Speed Enforcement System
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Chapter 1

Conventions in the User Manual
1 Conventions in the User Manual

Operating Instructions

➢ Text

The operating instructions are identified by a chevron icon.

It is recommended that the operation instructions are executed in the specified order to ensure correct operation.

Results

☑ Text

The results of a given action are identified by a checkbox icon.

This helps to easily separate the action text from the results text which in turn permits the reader to make a quick and clear comparison between the actual state and the target state.

Listings

● Text

The listings in the description are identified by a bulletpoint icon.

Safety Instructions

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text</td>
</tr>
</tbody>
</table>

The safety instructions and warnings about health and life-threatening hazards are identified by the signal word DANGER!.

Dangers related to property damage are identified by the signal word ATTENTION!.

Danger and warning signs are also used in addition to the text warnings.

For details regarding the safety symbols used in the operating instructions, please refer to the safety chapter of the user manual.
**Tips and Important Information**

**NOTE!**
Text

Very important information and tips for use are indicated by the hand symbol and combined with the words NOTE! or IMPORTANT!

The respective text part is framed.
2 System Safety

ATTENTION!
Any changes, additions or modifications to the system, interfere with the domestic design approval and lead to premature expiration of the calibration!

The system’s design and construction is state of the art and complies with recognized safety and engineering rules. This ensures that the system does not pose any safety or health hazards to the operating and/or servicing personnel or others when used as designated.

However, dangers may arise to the user or adversely effect the system and/or other material assets if the system

- is operated by unauthorized personnel,
- is not used according to the instructions,
- is incorrectly maintained or repaired.

The information in this user manual is valid only for the system whose serial number is specified in the CE declaration of conformity at the beginning of the user manual.

All other safety instructions must be observed.

This includes but is not limited to additional instructions which are introduced: in other chapters of the user manual, before any operating instructions, and all safety instruction described in the provided client information.
2.1 Safety Instruction Designations

In the user manual, the danger and warning messages are always designated by the signal words DANGER! or ATTENTION! and a hazard symbol. In addition, there are also messages that can be identified by the signal words IMPORTANT! and HINT! and the hand symbol.

Table 1: Safety symbols

<table>
<thead>
<tr>
<th>Safety Symbol</th>
<th>Type of the Warnings or Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Warning for lethal danger</td>
</tr>
<tr>
<td></td>
<td>Warning for property damage</td>
</tr>
<tr>
<td></td>
<td>Warning for laser beam</td>
</tr>
</tbody>
</table>

2.2 System Hazard Designations

The safety signs and instructions, which are placed directly on the equipment, must be observed unconditionally.

They must not be removed and should be maintained in completely legible condition!
2.3 Safety Instructions

In order to prevent personal injuries and damage to the system and the data stored in it, the safety instructions introduced here as well as all safety instructions included in the chapters of the user manual must be unconditionally observed.

2.3.1 Safety Instructions for the LIDAR

When the LIDAR laser device is handled correctly, an injury hazard from the emitted laser beam is unlikely. During the measurement operation, the scanner is safe for the eyes, i.e. it is of laser class 1.

The LIDAR is categorized as safe under reasonably predictable operating conditions; however, the following safety tip must be observed under all circumstances:

<table>
<thead>
<tr>
<th>LASER RADIATION HAZARD!</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is not permitted to open the protective housing of the LIDAR as the emitted laser radiation may be amplified when optical accessories are used!</td>
</tr>
</tbody>
</table>

2.3.2 Safety Instructions for the Flash

The built-in white light flash is not subject to any laser class and is harmless when handled and maintained correctly. However, hazards can arise if safety instructions are not followed:

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
</table>
| Possible eye injury.  
Never look directly in the flash and always maintain a sufficient safety distance of at least 2 meters.  
Ensure that the flash is not inadvertently triggered. |

Minimize the risk associated to flash exposure by covering the flash with a cloth or turn it off when appropriate.
DANGER!

Equipment subject to live electrical voltage. Mortal danger by electric shock and destruction of components possible. It is not allowed to make any modifications, alterations or additions to the system which could endanger personnel or jeopardize the safety of the system without the prior written approval of VITRONIC. Ensure that neither metal objects nor liquids strike the contacts.

Apart from that there is no danger due to live parts as the capacitors are properly insulated.

Figure 1: Live contact

2.3.3 Safety Instructions for the Measurement Unit

The measurement unit of PoliScan\textsuperscript{speed} contains sensitive electronic and optical components. Therefore, it is absolutely necessary to protect the components from contaminations, mechanical vibrations and impacts, strong magnetic and electromagnetic fields and direct solar radiation. It is also necessary to prevent any scratches or dirt on the front pane because they may have a negative effect on the precision of the measurement results.
## 2.3.4 Safety Instructions for Electrical Hazards

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lethal danger due to electrical voltage. Any work carried out on the electrical equipment of the system must only be executed by a qualified electrician or by instructed personnel under the direction and supervision of a qualified electrician in accordance with applicable electrical regulations.</td>
</tr>
</tbody>
</table>

- Before starting maintenance work on the system components, switch the components voltage-free.

<table>
<thead>
<tr>
<th>CAUTION!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equipment subjected to live electrical voltage. Component destruction and loss of data possible. Ensure that no metal objects or liquids come into contact with the components.</td>
</tr>
</tbody>
</table>

- Operate the system only with the permitted supply voltage of 230 V, 50 Hz.

## 2.3.5 Safety Instructions for General Hazards

The system must be installed, mounted, maintained and put into operation only by qualified specialized personnel and must be operated only by trained and competent personnel. In your capacity as authorized operator, you are obliged to inform and instruct the operating personnel about the existing, generally applicable legal and accident prevention regulations as well as about the safety devices on and around the system. The personnel that have to work with the system must be acquainted with the user manual, and in particular with the Safety chapter, before beginning any work.

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>The safety devices must not be removed or handled improperly.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DANGER!</th>
</tr>
</thead>
<tbody>
<tr>
<td>High risk of accident and injury caused by street traffic. Wear high-visibility vests! Avoid any risks for the traffic and yourself!</td>
</tr>
</tbody>
</table>
2.4 Designated Use

PoliScan\textsuperscript{speed} is designed for its exclusive use for traffic speed measurement.

The safety instructions described in the user manual as well as the operating, assembly and maintenance instructions must be observed.

When the system is used and handled as intended, there are no dangers for people or components.

Any other use or any use that deviates from its intended use is considered inappropriate. In such a case, only the user/operator of the equipment is liable for any damage caused.

2.5 Safety Devices

Protective fittings such as enclosures for computers, cameras or illumination must not be removed or handled improperly.

2.6 Personnel Training

Only qualified, trained personnel should perform work on the system.

The system must be installed, assembled, equipped, serviced and maintained exclusively by qualified specialized personnel and operated only by trained, expert personnel.

The training of the operating personnel is performed according to the VITRONIC standards and depending on the scope and content of the training. VITRONIC reserves the right to determine the scope and content of the training and document it by certification.

The operating authority is obliged to inform and, respectively, instruct the operating personnel about the existing and generally applicable legal and accident prevention regulations as well as about the existing safety devices on and around the system.
Chapter 3

Definitions
3 Definitions

This chapter contains explanations for important terms used in this operating manual. It is intended to help the user to understand the terms and to distinguish between them.

3.1 Traffic Situation

The measured vehicle and its surroundings. It influences the formation and/or correlation of the measurement value.

3.2 Approaching Traffic

During the speed measurement the vehicles move towards PoliScan\textsuperscript{speed}.

3.3 Receding Traffic

During the speed measurement the vehicles move away from PoliScan\textsuperscript{speed}.
3.4 **Left Measurement**

The PoliScan™ setup that places the left lane border, (in the line of sight of the measurement system), closest to the measurement system is called left measurement. The term is important for the measurement range and the evaluation.

![Figure 2: Left measurement](image)

3.5 **Right Measurement**

Measurement situation where the right lane border (in the line of sight of the measurement system) is the closest to the measurement system is called right measurement. The term is important for the measurement range and the evaluation.

![Figure 3: Right measurement](image)
3.6 LIDAR

Light Detection and Ranging
LASER-based transmitting and receiving device of PoliScan<sup>speed</sup>.

3.7 Case Data

Measured data, possibly complementary data and possibly photo documentation.

3.8 Photo-trigger Speed

The minimum speed threshold, leading to the generation of a photo document.

3.9 Fully Automatic Measurement

Automatic registration of all speed violations exceeding the photo-trigger speed. The image data is saved together with the integrated case data in the internal data storage.

3.10 Manual Measurement

Automatic registration of a single speed violation exceeding the photo-trigger speed. PoliScan<sup>speed</sup> remains blocked for further measurements until it is unblocked by the operation personnel.

3.11 Evaluation

Examination of speed violations saved in the internal data storage with regards to their usability/validity in court.
Chapter 4

Functional Description
4  Functional Description

4.1  Measurement Principle

PoliScan\textsuperscript{speed} is a speed enforcement system, combining the ability of digital speed detection and recording on the basis of a Light Detection And Ranging instrument (LIDAR), and the documentation of the traffic incident by means of a twin-high-resolution-digital-camera system (including pictures of the license plate, an overview picture and the portrait of the driver). The measurement sensors developed for PoliScan\textsuperscript{speed} permit a multi-lane monitoring of the roadway, so that all vehicles located in the monitored corridor can be simultaneously processed and measured. The system also permits different speed limits for cars and trucks to be set up and enforced.

Figure 4: Multi-lane speed measurement

PoliScan\textsuperscript{speed} is designed for stationary use in a roadside housing.

The concepts designed and built into the system prevent erroneous or inexact measurement values be obtained.

PoliScan\textsuperscript{speed} performs self-calibration with automatic determination of the swivel angle (see Chapter 6.1.1). Measurements in curves are admissible.

Prior to beginning the measurement operation, PoliScan\textsuperscript{speed} independently performs an automatic camera test – i.e. without any interaction from the operator.
4.2 Measurement Process

The measuring sensor developed for PoliScan\textsuperscript{speed} is based on a scanning (eye-safe) LIDAR, which is mounted in a stationary position and transmits short pulses of light out to a target. The measurement beam monitors a portion of the roadway at a distance between about 10 and 75 meters. The transmitted light interacts with the target and is reflected/scattered back to the receiver of the LIDAR instrument where it is analysed. The time for the light to travel out to the target and back to the LIDAR is used to determine the range of the target. These measurements are carried out with a high repetition rate. The temporal analysis of the distance values enables a very precise speed measurement.

The system constantly checks the precision of the independent measured value. If the required precision has not been attained, the measured value is discarded.

The internal processing unit of PoliScan\textsuperscript{speed} analyses the measurement results of the LIDAR. The average speed is calculated for each vehicle in the surveillance area.

If this average speed exceeds the speed limit, the internal processing unit initiates the image acquisition via a twin-camera system consisting of two high-resolution matrix cameras.

Note: The classification of the vehicles into cars and trucks is based on the detected size of the vehicle and is therefore not 100 % correct.

To guarantee an optimal image the processing unit delays the triggering of the photo until the respective vehicle has approached the sensor to a defined lane-dependent distance. For every traffic incidence, the traffic situation is recorded with the vehicle license plate and the driver area. A flash is used to illuminate the captured scene.

The measured speeds are displayed on the screen of the device in the nominated speed units km/h or mph.

All incidences can be documented by the same camera up to the flash repetition rate even if several vehicles exceed the speed limit in the measurement area in the same lane.

The precise allocation of the calculated average speed to a definite vehicle is guaranteed by the evaluation template in the photo contained in the case files (see chap. 8). Obstructed allocations are easily detected during case evaluation at which time they can be annulled.

Measurements can be carried out at the curb side without the need to enter the traffic area. This helps to minimize the risk associated to working in a road zone.

Unattended measurements are possible.

Extreme weather conditions can affect measurement range and photo documentation.

At 0.00 a.m. the current measurement session is stopped and a new session is started.

The image, measurement and case data is combined as evidence and the data is downloaded to a separate PC in the roadside housing. From there the case files are automatically uploaded to the central server in the central office. Several workstations may be connected via LAN to the central server.
The system status of all connected PoliScan\textsuperscript{speed} units can also be monitored in the central office.

**4.3 Photo Documentation**

PoliScan\textsuperscript{speed} generates from every automatically or manually triggered photo shot an signed and watermarked evidence data file in \textit{tuff}-format, consisting of:

- case-relating text
- image for documentation of the offence including a graphical template for evaluation.

The data is downloaded to a separate PC in the roadside housing. From there the case files are automatically uploaded to the central server in the central office. The data is moved, not copied and therefore existing only once: Thus authenticity is guaranteed.

The data can be checked for integrity and authenticity and used as evidence with the help of the image viewing program PoliScan \textit{TUFF-Viewer}.
Chapter 5

Component Description
5 Component Description

PoliScan\textsuperscript{speed} is mounted in a mobile-stationary mode in a roadside housing.

\textbf{NOTE!}

When installing the roadside housing, ensure a minimal distance from the speed limit traffic sign which must not fall short of the end of the operational measurement range (see Chapter 6.1.1).

---

PoliScan\textsuperscript{speed} consists of the following components:

- Sensor unit consisting of the LIDAR with LCD display, processing unit, data storage unit, 2 digital cameras
- Flash unit
- Download PC
- Location module
- Power supply units
- Cooling unit
NOTE!
Please refer to the technical data sheet in the appendix for more detailed technical information.

5.1 Sensor Unit
The sensor unit consists of the measurement system LIDAR, a twin-high-resolution-digital-camera system (two matrix cameras), the processing unit and the LCD display.

5.2 Flash Unit
A white light flash unit is used for illumination of the inside of the vehicle.

5.3 Download PC
Case files and alarm messages are downloaded to the Download PC and from there uploaded to the Central Server.

The PSS_RemoteUI user software is installed on the Download PC and used as the user interface for PoliScan\textsuperscript{speed}. Work stations within the network of the central server can access this user interface.

In the fully automatic mode the PoliScan\textsuperscript{speed} user interface is only required to Start and Stop the traffic measurement phase.

5.4 Location Module
The Location Module is used to store site-specific information.

5.5 Power Supply
The roadside housing includes power supply packs and an Uninterruptible Power Supply (UPS).

5.6 Cooling Unit
The system cooling is provided by a common industrial air condition. This air condition is modified with an air distributor for better air circulation.
5.7  Cable Loom

To operate PoliScan™ a cable loom consisting of LAN cable, power supply cable for the sensor unit and power supply cables for the flash units is delivered. Only the LAN cables delivered by VITRONIC are allowed to be used.

5.8  Accessories

**Y-cable**

As an option, a Y-cable can be used for the connection between sensor unit and two flash units.

**Lenses for SVS Vistek Camera**

Three Lenses - one with a 35 mm focus, one with a 50 mm focus and one with a 75mm focus - are part of the standard delivery.

As an option further lenses with the same focus can be delivered.

**Filter**

For each lens the following filters are part of the delivery:

- 1 UV-IR-cut filter
- 1 polarizing filter.
6 System Operation

This chapter provides simple yet detailed information regarding the correct setup and safe operation of the PoliScan\textsuperscript{speed} system.

6.1 Positioning and Coarse Adjustment of PoliScan\textsuperscript{speed}

6.1.1 Definitions

- **Lane**
  A portion of a roadway, usually indicated by pavement markings, designated for travel by one line of vehicles.

- **Lane border**
  The border between the roadway used by the vehicles (lanes) and the roadway shoulder. The lane border is usually defined by pavement markings.

- **Measurement range**
  The measurement range covers distances from 20 m to 50 m from PoliScan\textsuperscript{speed}.

- **Roll angle of the system**
  The roll angle is the rotation around the longitudinal axis of the tripod.

- **Pitch angle of the system**
  The pitch angle is the rotation around the transverse axis of the tripod head.

- **Yaw angle of the system**
  The yaw angle is the rotation around the vertical axis of the tripod plate.
Figure 6: Angle destination

- Vertical axis
- Yaw angle
- Pitch angle
- Longitudinal axis
- Transverse axis
- Roll angle
6.1.2 Mounting the Sensor Unit

Mount the sensor unit on the lower mounting plate and lock it:

- Lift the sensor unit above the tripod head.

Figure 7: Tripod head, top view
Insert the fixing studs and screw at the bottom of the sensor unit (see Figure 8) into the corresponding openings of the tripod head (see Figure 7).

- Push the sensor unit to the stop of the fixing screw.
- Use fingers to tighten the knurled fixing screw.

The sensor unit is mounted on the mounting frame. PoliScan\textsuperscript{speed} can now be put into operation.

\textbf{NOTE!}
The yaw angle must not be altered!
The sensor unit is mounted on the mounting frame. You can now put PoliScan M1 into operation.
6.2 Setting PoliScan<sup>speed</sup> into Operation

- Unlock the connection caps of the sensor unit and open them.
- Connect the sensor unit of PoliScan<sup>speed</sup> with the cables for:
  - the Download PC via LAN
  - optionally one or two flash unit(s)
  - the power supply.

![Connections of the sensor unit of PoliScan<sup>speed</sup>](image)

- The sensor unit’s LIDAR and cameras are automatically switched on and the software initialized once power is connected.

**NOTE!**

Once the power is connected the results of the boot phase and self-tests displayed at the rear of the sensor unit should be monitored.
6.2.1 Boot

During this boot phase a blinking cursor appears on the display at the rear of the sensor unit.

![Display during the boot phase](image)

This process takes a little over one minute. Please wait until the boot phase has finished: The name of the sensor unit – consisting of the letters “PS-“ (for PoliScan) and the serial number (six letters) – is displayed. This serial number should be the same as the number on the type plate.

![PS-xxxxxx](image)

The boot phase is immediately followed by the self test phase.

6.2.2 Self-test

**NOTE!**
The self-test (duration about 40 seconds) can not be influenced by the user or by passing traffic.

**Display Test**
The test results are shown on the display at the rear of the sensor unit. For this reason a display test is conducted first. For this purpose all character matrices are displayed in black color for 5 seconds:

![Display test](image)

- Shutdown PoliScan and contact service if any of the pixels in the character matrices fail to display.

**NOTE!**
If one of the following self-tests fails, an error message is shown on the display. The meaning of this message and the necessary remedy is explained in chap. 7.5.
Storage Test/Software Test

After the display test the self-test for the enforcement software integrity of the system is conducted:

Test Software running

Figure 14: Self-test Software

After a successful self-test the following message is shown on the display:

Software
Version x.x

Figure 15: Self-test Software successful

LIDAR Test

After the software test the self-test for the LIDAR is conducted:

Test LIDAR running

Figure 16: Self-test LIDAR

After a successful self-test the following message including the serial number (SN, six figures) of the LIDAR is shown on the display:

LIDAR OK
SN xxxxxxx

Figure 17: LIDAR test successful

Camera Tests

After the LIDAR test, the camera 1 and camera 2 self-tests are conducted one after the other:

Test Camera 1 running

Figure 18: Self-test camera 1
After a successful self-test the following message is shown on the display:

Figure 19: Self-test camera 1 successful

The camera type “V” stands for “Vistek” and “H” for “VICAMhd4”. The camera property “MC” stands for “Monochrome C-Link” and “CG” for “Colour GigE”.

The system name is displayed by the letters “PS-” followed by the serial number of the system.

After the conclusion of the self-tests PoliScan^{speed} is ready to receive commands from the user interface.
6.3 Accessing Control Application

The user software is installed on the Download PC and used as the user interface for PoliScan<sup>speed</sup>. The Download PC can be accessed from a work station within the network of the central server or on-site.

**Access from a Work Station**

- Start the VNC Client on the work station.
- Enter the IP address of the site.
- The screen displays the Graphical User Interface of the control application.

**Access On-Site**

To get access to the control application on-site requires the following tools:

- Service laptop with monitor and installed VNC client
- LAN Switch 100MBit, Ethernet cable

Carry out the following steps:

- Carefully plug off the LAN cable for the central office from the Download PC.
- Using the Ethernet cable, connect the switch to the Download PC.
- Connect the LAN cable for the central office to the switch.
- Connect the service laptop to the switch.
- Start the VNC Client on the work station.
- Enter the IP address of the site.
- The screen displays the Graphical User Interface of the control application.
NOTE!
Language and units of measurement on the Graphical User Interface can be adjusted via the Settings | Region- and Language options sub-menu.

Figure 23: Login tab

- Enter your personal user name in the field Name.
- Enter the responsible authority/organization in the entry field Organisation.
- If applicable enter the name of your companion in the entry field Witness.
- Select the destination (IP address) of the measuring device in the Network address list.
- Enable the checkbox Reconnect automatically to network after interruption
- The connection will be restored after an interruption.

The system will continue where it stopped before the interruption (e. g. archiving case files). If the checkbox is disabled, a new login is required after the interruption.

Press the Log in button.

If the login is successful and a server exists, the message in the status bar changes from “disconnected” to “connected”. The connection icon on the left changes from red to green. Further navigation tabs are enabled.
Additionally, the *Measuring device* section becomes visible and displays name and IP address of the system, date and time, and the current content of the rear display of the sensor unit.

### 6.5 Define Location

- Select the *Location* tab.

You can load the data of your location in the list fields *Location* or – if necessary – set up a new record.

![Location tab](image)

**Figure 24:** *Location* tab

#### 6.5.1 Select a Location Record

- Select in the list fields *Location* your location.
- The data belonging to the selected record is loaded into the remaining fields.
- Press the *Apply* button.
- Your settings are adapted and the next active tab is displayed.
6.5.2 Set up a Location Record

If a record for your location does not exist, you need to set up a new record.

NOTE!
If a similar record exists, you can copy this record and change it afterwards (see chap. 6.5.4): You do not need to enter the entire record.

- Press the New… button.
- The dialog box Edit location data opens.

![Figure 25: Dialog box Edit location data for a new location record](image)

- Enter your new location details.
- Press the Apply button.
- The dialog box closes. The new location details are displayed in the fields Location [1], Location [2] and Location [3].
- Select the number of existing lanes (check boxes 1, 2, 3 and 4 in the Lane properties section).

NOTE!
The checkboxes serve for lane division (lane 1 is always the lane closest to the measurement system). Whether the respective lane is in fact monitored, is determined on the Speed tab.

- Check or edit the lane width in the last row of entry fields (with a tolerance of ±20cm).

As an option, you can also
- enter GPS data (the Settings menu allows to choose between DMS-Format and DEG-Format)
- assign names to driving directions
- assign names to the individual lanes (Name row in the Lane properties section)
- Press the Apply button.
Your settings are adapted and the next active tab is displayed.

### 6.5.3 Edit a Location Record

- Select the location record you want to change.
- Press the *Edit* button.
- The dialog box *Edit location data* with the selected location data opens.

![Dialog box Edit location data](image)

- Modify your location data as desired.
- Press the *Apply* button.
- The dialog box closes. The new location details are displayed in the fields *Location [1]*, *Location [2]* and *Location [3]*.
- Select the number of existing lanes (check boxes 1, 2, 3 and 4 in the *Lane properties* section).

#### NOTE!

The checkboxes serve for lane division (lane 1 is always the lane closest to the measurement system). Whether the respective lane is in fact monitored, is determined on the *Speed* tab.

- Check or edit the lane width in the last row of entry fields (with a tolerance of ±20cm).

As an option, you can also

- enter GPS data
- assign names to driving directions
- assign names to the individual lanes (Name row in the *Lane properties* section)

- Press the *Apply* button.
- Your settings are adapted and the next active tab is displayed.
6.5.4 Copy a Location Record
If you do not want to enter a new location record completely, you can copy a similar existing record and change it afterwards.

- Select a similar existing record (see chap. 6.5.1).
- Press the Copy button.
- The dialog box Edit location data (see Figure 26) with the selected location data opens.

You can now modify the location data (see chap. 6.5.3).

6.5.5 Delete a Location Record

- Select the record you want to delete (see chap. 6.5.1).
- Press the Delete button.
- The chosen record is deleted. You can now set up a new record (see chap. 6.5.2) or load an existing record (see chap. 6.5.1).

6.5.6 Check Date and Time
Date and Time are delivered by the user interface and can be changed.

- Check Date and Time in the Measuring device section.
- If necessary correct Date and Time (see chap. 6.13).
6.6 Define Speed Limit

- Select the *Speed* tab.

![Speed tab](image)

Figure 27: Speed tab

- Determine by means of the icon buttons for the respective lane, if
  - approaching traffic should be monitored
  - receding traffic should be monitored
  - approaching and receding traffic should be monitored
  - no traffic should be monitored at all.

- Click the respective icon button until the desired symbol is displayed.

- Check or edit the following settings:
  - the speed limit for cars in the first row of entry fields
  - photo-trigger speed for cars in the second row of entry fields
  - the speed limit for trucks in the third row of entry fields
  - the photo-trigger speed for trucks in the fourth row of entry fields.

- Press the *Apply* button.

☑ Your settings are adapted and the next active tab is displayed.
6.7 Edit Sensor Position Data

➢ Select the *Position data* tab.

**NOTE!**

Do not change the settings of this tab. The correct settings have already been entered by the VITRONIC commissioning team.

![Position data tab](image)

**Figure 28:** *Position data* tab

The following settings are displayed:

- *Distance (Lane <-> Measuring device)*
  Distance of the system from the lane edge.

- *Height (Lane <-> Measuring device)*
  Height of the sensor above the road level, measured from the bottom side of the sensor unit ±0.05 m

- *Side of the road (Viewing direction of the measuring device)*
  Left or right measurement.

➢ Confirm the settings by pressing the *Apply* button.
6.8 Camera Settings

- Select the **Cameras** tab.

**NOTE!**

Do not change the settings of this tab. The correct settings have already been entered by the VITRONIC commissioning team.

![Figure 29: Cameras tab](image)

In the **Suggestion** column the system suggests which lens to fit to the respective camera. Each camera can have a different lens fitted to cover different detection zones.

In the **Flash type selection** field the used flash can be selected. In case a second flash including double flash switch is used, enable the respective checkbox.

- Confirm the settings by clicking the **Apply** button.

Your settings are applied and the next active navigation tab is displayed.
6.9 Checking Settings with Test Images

- Select the Enforcement tab and select the camera from which test photos are to be displayed (see Figure 30).
- Click the snapshot button.

A test photo from the current traffic situation is captured. No case data is generated. The test photo is shown in the Evidence Photo area. A camera symbol with the camera number is displayed next to the photo.

Figure 30: Enforcement tab with displayed test photo

Alternatively, an image of the next vehicle driving on the lane, which is monitored by the selected camera, can be captured.

- Click the next vehicle button.

The next vehicle driving with a minimum speed of 10 km/h is measured for testing purposes. No case data is generated. The test photo of the measured vehicle is shown in the Evidence Photo area. A hand symbol is displayed.

NOTE!

If you click the icon, the Photo expands to fill the whole tab. A click on the symbol restores the original view.
Click the photo to zoom in, double-click it to zoom out. A context menu opens when clicking the right mouse key:

- **Adjust image size**
  - Zoom in
  - Zoom out
- **Show overlay**

Adjust image size restores the pre-zoom size of the image. Show overlay enables or disables the evaluation template.

If you click the icon, a dialog for adjusting the photo trigger time is opened. The dialog closes as soon as you release the regulator or click outside the dialog.

- **Check with test images:**
  - the setting of the aperture
the angle of the polarizing filter

**Aperture Adjustment**

- Check with the help of test photos the aperture adjustment.

To correct the aperture adjustment:

- Loosen the fixing screw of the aperture.
- Set the aperture to the value which delivers the best exposed image (Increase the f-stop number to darken the image. Decrease the f-stop number to lighten the image).
- Fix the best aperture position by tightening the fixing screw.

**Angle of the Polarizing Filter**

If you use a polarizing filter, you need to find the most favorable angle. For this purpose two positions are marked on the ring of the filter.

- Turn the filter to bring both positions in a horizontal line.
- Create for each filter position a test photo and compare the photo quality in the Photo area.
- Leave the polarizing filter in the position generating the best photo quality.
- Correct the position regularly.

Starting a measurement session ends the alignment phase. At this point the adjustments are accepted.

### 6.10 Apply Settings

- Click the *Stop optimization* button.
- Your Settings are applied.
6.11 Monitoring

You can start monitoring only after login, location definition, setting-up of the cameras and adjustment.

- Select the Enforcement tab.

![Enforcement tab]

**Create a Comment**

You can save the comments for every measurement session. A comment can contain information which cannot be entered via the tabs of the user interface.

**NOTE!**

A comment can only be created after login and before the monitoring has started.

- Click into the entry field *Comment*...
- The *Comment window* opens.
Figure 35: Comment window

- Enter your information in the entry field (no more than 500 characters).
- Save your comment via the Apply button.
- The Comment window closes. The comment will be saved together with the case files.

NOTE!
If you open the Comment window again, it will contain the last entry. Restarting the control application will erase the comment information.
6.11.1 Fully Automatic Measurement Operation

- Press the **Start enforcement** button.

The measurement starts.

![Figure 36: After the start of the measurement](image)

The current measuring result is displayed. The speed measurement data such as session index, case index, allowed and measured speed, driving direction, vehicle class, lane, lane name (if available), vehicle index, time and day of the incidence is displayed. The tachometer mark is displayed in case of a valid speed incidence.

When you click on the **next vehicle** button, a speed measurement is taken of the next vehicle regardless of the vehicle's actual speed. A **next vehicle** case is designated by a hand icon except when there is a speed limit incidence – in this case a tachometer mark is blended in.

The options for image display mentioned in *chap. 6.9* (zoom, brightness adjustment and so on) are available here too.

---

**NOTE**

The photo display of the user interface works with reduced resolution and is therefore not valid evidence in court. However, the underlying measuring results including the photo documentation can be downloaded by an authorized user (see *chap. 6.12*). Afterwards the data can be decrypted with the help of PoliScan™ VPF Viewer and used as evidence in court (see *chap. 8*).
If you want to view a case without hurry:

- Click the symbol.

The sections Evidence Photo and Case information of the case are displayed in a separate window and remain unchanged. In contrast the content of these sections in the program window changes from case to case.

![Image](image_url)

**Figure 37:** Evidence photo and case information “freeze”

**Rear Display**

For every detected vehicle which generates a speed measurement the following layout is shown on the rear display:

![Image](image_url)

**Figure 38:** Layout of the speed measurement on the rear display
**Categories**

For the category two symbols are used.

- The first symbol stands for the type of measurement result:
  - `<` Measurement range not reached
  - `>` Measurement range exceeded
  - `!` Speed incidence
  - `M` Manual image capture (see the next section)

**NOTE!**

Exceeding of the measurement range leads to the creation of a valid case.

**Figure 39:** Example for exceeding of the measurement range leading to the creation of a valid case

- The second symbol stands for the status of the case documentation:
  - `X` incidence, but no evidence photo was shot
  - `x` The case documentation is incomplete
  - `!` The case documentation is complete

All reasonable combinations of both symbols are possible.

- Additionally, the following can be displayed:
  - *No display* no incidence
  - `XX` The measured value was cancelled

**Driving Direction**

- `+` approaching vehicle
- `-` receding vehicle

**Vehicle Type**

- *car*
  - or
- *truck*
**Manual Image Capture**

With the *snap shot* function, you can - independently of the measurement operation –
manually capture and document a non speed related traffic situation. This function is
used when desired, for instance, to document:

- drivers who violate the mandatory seat belt wearing,
- drivers who disregard the ban on cell phone use when driving,
- Motorcycle drivers looking back.

In order to manually capture and document a non speed related traffic situation:

- Press the *snap shot* button
  or the <ENTER> key.

  ✓ A picture of the non speed related traffic situation will be taken. The picture is
designated by a camera symbol in the *Offense type* field.

---

**NOTE!**

The automatic measurement operation always has a priority with respect to the
manual operation. The *snap shot* function becomes inactive when a speed incidence is
being processed by the system. The system will ignore the request for a manual image
capture if you press the button during this time.

---

**NOTE!**

The cases which are captured manually through *snap shot* function do not contain
speed measurement data and therefore they do not contain any entries in the *Case
information* section except for the date and time the picture was captured as well as
session number and case number.
Rear Display at Photo Acquisition without Speed Measurement

Photo acquisition without speed measurement generates the following notice on the rear display:

“M” for manual photo acquisition

15:07:23

Time

To End the Fully Automatic Measurement Operation

- Press the Stop enforcement button.
- The measurement is stopped.
6.11.2 Fully Automatic Measurement Operation – Snap-and-Stop Mode

- Enable the *Snap-and-Stop Mode* checkbox. (This is located next to the *Start enforcement* button at the bottom of the window)
- Press the *Start enforcement* button.
- The measurement starts.

![Figure 42: The Enforcement tab for the Snap-and-Stop Mode](image)

- Press the *Next offence* button.

PoliScan\textsuperscript{speed} generates an evidence photo of the next passing vehicle, if it exceeds the photo-trigger speed. Displayed next to the picture are session number and case number, permissible and measured speed, driving direction, vehicle type, lane, vehicle number, time and day of the incidence. Speed incidences are indicated by means of an hand mark and a tachometer mark in the *Offense type* field.

**NOTE**

The photo display of the user interface works with reduced resolution and is therefore not valid evidence in court. However, the underlying measuring results including the photo documentation can be downloaded by an authorized user (see *chap. 6.12*). Afterwards the data can be decrypted with the help of PoliScan\textsuperscript{TUFF Viewer} and used as evidence in court.

If you double click on the photo, the *Evidence Photo* area fills the whole tab. A further double click restores the original view.
**Rear Display**

This measurement generates the following notice on the rear display:

![Notice on the rear display](image)

The last measured value disappears when the fully automatic measurement operation with pausing is ended by pressing the Stop button or when a new measurement cycle is started.

**Manual Triggering**

Manual triggering (snap shot) is done in the same way as in the fully automatic measurement operation (see Chapter 6.11.1) via the snap shot button.

**Ending the Fully Automatic Measurement Operation –Snap-and-Stop Mode**

- Press the Stop enforcement button.
- The measurement is stopped.
6.12 Saving Case Records

To remove the case records signed and saved on the system to the connected user front end:

- Select the Archive tab.

![Archive tab](image)

**Figure 44: Archive tab**

**Storage Information of System**

This region displays information about

- **Available capacity:**
  Storage still available on the camera unit

- **Stored case files:**
  Number of case files already saved on the camera unit

- **Other files**

- **Total capacity:**
  Overall storage size of the camera unit

- **Case files in progress:**
  Number of case files which are still post-processed.

A pie chart indicates the seizure of the storage size. Storage occupied by case files is displayed in green colour, by other files in blue colour, and free storage is depicted in grey colour.
**Archiving**

In this region settings for the file transfer can be adjusted. As soon as the transfer has been started, information about the process is displayed.

- **Archive measuring device stored case files**
  If this checkbox is enabled, all files stored on the sensor unit at the beginning of the file transfer are removed to the connected Download PC.

- **Continuously archiving of measuring device case files**
  If this checkbox is enabled, case files generated during measurement are transferred. Additionally, temporary case files from previous measurements are completed and archived.

- **Archive directory path**
  This field displays the target folder where the files are to be saved.

- **Subdirectory structure**
  This field displays the folder structure in which the transferred files are stored. The dialog box Subdirectory structure opens.

**NOTE!**
Always enable the checkbox **Continuously archiving of measuring device case files**. Leave the predefined settings for Archive directory path and Subdirectory structure unchanged. Otherwise the file download to the Download PC will not work.

- **Archived file**
  After the start of the transfer the name of the last transferred file is displayed in this field.

- **Archiving progress**
  After the start of the transfer a progress bar indicates the state of the file transfer.

**File Transfer**

To remove the case records signed and saved on the system to the connected user front end:

- If necessary enable the checkbox **Continuously archiving of measuring device case files**.
- Press the **Start archiving** button.
- The inscription of the **Start archiving** button changes into **Stop archiving**.
- The case records saved on the camera system are transferred to the selected destination. The status bar displays a progress bar indicating the state of the file transfer and the name of the case currently transferred.

You can cancel the transfer via the **Stop archiving** button.
6.13 System Properties

You can view certain system properties on the Measurement device tab and to some extent change them.

System

- **PTB survey mode**
  This function is only available for the Physikalisch-Technische Bundesanstalt (PTB).

- **Automatic start of monitoring**
  This option is not applicable for mobile systems.

- **Error messages and warnings**
  If you click the related Show me button, a message window opens which displays a history of all malfunctions during the measuring session (see Figure 64).
Measuring device time
If you click the related Configure button, the dialog window Measuring device time opens.

NOTE!
The system time can not be modified in the adjustment mode or in the enforcement mode.

- Check the entries in the fields Date and Time and correct them if necessary.

In case date and time should be delivered by the user interface:

- Click the Copy computer time to measuring device button.

In order to select the desired time zone:

- Click the Select measuring device time zone button.

- The dialog window Time zone opens.

- Select the desired time zone in the Time zone list.
- Click the Apply button.

- The dialog window System time zone closes.
- Click the Apply button in the dialog window Measuring device time.

- The dialog box Measuring device time closes. The set time is used as system time and is displayed in the System section below the navigation tabs.

Self test
If you click the Start button a self-test of the system (see chap. 6.2.2) is triggered.

Network settings
If you click the related Change button the dialog window Network settings opens.
The network settings of the PC of the sensor unit can be configured in this window.

- **Current IP Address/Subnet Mask of the measuring device**
  This field displays the current IP address and network mask of the PC of the sensor unit.

- **New IP-Address**
  In this field a new IP address for the PC of the sensor unit can be entered.

- **New network subnet mask**
  In this field a new subnet mask for the PC of the sensor unit can be entered.

- **Apply**
  Click this button, and your settings are adapted.

- **Shut down**
  If you click this button the processing unit of the sensor unit is shut down.

- **Reboot**
  If you click this button the processing unit of the sensor unit is restarted.

**User Administration**

- **Number of established connections**
  Here the number of user interfaces connected to the sensor unit is displayed.

- **User administration**
  This button is inactive.
6.14 Stopping PoliScan<sup>speed</sup> Operation

**NOTE!**
It is strongly recommended to shut down the internal processing unit of the measurement system before interrupting the power supply. Before a relocation shut down the processing unit, too.

- Enable the *Measuring device* tab.
- Click the *Shut down* tab and confirm the subsequent query with *Yes*.

If files are still being encrypted in the background, a warning pops up.

- Press the *Yes* button to stop the encryption immediately (non-encrypted case files are lost),
  or press the *No* button to continue after the post-processing of case data.
- The processing unit is shut down. The status bar displays the message *Connection lost* and a message window opens.
- Click the navigation tab *Quit* and confirm the subsequent query with *Yes*.

☑ All processes are terminated and the graphical user interface is closed.
- Shutdown the user interface.

As soon as the rear display shows the message “shut down”, the power supply can be disconnected from the measuring system.

- Disconnect all the cables between the user interface, sensor unit, flash unit(s) and battery block.
Chapter 7

Monitoring
7 Monitoring

In critical situations PoliScan™ generates alarm messages or warning messages. Besides that it generates messages with status information.

These messages are sent to the central server via the Download PC. The central server writes the messages in a Monitoring Database. This database is accessible via web server for operators using a work station which is connected via LAN to the central server.

- Enter the IP address of the central server in the command line of your browser.
- Confirm your entry with <Enter>.

The connection to the web server is established. The web server displays the Graphical User Interface (GUI) of the Monitoring Database.

7.1 Monitoring GUI

The GUI displays the current state of all monitored sites. Information related to an individual site is structured as follows:

![Graphical User Interface of the Monitoring Database](image)

**Figure 49:** Graphical User Interface of the Monitoring Database

The GUI displays the current state of all monitored sites. Information related to an individual site is structured as follows:

![Status of an individual site](image)

**Figure 50:** Status of an individual site
Notice

This section displays – if available – a comment. You can add, modify or delete a comment.

- Click the pencil icon.
- The notice section is expanded.

![Figure 51: Expanded notice section](image)

If you want to add a notice:

- Enter a text in the entry field.
- Click the Confirm icon.

If you want to modify a notice:

- Modify the text in the entry field.
- Click the Confirm icon.

If you want to delete a notice:

- Click the Delete icon.

Alarm List

The alarm list contains all alarm messages which have not been regarded as solved by the operator. The number of messages in the list is displayed in the section header.

![Alarm List (1)](image)

Figure 52: Alarm list (example)

Each entry contains date and time of the message, the error name and the error code.

**NOTE!**

The structure of the error code is explained in *chap. 7.4*. All error codes are listed in *chap. 7.5*.

If you double-click error name/error code, a window opens.
Besides error name and error code, date and time, serial number of the sensor unit and site a solution for the problem is offered.

- Close the window with Close.

As soon as you have taken appropriate measures (e.g. informed the service):

- Click the set noticed button.
- The inscription of the button changes to set proceeded.

As soon as the problem has been solved:

- Click the set proceeded button.
- The error message is deleted from the alarm list.

In case a new error message is received, an info window pops up immediately.
Figure 54: Alert notification

Besides the jump to button this window is very similar to the error window.

If you click the jump to button:

☑ The correct site where the error occurred is displayed in the site list of the Monitoring GUI (no scrolling required).

**System List**

The system list displays all sensor units at the specific site.

Figure 55: Entry in the system list (example)

At the left-hand, an entry displays the serial number of the sensor unit. In case there is no entry in the alarm list, the background color is green; otherwise the background color is red.

The system information displays the following data:
**Message Counter**
Number of all messages sent to the central server, date and time of the last message

**No. of transferred Tuffs**
Number of transferred case files, date and time of the last transferred case file

**System Found**
Serial number or IP address of the sensor unit, date and time of the last start of the sensor unit

### 7.2 Monitoring Archive

The Monitoring Archive lists all alarm messages received by the central server in chronological order.

- Click the **View Logs** button at the very top of the Monitoring GUI.

The Monitoring Archive opens.

The screen is divided into the **Navigation Bar**, the **Search Options**, the **Results Screen** and the **Download button**.

**Navigation Bar**

Using the **Navigation Bar** it is possible to skip through the pages in the **Results Screen**.

- **First**
  Back to the first page
MONITORING

Figure 58: Search Options

Here it is possible to define the results by selecting from predetermined criteria. The following search options are available:

- **Error level**
  Select the error level of messages (see chap. 7.4) which should be displayed.

- **Error name**
  Select the error name of messages (see chap. 7.5) which should be displayed.

- **System name**
  Select the serial number of the sensor unit which should be displayed.

Results Screen

<table>
<thead>
<tr>
<th>Time</th>
<th>IP</th>
<th>System name</th>
<th>Event name</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009-12-14 15:25:18</td>
<td>0.0.0.0</td>
<td><a href="#">Console rate too high</a></td>
<td><a href="#">ERROR_10230020</a></td>
<td>10230020</td>
</tr>
<tr>
<td>2009-12-14 15:36:03</td>
<td>0.0.0.0</td>
<td><a href="#">System disconnected</a></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2009-12-14 15:37:21</td>
<td>0.0.0.0</td>
<td><a href="#">Console rate too high</a></td>
<td><a href="#">ERROR_10230020</a></td>
<td>10230020</td>
</tr>
<tr>
<td>2009-12-14 15:49:51</td>
<td>0.0.0.0</td>
<td><a href="#">Console rate too high</a></td>
<td><a href="#">ERROR_10230020</a></td>
<td>10230020</td>
</tr>
<tr>
<td>2009-12-15 00:31:08</td>
<td>0.0.0.0</td>
<td><a href="#">Console rate too high</a></td>
<td><a href="#">ERROR_10230020</a></td>
<td>10230020</td>
</tr>
<tr>
<td>2009-12-15 04:00:51</td>
<td>0.0.0.0</td>
<td><a href="#">Console rate too high</a></td>
<td><a href="#">ERROR_10230020</a></td>
<td>10230020</td>
</tr>
<tr>
<td>2009-12-15 09:05:58</td>
<td>0.0.0.0</td>
<td><a href="#">System disconnected</a></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>end of log...</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure 59: Results Screen (example)

Here you receive the following information for each message (on a separate line):

- **Time**
  Date and time of the error message

- **IP**
  IP address of the related sensor unit

- **System name**
  Serial number of the related sensor unit

- **Event name**
  Error name of the message (see chap. 7.5)

- **Value**
  Error code of the message (see chap. 7.5)
**Download Button**

You can save the content of the Results Screen as *.txt*-file.

- Click the **Download** button.

- The dialog window **File Download** opens.

![File Download Dialog Window](image)

**Do you want to open or save this file?**

- Name: log.txt
- Type: Text Document
- From: 10.10.0.2

- Open
- Save
- Cancel

While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not open or save the file. [What’s this?]?

**Figure 60:** Dialog window **File Download**

- Click the **Save** button.

- A file administration window opens.

- Select the destination folder for the file and assign a file name.

- Click the **Save** button.

- The file is saved in the selected folder.
7.3 Control Application

The user software installed on the Download PC and used as the user interface for PoliScan\textsuperscript{speed} also generates alarm signals in critical situations. Every signal consists of:

- an acoustic signal
- a message in the status bar colored red (visible for five seconds or five seconds after the notification dialog is acknowledged – see below)

![Warning in the status bar](image1)

![Error message in the status bar](image2)

![Message of a service case in the status bar](image3)

- a message window displaying the cause of the malfunction and a history of all malfunctions (needs to be acknowledged by the user via the OK button)

![Message windows for warning, error and service case](image4)

The display of warnings can be suppressed by enabling the checkbox *Don’t show warning*. 

2570 udi, page 7-8
7.4 Structure of the Error Codes

Figure 65: Structure of the error codes

7.4.1 Error Level

<table>
<thead>
<tr>
<th>Value (Hex)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7xxx xxxx</td>
<td>Service case: The system no longer allows measurement operation. The status bar displays the message <em>Server in suspended mode.</em></td>
</tr>
<tr>
<td>5xxx xxxx</td>
<td>Device self-monitoring: incorrect status, no measurement operation possible</td>
</tr>
<tr>
<td>4 xxx xxxx</td>
<td>Device self-monitoring: hardware component out of service, no measurement operation possible</td>
</tr>
<tr>
<td>1 xxx xxxx</td>
<td>Warning</td>
</tr>
<tr>
<td>0 xxx xxxx</td>
<td>Information</td>
</tr>
</tbody>
</table>

Table 1: Error level
7.4.2 Modules

<table>
<thead>
<tr>
<th>Value (Hex)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>x00xxxx</td>
<td>Module for initial self-test and on-going system monitoring</td>
</tr>
<tr>
<td>x02xxxx</td>
<td>Module for detection and tracking of vehicles</td>
</tr>
<tr>
<td>x03xxxx</td>
<td>Module for the adjustment of the measurement system</td>
</tr>
<tr>
<td>x04xxxx</td>
<td>Module for relevance filtering</td>
</tr>
<tr>
<td>x05xxxx</td>
<td>Module for evidence image acquisition and case generation</td>
</tr>
<tr>
<td>x06xxxx</td>
<td>Module for encryption, signature and saving of case data</td>
</tr>
<tr>
<td>x07xxxx</td>
<td>Module for process monitoring</td>
</tr>
<tr>
<td>x10xxxx</td>
<td>Module of the user interface</td>
</tr>
<tr>
<td>xFExxxx</td>
<td>Driver module</td>
</tr>
</tbody>
</table>

Table 2: Modules

7.4.3 Error Classes

<table>
<thead>
<tr>
<th>Value (Hex)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>xxx2xxxx</td>
<td>Initializing Error</td>
</tr>
<tr>
<td>xxx3xxxx</td>
<td>Processing Error</td>
</tr>
<tr>
<td>xxx7xxxx</td>
<td>Unspecified</td>
</tr>
</tbody>
</table>

Table 3: Error classes
## 7.5 Error Codes

<table>
<thead>
<tr>
<th>Code (Hex)</th>
<th>Description</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>0002 1002</td>
<td>The validity period of the calibration will expire in less than 14 days. Following this the enforcement function will become inoperable.</td>
<td>The measuring device has to be recalibrated for the system to be in operational readiness.</td>
</tr>
<tr>
<td>1003 0100</td>
<td>The power supply of the measuring device is not sufficient for further operation.</td>
<td>Please carry out a controlled shut down of the device and exchange the battery immediately.</td>
</tr>
<tr>
<td>1003 0200</td>
<td>The temperature inside the measuring device is low and almost outside of the normal operating temperature range.</td>
<td>The system should be heated</td>
</tr>
<tr>
<td>1003 0201</td>
<td>The temperature inside the measuring device is high and almost outside of the normal operating temperature range.</td>
<td>The system should be cooled</td>
</tr>
<tr>
<td>1003 0300</td>
<td>The storage capacity of the measuring device is almost full. The device allows for documentation of a few offenses only.</td>
<td>Please archive case files to make storage capacity available.</td>
</tr>
<tr>
<td>1023 0040</td>
<td>The vehicle recognition rate is quite low at the moment.</td>
<td>Possible causes are low traffic, maladjustment of the measuring device and/or an obscurement of its visual field.</td>
</tr>
<tr>
<td>1043 0020</td>
<td>The measuring rate is quite low at the moment.</td>
<td>Possible causes are maladjustment of the measuring device and/or an obscurement of its visual field.</td>
</tr>
<tr>
<td>1053 0010</td>
<td>Communication with camera 1 has failed.</td>
<td>Please check the cable connections. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>1053 0011</td>
<td>Communication with camera 2 has failed.</td>
<td>Please check the cable connections. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>4002 0010</td>
<td>(Camera 1) - Self test of camera 1 has failed.</td>
<td>Please check the cable connections and reboot the measuring device. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>Code (Hex)</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>4002 0011</td>
<td>(Camera 2) - Self test of camera 2 has failed.</td>
<td>Please check the cable connections and reboot the measuring device. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>4003 0100</td>
<td>(Low voltage) - The power supply of the measuring device is not sufficient. Further operation is not possible. The device has stopped all functions and will shut down automatically in a short time.</td>
<td>After the shutdown: Exchange the battery</td>
</tr>
<tr>
<td>4003 0200</td>
<td>(Low temperature) - The temperature inside the measuring device is too low.</td>
<td>Check the internal heating status LED, if OK wait a few minutes. If the device still does not heat up automatically, use another means to raise the internal temperature.</td>
</tr>
<tr>
<td>4003 0201</td>
<td>(High temperature) - The temperature inside the measuring device is too high. The previous operating mode will be continued after cooling down.</td>
<td>The system should be cooled.</td>
</tr>
<tr>
<td>4003 1003</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>4003 1004</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>4022 0000</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction. Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>4023 0010</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>4023 0020</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>Code (Hex)</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>4033 0010</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>4052 0000</td>
<td>(Camera 1) - Communication with camera 1 has failed.</td>
<td>Please check the cable connections and reboot the measuring device. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>4052 0001</td>
<td>(Camera 2) - Communication with camera 2 has failed.</td>
<td>Please check the cable connections and reboot the measuring device. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>4053 0010</td>
<td>(Camera 1) - Communication with camera 1 has failed.</td>
<td>Please check the cable connections and reboot the measuring device. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>4053 0011</td>
<td>(Camera 2) - Communication with camera 2 has failed.</td>
<td>Please check the cable connections and reboot the measuring device. Contact your service partner in case of repeated occurrence.</td>
</tr>
<tr>
<td>4063 0000</td>
<td>(Storage capacity) - The storage capacity of the measuring device is full. Documentation of offenses is stopped.</td>
<td>Please archive case files to make storage capacity available.</td>
</tr>
<tr>
<td>4063 0001</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>4102 0006</td>
<td>(Enforcement) - The configuration of the measuring device and the features of the location are not compatible with the speed parameters. The chosen enforcement function is not operational.</td>
<td>The site does not allow any of the surveillance modes provided by the system.</td>
</tr>
<tr>
<td>4102 0007</td>
<td>(Autostart) - The automatic start function can not be executed.</td>
<td>Ensure complete configuration of the location parameters. Contact your service partner in case of repeated occurrence in spite of correct settings.</td>
</tr>
<tr>
<td>5062 0010</td>
<td>(Service) - The measuring device is out of order due to a system malfunction. Please contact your service partner. Please contact your service partner.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>Code (Hex)</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>5062 FFFF</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5063 0010</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5072 0001</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>5072 0002</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>5072 0003</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>5072 0006</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5072 000A</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>5102 0004</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5102 0005</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5103 0003</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5103 0004</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>5103 0005</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>Code (Hex)</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>------------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>5FE2 0010</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>5FE3 0010</td>
<td>(Malfunction) - The normal operation of the measuring device is affected by a system malfunction.</td>
<td>Please reboot the device; in case of repeated occurrences please contact your service partner.</td>
</tr>
<tr>
<td>7002 0000</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7002 00F0</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7002 1000</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7002 1001</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7002 1002</td>
<td>(Validity period) - The validity period of the calibration has expired. The enforcement function can not be started. All other functions are still in operation.</td>
<td>The measuring device has to be recalibrated.</td>
</tr>
<tr>
<td>7003 1002</td>
<td>(Validity period) - The validity period of the calibration has expired. The enforcement function has been stopped. All other functions are still in operation.</td>
<td>The measuring device has to be recalibrated.</td>
</tr>
<tr>
<td>7003 1013</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7063 0001</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7063 0011</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>Code (Hex)</td>
<td>Description</td>
<td>Solution</td>
</tr>
<tr>
<td>-----------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>7102 0009</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
<tr>
<td>7102 000A</td>
<td>(Service) - The measuring device is out of order due to a system malfunction.</td>
<td>Please contact your service partner.</td>
</tr>
</tbody>
</table>

Table 4: Error codes

### 7.6 LED Display

The LEDs at the rear side of the sensor unit indicate the following states:

- Heating time depends on ambient temperature
- Temperature is outside min./max. limits. The measurement is stopped.
- There is 0.5-1 hour left for system operation (depending on battery age/ambient temperature)
- There are only some minutes left for system operation. Shutdown the system!
- Battery is connected with wrong polarity.

Figure 66: LED display at the rear side of the sensor unit
8 Photo Evaluation

8.1 General

The data collected and saved by PoliScan\textsuperscript{speed} are automatically downloaded to the Download PC and sent to the central server. This data is removed but not copied and therefore exist only once: The authenticity is guaranteed.

The signed and watermarked can only be checked on authenticity with the help of a certified viewer program (PoliScan\textsuperscript{TUFF-Viewer}).

8.2 Case Data Record Description

PoliScan\textsuperscript{speed} generates from every automatically and manually triggered photo shot an watermarked evidence data file in \textit{tuff}-format, consisting of:

- a case-relating text
- a case-relating photo documentation
- a graphical template for evaluation

The template is a perspectively displayed rectangular region of 1m height at the vehicle front. Its width corresponds to the part of the vehicle front from which measurement values have been acquired (at least 80 cm). At least one front wheel (in case of front measurement) respectively one rear wheel (in case of rear measurement) and/or the license plate of a vehicle must at least in part be visible within the template. Other road users travelling on the same lane or an adjacent lane must not be visible within the template. Moreover, the lower edge of the template frame must be beneath the wheels. Otherwise, the photo must be rejected as evidence.

Additionally, the graphical template includes an auxiliary line which corresponds with a scale of 0.5 m. Its vertical position visualises the sampling level.
### Case-relating Text

<table>
<thead>
<tr>
<th>Data</th>
<th>Manual Image Capture</th>
<th>Next Vehicle</th>
<th>Speed Offence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Witness (user of the system at the time of the measurement)</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Authority in charge</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Location of the photo shot</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Speed limit for the selected vehicle class (car or truck)</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Photo trigger speed</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Measured speed</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Time of the offence&lt;sup&gt;1&lt;/sup&gt;</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Start time of the particular series of measurements</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Current number in the particular series of measurements</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Number of the particular series of measurements</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Vehicle class (car or truck)</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td>Case index</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Direction in which the vehicle moves relating to the measuring system</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Commentary – if it exists</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>Serial number of the measuring system</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 5: Data in the case-relating text

<sup>1</sup> Time of abandonment of the measuring range.
Photo Documentation

All images in the case data record are overview images including the license plate. The viewer program displays two split images:

a) with a higher resolution portion of the dynamic range for number plate recognition,
b) with a lower resolution portion of the dynamic range for the driver recognition.

The following table lists for the different offences which images are generated with or without a graphical template for evaluation.

<table>
<thead>
<tr>
<th>Offence</th>
<th>Graphical Template for Evaluation?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manual Image Capture</td>
<td>no</td>
</tr>
<tr>
<td>Next Vehicle</td>
<td>yes</td>
</tr>
<tr>
<td>Speed Offence</td>
<td>yes</td>
</tr>
</tbody>
</table>

Table 6: Images with or without graphical template for evaluation

NOTE!
For precise allocation of the measured speed to a definite vehicle use the evaluation template solely (and not the lane number).

IMPORTANT!
In individual cases, the identification of the vehicle class (car/truck) may not be reliable. If there are different speed limits for the individual vehicle classes, the evaluator must convince himself that the value from the case data record applies to the displayed vehicle.
8.3 Evaluation of Approaching and Receding Traffic

The evaluation of the photo documentation is the same for both approaching and receding traffic.

Valid Evidence Photos

Figure 67: Valid evidence photo – a vehicle on one lane (approaching traffic)
Figure 68: Valid evidence photo - a vehicle on one lane (receding traffic)

Figure 69: Valid evidence photo – the width of the vehicle has been underestimated by the system. The evaluation criteria have nevertheless been met: A wheel and partly also the license plate are within the evaluation template. The lower edge of the template is beneath the wheels.

- Reject the photo as an evidence, if
  - neither a front wheel (in case of front measurement) nor the license plate are at least in part visible within the template, respectively
• neither a rear wheel (in case of rear measurement) nor the license plate are at least in part visible within the template, or

• other road users travelling on the same lane or an adjacent lane are visible within the template, or

• the lower edge of the template frame is not beneath the wheels.

Not Valid as Evidence Photos

Figure 70: Not valid as evidence photo - a vehicle on one lane. The lower edge of the template frame is not beneath the wheels.
Figure 71: Not valid as evidence photo - two vehicles on two lanes. There are parts of two vehicles visible within the template frame. Moreover there is no traffic violation of the truck driver, since neither a front wheel nor the license plate of the truck is within the evaluation template. The measured violation has not been committed by the truck driver, but by the car driver covered by the truck.
Chapter 9

Technical Data
9 Technical Data

9.1 General Data

<table>
<thead>
<tr>
<th>Speed measurement range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Permissible speed range</td>
<td>10 km/h to 250 km/h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Power supply</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LIDAR/digital camera</td>
<td>Power pack 230/12 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Permissible input voltage range</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Lower limit</td>
<td></td>
</tr>
<tr>
<td>Warning</td>
<td>&lt; 11.5 V</td>
</tr>
<tr>
<td>blockade of measurements</td>
<td>&lt; 10.5 V</td>
</tr>
<tr>
<td>complete cut-off</td>
<td>8.5 V</td>
</tr>
<tr>
<td>Upper limit</td>
<td>16.0 V</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current consumption</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LIDAR</td>
<td>8 W</td>
</tr>
<tr>
<td>Digital Camera</td>
<td>7 W each</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions/Weight/Temperature</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PoliScan\textsuperscript{speed}</td>
<td>17.5 kg</td>
</tr>
<tr>
<td>Recommended environmental temperature range</td>
<td>+5°C to +70°C</td>
</tr>
</tbody>
</table>

(PoliScan\textsuperscript{speed} monitors the internal temperature of the system, and stops operation when the permissible range is abandoned)

Table 7: General Data
9.2 LIDAR

<table>
<thead>
<tr>
<th>Technical Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range of measured distances</td>
<td>10 m – 75 m</td>
</tr>
<tr>
<td>Measuring frequency</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Number of measurements/scans</td>
<td>158</td>
</tr>
<tr>
<td>Angular resolution (horizontal)</td>
<td>0.28 °</td>
</tr>
<tr>
<td>Horizontal measurement angle</td>
<td>45 °</td>
</tr>
<tr>
<td>Horizontal beam spread</td>
<td>6 mrad</td>
</tr>
<tr>
<td>Vertical beam spread</td>
<td>19 mrad</td>
</tr>
<tr>
<td>Depth resolution</td>
<td>312.5 mm</td>
</tr>
<tr>
<td>Pulse duration</td>
<td>15 ns</td>
</tr>
<tr>
<td>Pulse width</td>
<td>4.5 m</td>
</tr>
<tr>
<td>Resolution A/D-converter</td>
<td>8 bit</td>
</tr>
<tr>
<td>Power supply</td>
<td>12 V DC</td>
</tr>
<tr>
<td>Laser class</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 8: Technical data LIDAR

9.3 Display at Sensor Unit

<table>
<thead>
<tr>
<th>Technical Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Displayed speed range</td>
<td>10 km/h to 250 km/h</td>
</tr>
<tr>
<td>Speed display</td>
<td>Redundant, alpha-numeric, dot matrix</td>
</tr>
</tbody>
</table>

Table 9: Technical data of the calibrated display
9.4  Digital Camera

<table>
<thead>
<tr>
<th>SVS Vistek</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>CCD chip</td>
<td>4 megapixel</td>
</tr>
<tr>
<td>Shutter speed</td>
<td>120 µs - 9.4 sec</td>
</tr>
<tr>
<td>Lenses</td>
<td>35 mm</td>
</tr>
<tr>
<td>Aperture angle (horizontal)</td>
<td>24°</td>
</tr>
<tr>
<td>Exposure rate</td>
<td>max. 8 photos/s</td>
</tr>
</tbody>
</table>

Table 10:  Technical data digital camera

9.5  Operating Device

<table>
<thead>
<tr>
<th>Operating system</th>
<th>WindowsNT4.0, 2000, XP</th>
</tr>
</thead>
<tbody>
<tr>
<td>JavaVM</td>
<td>from version 1.5</td>
</tr>
<tr>
<td>Limiting values</td>
<td>Adjustable in 1 km/h-steps</td>
</tr>
<tr>
<td>Fade-ins</td>
<td>On the Enforcement tab in mask form next to the evidence photo</td>
</tr>
<tr>
<td>Date, time</td>
<td>Digital clock in the PC, quartz-controlled</td>
</tr>
</tbody>
</table>

Table 11:  Technical data operating device

WindowsNT / 2000 / XP and JavaVM are registered trademarks of the companies Microsoft and, respectively, Sun Microsystems.