including the exported result files.

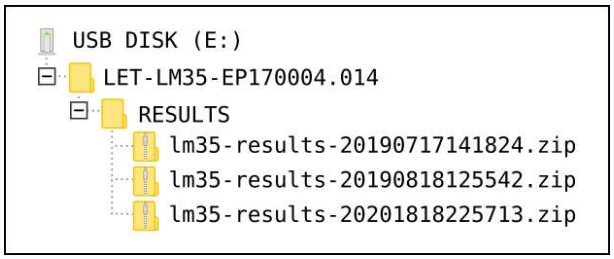


Figure 78: Folder structure on the USB stick

The naming of the exported test result file follows the format `lm35-results-yyyymmddhhmmss.zip` where the section `yyyymmddhhmmss` is calculated upon the file creation timestamp as explained below.

Field content	Format	Example	Explanation
Year	*yyyy*	2020	4-digit format.
Month	*mm*	03	2-digit format, left zero-padded.
Day	*dd*	17	2-digit format, left zero-padded.
Hour	*hh*	09	2-digit format, left zero-padded.
Minutes	*mm*	52	2-digit format, left zero-padded.
Seconds	*ss*	04	2-digit format, left zero-padded.
Extension	.zip	.zip	Compressed archive file extension.

The exported test result file has an internal structure which includes a `pdf` folder with a number of *PDF* test cycle report files. Each of them is the product of a single test cycle.

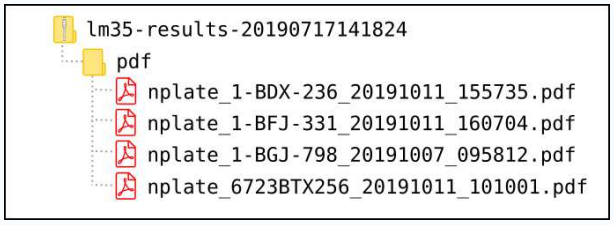


Figure 79: Exported test result file structure including PDF test cycle report files

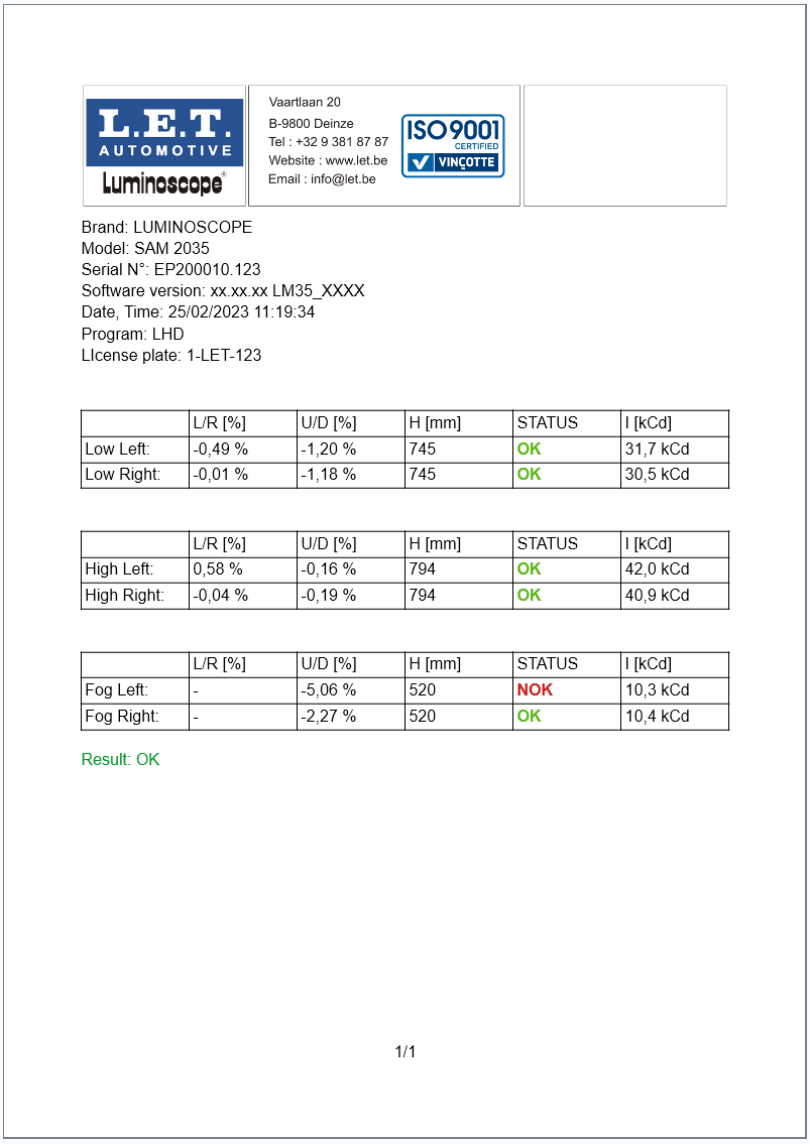
The naming of each *PDF* test cycle report file follows the format `nplate_licenseplate_yyyymmdd-hhmmss.pdf` including the file creation timestamp among other fields as described below.

Field content	Format	Example	Explanation
File identifier	*nplate*	nplate	Constant string for identification of the file contents.
License plate	*licenseplate*	1-BDX-236	Registration plate of the corresponding vehicle. If the number was not defined during the test, it is substituted by *unknown*.
Year	*yyyy*	2020	4-digit format.

Field content	Format	Example	Explanation
Month	*mm*	03	2-digit format, left zero-padded.
Day	*dd*	17	2-digit format, left zero-padded.
Hour	*hh*	09	2-digit format, left zero-padded.
Minutes	*mm*	52	2-digit format, left zero-padded.
Seconds	*ss*	04	2-digit format, left zero-padded.
Extension	*.pdf*	.pdf	File extension.

5. Open the desired test cycle report file.

Note: The test cycle report file may have a different appearance depending on the customer's specific implementation. Consequently, the example underneath may differ from your Luminoscope® configuration.



L.E.T. AUTOMOTIVE Luminoscope®

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Website : www.let.be
Email : info@let.be

ISO 9001 CERTIFIED VINÇOTTE

Brand: LUMINOSCOPE
Model: SAM 2035
Serial N°: EP200010.123
Software version: xx.xx.xx LM35_XXXX
Date, Time: 25/02/2023 11:19:34
Program: LHD
LIcense plate: 1-LET-123

	L/R [%]	U/D [%]	H [mm]	STATUS	I [kCd]
Low Left:	-0,49 %	-1,20 %	745	OK	31,7 kCd
Low Right:	-0,01 %	-1,18 %	745	OK	30,5 kCd

	L/R [%]	U/D [%]	H [mm]	STATUS	I [kCd]
High Left:	0,58 %	-0,16 %	794	OK	42,0 kCd
High Right:	-0,04 %	-0,19 %	794	OK	40,9 kCd

	L/R [%]	U/D [%]	H [mm]	STATUS	I [kCd]
Fog Left:	-	-5,06 %	520	NOK	10,3 kCd
Fog Right:	-	-2,27 %	520	OK	10,4 kCd

Result: OK

1/1

Figure 80: Example of test cycle report

9.6.1.3 Export of log files

The **Export logs** button on the **USB** screen can be used to export the Luminoscope® log files to an *USB* stick.

There are two categories of files which are grouped into log files:

- Log files in text format containing a number of timestamped lines describing events, related to the activity of the Luminoscope®. The information in these log files can be useful for tracking or diagnostic tasks. It may be interesting to store or archive them for future reference. The content of these log files is not intended to be used by regular users and is continuously generated.
- Headlamp images as obtained from the camera of the Luminoscope®, so as screenshots of its user interface. They are captured simultaneously along with some diagnostic files each time the user taps on the *LET Automotive logo* on the touch screen and may be useful for future reference.

Starting from the **USB** screen.

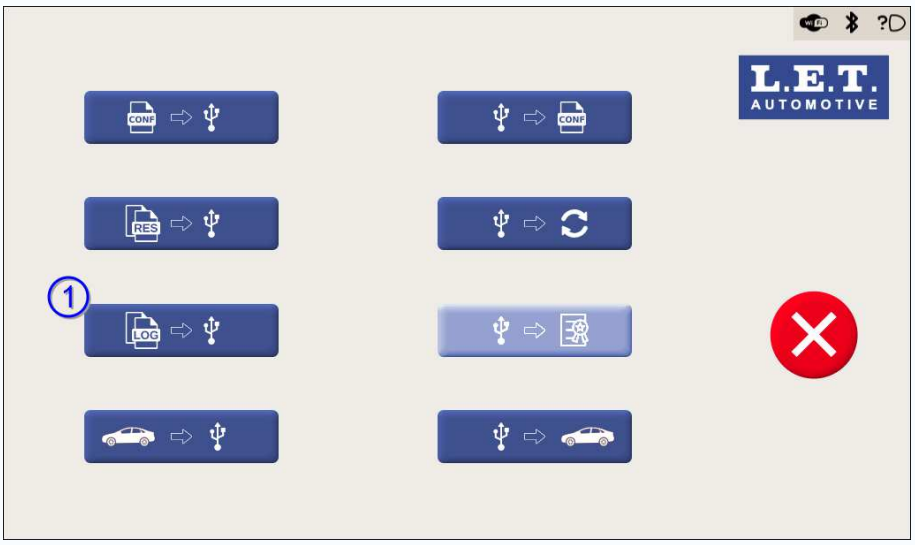

*Figure 81: **USB** screen with **Export logs** button*

1. Tap on the **Export logs** button 1 on the **USB** screen.

   All the different log files are immediately exported to the *USB* stick. During the operation the following screen is displayed:

*Figure 82: **Export logs** operation progress*

   Once the **Export logs** operation has finished, the *USB* stick can be safely removed and the following screen is displayed:

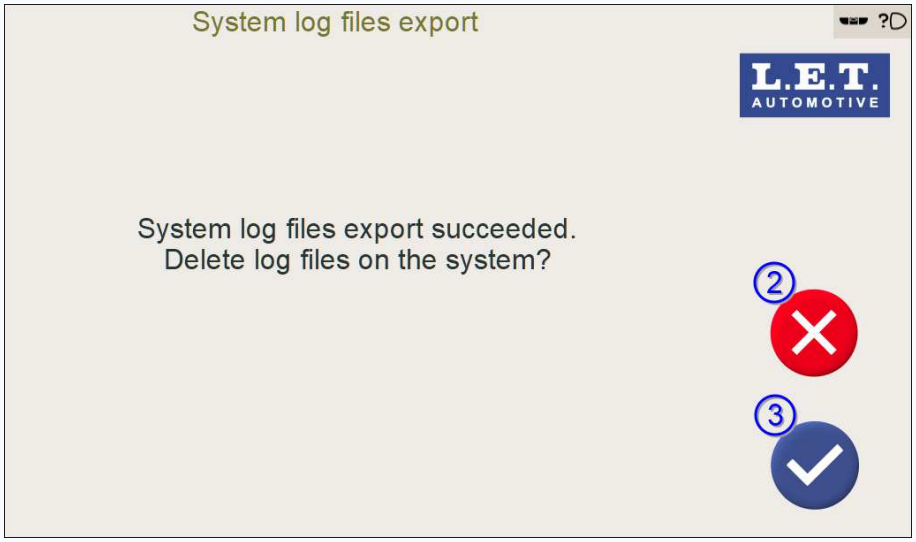

Figure 83: Delete log files from the Luminoscope®

After the Luminoscope® has stored the log files on the *USB* stick, the user is offered with the option of completely deleting the exported log files from the Luminoscope®.

2. Tap on the **Validation** button 3 to remove the log files from the Luminoscope® or tap on the **Abort** button 2 in case the log files should be kept.

3. Remove the *USB* stick from the socket of the Luminoscope® connector panel and connect it to a PC.

4. Browse the *USB* stick and open its root folder.

   The **Export logs** operation has created a main Luminoscope® folder on the *USB* stick if it didn't previously exist.

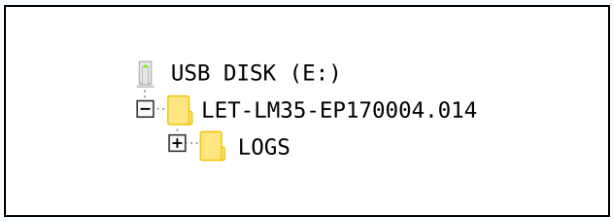

Figure 84: Main Luminoscope® *folder on the USB stick*

The syntax of the main Luminoscope® folder name follows the format `LET-LM35-EPxxxxxx.xxx` where the section `EPxxxxxx.xxx` represents the unique serial number of the optical block.

The **Export logs** operation has also created a `LOGS` folder under the main Luminoscope® folder, if it didn't exist yet. The **Export logs** operation creates a number of files and folders under the `LOGS` folder, depending on their availability.

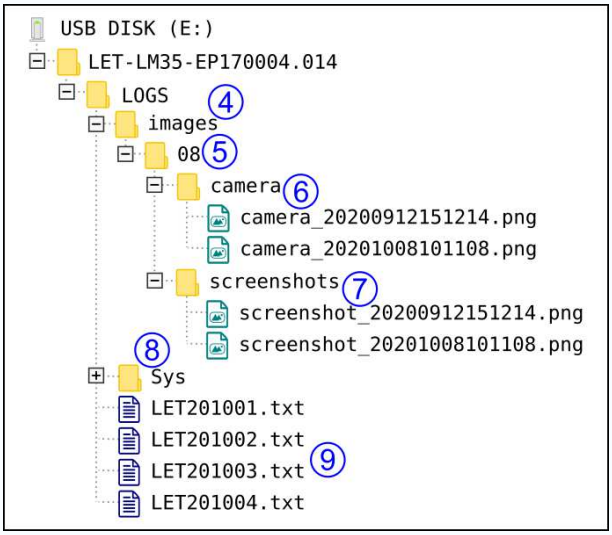

Figure 85: Folder structure on the USB stick

#	Name	Explanation
4	`images`	This folder has been created (if it didn't exist yet) if there were camera images and screenshots of the user interface in the Luminoscope® memory.
5	`08`	This subfolder has been created (if it didn't exist yet), labeled with the (zero-padded) current day of the month of the **Export logs** operation. Successive applications of the **Export logs** operation may create similar folders.
6	`camera`	This subfolder has been created (if it didn't exist yet), if there were any pictures to be exported. It contains a variable number of *PNG* files, each of them generated by the tapping on the *LET Automotive logo* of the Luminoscope® screen and containing a screenshot of the status of the device camera. Successive applications of the **Export logs** operation may add more pictures to this folder. The name of the picture includes the file creation timestamp.
7	`screenshots`	This subfolder has been created (if it didn't exist yet), if there were any pictures to be exported. It contains a variable number of *PNG* files, each of them generated by the tapping on the *LET Automotive logo* of the Luminoscope® screen and containing a screenshot of the status of the user interface of the device. Successive applications of the **Export logs** operation may add more pictures to this folder. The name of the picture includes the file creation timestamp.
8	`Sys`	This subfolder has been created (if it didn't exist yet), if there were diagnostic files to be exported. It contains useful diagnosing information and it is not intended for regular users but may be eventually requested by LET service technicians. Successive applications of the **Export logs** operation update the content of this folder.

#	Name	Explanation
9	log files	Text files containing a number of timestamped lines describing events related to the activity of the Luminoscope®. Each file is named with a timestamp and contains the events happening on that date. Successive applications of the **Export logs** operation may then either append to existing files or add new files to the list.

9.6.1.4 Export of a configuration file of vehicles and headlamps

The **Export vehicles and headlamps** button on the **USB** screen can be used to export a specific part of the Luminoscope® configuration to an *USB* stick. This operation specifically exports the vehicles (*programs*) and headlamps (*tests*) with all their related parameters from the database, while excluding any other configuration parameter.

Attention: This feature is not available for the current access level. Please refer to a user who has the necessary permissions if the feature is required.

9.6.2 Import operations: *USB* to Luminoscope®

All the following operations read different data from an *USB* stick and write them to the Luminoscope®.

9.6.2.1 Import of a configuration file

The **Import configuration** button on the **USB** screen can be used to import a configuration file (that was previously stored on an *USB* stick) to the Luminoscope®. The **Import configuration** operation allows restoring the Luminoscope® to a previous status for which an **Export configuration** operation was done.

Attention: This feature is not available for the current access level. Please refer to a user who has the necessary permissions if the feature is required.

9.6.2.2 Software update from a *USB* stick

The **Import update** button on the **USB** screen can be used to update the system software from a properly crafted *USB* stick. This functionality allows the user to apply, under remote supervision by LET technicians, specific small patches for particular parts of the system in order to modify its behavior or configuration details.

Attention: This feature is not available for the current access level. Please refer to a user who has the necessary permissions if the feature is required.

9.6.2.3 Import of a *license token file*

The **Import license token** button on the **USB** screen can be used to import a new *license token file* from an *USB* stick to the *USB License Dongle* in the Luminoscope®.

Attention: This feature is not available for the current access level. Please refer to a user who has the necessary permissions if the feature is required.

9.6.2.4 Import of a configuration file of vehicles and headlamps

The **Import vehicles and headlamps** button on the **USB** screen can be used to import a specific part of the Luminoscope® configuration that was previously stored on an *USB* stick to the Luminoscope® memory. This operation specifically imports the vehicles (*programs*) and headlamps (*tests*) with all their related parameters from the database, while excluding any other configuration parameter.

Attention: This feature is not available for the current access level. Please refer to a user who has the necessary permissions if the feature is required.

10 Setup screen

The **Setup** screen acts as a hub for a number of functions. Among others, it gives access to the following functions which are thoroughly explained in the upcoming chapters:

- Turn off or restart the Luminoscope®.
- Computer configuration of the Luminoscope®.
- Settings program menu.
- Verification menu.
- Calibration menu.

When powered up, the Luminoscope® displays the **Program selection** screen. Follow the navigation sequence below for reaching the **Setup** screen.

1. Tap on the **System** button 1 on the **Program selection** screen.

Note: The screen may have a different appearance depending on the customer's specific implementation.

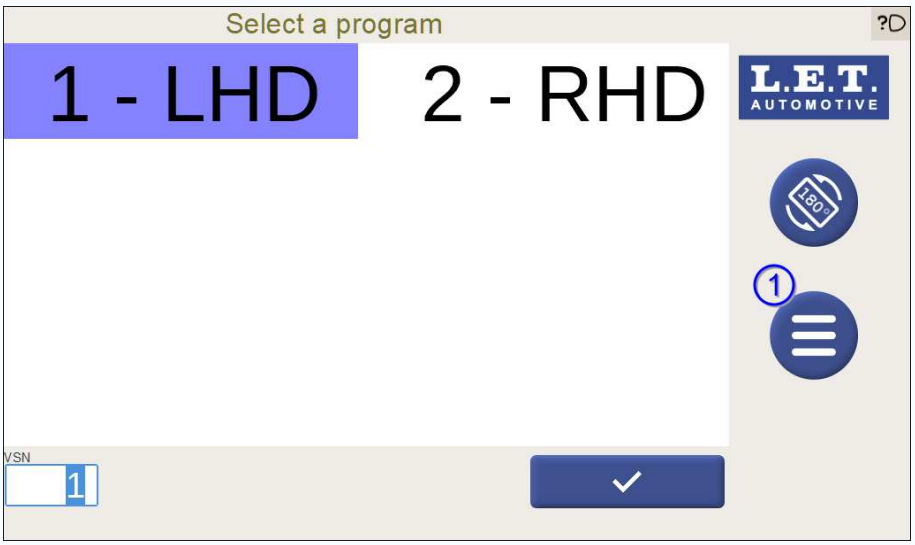

*Figure 86: **Program selection** screen with **System** button*

The **System** screen is now displayed.

2. Tap on the **Setup** button 2 on the **System** screen.

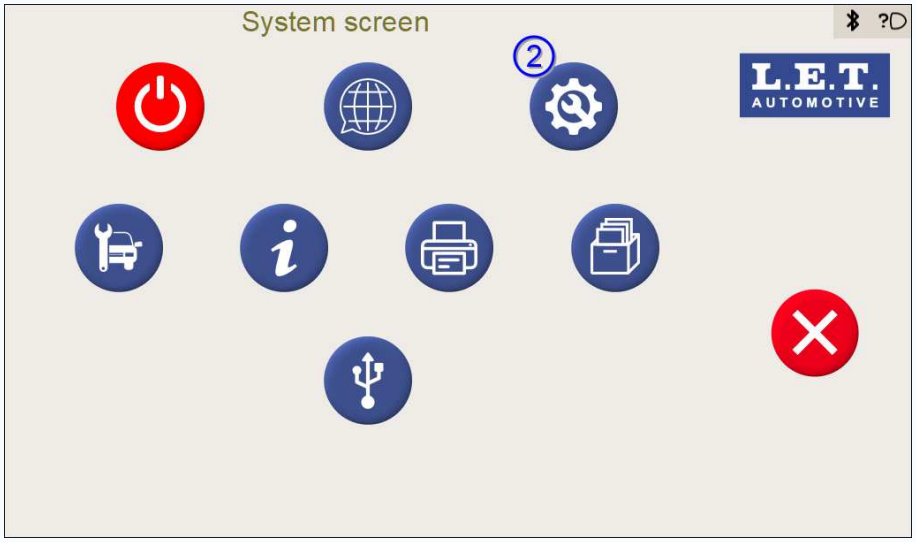

*Figure 87: **System** screen with **Setup** button*

The **Setup login** screen is now displayed.

3. Enter your credentials 3 and tap on the **Validation** button 4. Alternatively tap on the **Abort** button 5 to return to the **System** screen.

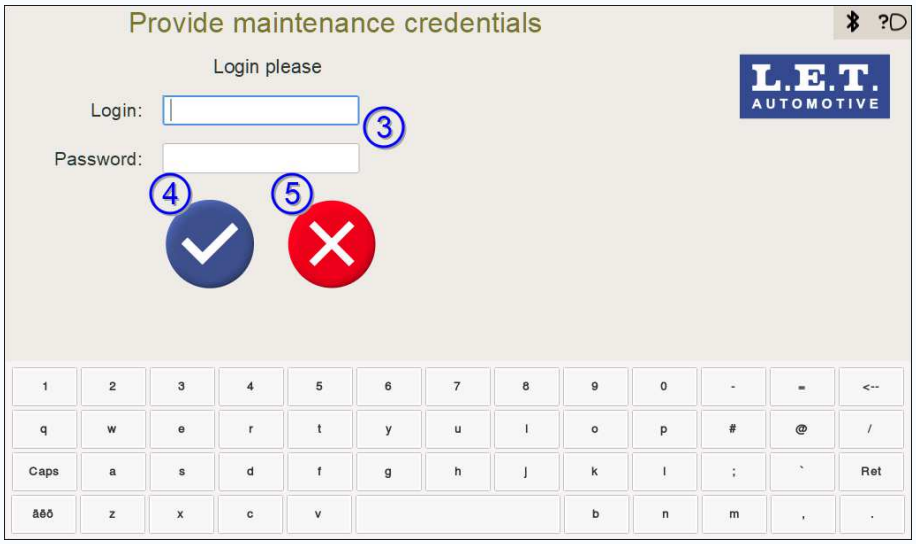

*Figure 88: **Setup login** screen*

The access to the different menus and their options is hierarchical and depends on the access rights of each login, which is identified with a password as follows:

Level	Login	Password	Description
Operator	1	1234	*Operator staff* working with the equipment.
Maintenance	2	Confidential	*Maintenance staff* and *production leaders* have access to most common functions except data related with vehicles and headlamps.
Process	3	Confidential	*Process staff* have additional access to data related to vehicles and headlamps.

Level	Login	Password	Description
Integrator	4	Confidential	*Third-party company* responsible for the integration of the Luminoscope® in a production or audit line.
LET Service Engineer	5	Confidential	LET Service Engineer.

Note:

This password is hard-coded and cannot be changed.

The following screen appears when either wrong or no credentials at all are introduced. In this case the **Setup** screen will be automatically displayed with very limited access rights.

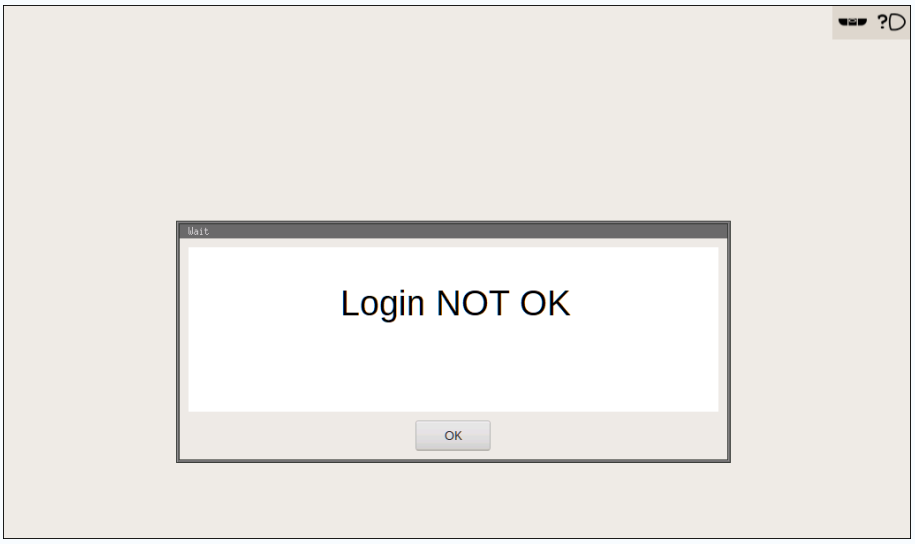

*Figure 89: **Login not OK** screen*

4. Choose one of the options on the **Setup** screen and tap on the corresponding button.

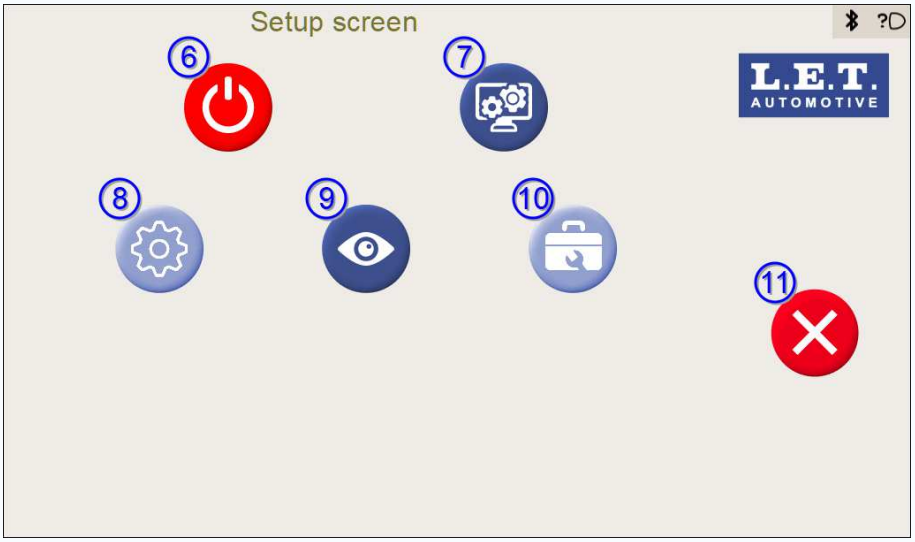

*Figure 90: **Setup** screen*

Note: The **Setup** screen, **Computer configuration** screen, **Settings program** screen, **Verification** screen and **Calibration** screen may have different appearances depending on the customer's specific implementation and the applied login level.

Consequently, probably not all functions listed in the table below are accessible.

#	Button	Description
6	**Power** button	Turn off or restart the Luminoscope®.
7	**Computer configuration** button	Amongst others, the **Computer configuration** screen gives access to the following functions: • Date and time setup • *Wi-Fi* setup • *Ethernet* setup • *Bluetooth* setup • *HDMI* monitor setup • Check for and apply available firmware updates • Log file information • Licensing information
8	**Settings program** button	The settings program (system database) provides access to the following items: • Vehicle parameters (programs) • Headlamp parameters (tests) • Component parameters • User parameters
9	**Verification** button	Among others, the **Verification** screen gives access to the following functions: • *Zero reference* verification • *Intensity* verification • *I/O* diagnostics: parallel, serial and Bluetooth • *System information* • *Position Check* verification • *ESL* (Electronic Spirit Level) module verification • *Light modulation* verification • *Electronic height measurement* verification • Battery verification • *CAN bus* modules verification
10	**Calibration** button	Among others, the **Calibration** screen gives access to the following functions: • Direct camera connection • *Zero reference* calibration • *Position Check* calibration • *ESL* (Electronic Spirit Level) module calibration • *Electronic height measurement* calibration • Battery calibration
11	**Abort** button	Return to the **Program selection** screen.

Related tasks

Computer configuration screen (pg. 111)

Related information

Power management (pg. 47)

11 Computer configuration screen

The **Computer configuration** screen acts as a hub for a number of functions. Among others, it gives access to the following functions, which are thorougly described in the upcoming chapters:

- Date and time setup.
- *Wi-Fi* setup.
- *Ethernet* setup.
- *Bluetooth* setup.
- External *HDMI* monitor setup.
- Check for and apply available firmware updates.
- Log file information.
- Delete log and result files.
- Licensing information.

The **Computer configuration** screen is reached via a button on the **Setup** screen. If needed, please check relevant link at the end of this chapter.

Starting from the **Setup** screen.

1. Tap on the **Computer configuration** button 1 of the **Setup** screen.

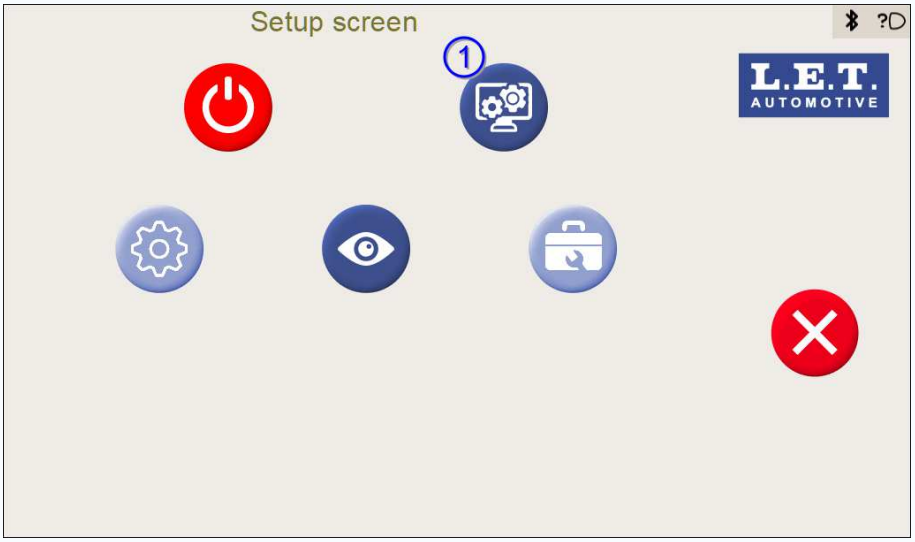

*Figure 91: **Setup** screen with **Computer configuration** button*

   The **Computer configuration** screen is now displayed.

2. Choose one of the options of the **Computer configuration** screen and tap on the corresponding button.

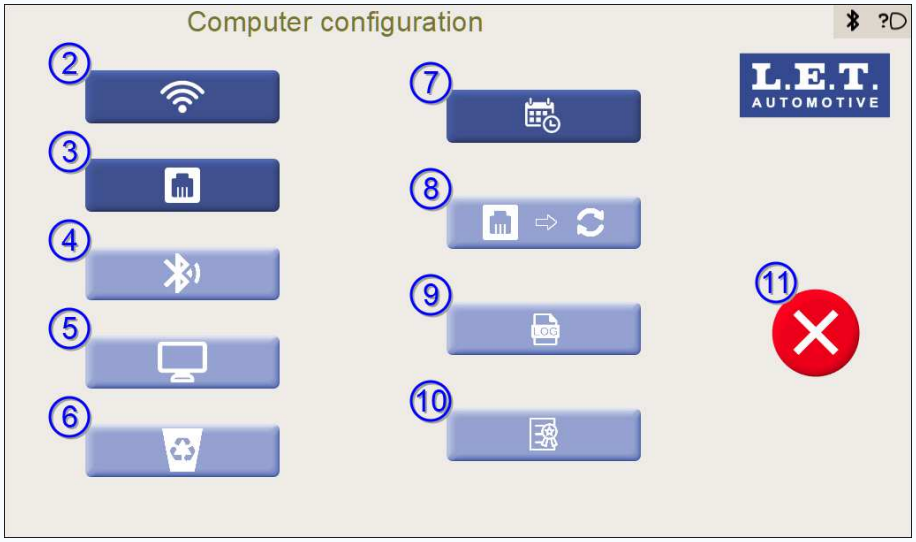

Figure 92: ***Computer configuration*** *screen*

Note: The screen may have a different appearance depending on the customer's specific implementation and the applied access level.

#	Button	Description
2	***Wi-Fi*** button	*Wi-Fi* connection setup.
3	***Ethernet*** button	Ethernet connection setup.
4	***Bluetooth*** button[1]	Bluetooth connection setup.
5	**External *HDMI* monitor** button[1]	External *HDMI* monitor setup.
6	**Delete logs and results** button[1]	Delete log and result files from the Luminoscope®.
7	**Date and time** button	Date and time setup.
8	**Online firmware update** button[1]	Check for and apply available firmware updates.
9	**View log** button[1]	Check log files.
10	**Licensing information** button[1]	Check software licensing info.
11	**Abort** button	Return to the **Setup** screen.

Related tasks

Setup screen (pg. 105)

[1] Function not available for the current access level.

11.1 Date and time setup

The **Date and time** button on the **Computer configuration** screen gives access to the menu to configure the date and time settings of the Luminoscope®.

Date and time settings can be achieved either manually or via an automatic synchronization over the network.

Starting from the **Computer configuration** screen.

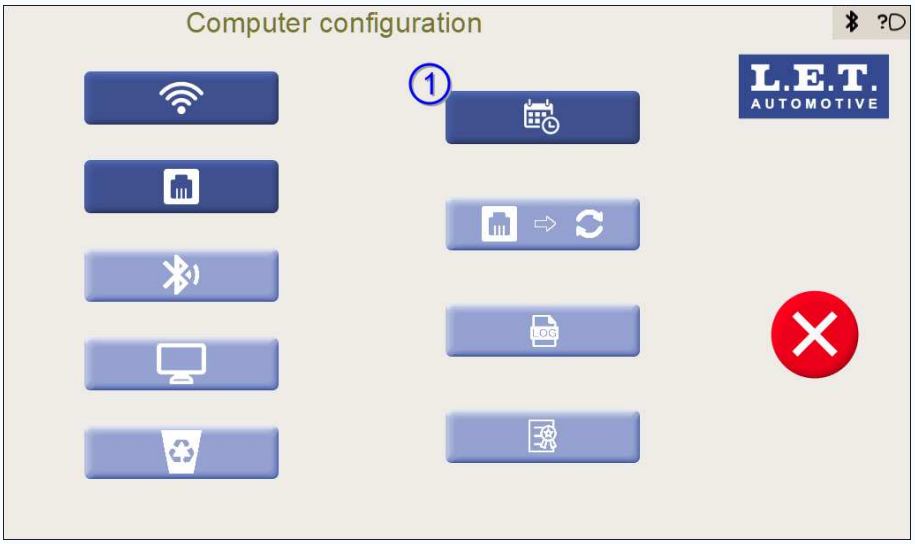

*Figure 93: **Computer configuration** screen with **Date and time** button*

1. Tap on the **Date and time** button 1 on the **Computer configuration** screen.

   The **Time zone settings** screen is now displayed.

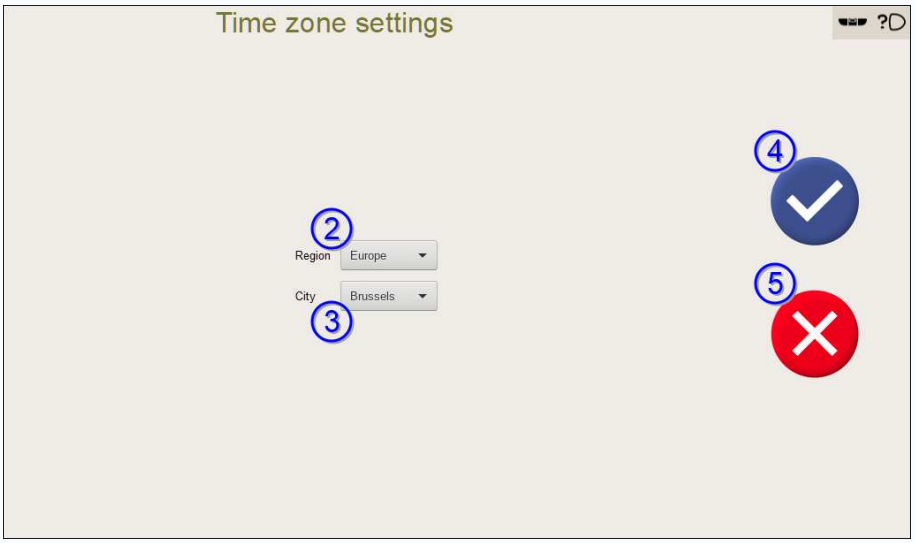

Figure 94: Time zone settings

2. Select the correct time zone region 2 and the nearest city 3 out from the list.

3. Tap on the **Save** button 4 to save the settings. Alternatively tap on the **Abort** button 5 to return to the **Computer configuration** screen.

11.1.1 Manual date and time setting

The Luminoscope® date and time can be set manually.

Start from the **Date and time setup** screen.

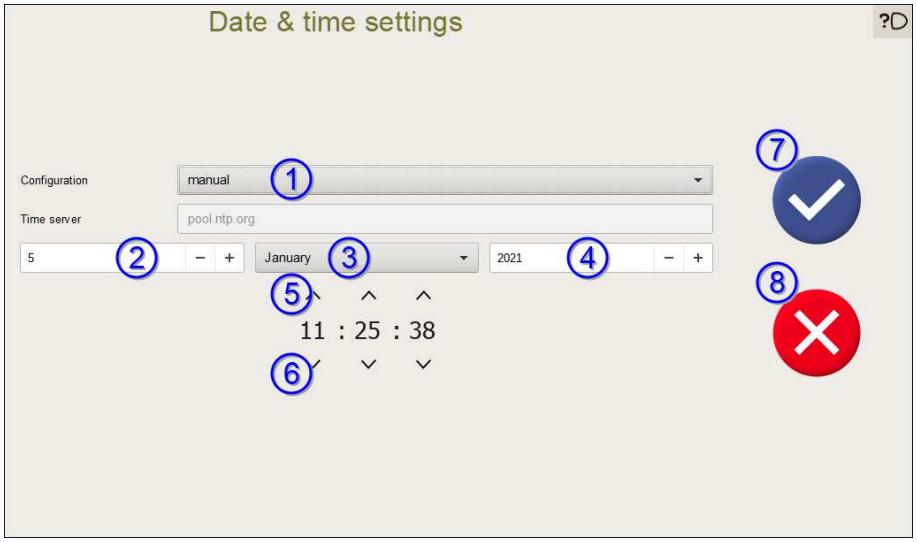

Figure 95: Manual date and time setup

1. Select **Manual** option from the **Configuration** menu 1.
2. Set the correct day 2, month 3 and year 4.
3. Set hour, minutes and seconds by using the corresponding up 5 and down 6 arrows.
4. Tap on the **Save** button 7 to save the settings. Alternatively tap on the **Abort** button 8 to return to the **Computer configuration** screen.

11.1.2 Automatic date and time setup

The Luminoscope® date and time can be set to automatically synchronize over the network.

Attention: The Luminoscope® must be connected to a network providing access to the *NTP* server which is to be used. Additionally, it also needs connectivity for a *DNS* server. Make sure the following ports of the selected servers are reachable:

- *NTP* server, port *UDP*/123.
- *DNS* server, port *UDP*/53 and port *TCP*/53.

Start from the **Date and time setup** screen.

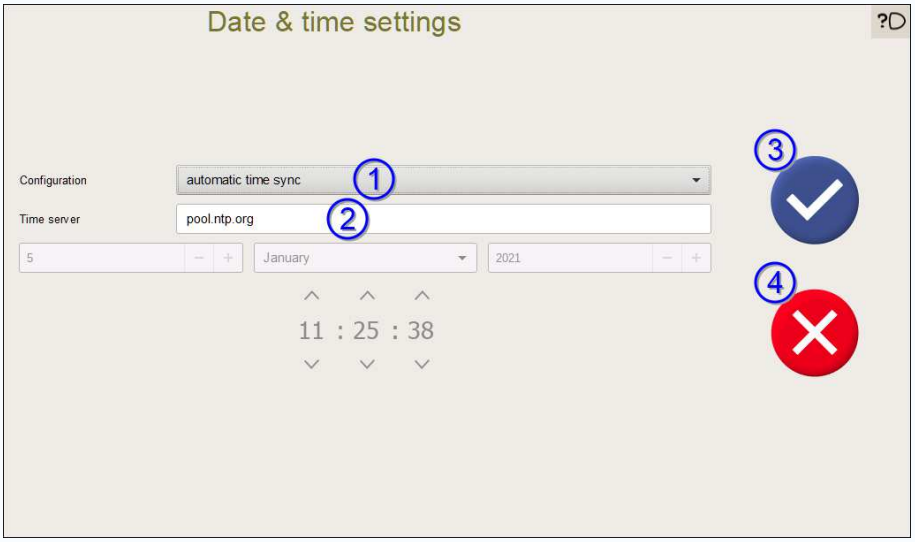

Figure 96: Automatic date and time setup

1. Select **Automatic time sync** from the **Configuration** menu 1.

   Note: The **Date and time settings** controls can no longer be changed manually.

2. Enter the name or address of the time server 2 (e.g. *pool.ntp.org*).

3. Tap on the **Save** button 3 to save the settings. Alternatively tap on the **Abort** button 4 to return to the **Computer configuration** screen.

11.2 *Wi-Fi* networking

The ***Wi-Fi*** button on the **Computer configuration** screen gives access to the configuration of the different *Wi-Fi* network operations and settings of the Luminoscope®.

The Luminoscope® *Wi-Fi* networking can operate in two different modes:

- **AP mode**, on which the Luminoscope® acts as a *Wi-Fi* local access point (*AP*). This mode doesn't provide any additional routing to other networks and is limited to the access to the Luminoscope® provided services. It is very convenient when there is no available *Wi-Fi* infrastructure on the site.
- **Regular mode**, connecting the Luminoscope® to an available *Wi-Fi* network via either *Dynamic Host Configuration Protocol* (*DHCP*) or specifying a static connection networking set of parameters.

Start from the **Computer configuration** screen.

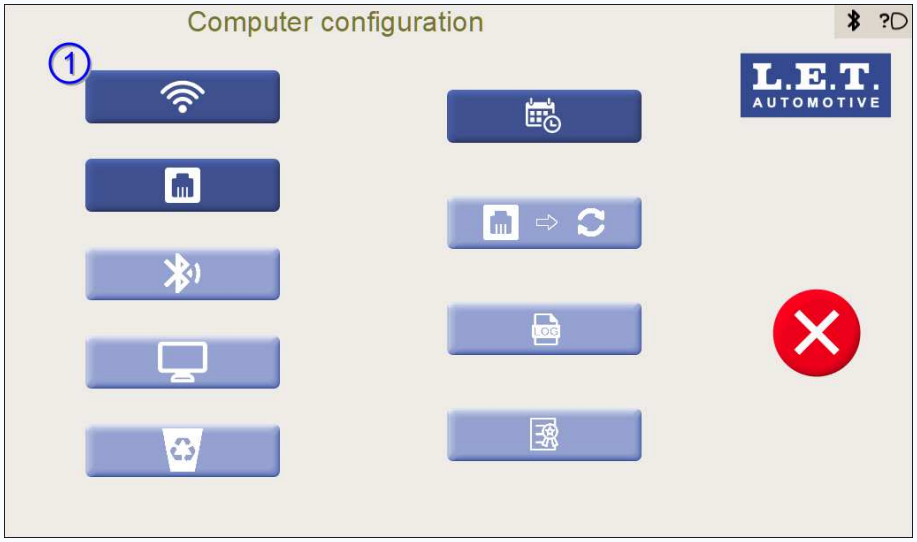

*Figure 97: **Computer configuration** screen with **Wi-Fi** button*

Tap on the ***Wi-Fi*** button 1 on the **Computer configuration** screen.

The **Wi-Fi settings** screen is now displayed and the **General info** tab is active.

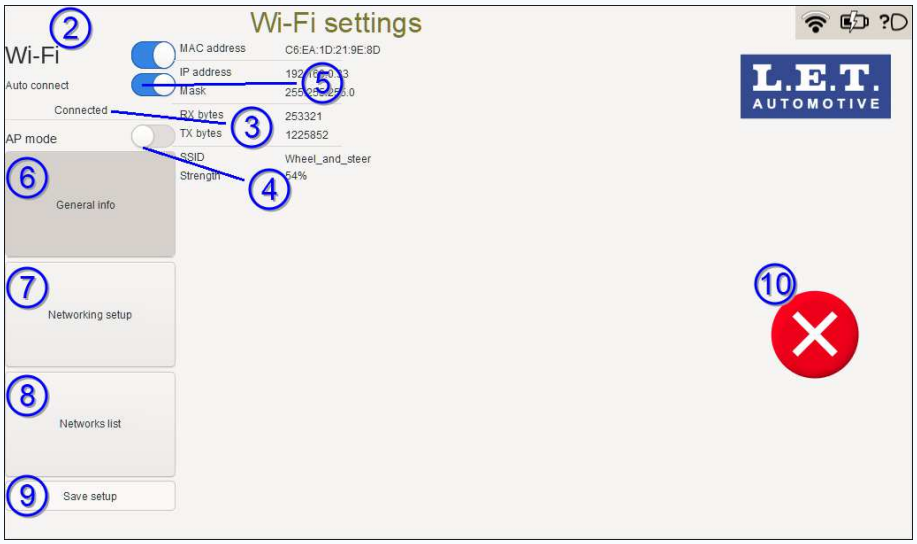

*Figure 98: **Wi-Fi settings** screen with general info*

Note: The screen may have a different appearance depending on the earlier applied *Wi-Fi* settings.

#	Name	Description
2	*Wi-Fi* **ON / OFF** switch	Enables or disables *Wi-Fi* communication.
3	**Connection status** indication	Shows if the wireless connection is currently stablished and usable.
4	**AP mode** switch	Controls the *Wi-Fi* networking working mode of the Luminoscope®, switching between *AP mode* and *Regular mode*.

#	Name	Description
5	***Wi-Fi* autoconnect** switch	Enables or disables automatic connection to the last *Wi-Fi* network.
6	**General info** tab	Provides access to the General information on the *Wi-Fi* communication: • MAC address of the physical interface • IP address of the Luminoscope® • Network Mask • RX bytes (number of received bytes) • TX bytes (number of transmitted bytes) • SSID (Service Set Identifier) • Signal strength
7	**Networking setup** tab	Provides access to the Network setup for the *Wi-Fi* configuration. • DHCP (Dynamic Host Configuration Protocol) ON/ OFF switch. In case DHCP is not selected: • IP address • Netmask • Gateway • DNS server
8	**Network list** tab	Provides access to a list of available *Wi-Fi* networks including the signal strength and the *Wi-Fi* protection type. It allows the operator to select the network to connect to.
9	**Save setup** button	Saves the current setup for being used upon a restart.
10	**Abort** button	Returns to the **Computer configuration** screen.

11.2.1 *Wi-Fi* applications

The applications of the *Wi-Fi* connection are among others:

- Remotely operating the Luminoscope®. This is achieved via the VNC-protocol access to the Luminoscope®. Both **AP mode** and **Regular mode** provide support for this application.
- Remotely accessing the configuration of the Luminoscope®, providing the eventual maintenance or technical staff with the possibility of completing their task from a suitable or adequate workplace. This is achieved via the VNC-protocol access to the Luminoscope®. Both **AP mode** and **Regular mode** provide support for this application.

  However, operations such *Remote Upload* or *Check for Updates* over network, for which the Luminoscope® needs internet access, cannot be completed unless the **Regular mode** is active.
- Integration of the Luminoscope® into an upper level network for sharing the inspection reports outcome data with a higher level system as technical registers, factories' SCADAs (*Supervisory Control and Data Acquisition*), databases and so on. The nature of these networking applications is better achieved with the **Regular mode** which purpose is more focused on a permanent connection.
- Remotely accessing the Web Interface of the Luminoscope®.

In all cases, any multimedia device (desktop, laptop, tablet, smartphone, etc.) can be used as the client for these activities.

Requirements are:

- Proper *Wi-Fi* connectivity
- VNC protocol client available

The upcoming chapters explain how the Luminoscope® can be switched between the described modes and how to manage the connection of the Luminoscope® to an available *Wi-Fi* network.

Related information

Remote operation (pg. 139)

11.2.2 Local Access Point setup

The Luminoscope® can be configured to act as a *Wi-Fi* local access point (*AP mode* for short).

Starting from the **Wi-Fi settings** screen.

1. Enable the *AP* mode by setting the **AP mode** switch 4 to its **ON** position.
   The Luminoscope® creates a *Wi-Fi* hotspot with the name `LuminoscopeAP`.
2. Tap on the **Save setup** button 9 to save the current settings and use them upon restart.
3. Connect a *Wi-Fi* equipped laptop to the hotspot `LuminoscopeAP`.
   Use the password `Luminoscope00` (with two trailing zeros) for that purpose.
4. Check the relevant link at the end of this chapter for a clear explanation on how to remotely control the Luminoscope® via a *VNC* client installed on a laptop.
5. Configure the Luminoscope® as required.
   Remotely complete the configuration of the different settings with the convenience and flexibility of the *Wi-Fi* network range.
6. Once finished, disable the *AP* mode by setting the **AP mode** switch 4 to its **OFF** position.
7. Tap on the **Save setup** button 9 to save the current settings and use them upon restart.

Related information

Remote operation (pg. 139)

11.2.3 Regular mode setup

The Luminoscope® can be connected to an available *Wi-Fi* network via either *Dynamic Host Configuration Protocol* (*DHCP*) or specifying a static connection networking parameter set.

Starting from the **Wi-Fi settings** screen.

Enable/disable the *Wi-Fi* communications:

1. Set the *Wi-Fi* **ON / OFF** switch 2 to the **ON** position to enable the *Wi-Fi* communications. Alternatively, set the switch to **OFF** to disable them.

2. Tap on the **Network list** tab 8.
   The **Wi-Fi networks List** screen is now displayed.

*Figure 99: **Wi-Fi networks List** screen without available networks*

3. Tap on the **Refresh** button 11 to show all available *Wi-Fi SSID*s (wireless network names) or to refresh the network list.

   The following screen is displayed:

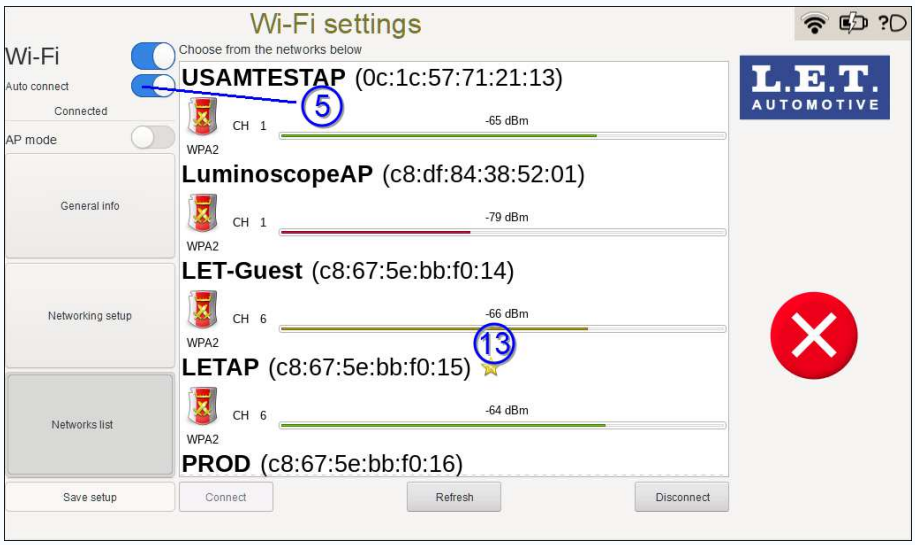

*Figure 100: **Wi-Fi networks List** screen with available Wi-Fi networks*

Note: The network list may have a different appearance and content depending on the available *Wi-Fi* networks and the customer's specific implementation.

A yellow star icon 13 signals the *Wi-Fi* network *SSID* to which the Luminoscope® is connected if so. Otherwise, there is no star icon associated to any network.

4. Activate the ***Wi-Fi* autoconnect** switch 5 in order to automatically connect to the last *Wi-Fi* network.

If it is needed to connect to another *SSID*:

5. Delete the current *Wi-Fi* connection setup initially by tapping on the **Disconnect** button 12 if already established.

6. Select the preferred *SSID* by tapping on it.
The selected network is highlighted.

Attention:

- Use the SSID with the strongest signal for which you have proper credentials.
- A stable and dependable *Wi-Fi* link will require a signal level stronger than -75dBm.
- *WPA2* protection is mandatory.

7. Tap on the **Connect** button 10 to connect to the selected *SSID*.
The following screen is displayed:

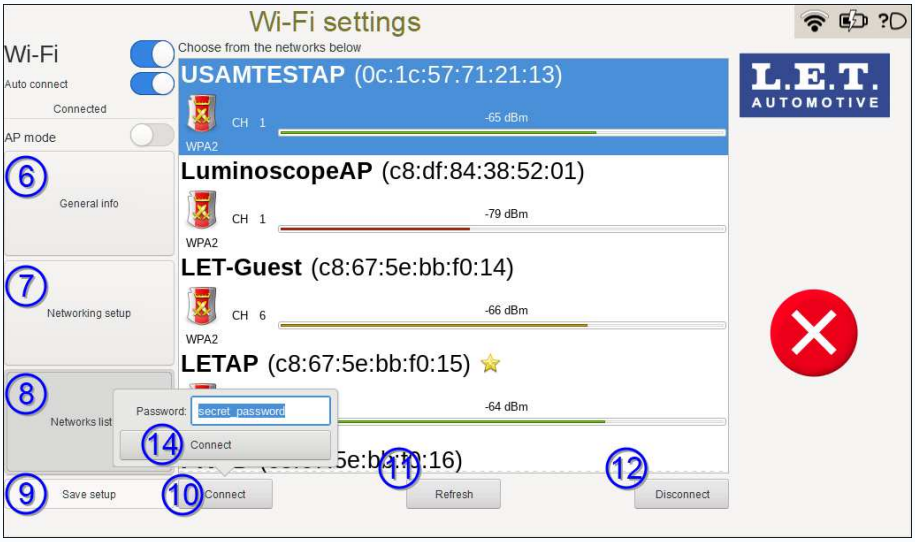

*Figure 101: **Wi-Fi networks List** screen with password entry*

8. Enter the *Wi-Fi* network password and tap on the **Connect** button 14 on the pop-up screen.

9. Tap on the **Save setup** button 9 to save the current settings and use them upon restart.

10. Tap on the **Refresh** button 11 to update the network list.

Note: The chosen network *SSID* is marked with a yellow star icon.

Recalling the data corresponding with the current connection:

11. Tap on the **General info** tab 6 to consult the info about the *Wi-Fi* communication.

- **MAC address**
- **IP address**
- **Netmask**
- **RX bytes** (Received bytes)
- **TX bytes** (Transmitted bytes)
- ***SSID*** (Service Set IDentifier i.e. wireless network name)
- Signal **Strength**

The following screen is displayed:

Figure 102: ***Wi-Fi networks List*** *screen with General info*

Accessing for modifying or querying the network details of the *Wi-Fi* connection:

12. Tap on the **Networking setup** tab 7 to modify the *Wi-Fi* info.
The following screen is displayed:

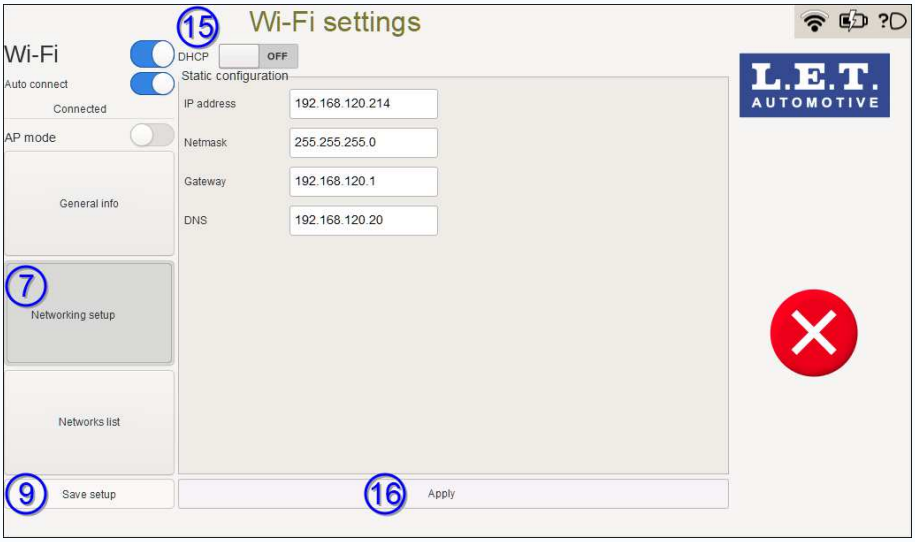

*Figure 103: **Wi-Fi networks List** screen with network configuration*

The networking parameters can be set manually or automatically via *DHCP*.

Obtaining network parameters automatically via *DHCP*:

13. Set the ***DHCP*** switch 15 to **ON** to let the Luminoscope® adjust the network parameters without manual intervention.
The Luminoscope® dialogs with the *DHCP* server to obtain the applicable set of networking parameters and they are updated on the display fields.

14. Tap on the **Apply** button 16 to apply the new values to the current connection.

15. Tap on the **Save setup** button 9 to save the current settings and use them upon restart.

Setting the network parameters manually:

16. Set the ***DHCP*** switch 15 to **OFF** to manually enter the networking parameters.
Depending on the specific network setup, it may be interesting to set manually the network parameters.

17. Set the correct network values.
Carefully enter the proper valid values for:

- **IP address**
- **Netmask**
- **Gateway**
- **DNS**

18. Tap on the **Apply** button 16 to apply the new values to the current connection.

19. Tap on the **Save setup** button 9 to save the current settings and use them upon restart.

11.3 *Ethernet* networking

The ***Ethernet*** button on the **Computer configuration** screen gives access to the configuration of the *Ethernet* network operations and settings of the Luminoscope®.

Note: Some Luminoscope® optical blocks are provided with the optional *Ethernet* port on their connector plate. The settings underneath may not be of application for your specific Luminoscope®.

Starting from the **Computer configuration** screen.

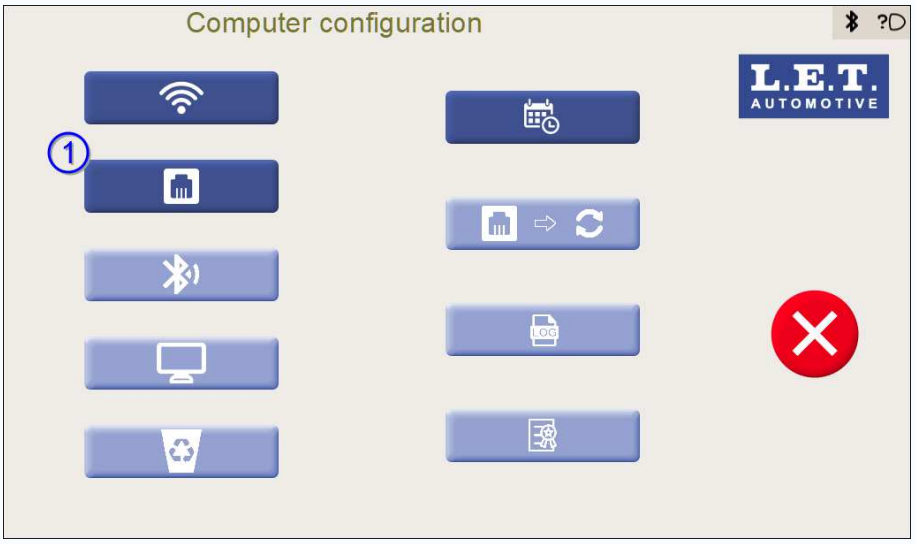

*Figure 104: **Computer configuration** screen with **Ethernet** button*

Tap on the ***Ethernet*** button 1 on the **Computer configuration** screen.

The **Ethernet settings** screen is now displayed and the **General info** tab is active.

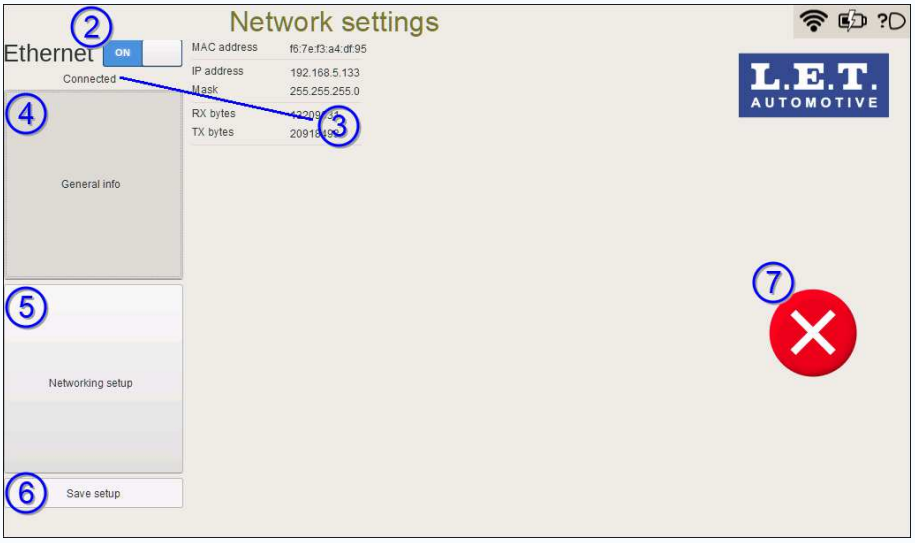

*Figure 105: **Ethernet settings** screen with general info*

Note: The screen may have a different appearance depending on the earlier applied *Ethernet* settings.

#	Name	Description
2	*Ethernet* **ON / OFF** switch	Enables or disables the *Ethernet* communication.
3	**Connection** status indicator	Shows if the *Ethernet* wired connection is currently established and usable.
4	**General info** tab	Provides access to the General information on the *Ethernet* communication configuration: • MAC address of the physical interface • IP address of the Luminoscope® • Network Mask • RX bytes (number of received bytes) • TX bytes (number of transmitted bytes)
5	**Networking setup** tab	Provides access to the Network setup for the *Ethernet* configuration. • DHCP (Dynamic Host Configuration Protocol) ON/OFF switch. In case DHCP is not selected: • IP address • Netmask • Gateway • DNS server
6	**Save setup** button	Saves the current setup for being used upon restart.
7	**Abort** button	Returns to the **Computer configuration** screen.

11.3.1 *Ethernet* applications

The applications of the *Ethernet* connection are among others:

- Remotely operating the Luminoscope®. This is achieved via the VNC-protocol access to the Luminoscope®.
- Integration of the Luminoscope® into an upper level network for sharing the inspection reports outcome data with a higher level system as technical registers, factories' SCADAs (*Supervisory Control and Data Acquisition*), databases and so on.
- Remotely accessing the Web Interface of the Luminoscope®.

In all cases, a desktop or a laptop computer can be used as the client for these activities.

Requirements are:

- Proper *Ethernet* connectivity
- VNC protocol client available

The upcoming chapter explains how to manage the connection of the Luminoscope® to an available *Ethernet* network.

Related information

Remote operation (pg. 139)

11.3.2 Ethernet setup

The Luminoscope® can be connected to an available *Ethernet* network via either *Dynamic Host Configuration Protocol* (*DHCP*) or specifying a static connection networking parameter set.

Starting from the **Ethernet settings** screen.

Enable/disable the *Ethernet* communications:

1. Set the *Ethernet* **ON / OFF** switch 2 to the **ON** position to enable the *Ethernet* communications. Alternatively set the switch to **OFF** to disable them.

   The **Connection** status indicator 3 reflects the changes on the network connection availability.

Recalling the data corresponding with the current connection:

2. Tap on the **General info** tab 4.

   The following screen is displayed:

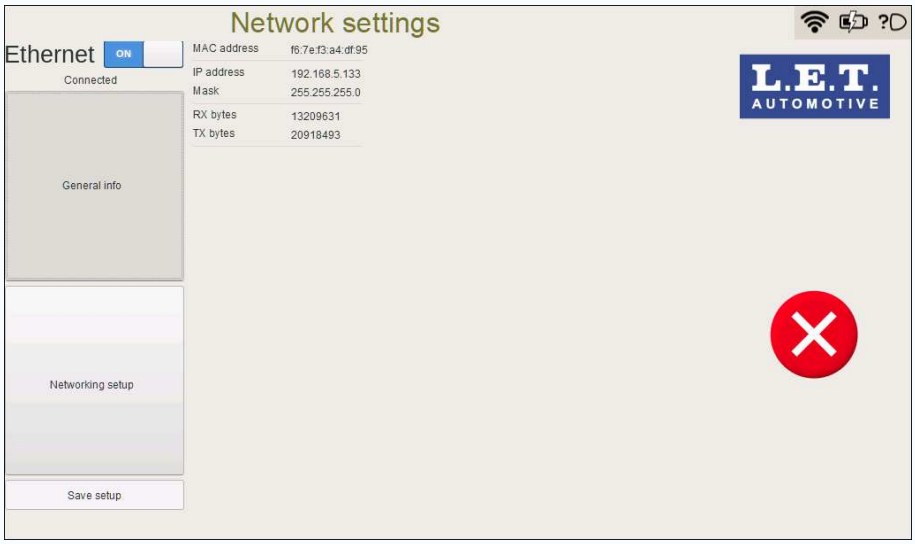

*Figure 106: **Ethernet settings** screen with **General info** tab*

The currently applied network parameters can be reviewed:

- **MAC address** of the physical interface
- **IP address** of the Luminoscope®
- **Network mask**
- **RX bytes** (Received bytes)
- **TX bytes** (Transmitted bytes)

Obtaining network parameters automatically via *DHCP*:

3. Tap on the **Networking setup** tab 5.

   The following screen is displayed:

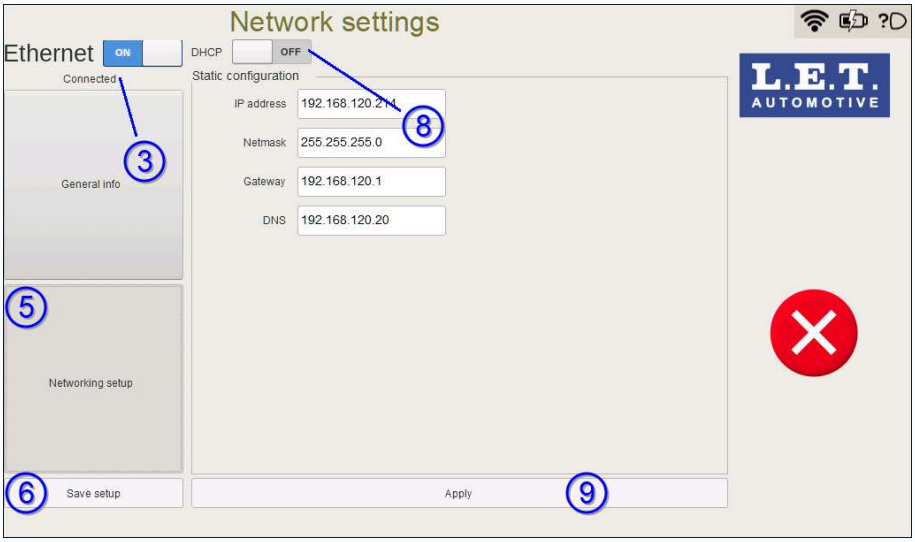

*Figure 107: **Ethernet settings** screen with **Networking setup** tab activated changing DHCP status*

4. Set the ***DHCP*** switch 8 to **ON** to let the Luminoscope® adjust the network parameters without manual intervention.

The Luminoscope® dialogs with the *DHCP* server to obtain the applicable set of network parameters so it can communicate efficiently with other network connected devices. *DHCP* also assigns the subnet mask, default gateway address, domain name server (*DNS*) address and other pertinent configuration parameters.

Of course, the network to which the Luminoscope® is connected must count with an appropriately configured *DHCP* server.

Once the IP address is assigned, the rest of inputs (IP address, Netmask, Gateway and DNS) are updated with the obtained values and disabled.

5. Tap on the **Apply** button 9 to apply the new values to the current connection.

Once the values are correct and the network connection is established, the **Connection** status indicator 3 is updated.

6. Tap on the **Save setup** button 6 to save the current settings and use them upon restart.

Setting the network parameters manually:

7. Set the ***DHCP*** switch 8 to **OFF** to manually enter the network parameters.

The Luminoscope® requires a set of network parameters so it can communicate efficiently with other network connected devices.

8. Set the correct network values.

Carefully enter the proper valid values for:

- **IP address**
- **Netmask**
- **Gateway**
- **DNS**

9. Tap on the **Apply** button 9 to apply the new values to the current connection.

Once the values are correct and the network connection is established, the **Connection** status indicator 3 is updated.

10. Tap on the **Save setup** button 6 to save the current settings and use them upon restart.

12 APS (Automatic Positioning System)

The *APS* (Automatic Positioning System) controls all movements of the Luminoscope® system. There are a number of topics related to the *APS* that are all collected below.

12.1 *APS* components and functional description

The following chapter explains the basic components and functional description of the *APS* (Automatic Positioning System).

The *APS* consists of several main components (sensors, actuators, etc). The heart of the *APS* is the *APS* circuit board which is located in the yellow cabinet on the trolley base. This circuit board communicates over *CAN bus* with the control panel of the Luminoscope®.

The next *APS* components are present on an FM (Floor Mounted) Luminoscope® system:

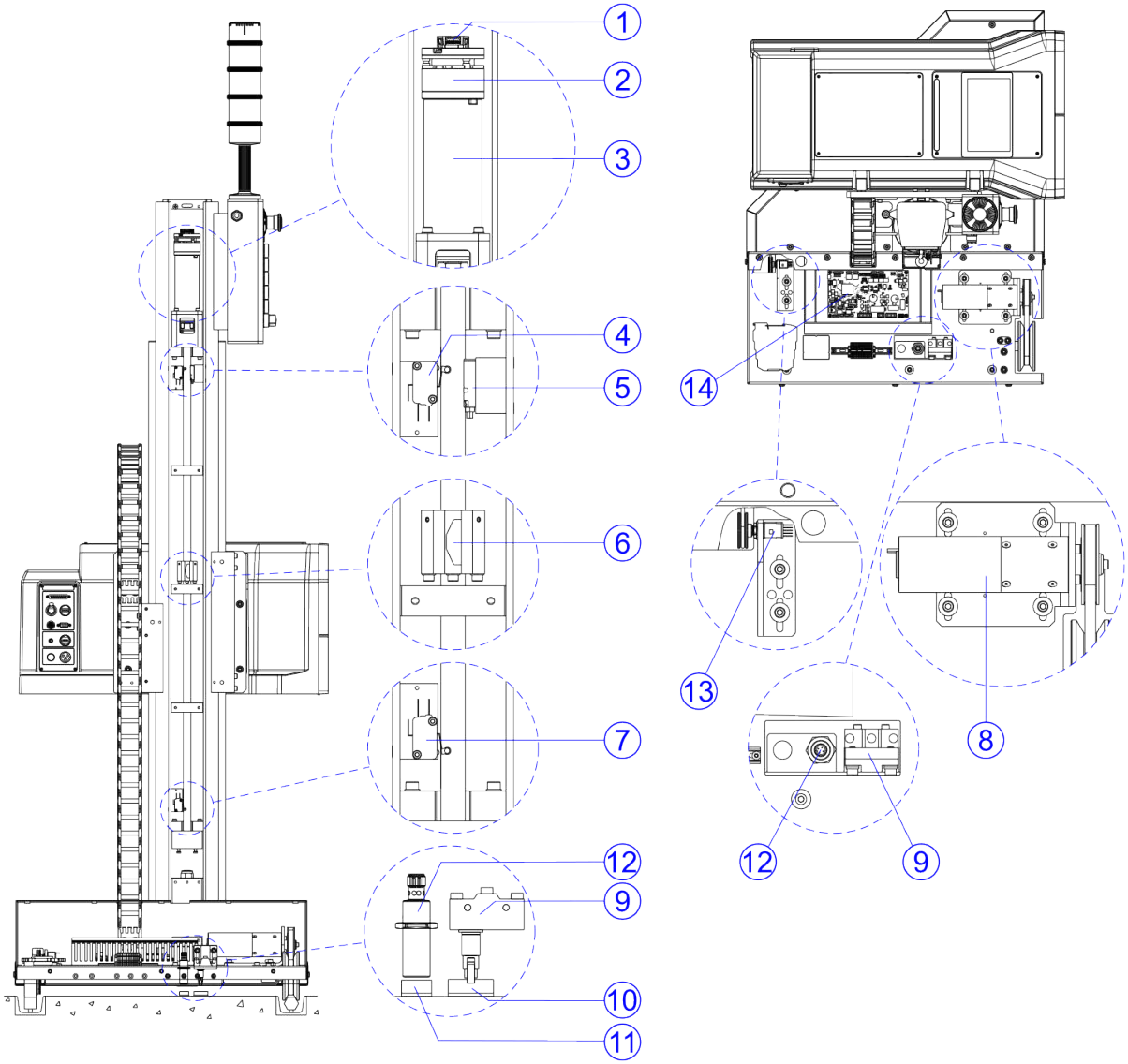

Figure 108: APS (Automatic Positioning System) components on an FM system.

Note: The device could look slightly different depending on the customer's specific configuration.

#	Description	#	Description
1	Encoder attached to the electric motor for the vertical movement.	2	Brake on the electric motor for the vertical movement.
3	Electric motor for the vertical movement.	4	Hardware limit switch at the highest position for the vertical movement.
5	Zero proximity switch for the vertical movement.	6	Actuator for the hardware limit switches for the vertical movement and for the zero proximity switch for the vertical movement.
7	Hardware limit switch at the lowest position for the vertical movement.	8	Electric motor for the horizontal movement.
9	Hardware limit switch for the horizontal movement.	10	Detection bar for the hardware limit switch for the horizontal movement (one at each end position of the rails).
11	Detection bar for the zero proximity switch for the horizontal movement.	12	Zero proximity switch for the horizontal movement.
13	Encoder for the horizontal movement.	14	*APS* (Automatic Positioning System) circuit board.

Note:

- The horizontal (L/R) direction is also called the X-direction.
- The vertical (U/D) direction is also called the Z-direction.

12.1.1 Electric motors

The following chapter provides a brief explanation of the electric motors of the *APS*.

The *APS* circuit board 14 controls both the electric motor for the horizontal movement 8 of the system as the electric motor for the vertical movement 3 of the optical block.

The electric motor for the horizontal movement 8 drives one of the two V-wheels of the trolley base by means of a transmission belt.

The electric motor for the vertical movement 3 drives a long spindle in the stand. The vertical sliding table on which the Luminoscope® optical block is attached, is mechanically connected to the spindle. This enables the vertical movements of the optical block.

12.1.2 Encoders

The following chapter provides a brief explanation of the encoders of the *APS*.

Both movement directions have an encoder for a precise determination of the actual horizontal and vertical position of the system. The encoder for the horizontal movement 13 is coupled by means of a transmission belt to the rear flat wheel of the trolley base. The encoder for the vertical movements 1 is coupled directly to the axis of the electric motor for the vertical movement 3.

12.1.3 Zero routines

The following chapter provides a brief explanation of the zero routine of the *APS*.

At the initial start-up phase of the system (also called a cold start), the absolute zero position of both movement directions need to be determined. This is done during the automatic zero routine. For this purpose there are two zero proximity switches with their own actuators available.

Zero routine for horizontal movement:

The system slowly moves towards its zero position on the rails. This can be to the left or to the right, depending on the customer's specific configuration. At a certain moment, the zero proximity switch 12 in the trolley base is activated by the zero detection bar 11 on the floor. The digital counter for the horizontal movement is now set to zero. From now on, the encoder for the horizontal movement 13 can determine the absolute horizontal position of the system.

Note: The zero routine frequency is tunable (e.g. after a number of test cycles, after each test cycle, etc).

Zero routine for vertical movement:

The system slowly moves upwards to its zero position. At a certain moment, the zero proximity switch 5 in the stand is activated by the actuator 6 which is connected to the vertical sliding table. The digital counter for the vertical movement is now set to zero. From now on, the encoder for the vertical movement 1 can determine the absolute vertical position of the system.

Note: The zero routine frequency is tunable (e.g. after a number of test cycles, after each test cycle, etc).

12.1.4 Hardware limits

The following chapter provides a brief explanation of the hardware limits of the *APS*.

The *APS* is equipped with some hardware limit switches to stop the horizontal and vertical movement immediately in case of an anomaly, where the system would reach an end-of-range position. For this purpose there are tree hardware limit switches with their own actuators available.

Hardware limit for horizontal movement:

At the left and right end position of the rails, a detection bar 10 is attached to the floor at a strategically chosen place. The hardware limit switch in the trolley base 9 can be activated by one of the two detection bars 10. In case the Luminoscope® system reaches one of the end positions of the rails, the hardware limit switch 9 is activated. In this exceptional situation, the power of the electric motors is turned off immediately and the system cannot move any further. This is an emergency stop situation and the position is called a horizontal hardware limit position.

Hardware limit for vertical movement:

Inside the stand there are two hardware limit switches 4 and 7 (micro switches), one at the highest position for vertical movement and one at the lowest position for vertical movement. Both micro switches can be activated by the actuator 6 inside the stand. In this exceptional situation, the power of the electric motors is turned off immediately and the system cannot move any further. This is an emergency stop situation and the position is called a vertical hardware limit position.

12.1.5 Software limits

The following chapter provides a brief explanation of the software limits of the *APS*.

To prevent the system of moving to any hardware limit position, there are some software limit positions configured. The software limit positions are typically at a position which is close to the hardware limit position but slightly before that position. In normal circumstances, the system should not move further than the software limit positions.

12.1.6 Vertical brake

The following chapter provides a brief explanation of the vertical brake of the *APS*.

To prevent the optical block from dropping down when the electric motor for the vertical movement 3 is not operated, the brake on the vertical electric motor 2 is automatically controlled by the *APS* circuit board 14. As soon as the electric motor for the vertical movement 3 is driven, the brake is released.

12.1.7 Tracking error

The following chapter provides a brief explanation of a tracking error of the *APS*.

The electric motors are driven by the *APS* circuit board (output). The encoders detect the displacement of the system and report this to the *APS* circuit board (input). This is a closed loop regulation principle. If the *APS* circuit board does not receive an input signal of the encoders or if multiple encoder pulses get lost during the movement, the system movement will stop and a tracking error will be generated. This can be the case if for example the horizontal movement of the system is obstructed.

Note: The sensitivity of the tracking error detection is tunable.

12.1.8 Safety circuit

The following chapter provides a brief explanation of the safety circuit of the *APS*.

Note: This safety circuit is optional for the SAM 2035.

The *APS* circuit board also controls an optional relay circuit with a **Start** button and an **Emergency stop** button for safety purposes (called the safety circuit). A signal tower on top of the stand is also part of the safety circuit. The signal tower has a green light (indicating the system ready status), red light (for emergency or warning purposes) and a buzzer.

Note: The function of the lights and buzzer depends on the customer's specific implementation.

12.1.9 In- and output signals

The following chapter provides a brief explanation of the in- and output signals of the *APS*.

There are some in- and output signals available on the *APS* circuit board for controlling other devices (e.g. the signal tower on the stand, hold signal to stop all movements of the system) as well as other in- and output signals.

Note: The function of the in- and output signals depends on the customer's specific implementation.

12.1.10 *Height detection bar*

The following chapter provides a brief explanation of a *Height detection bar* of the *APS*.

The *Height detection bar* is vertically attached to the stand and has sixteen light sensitive photo cells (with a spacing of 58 mm) for scanning the rough position of the beam source. The photo cells are directly connected to the *APS* circuit board.

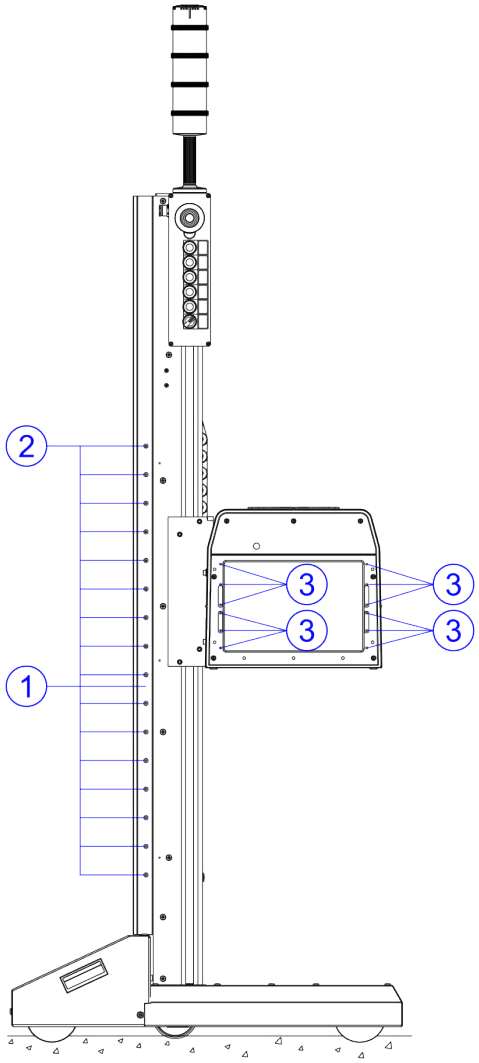

Figure 109: Height detection bar on a FM system

Note: The device could look slightly different depending on the customer's specific configuration.

#	Description
1	*Height detection bar*.
2	Photo cells of *Height detection bar*.
3	Photo cells of electronic *Position Check* system.

The sixteen light sensitive photo cells 2 of the *Height detection bar* 1 can detect the beam of a headlamp if they are positioned in front of the beam.

A *Height detection bar* is typically used in an inspection station environment where the physical position of the headlamps is less predictable than in a car factory environment. As the position of the beam of a random vehicle in an inspection station is unknown, the *APS* first makes a rough scan in the zone where the beam should be approximately located. This zone is called the search zone. The stand moves from one side of the search zone to the other side and enables the height detection bar to scan for any light of the beam.

At a certain horizontal position of the *Height detection bar* in front of the beam, there will be an intensity peak on one or more cells of the *Height detection bar*. The horizontal position of the system can be exactly determined by the encoder for the horizontal movement, so the rough horizontal position of the beam can be determined.

Depending on the amount of light on each photo cell, the rough mounting height of the headlamp can be determined. The photo cell of the *Height detection bar* that detects an intensity peak will approximately have the same height as the mounting height of the headlamp.

If the scan sequence has finished, the *APS* system drives the optical block towards the rough beam position. After that the electronic *Position Check* system, which uses twelve photo cells 3 around the lens, positions the lens of the optical block at the most optimal position in front of the headlamp. After that the headlamp beam measurement can start.

Note: There are different scan sequences (also called lamp search sequences) available (e.g. search each lamp separately, search each lamp group separately, no searching, etc).

12.1.11 *APS* circuit board

The heart of the *APS* (Automatic Positioning System) is the *APS* circuit board which is located in the yellow cabinet on the trolley base. This circuit board communicates over *CAN bus* with the control panel of the Luminoscope®.

The *APS* circuit board has some diagnostic LED's and movement buttons available which are explained in the following chapters.

12.1.11.1 Diagnostic LED's

The following chapter explains the functionality of the thirteen consecutive diagnostic LED's on top of the *APS* circuit board.

X-ZPX	X-ENC	X-LIM	X-TRA	X-TMP	Z-ZPX	Z-ENC	Z-LIM	Z-TRA	Z-TMP	HLD	WDG	CAN
(X0)	(XEN)	(XLM)	(XTR)	(XTM)	(Z0)	(ZEN)	(ZLM)	(ZTR)	(ZTM)	(HLD)	(WDG)	(CAN)

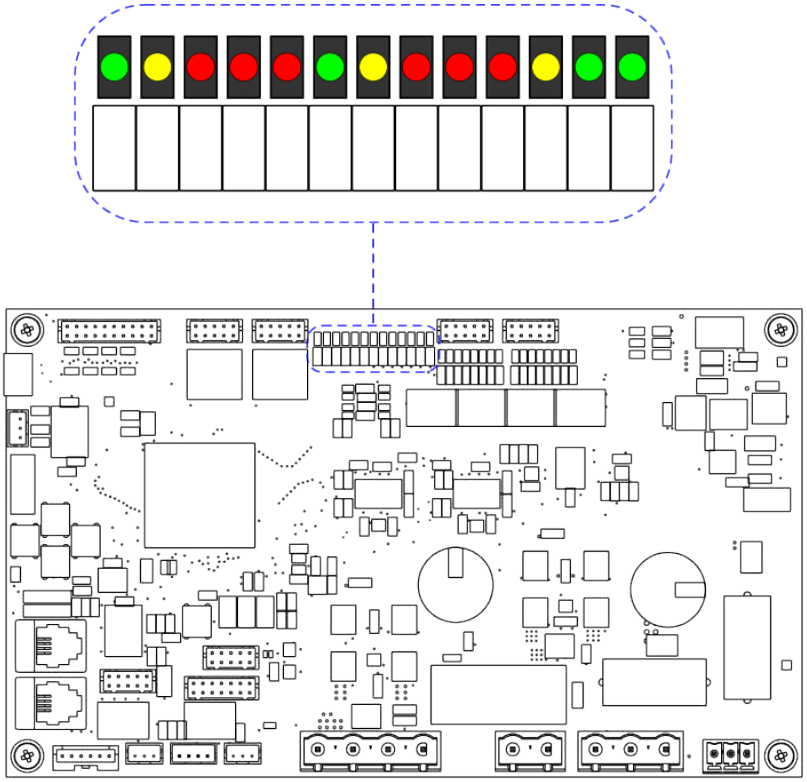

Figure 110: Diagnostic LEDs on APS circuit board.

Aside each LED there is a marking with a functional description.

Note:

- The horizontal (L/R) direction is also called the X-direction.
- The vertical (U/D) direction is also called the Z-direction.

Diagnostic LED's for horizontal movement:

Marking	Function	Description
X-ZPX (X0)	X-zero position	On if the zero proximity for the horizontal movement is activated.
X-ENC (XEN)	X-encoder	Blinks if the encoder for the horizontal movement is operated.
X-LIM[1] (XLM)	X-limit	On if the hardware limit switch for the horizontal movement is operated.
X-TRA[1] (XTR)	X-tracking error	On if a tracking error occurs during the horizontal movement.
X-TMP[1] (XTM)	X-temperature overflow	On if the bridge temperature of the horizontal motor controller module is too high.

Diagnostic LED's for vertical movement:

[1] A blinking RED LED indicates that the error situation occurred but has been resolved.

Marking	Function	Description
Z-ZPX (Z0)	Z-zero position	On if the zero proximity for the vertical movement is activated.
Z-ENC (ZEN)	Z-encoder	Blinks if the encoder for the vertical movement is operated.
Z-LIM[1] (ZLM)	Z-limit	On if one of the two hardware limit switches for the vertical movement is operated.
Z-TRA[1] (ZTR)	Z-tracking error	On if a tracking error occurs during the vertical movement.
Z-TMP[1] (ZTM)	Z-temperature overflow	On if the bridge temperature of the vertical motor controller module is too high.

General diagnostic LED's

Marking	Function	Description
HLD	Hold	On if the hold signal is active. The hold signal stops all movement on the system and is an input signal on the *APS* circuit board.
WDG	Watch dog	Blinks when the watch dog is running.
CAN	*CAN* mode	On if the *APS* circuit board is in operational mode. Blinking if the *APS* circuit board is in pre operational mode.

Related information

APS components and functional description (pg. 129)

12.1.11.2 Movement buttons

The following chapter explains the functionality of a group of four push buttons at the *APS* circuit board for manual operation of the movement of the *APS*.

Attention:

- The four push buttons can only be used for manual operation of the movement, if the *APS* is in manual mode.
- The four push buttons should only be used for recovering from the vertical or horizontal hardware limit position or for diagnostic purposes.

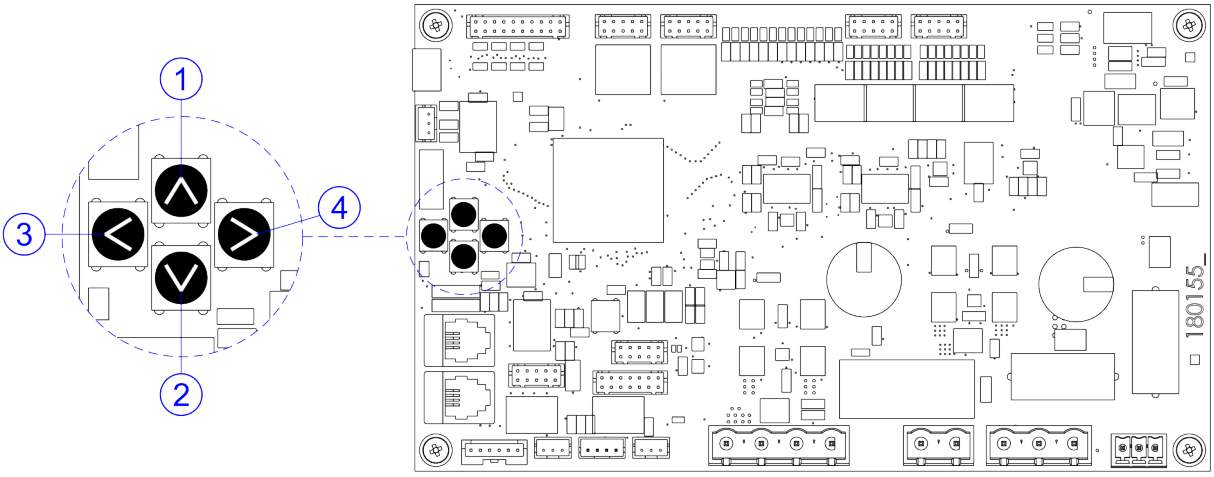

Figure 111: Generic representation of the movement buttons on the APS circuit board.

#	Description
1	Move the optical block upward.
2	Move the optical block downward.
3	Move the system to the left.
4	Move the system to the right.

Attention: Watch the orientation of the *APS* circuit board to push the correct movement button

The following procedure can be executed to get into the manual mode:

1. Turn off the optical block.
2. Push the **Emergency stop** button.
3. Release the **Emergency stop** button.
4. Push the **Start** button on the control box module.

Note: The manual mode is disabled as soon as the system starts a normal zero routine.

Related information

APS components and functional description (pg. 129)
Power management (pg. 47)

13 Remote operation

This chapter explains how to connect a remote device (tablet, smartphone, laptop, desktop, ...) to the Luminoscope® over *Wi-Fi* in order to remotely control the Luminoscope®.

The instructions below require a *VNC* client to be installed on the remote device, and that both the Luminoscope® and the remote device are properly connected to the corresponding *Wi-Fi* access points of the network, allowing mutual IP access.

Note:

- The following instructions can be applied to any platform which has a *VNC* client installed.
- The present explanation refers to an *Android* tablet using the freely available *bVNC* application. Neither of the *VNC* client or the remote device are exclusively supported by the Luminoscope®.

Note: The screen displayed on the tablet may have a different appearance depending on customer's specific implementation.

Figure 112: Luminoscope® *screen displayed on a tablet*

13.1 VNC client setup

Note: The following instructions refer to the *bVNC* application and will be similar but not identical for any other client. Take also into account that the *bVNC* application appearance may differ to the one depicted below.

1. Locate the *IP* address 1 of the Luminoscope® on the **System information** screen that is accesible via the **System** screen.

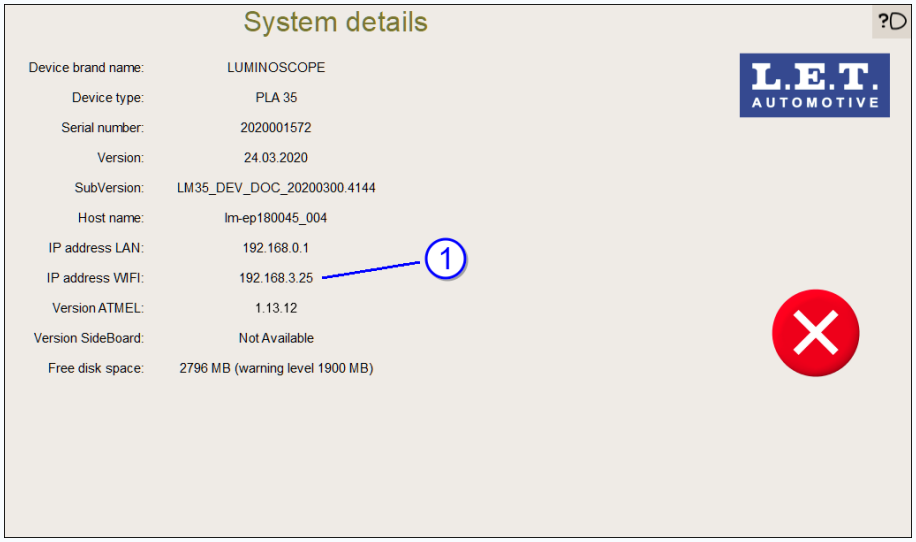

*Figure 113: **System information** screen displaying the Wi-Fi IP address*

2. Write down the *IP* address.
It will be used in an upcoming step.

3. Open the *bVNC* application 2 on the tablet.

Figure 114: bVNC icon on tablet screen

Eventually, the next message or a similar one is displayed.

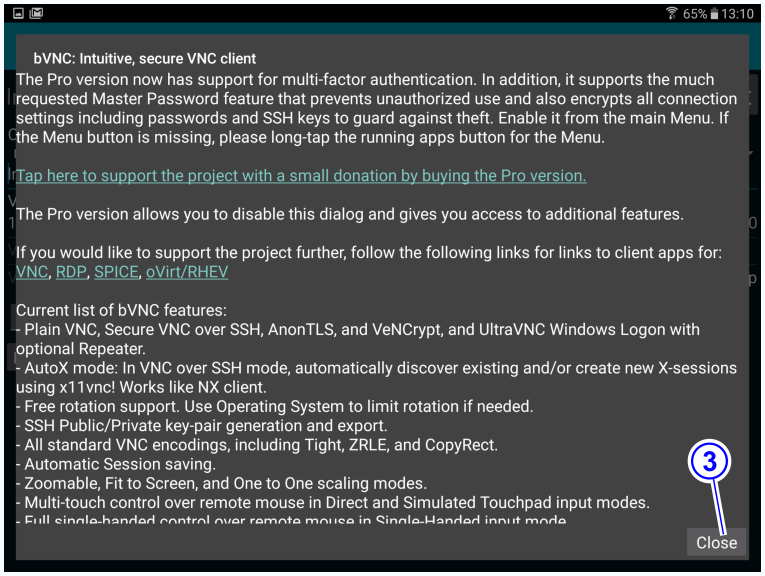

Figure 115: bVNC application message

4. Tap on the **Close** button 3.

   The following screen is displayed.

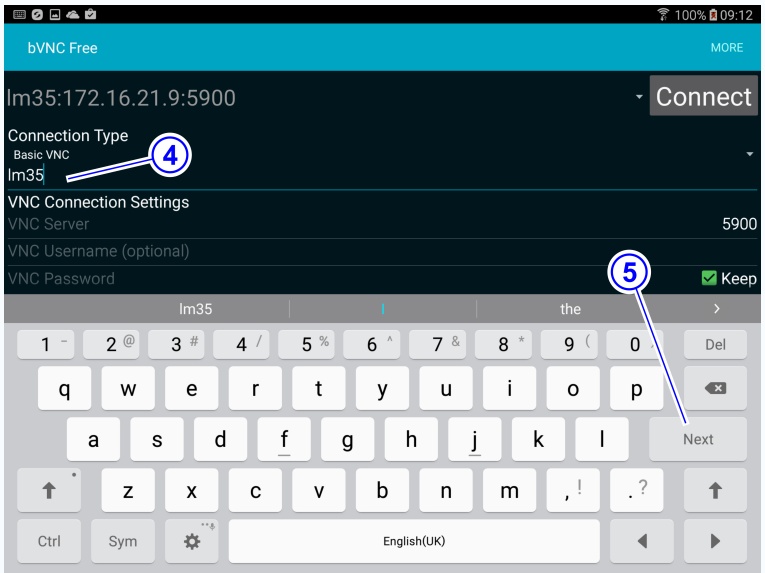

Figure 116: Connection name in the bVNC application

5. Enter a name for identifying the connection 4 (e.g. **lm35**).

6. Tap on the **Next** button 5.

   The following screen is displayed.

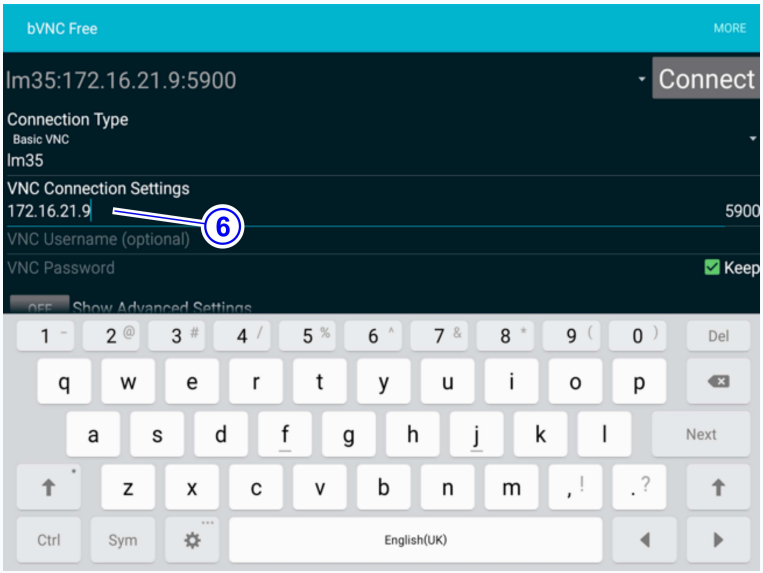

Figure 117: Luminoscope® *IP address in the bVNC application*

7. Enter the IP address of the *Wi-Fi* connection of the Luminoscope® 6 (e.g. **172.16.21.9**).

8. Enter the hardcoded password 7 to complete the configuration.
   Use ***Luminoscope*** as the *VNC* password.

Note: No *VNC* username is required.

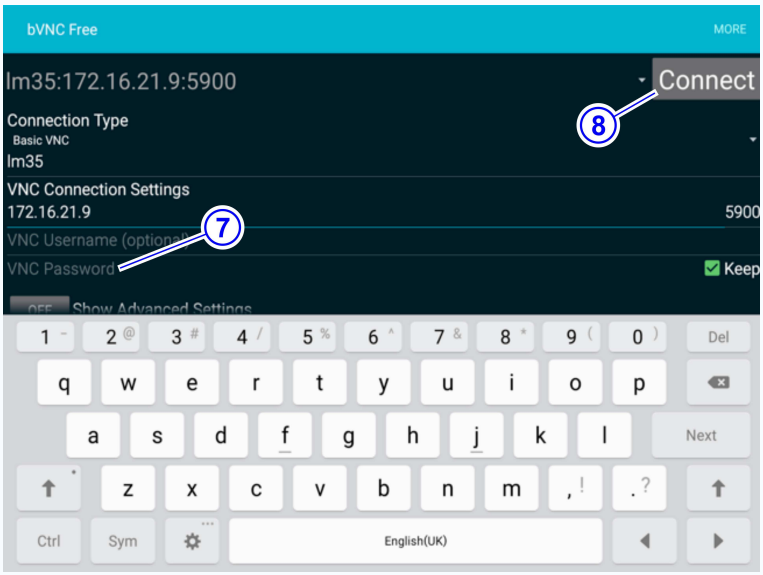

Figure 118: VNC connection password in bVNC application

9. Tap on the **Connect** button 8.

A copy of the Luminoscope® screen appears on the tablet screen and the system can now be remotely controlled.

Related tasks

System information of the Luminoscope (pg. 87)

13.2 Terminate the session

Once the interaction with the Luminoscope® is no longer needed, it is advisable to properly terminate the session.

Note: The following instructions are specific for the *bVNC* application on an *Android* tablet, but the same functionality is available for any other platform and *VNC* client.

Starting from the connected *bVNC* application.

Figure 119: Invoke the bVNC application auxiliary buttons

1. Tap anywhere out from the Luminoscope® screen image 1 on the tablet to invoke the overlay auxiliary buttons of the *bVNC* application.

   The following screen is displayed.

Figure 120: ***Dotted icon*** *button*

2. Tap on the **dotted icon** button 2 to invoke the pop-up configuration menu of the *bVNC* application.

   The following screen is displayed.

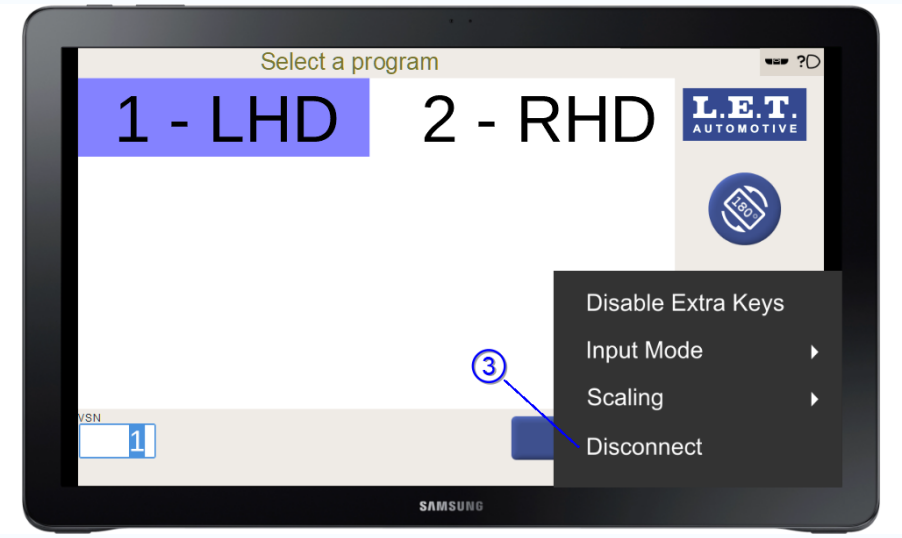

Figure 121: bVNC pop-up configuration menu

Note: The shape and layout of the pop-up configuration menu may differ from yours.

3. Tap on the **Disconnect** button 3 of the pop-up of the *bVNC* application.
   The link between both device's displays is now terminated.

14 Web interface

This chapter explains how to operate the *web interface* of the Luminoscope® on a remote device (tablet, smartphone, laptop, desktop, …). The remote device should have a *web browser* (e.g. Google Chrome, Firefox, …) for accessing the *web interface*.

The *web interface* has many functions. Among others, it gives access to the following functions which are thoroughly explained in the upcoming chapters:

- Check the contact information of LET Automotive.
- Upload a logo on the *PDF* test reports.
- Check and/or print the *PDF* test reports.
- Export the configuration file (backup file) of the Luminoscope®.
- Check or modify some settings in the Luminoscope®.
- Check the log files of the Luminoscope®.
- Check the stored camera images of the Luminoscope®.
- Check the stored screenshots of the Luminoscope®.
- Remotely operate the Luminoscope®.

Note:

- Both the Luminoscope® and the remote device should be properly connected to the same network (*LAN* or *Wi-Fi*), allowing mutual IP access. At the end of the chapter there is a link with related information on how to connect the Luminoscope® to a *Wi-Fi* network or *Ethernet* network.
- Some Luminoscope® optical blocks are provided with an optional *Ethernet* port on the connector plate. Consequently the *web interface* should be accessed over *Wi-Fi* if the Luminoscope® has no *Ethernet* port.

The access to the options in the *web interface* is hierarchical and depends on the access rights of each login, which is identified with a password as follows:

Level	Login	Password	Description
Operator	1	1234	*Operator staff* working with the equipment.
Maintenance	2	Confidential	*Maintenance staff* and *production leaders* have access to most common functions except data related with vehicles and headlamps.
Process	3	Confidential	*Process staff* have additional access to data related to vehicles and headlamps.
Integrator	4	Confidential	*Third-party company* responsible for the integration of the Luminoscope® in a production or audit line.
LET Service Engineer	5	Confidential	LET Service Engineer.

Note:

This password is hard-coded and cannot be changed.

14.1 Access to the *web interface*

The following instructions explain how to access the *web interface* of the Luminoscope® either via the *LAN IP* address; *Wi-Fi IP* address or *host name* of the Luminoscope®. The *web interface* will appear in the *web browser* of a remote device.

1. Open the **System information** screen that is accessible via the **System** screen.

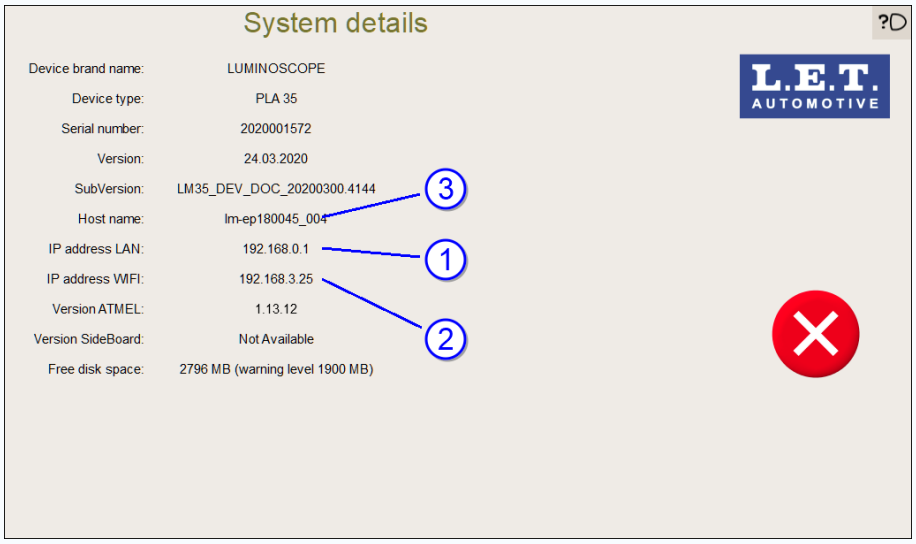

*Figure 122: **System information** screen with system details for web connection*

2. Locate the *LAN IP* address 1 (if applicable), the *Wi-Fi IP* address 2 or the *host name* 3.

3. Enter the corresponding address in any of these forms, in the navigation bar of a web browser of a remote device, prepended with the protocol scheme (`http://`).

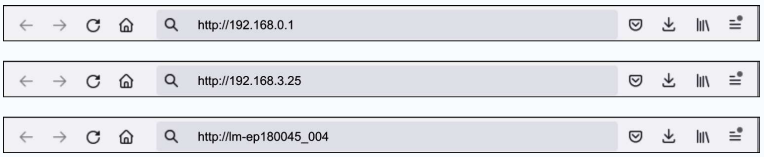

Figure 123: Browser navigation bar pointing to the LAN IP address, the Wi-Fi IP address and the hostname of the Luminoscope®*, from top to bottom*

4. Tap on the **Enter** button on the remote device.

   The **Web interface main** screen is now displayed:

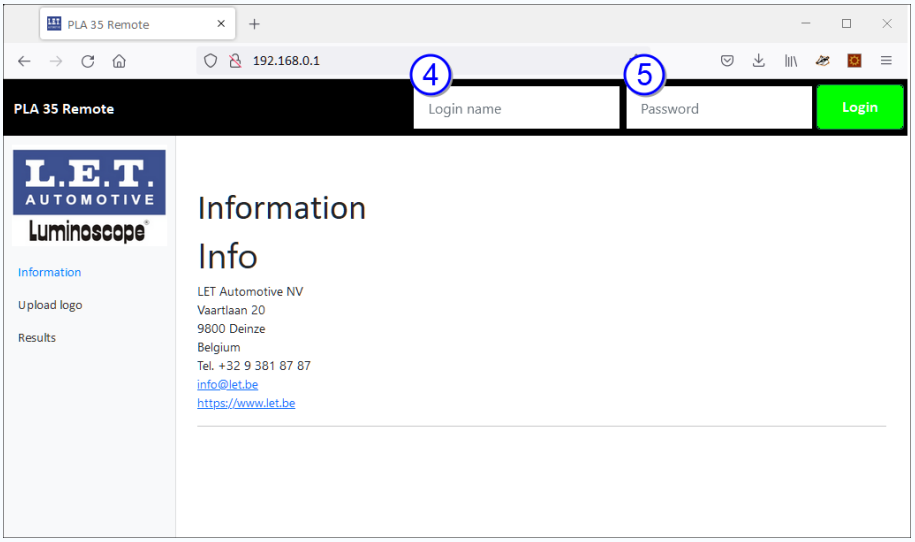

*Figure 124: **Web interface main** screen*

Note: It's recommended to create a shortcut in the web browser, for easily connecting to the Luminoscope® *web interface*.

5. Enter the login name 4 and password 5 in order to enable more functions of the *web interface*.

Use the table above to select the proper login and password for the corresponding access level.

The following screen is now displayed:

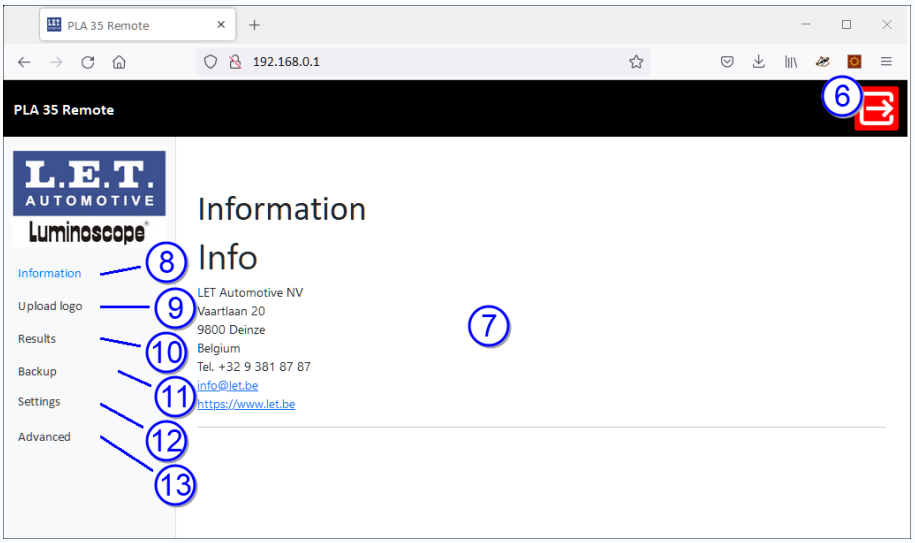

*Figure 125: **Web interface main** screen*

The following information fields, selection fields and buttons are available.

#	Element	Description
6	**Logout** button	Logout from the *web interface*.
7	**Information** field	*LET Automotive* contact information.

#	Element	Description
8	**Information** link	Displays *LET Automotive* contact information.
9	**Upload logo** link	Upload a logo (in *PNG* format) for the *PDF* test reports.
10	**Results** link	Check and/or print the *PDF* test reports.
11	**Backup** link	Export the configuration file (backup file) from the Luminoscope® to a remote device.
12	**Settings** link	Check and/or modify some settings of the Luminoscope®: Customer settings: Name, Address, Phone, E-mail.
13	**Advanced** link	Access the advanced settings of the Luminoscope®: • Check the log files. • Check the stored camera images. • Check the stored screenshots. • Remote operation.

The following chapters explain the different functionalities of the *web interface*.

After logging in with the applicable password, the user has access to more functions of the *web interface*. From now on the session is called an *authorized session*.

Related tasks

Wi-Fi networking (pg. 115)
Ethernet networking (pg. 123)

14.2 Upload a customer logo for the *PDF* test reports

This chapter explains how to upload a logo (in *PNG* format) to be displayed, centered on top of the *PDF* test reports in the *web interface*.

Starting from the **Web interface main** screen in an authorized session.

Note: This functionality can also be achieved by a user which has not been logged in.

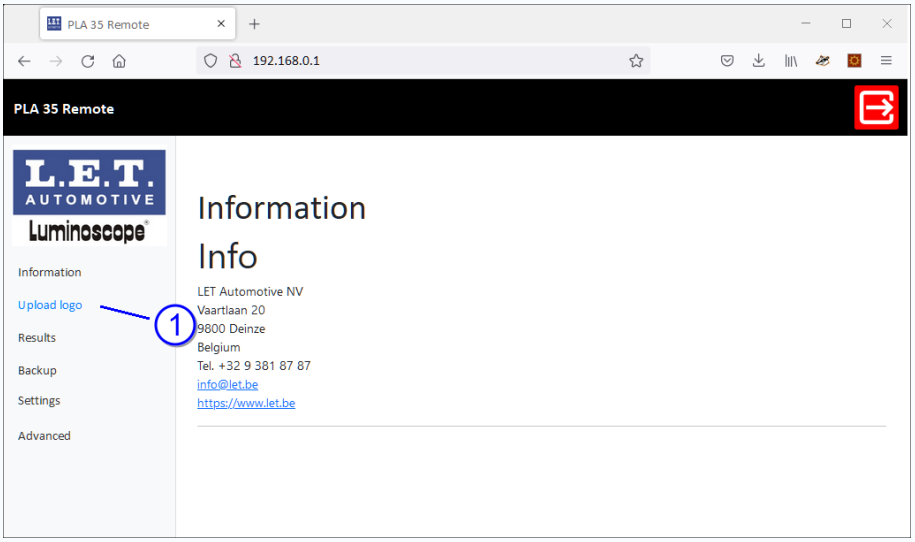

*Figure 126: **Web interface main** screen in an authorized session*

1. Click on the **Upload logo** link 1 on the **Web interface main** screen.
   The following screen is now displayed:

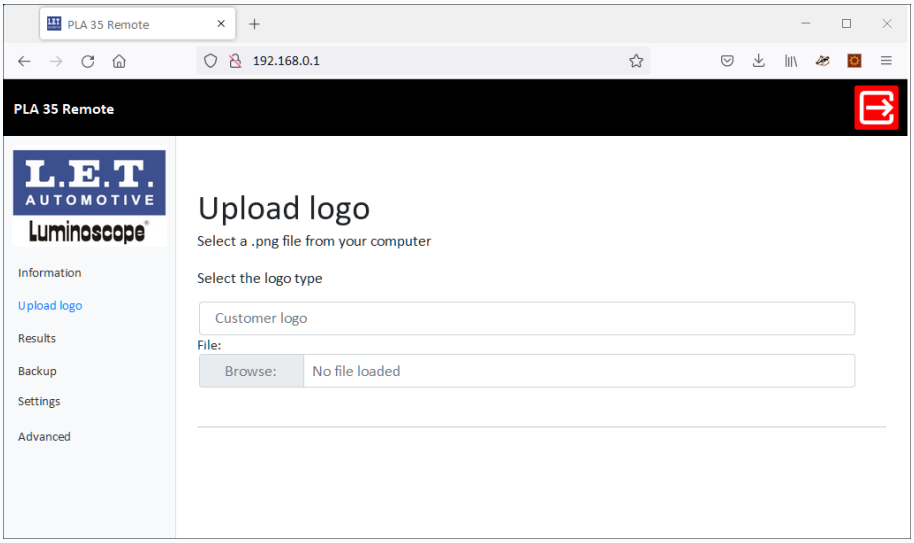

*Figure 127: **Upload logo** screen*

2. Browse to a customer logo (*PNG* format) and store the image to the Luminoscope®.
   The customer logo will now be shown centered on top of each *PDF* test report.

14.3 Check and/or print the *PDF* test reports

This chapter explains how to check and/or print the *PDF* test reports in the *web interface*.

Starting from the **Web interface main** screen in an authorized session.

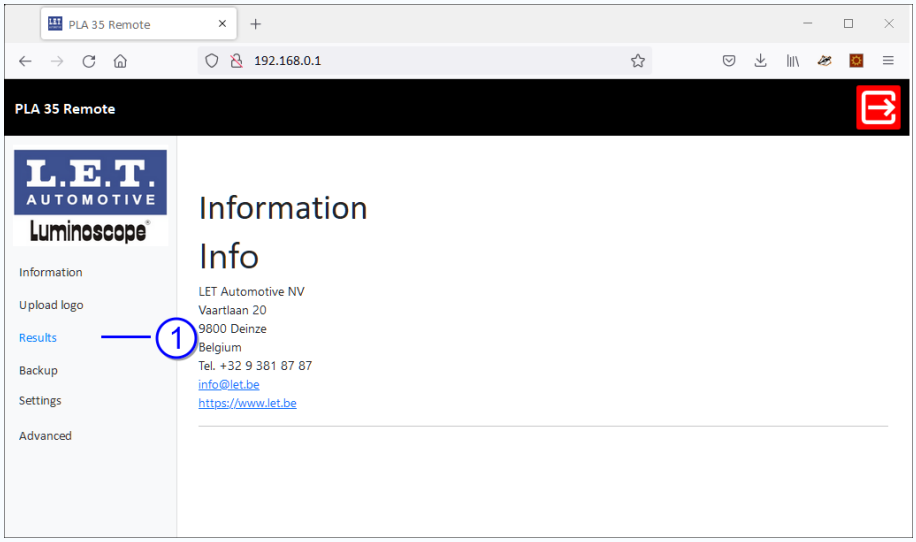

*Figure 128: **Web interface main** screen in an authorized session*

1. Click on the **Results** link 1 on the **Web interface main** screen.
   The following screen is now displayed:

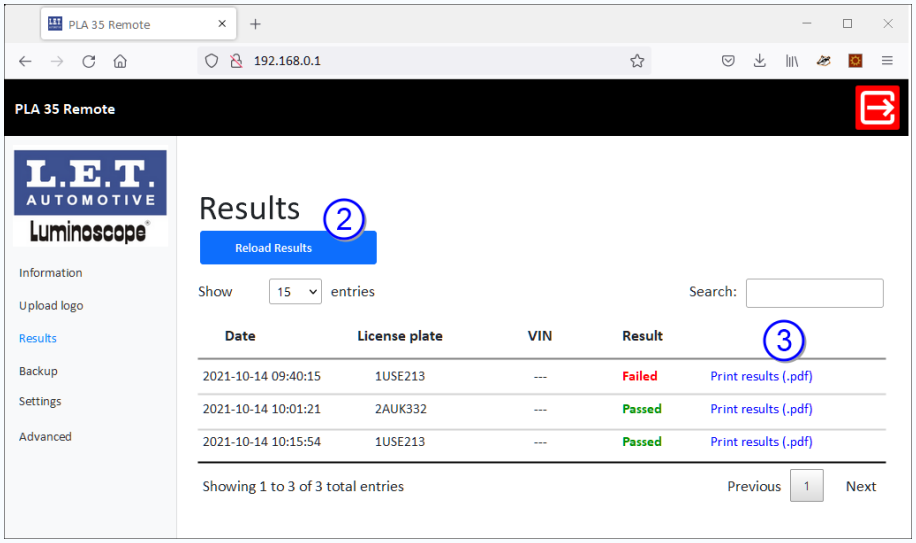

*Figure 129: **Results** screen*

   The screen shows a list of all available test results. The test results can be split into different tab pages. Each entry shows the date and time, number plate (if applicable), VIN (vehicle identification number - if applicable) and the global result (passed or failed) of a test result.

2. Click on the **Print results** link 3 of a test result.
   The *PDF* test report is now displayed in an extra tab page in the web browser. The *PDF* test report can be downloaded and then stored locally or printed on a local printer.

3. Tap on the **Reload results** button 2 for checking the availability of more test results.
   All available test results are now displayed.

14.4 Export the configuration file of the Luminoscope®

This chapter explains how to export a configuration file (backup file) from the Luminoscope® to a remote device via the *web interface*.

Starting from the **Web interface main** screen in an authorized session.

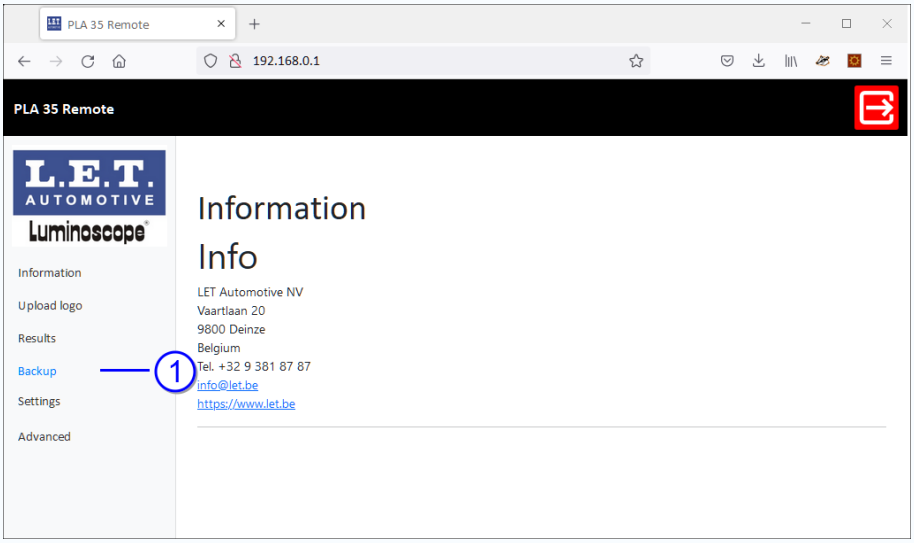

*Figure 130: **Web interface main** screen in an authorized session*

1. Click on the **Backup** link 1 on the **Web interface main** screen.
   The following screen is now displayed:

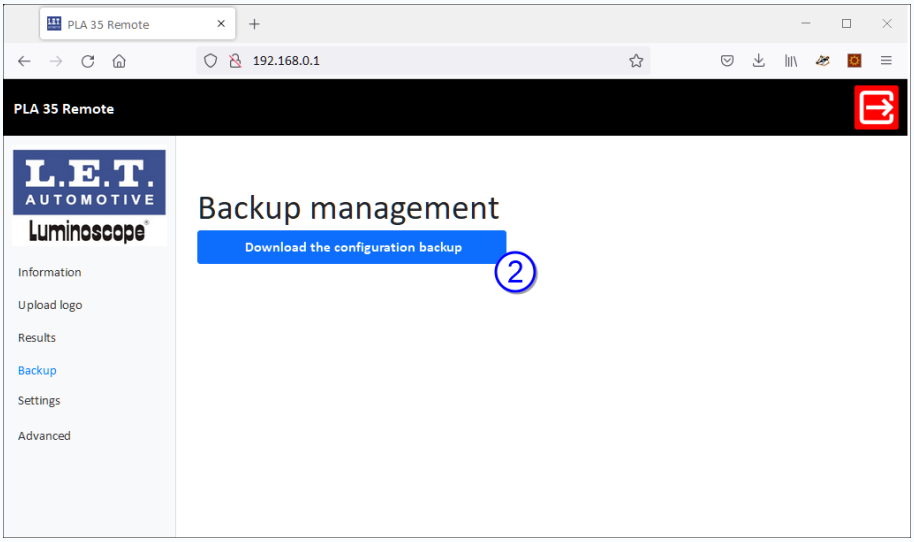

*Figure 131: **Backup** screen*

2. Tap on the **Download configuration backup** button 2 and choose a location for storing the configuration file of the Luminoscope® to the remote device.
   The configuration file of the Luminoscope® has now been exported from the Luminoscope® and stored at the chosen location.

14.5 Check and/or modify some settings of the Luminoscope®

This chapter explains how to check and/or modify some settings of the Luminoscope®.

Starting from the **Web interface main** screen in an authorized session.

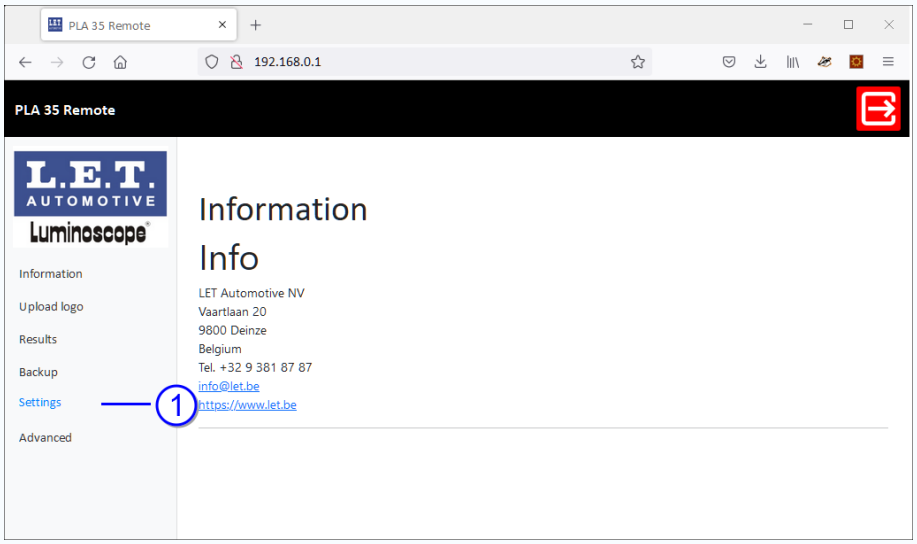

*Figure 132: **Web interface main** screen in an authorized session*

1. Click on the **Settings** link 1 on the **Web interface main** screen.
   The following screen is now displayed:

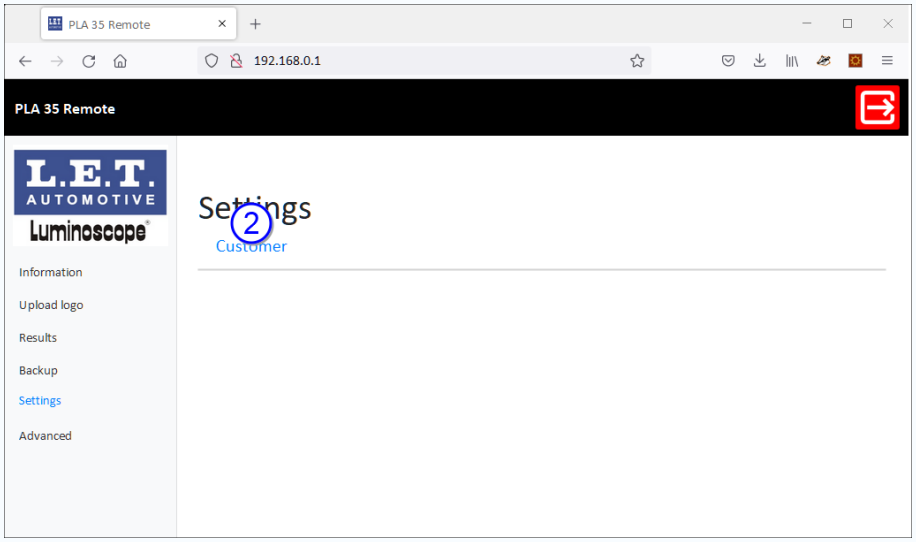

*Figure 133: **Settings** screen*

Modify customer settings

2. Click on the **Customer** link 2 to access the **Customer settings** screen.
   The following screen is now displayed:

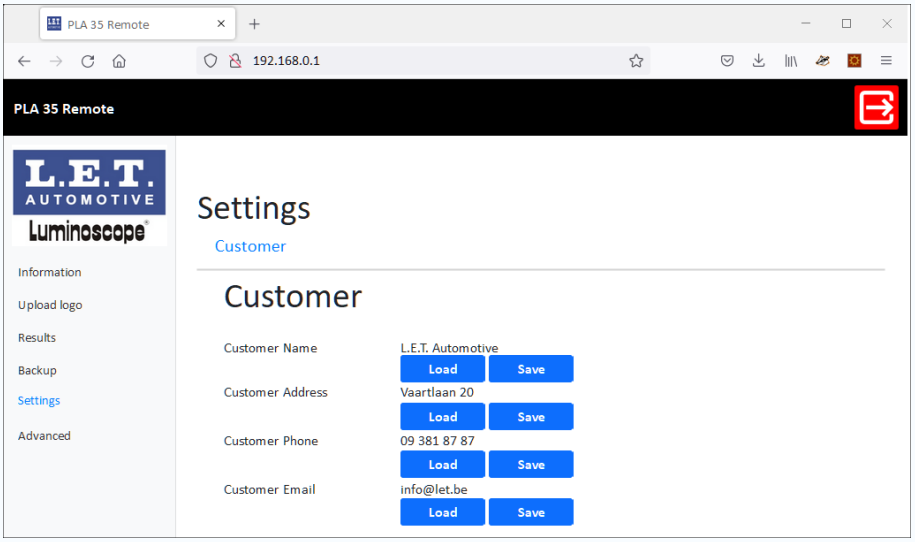

Figure 134: ***Customer settings*** *screen*

3. Tap on the corresponding **Load** button to retrieve the current setting.

4. Check and/or modify the required information: customer name, customer address, customer phone number, customer e-mail address.

5. Tap on the corresponding **Save** button to store the setting to the Luminoscope®.
   The modified settings will now be shown on top of each *PDF* test report.

14.6 Check stored info and remotely operate the Luminoscope®

This chapter explains how to access some stored info in the Luminoscope® such as log files, camera images and screenshots and how to remotely operate the Luminoscope®.

Starting from the **Web interface main** screen in an authorized session.

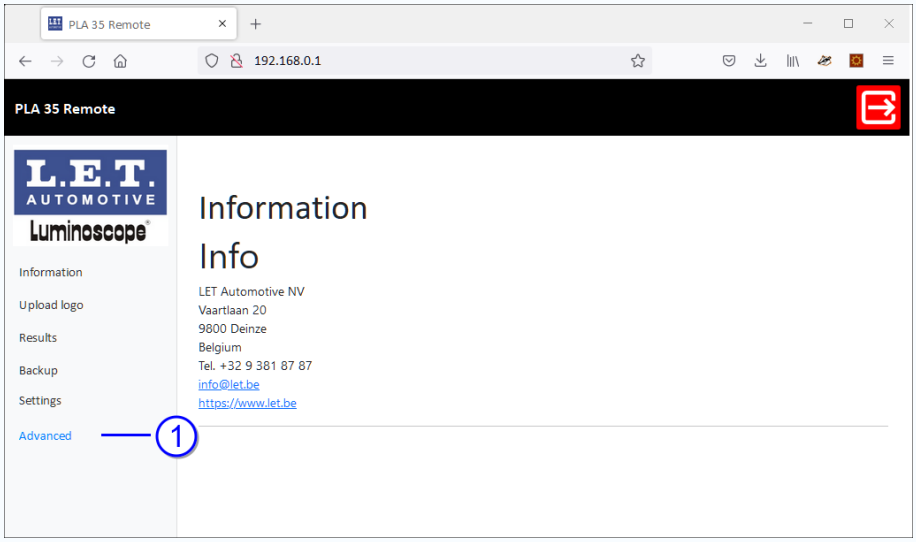

*Figure 135: **Web interface main** screen in an authorized session*

Click on the **Advanced** link 1 on the **Web interface main** screen.

The following screen is now displayed:

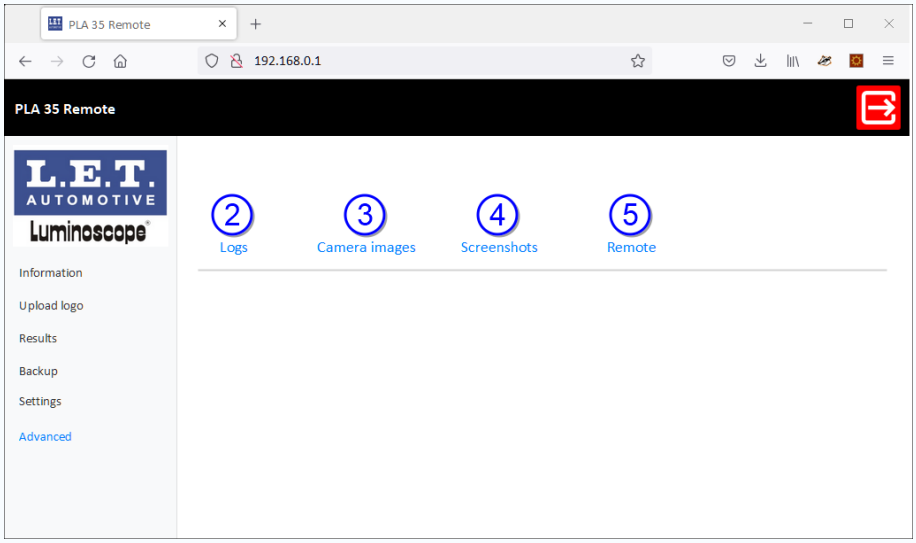

*Figure 136: **Advanced** screen*

The following options are available:

#	Element	Description
2	**Logs** link	Displays a list of all available log files in the Luminoscope®.
3	**Camera images** link	Displays a list of all available camera images in the Luminoscope®.
4	**Screenshots** link	Displays a list of all available screenshots in the Luminoscope®.
5	**Remote** link	Access to the remote operation of the Luminoscope®.

14.6.1 Access to log files

Log files in text format contain a number of timestamped lines describing events, related to the activity of the Luminoscope®. The information in these log files can be useful for tracking or diagnostic tasks. It may be interesting to store or archive them for future reference. The content of these log files is not intended to be used by regular users and is continuously generated.

Starting from the **Advanced** screen.

1. Click on the **Logs** link 2 on the **Advanced** screen to access the **Logs** screen.
   The following screen is now displayed.

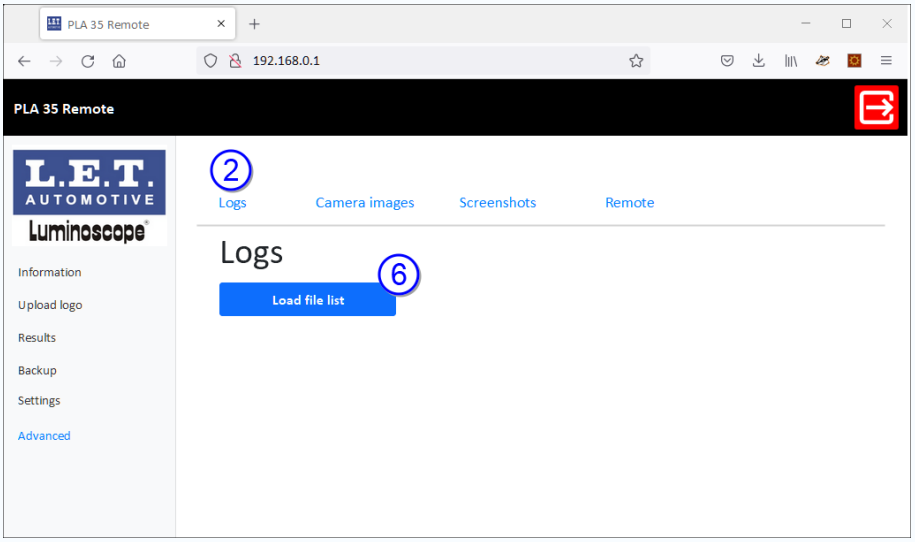

*Figure 137: **Logs** screen*

2. Tap on the **Load files list** button 6.
   The following screen is displayed:

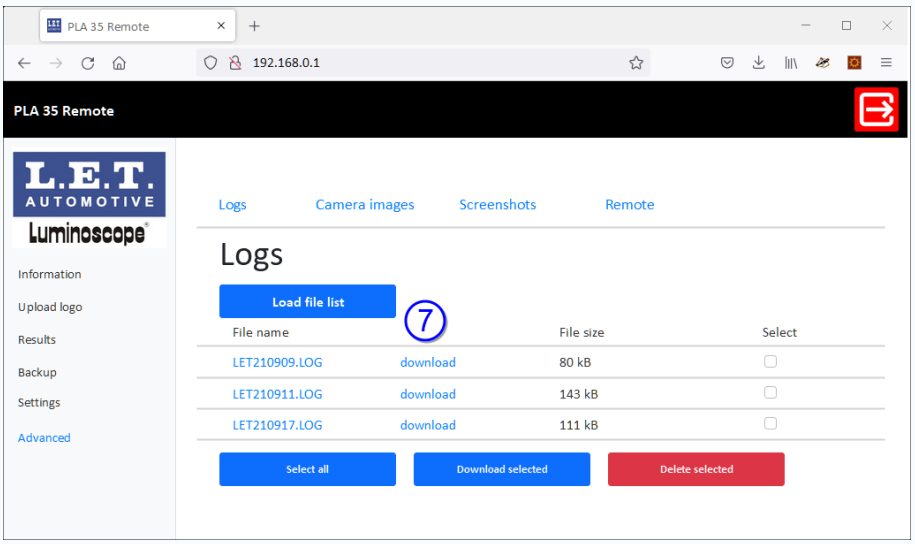

*Figure 138: **Logs** screen with all available log files*

The screen shows a list of all available log files. Each entry shows the date and time and the file size.

3. Click on the **Download** link 7 to download the log file. Alternatively tap on the log file name to open the log file.

   The log file is now displayed in an extra tab page in the *web browser*.

14.6.2 Access to camera images

Each time the user taps on the LET Automotive logo on the touch screen of the user interface of the Luminoscope® while a headlamp projection is displayed, it simultaneously captures the camera projection and some diagnostic files. These camera images may be useful for future reference.

Starting from the **Advanced** screen.

1. Click on the **Camera images** link 3 on the **Advanced** screen to access the **Camera images** screen.

   The following screen is now displayed.

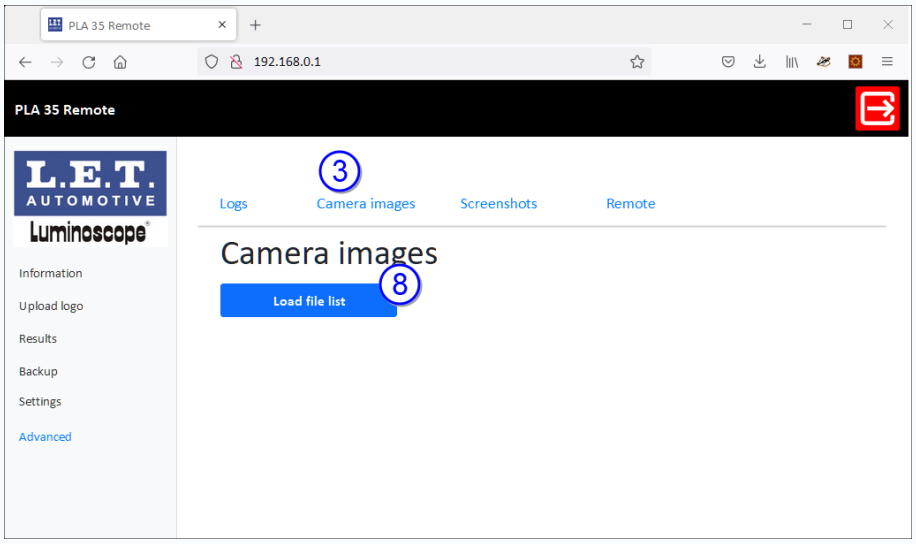

*Figure 139: **Camera images** screen*

2. Tap on the **Load files list** button 8.

   The following screen is displayed:

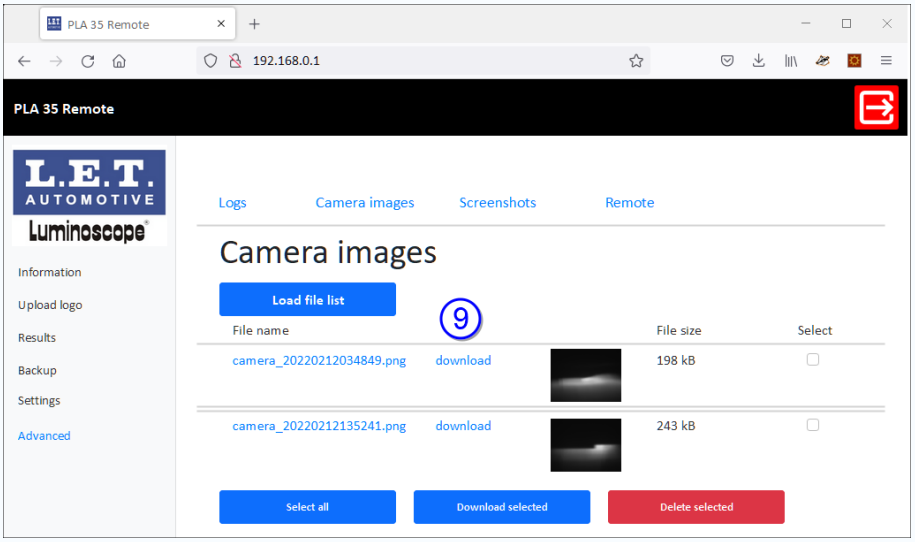

*Figure 140: **Camera images** screen with all available camera images*

The screen shows a list of all available camera images. Each entry shows the date and time and the file size.

3. Click on the **Download** link 9 to download the camera image. Alternatively tap on the camera image name to open the camera image.

   The camera image is now displayed in an extra tab page in the *web browser*.

14.6.3 Access to screenshots

Each time the user taps on the LET Automotive logo on the touch screen, a screenshot of the current user interface of the Luminoscope® is captured simultaneously with some diagnostic files. These screenshots may be useful for future reference.

Starting from the **Advanced** screen.

1. Click on the **Screenshots** link 4 on the **Web interface main** screen.

   The following screen is now displayed:

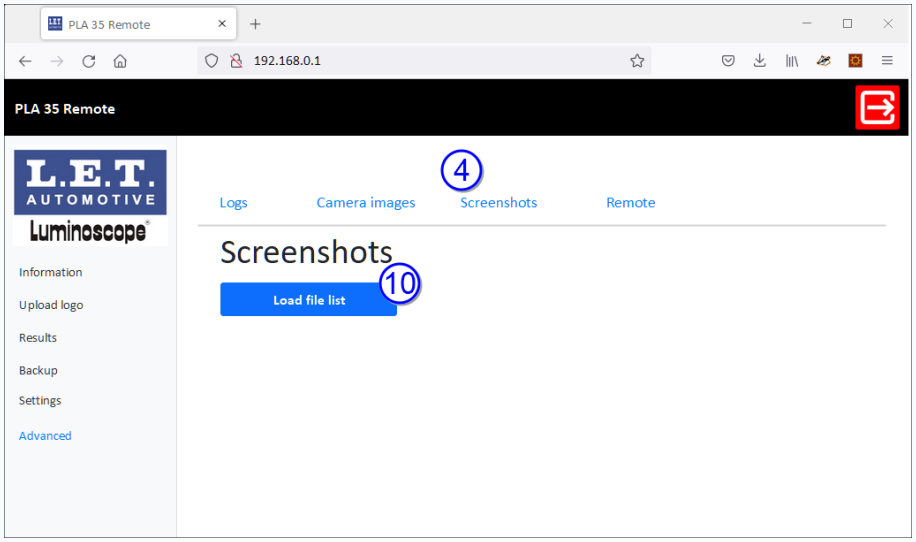

*Figure 141: **Screenshots** screen*

2. Tap on the **Load files list** button `10`.
   The following screen is displayed:

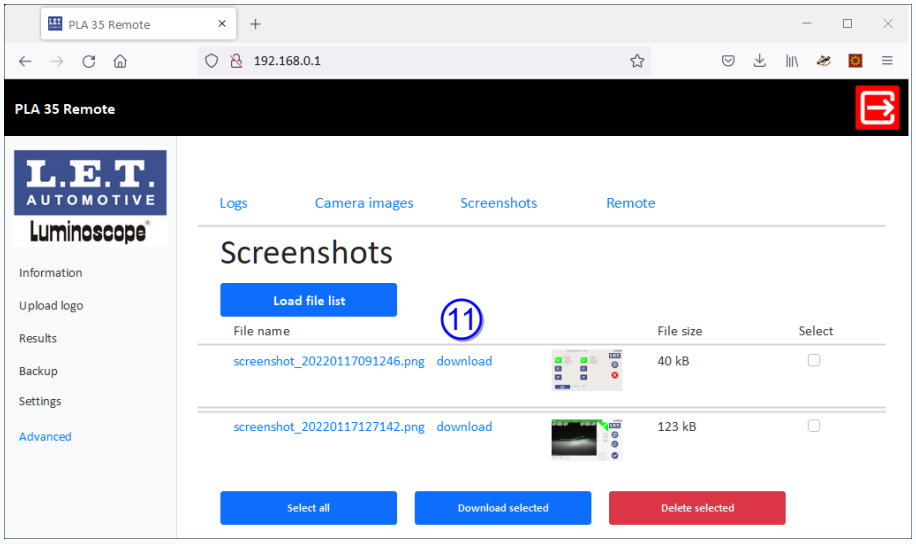

*Figure 142: **Screenshots** screen with all available screenshots*

   The screen displays a list of all available screenshots. Each entry shows the date and time and the file size.

3. Click on the **Download** link `11` to download the screenshot. Alternatively tap on the screenshot name to open the screenshot.
   The selected screenshot is now displayed in an extra tab page in the *web browser*.

14.6.4 Access to remote Luminoscope® screen

Starting from the **Advanced** screen.

1. Click on the **Remote** link 5 on the **Advanced** screen to open an extra tab page in the *web browser* showing a duplicate of the Luminoscope® screen.

   The following screen is now displayed:

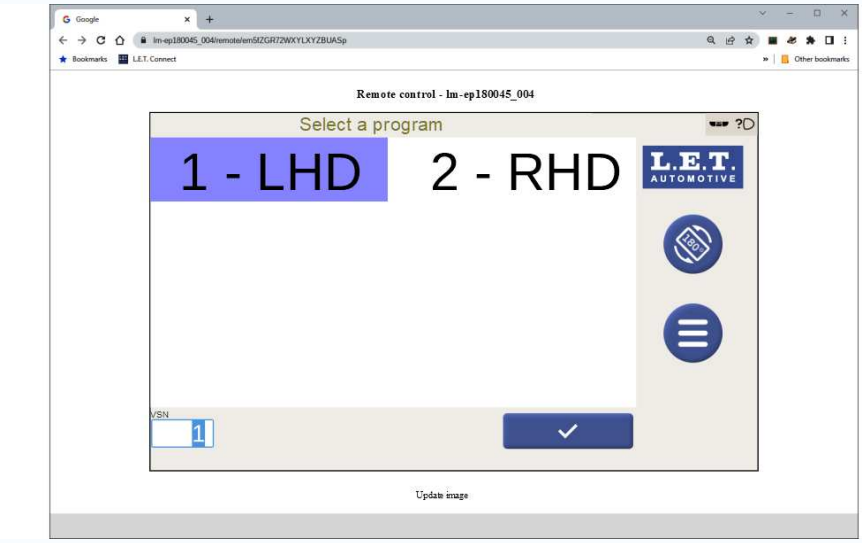

*Figure 143: **Remote Luminoscope** screen*

   The Luminoscope® can now be remotely controlled.

2. Close the **Remote control** tab page to terminate the remote view.

15 Personal notes