Operating instructions

Laser Positioning Sensor NAV310

Precise Laser Navigation for Maximum Efficiency

SICK
Sensor Intelligence.

Software version described

Software/tool	Function	Status
NAV310	Firmware	V 1.00
Device description NAV310	Device specific software module for SOPAS ET	V 1.000 or higher
SOPAS ET	Configuration software	V 02.28 or higher

Software access to the NAV310 is password protected. The default factory setting for the password is as follows:

User level	Password
Authorised client	client

NOTICE

The NAV310 laser positioning sensor is intended for use in industrial environments. When used in residential areas, it can cause radio interferences.

Version of the operating instructions

The latest version of these operating instructions can be obtained as PDF at **www.sick.com**.

Table of content

Abbreviations

CoLa	Communication Language = proprietary SOPAS ET communication language (ASCII = CoLa-A or binary = CoLa-B)
EEPROM	Electrically Erasable Programmable Read-only Memory
AGV	Automated guided vehicle
LED	Light Emitting Diode
RAM	Random Access Memory = volatile memory with direct access
ROM	Read-only Memory (permanent)
SOPAS ET	SICK OPEN PORTAL for APPLICATION and SYSTEMS ENGINEERING TOOL = configuration software for the configuration of the NAV310
USP	Protocol for user-programmed evaluation

Tables

Figures

1 About this document

Please read this chapter carefully before working with this documentation and the laser positioning sensor NAV310.

1.1 Function of this document

These operating instructions are designed **to address the technical personnel** in regards to safe mounting, electrical installation, configuration, commissioning and maintenance of the following laser positioning sensor.

1.2 Target group

The intended target group for this document is people in the following positions:

Activities	Target group
Mounting, electrical installation, maintenance and replacement	Factory electricians and service engineers
Commissioning, operation and configuration	Technicians and engineers

Tab. 1: Target groups of this document

1.3 Depth of information

These operating instructions contain the following information on the NAV310:

- Product description
- Assembly
- Electrical installation
- Commissioning and configuration
- Maintenance
- troubleshooting and rectification
- Ordering information
- conformity and approval

Planning and using a laser positioning sensor such as the NAV310 also require specific technical skills which are not detailed in this documentation.

Further information on the NAV310 is available from SICK AG, Division Auto Ident, and in the Internet at www.sick.com.

Important In the following the laser positioning sensor is referred to as NAV310 for short.

1.4 Symbology used

Recommendation Recommendations are designed to give you assistance in the decision-making process with respect to a certain function or a technical measure.

Important Sections marked “Important” provide information about special features of the device.

Explanation Explanations provide background knowledge on technical relationships.

MENU COMMAND This typeface indicates a term in the SOPAS ET user interface.

Terminal output This typeface indicates messages that the NAV310 outputs via its interfaces.

➢ **Take action ...** Here you must do something. This symbol indicates an instruction to perform an action that contains only one action or actions in warnings where a specific sequence does not need to be followed. Instructions to perform actions that contain several steps in a specific sequence are numbered.

This symbol refers to additionally available documentation.

Software notes show where you can make the appropriate settings and adjustments in the SOPAS ET configuration software.

NOTICE

Note!

A note provides indicates potential hazards that could involve damage or degradation of the functionality of the NAV310 or other devices.

⚠ WARNING

Warning!

A warning indicates an actual or potential hazard. They are designed to help you to prevent accidents.

The safety symbol beside the warning indicates the nature of the risk of accident, e.g. due to electricity. The warning category (DANGER, WARNING, CAUTION) indicates the severity of the hazard.

➢ Read carefully and follow the warning notices!

2 For your safety

This chapter deals with your own safety and the safety of the equipment operators.

➢ Please read this chapter carefully before working with the NAV310.

2.1 Authorised personnel

The NAV310 must only be installed, commissioned and serviced by adequately qualified personnel.

NOTICE

Repairs to the NAV310 are only allowed to be undertaken by trained and authorised service personnel from SICK AG.

The following qualifications are necessary for the various tasks:

Activities	Qualification
Mounting and maintenance	• Basic technical training • Knowledge of the current safety regulations in the workplace
Electrical installation and replacement	• Practical electrical training • Knowledge of current electrical safety regulations • Knowledge on the use and operation of devices in the related application (e.g. crane, assembly system)
Commissioning, operation and configuration	• Knowledge on the use and operation of devices in the related application (e.g. crane, assembly system) • Knowledge on the software and hardware environment in the related application (e.g. crane, assembly system) • Basic knowledge of the Windows operating system • Basic knowledge of data transmission

Tab. 2: Authorised personnel

2.2 Intended use

NOTICE

The NAV310 laser positioning sensor is intended for use in industrial environments. When used in residential areas, it can cause radio interferences.

The NAV310 meets the requirements for the navigation of automated guided vehicles (AGVs). As a product in the NAV range, the NAV310 provides the highest levels of flexibility for use in modern positioning systems. The acquisition of accurate spatial data, the locating of various reflector marks and the output of raw data support the user during the integration of the scanner. With high levels of speed and accuracy, the NAV310 laser measurement sensor delivers all the necessary spatial contour data through 360°, making it possible for the vehicle computer to calculate the position of the vehicle, even when the environmental conditions change.

The NAV310 is a sensor for use indoors.

Important In case of any other usage as well as in case of modifications to the NAV310, e.g. due to opening the housing during mounting and electrical installation, or to the SICK software, any claims against SICK AG under the warranty will be rendered void.

NOTICE

The NAV310 is only allowed to be operated in the ambient temperature range allowed (see *section 9.1 "Data sheet NAV310" on page 49*).

2.3 General safety notes and protective measures

⚠ WARNING

Safety instructions

Please observe the following items in order to ensure the correct and safe use of the NAV310.

- The notices in these operating instructions (e.g. on use, mounting, installation or integration into the existing machine controller) must be observed.
- When operating the NAV310, the national, local and statutory rules and regulations must be observed.
- National/international rules and regulations apply to the installation, commissioning, use and periodic technical inspections of the NAV310, in particular
  - the work safety regulations/safety rules
  - other relevant health and safety regulations.
- Manufacturers and operators of the machine/system on which the NAV310 is installed are responsible for obtaining and observing all applicable safety regulations and rules.
- The tests must be carried out by specialist personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time.
- The operating instructions must be made available to the operator of the system where the NAV310 is used. The operator of the system is to be instructed in the use of the device by specialist personnel and must be instructed to read the operating instructions.
- The NAV310 is not a device for the protection of people in the context of the related safety standards for machinery.

2.3.1 Electrical installation work

NOTICE

- Only authorised personnel are allowed to perform the electrical installation work.
- Only make and disconnect electrical connections when the device is electrically isolated.
- Select and implement wire cross-sections and their correct fuse protection as per the applicable standards.

➢ Do not open the housing.

➢ Observe the current safety regulations when working on electrical systems.

2.3.2 Laser radiation of the NAV310

⚠ CAUTION

Laser radiation!

The NAV310 complies with laser class 1 (eye safe) in accordance with EN 60825-1:2014+A11:2021, IEC 60825-1:2014, EN/IEC 60825-1:2007. Complies with 21 CFR 1040.10 and 1040.11 with the exception of the deviations as per Laser Notice No. 50. The laser beam cannot be seen with the human eye.

- Incorrect usage can result in hazardous exposure to laser radiation.
- ➢ Do not open the housing (opening the housing will not switch off the laser).
- ➢ Pay attention to the laser safety regulations as per EN 60825-1 (latest version).

Important No maintenance is necessary to ensure compliance with laser class 1.

Laser output aperture

The laser output aperture is the view window on the scanner head of the NAV310.

Fig. 1: Laser output aperture on the NAV310

Laser power

The laser operates at the wavelength λ = 905 nm (invisible infrared light). The radiation emitted in correct use is not harmful to the eyes and human skin.

2.4 Quick stop and Quick restart

2.4.1 Switch the NAV310 off

- ➢ Switch off the voltage supply (power supply) for the NAV310.

The NAV310 retains parameters stored in the internal, non-volatile memory. Measured values in the memory are lost.

2.4.2 Switch on the NAV310

- ➢ Switch on voltage supply (power supply) for the NAV310.

The NAV310 restarts operation with the last saved parameters.

2.5 Environmental protection

The NAV310 has been designed to minimise environmental impact. It uses only a minimum of power.

While working, always act in an environmentally responsible manner. For this reason please note the following information on disposal.

2.5.1 Power consumption

- The NAV310 consumes a maximum of 36 W in operation.

2.5.2 Disposal after final de-commissioning

➢ Always dispose of unserviceable or irreparable devices in compliance with local/national rules and regulations on waste disposal.

➢ Dispose of all electronic assemblies as hazardous waste. The electronic assemblies are straightforward to dismantle.

Important SICK AG does not accept unusable or irreparable devices that are returned.

3 Product description

This chapter provides information on the special features and properties of the NAV310. It describes the construction and the operating principle of the device, in particular the different operating modes.

Please read this chapter before mounting, installing and commissioning the device.

3.1 Scope of delivery

The NAV310 delivery includes the following components:

Piece(s)	Component	Remark
1	NAV310 Laser positioning sensor	–
1	Device instructions with electrical circuit diagram for getting started	Is included in the NAV310 packaging
1	Lens cloth	–

Tab. 3: Scope of delivery

Source for obtaining additional information

Additional information about the NAV310 and its optional accessories can be found in the following places:

Product web page for the NAV310

(www.sick.com/NAV3xx)

- Detailed technical specifications (online data sheet)
- Technical information (supplementary information on telegrams for CoLa A/B, part no.: 8016855 and USP, part no.:8016687)
- These operating instructions are available in German, English and other languages if required.
- Dimensional drawing and 3D CAD dimension models in various electronic formats
- Declarations of conformity and certificates
- SOPAS configuration software updates

Support is also available from your sales partner: *www.sick.com/worldwide.*

3.2 Construction of the NAV310

3.2.1 Views of device

Fig. 2: Views of device

3.2.2 Operating and display elements

User interface

The NAV310 operates fully automatically in normal operation without the intervention of an operator.

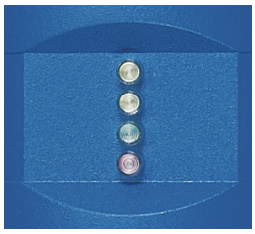
The interactive configuration is carried out using the provided SOPAS ET configuration software. The software used for this purpose runs on a PC with the operating system Windows that is connected to the NAV310 via one of the interfaces.

Use the graphic scan view in SOPAS ET to verify the generated measured values and to verify the measurement area online. During this process, note that SOPAS ET cannot display the data in real-time and therefore does not display all measured values.

Display elements

The LEDs signal the operational status of the NAV310.

The NAV310 has four LEDs. These visually signal the actual operational status and the status of the continuous self-check. The LEDs are on the front of the device on the NAV310. *tab. 4* shows the function of the LEDs.



Yellow (1)
Yellow (2)
Green
Red

Yellow LED (1)	Yellow LED (2)	Green LED	Red LED	Meaning
Off	Off	Off	Off	Device switched off. No supply voltage.
On	On	On	On	LED test for 5 s after switching on. The output signal switching device is active.
On	Any	Flashing 1 Hz/2.5 Hz	Off	SOPAS Command and USP Command
Any	On	Flashing 1 Hz/2.5 Hz	Off	SOPAS Command and USP Command
Any	Any	Flashing 1 Hz	Off	Stand by
Any	Any	Flashing 2.5 Hz	Off	Measurement mode
Flashing 4 Hz	Any	Flashing 1 Hz	Off	Firmware Update
Any	Any	Any	Flashing 1 kHz	Flashing 1 Hz => Scanner booting (Device not ready)
Any	Any	Any	On	System error in the device Troubleshooting => Device not ready see *section 8.3 "Troubleshooting and rectification" on page 47*

Tab. 4: Meaning of the LED status indicators

3.3 Special features of the NAV310

Special features	Specific form
High performance	• contact-free, active measurement method • scanning range up to 250 m on reflectors • resolution of angular step width: max. 1/8° • max. pulse frequency of laser diode 14.4 kHz • flexible system configurations • configurable scanning areas (sectors) Output of measured values (raw data) • profile of the field of view in two-dimensional polar coordinates as hex values • contents of one revolution (360°): incl. number of the profile emitted, profile counter, sector numbers, step width, number of points per sector, time stamp for start/end of each sector, direction at the start/end of each sector, value and direction of the distances measured, status User Service Protocol (USP) via Ethernet • Configuration/measurement request via User Service Protocol (command strings) • USP Ethernet Port: 49152 Near field filter (digital) • Suppression of near field (2.5 m) interference Synchronisation • Via telegram • Via telegram and digital output on the NAV310 • Via Sync pulse on hardware output Angular compensation • Query for compensation data saved on the device to correct the angular measurement externally
Safety and convenience	• Robust, compact metal housing (max. IP 65), CE marking • Laser class 1 • Maintenance-free
Configuration/ operation	• Configuration using SOPAS ET software for PC • Alternatively using telegrams CoLa-A (ASCII) or CoLa-B (binary) (command strings)
Electrical interfaces	• Supply voltage DC 24 V • Data interfaces: Ethernet, RS-232 serial • 1 x output signal switching device for synchronisation

Tab. 5: Special features of the NAV310

3.4 Applications

AGV line guidance based on contour and reflector measurements (mixed mode navigation):

- shuttle systems
- freely moving forklift
- truck loading
- general automated guided vehicles
- extremely accurate profile measurement
- deep stacking

3.5 Operating principle of the NAV310

The NAV310 has an opto-electronic laser measurement system that electro-sensitively scans the contour of its surroundings in a plane with the aid of laser beams. The NAV310 measures its surroundings in two-dimensional polar coordinates. If a measurement beam is incident on an object, the position is determined in the form of distance, direction and remission.

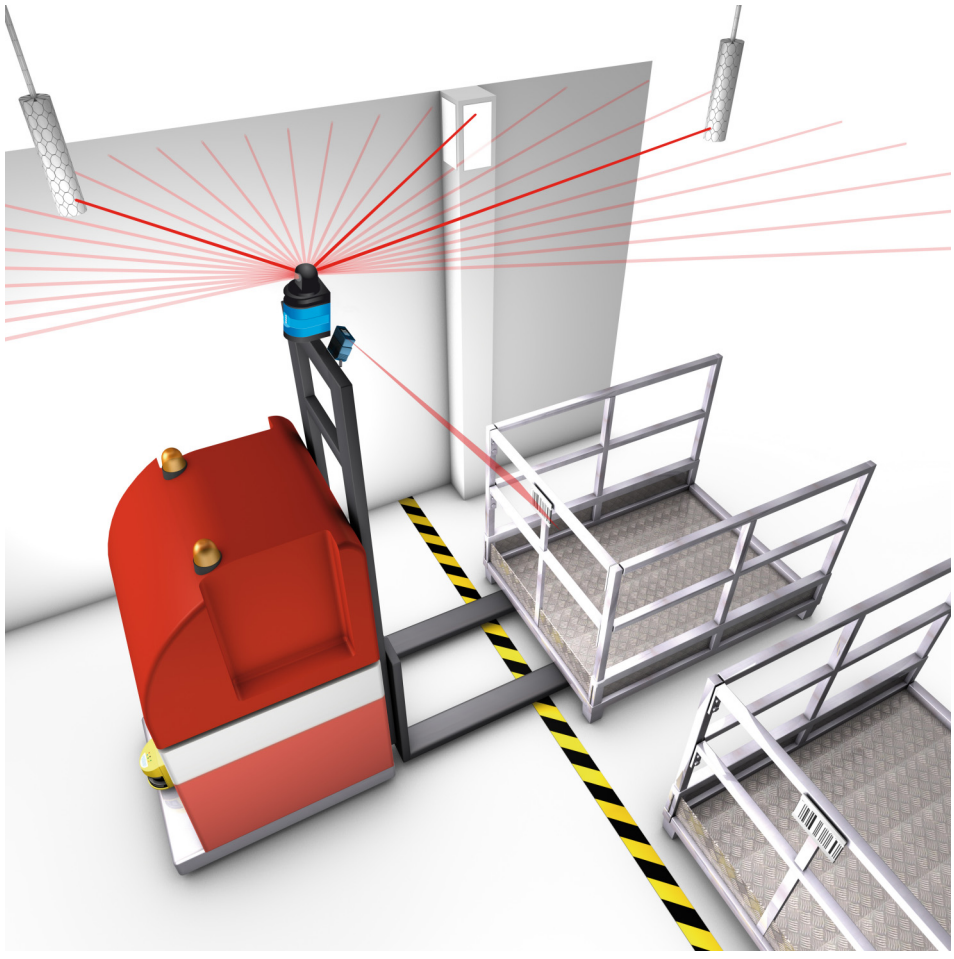


Fig. 3: Measuring principle of the NAV310

From the propagation time that the light requires from emission to reception of the reflec-tion at the sensor the NAV310 calculates the distance to the object.

3.5.1 Influences of objects on the measurement

The majority of surfaces reflect the laser beam diffusely in all directions. The reflection of the laser beam will vary as a function of the surface structure and colour. Light surfaces reflect the laser beam better than dark surfaces and can be detected by the NAV310 over larger distances. Brilliant white plaster reflects approx. 100% of the incident light, black foam rubber approx. 2.4%. On very rough surfaces, part of the energy is lost due to shading. The scanning range of the NAV310 will be reduced as a result.

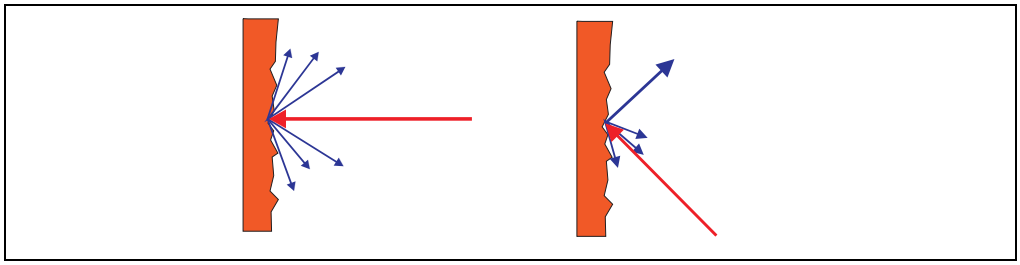


Fig. 4: Diffuse reflection from objects

The reflection angle is the same as the angle of incidence. If the laser beam is incident perpendicularly on a surface, the energy is optimally reflected (on the left). If the beam is incident at an angle, a corresponding energy and scanning range loss is incurred (on the right).

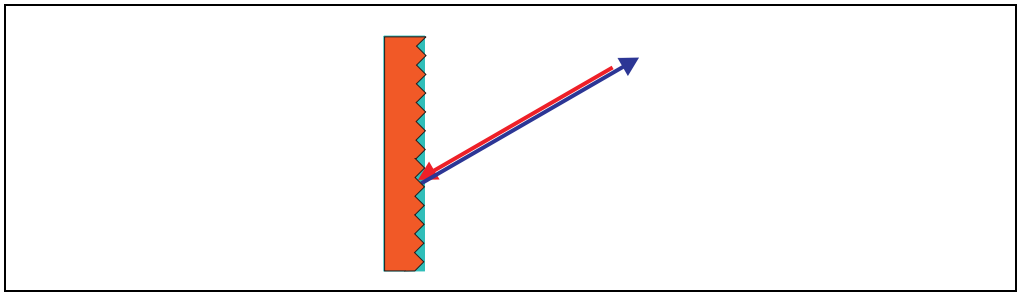


Fig. 5: Directional reflection from reflectors

The incident radiation is not reflected diffusely in all directions by reflectors, but directionally. As a result a large portion of the energy emitted can be received by the NAV310. The NAV310 makes use of this situation to be able to exactly measure the positions of reflectors.

Possible sources of errors

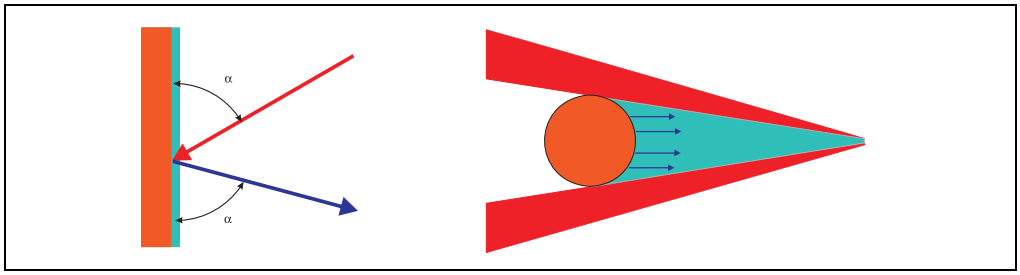


Fig. 6: Possible sources of errors during the measurement

At mirror surfaces (*fig. 6*, on the left) the laser beam is almost entirely deflected. Instead of the surface of the mirror, it is possible that the object on which the deflected laser beam is incident may be detected.

Objects that are smaller than the diameter of the laser beam (*fig. 6*, on the right) cannot reflect all the energy of the laser light. The energy in the portion of the laser light that is not reflected is lost. This means that the scanning range is less than would be possible theoretically based on the surface of the object.

3.5.2 Scanning range of the NAV310

The scanning range of the NAV310 is dependent on the remission of the objects to be detected. The better a surface reflects the incident radiation, the greater the scanning range of the NAV310.

Material	Remission	Range
Black photographic cardboard, matt	10%	0.5 ... 35 m (1.64 ... 114.8 ft)
White cardboard	90%	0.5 ... 120 m (1.64 ... 131.2 ft)
Reflective tape	>3000%	0.5 ... approx. 250 m (820.21 ft)

Tab. 6: Typical remissions and scanning ranges

3.5.3 Beam diameter and distance between measured points

With increasing distance from the NAV310 the laser beam increases in size. As a result the beam diameter on the surface of the object increases.

The distance-dependent beam diameter is the distance (mm (in)) × 0.005 rad + 20 mm (0.79 in).

With increasing distance from the NAV310 the spacing between the individual measured points also increases. The diagram in *fig. 7* shows the beam diameter and the distance between measured points as a function of the distance from the NAV310.

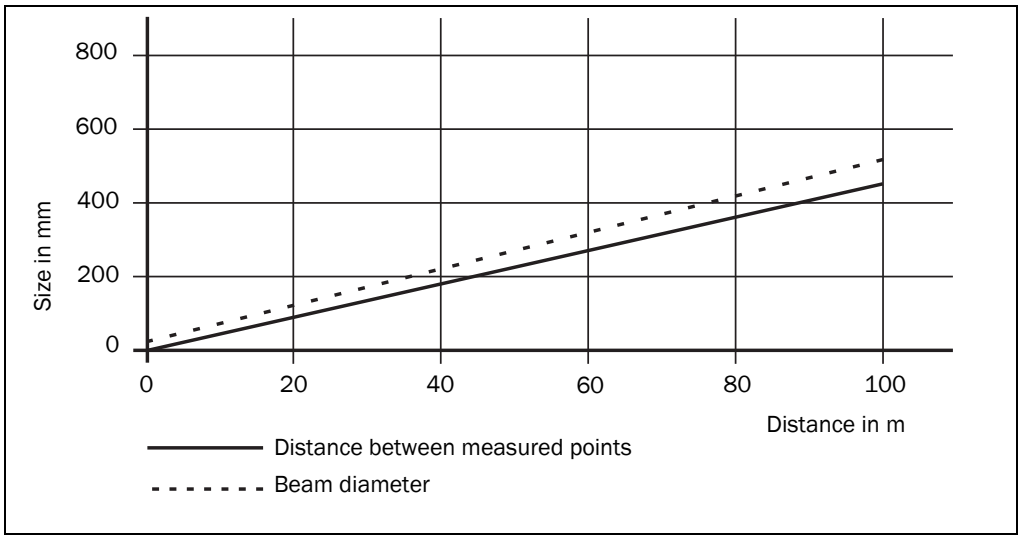


Fig. 7: Beam diameter and distance between measured points at 0 to 100 m

To reliably detect an object, a laser beam must be fully incident on it once. If the beam is partially incident, less energy will be reflected by an object than necessary in some circumstances (see *fig. 6 on page 20*).

How to calculate the minimum object size:

Beam diameter + distance between measured points = minimum object size

➢ For beam diameter and distance between measured points as a function of the distance from the NAV310 see the diagram in *fig. 7*.

Important In particular on the usage of the NAV310 for the output of measured values, it is necessary for a reliable measurement that the beam is incident on the object several times.

3.6 Output of measured values

The measured values can be transmitted to a computer system connected and evaluated here (see *section 3.7.2 "Data communication using telegrams" on page 23*). The host can calculate the position of the AGV from these measured values.

Navigation based on the surrounding contour measured is useful in places in which it is not possible to attach any reflectors, for example in truck cargo bays.

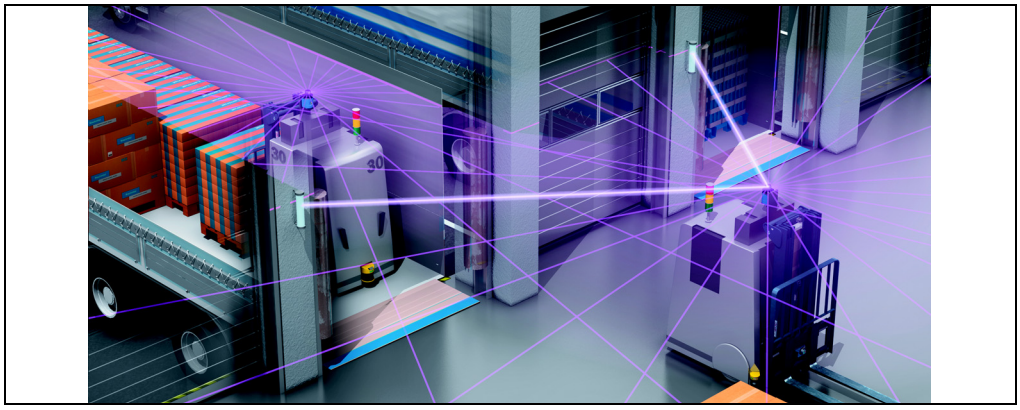


Fig. 8: Output of measured values for truck loading

The NAV310 outputs the following measured values at its data interfaces:

- profile of the field of view in two-dimensional polar coordinates as hex values
- contents of one revolution (360°): incl. number of the profile emitted, profile counter, sector numbers, step width, number of points per sector, time stamp for start/end of each sector, direction at the start/end of each sector, value and direction of the distances measured, status

Important It is only possible to output all measured values of a 360° scan in real-time using the Ethernet interface.

3.7 Integration of the NAV310 in an AGV's control system

Recommendation The integration of an NAV310 in an AGV's control system requires sound programming skills in the area of vehicle control. In addition knowledge of the data exchange between a laser positioning sensor such as the NAV310 and the vehicle computer are required.

3.7.1 Data interfaces

The NAV310 has a serial host interface and an Ethernet interface. The NAV310 is configured with the aid of SOPAS ET via these interfaces. The NAV310 also communicates with the AGV's vehicle computer via its interfaces.

3.7.2 Data communication using telegrams

The NAV310 sends telegrams over the interfaces described above to communicate with a connected vehicle computer, for configuration purposes and the transmission of measured values. The following functions can be run using telegrams:

- setting parameters by the AGV's computer for the configuration of the NAV310
- querying parameters and status logs by the AGV's computer
- requesting contour measured values by the AGV's computer, subsequent answer from NAV310

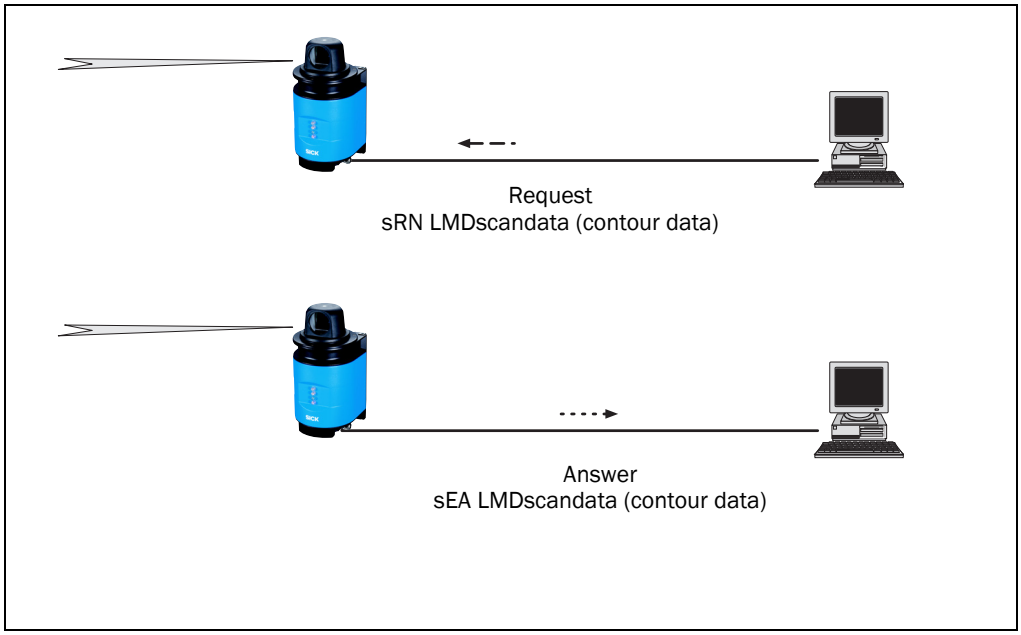


Fig. 9: Requesting contour data

The telegrams each comprise a frame and the data. See "Telegram listing USP", part no.: 8016687, "Telegram listing CoLa-A/B", part no.: 8016855

3.7.3 Digital output

The NAV310 has a digital output that is used for the synchronisation of the internal clock on the NAV310 and the vehicle computer's clock. The output supplies an at least 10 ms long pulse depending on the synchronisation method (see section *3.7.4 on page 24*). The pulse is output dependent on the synchronisation method.

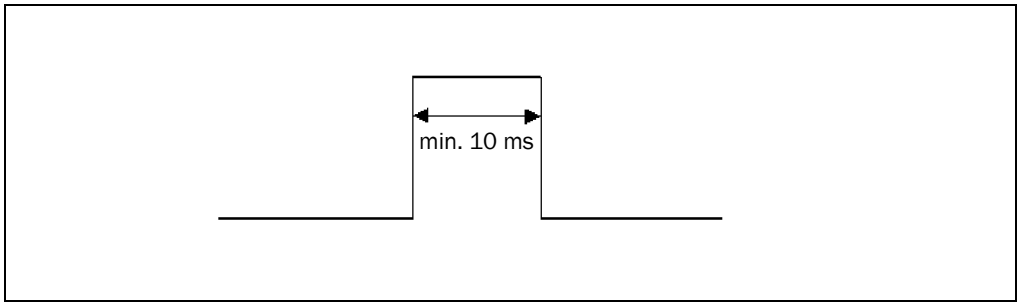


Fig. 10: Pulse for synchronisation

3.7.4 Synchronisation of the clock in the AGV and the clock in the NAV310

For precise control, it is necessary to synchronise as accurately as possible the contour data from the NAV310 and the calculations on the vehicle computer.

The internal time stamp in the NAV310 is added to the measured data from the NAV310. The internal time stamp in the NAV310 is a 32-bit counter that counts up by 1 every 1 ms.

To synchronise the internal time in the NAV310 with the system time in the vehicle's control system, the NAV310 provides three options.

1. via telegram
   The vehicle computer requests the internal time from the NAV310 using a telegram. The NAV310 writes its internal time in a telegram and sends it to the vehicle computer. However, there can be a delay of up to 3 ms on sending the data, as a result there is certain amount of inaccuracy.
2. via telegram „Timer Read"
   The vehicle computer request the internal time from the NAV310 using a telegram. The hardware output supplies a pulse of at least 10 ms in length *fig. 10* as soon as the internal time stamp is written to the telegram. When the telegram is subsequently received by the vehicle computer, the vehicle computer can add to the time in this telegram the delta between the pulse and the reception. As a result the AGV can determine the actual time in the NAV310.
3. Via Index (using the hardware output)

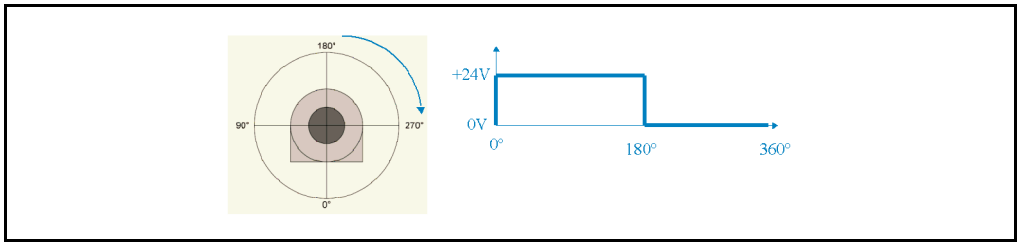


Fig. 11: Pulse on the head position

NAV310 sends a signal depending on the position of the scanner head. This signal is used to synchronize scans with the position of a swivel device for 3D measurements.

Important Program the vehicle computer so that it responds to the front edge of the output pulse

3.8 Near field suppression

Near field suppression is used to suppress interference that could occur, for example, when using housing windows or due to contamination of the optics.

If the digital filter has been activated, measurements will only be made from a distance of 2.5 m. The measuring system is disabled in the near field. Deviating measurements may occur around the outer edge of the filter.

Important On the NAV310, near field suppression is deactivated by default when delivered. If you install a NAV310 in a housing (e.g. for explosion protection), then you must configure the near field filter in SOPAS ET.

A feature of the NAV310 allows near field suppression for individually configured sectors to be enabled/disabled via a telegram, e.g. if a reference measurement is to be carried out in the near field. See the telegram listing downloadable at sick.com.

3.9 Planning

3.9.1 System requirements of the NAV310

For commissioning and operating the NAV310, the following are required at the user:

- Supply voltage DC 24 V ±15 %, generated as per IEC 60364-4-41 (VDE 0100, part 410), output power minimum 40 W (see *section 5.3.1 "Supply voltage" on page 32*)
- Standard Intel Pentium PC or compatible, at least Pentium III, 500 MHz
  - RAM: minimum 256 MB, 512 MB recommended
  - operating system: MS Windows 2000, XP, VISTA or 7
  - monitor: minimum 256 colours, 65,536 colours recommended; Screen resolution at least 800 × 600
  - hard disc: minimum 220 MB free memory
  - data interface RS232 or Ethernet (see *section 5.3.3 "General conditions for the data interface" on page 33*), if necessary RS232 converter, if PC interface and interface on the NAV310 do not match

3.9.2 Mounting requirements

The NAV310 must be mounted stable.

For the NAV310 the mounting kit part no. 5311055 with mounting material is available.

As an alternative you can use a strong stable mounting bracket that provides adjustable alignment of the NAV310 in the X- and Y axis. The NAV310 weighs approx. 2.4 kg (5.29 lb).

3.9.3 Distance between NAV310 and the object/surface to be measured

The measurement area on the NAV310 starts at 0.5 m (1.64 ft) in front of the optics (light output window).

To prevent false measurements, in the case of the recessed installation of the NAV310 the increase in the size of the laser beam with increasing distance is to be taken into account.

If mounted poorly, objects in the scan range may be continuously detected as the laser beam is always incident on them.

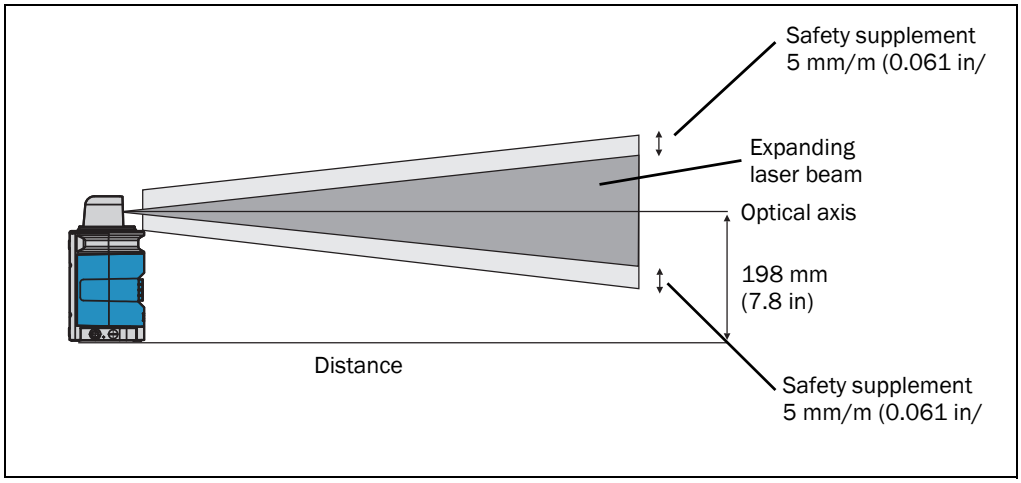


Fig. 12: Increase in the size of the beam and safety supplement

The optical axis is used as the reference plane for the distance to be maintained from the wall; on the vertically mounted NAV310 this axis is approx. 198 mm (7.8 in) above the bot-tom edge of the housing.

The distance-dependent increase in the size of the beam can be calculated using the formula:

beam diameter = (distance (mm (in)) × 5.0 mrad) + 20 mm (0.79 in)[1)]

The following table shows a few values as examples:

Distance in m	5	10	15	20	25	30	40	50	60	70
Beam diameter [mm]	45	70	95	120	145	170	220	270	320	370

Tab. 7: Beam diameter at different distances from the NAV310

For the assessment of whether the laser beam can be incident on an object, the distance of half the beam diameter from the optical axis is used.

Important Use a safety supplement of 5 mm (0.2 in) per metre top and bottom (see *fig. 12 on page 27*).

Recommendation For the simplified calculation of the sum of the increase in the size of the beam and safety supplement, a value of 16 mm (0.63 in) per metre can be used.

1) Due to the transmit lens.

3.9.4 Reflectors

Reflectors are shown in the measuring profile as particularly reflective targets. These can be detected by an external algorithm and used as landmarks. The recommended 983-10 reflective tape (part no. 5320565) can be obtained as an accessory from SICK AG by quoting REF-DG.

The reflector marks are designed as cylindrical reflectors. Cylindrical reflector marks can be detected from any angle.

Reflector height

The vertical size and the vertical position of the reflectors are to be chosen such that the measurement beam is incident on the reflector even on an uneven floor. The maximum scanning range of the NAV310 is 250 m (820.2 ft) onto reflectors. It is possible to determine the minimum reflector heights based on the characteristics of the floor and the measurement distance. The measurement beam on the NAV310 increases in size by around 5 mm per metre measurement distance (see *3.9.3 on page 27*). Tipping of the AGV due to unevenness on the floor must be taken into account as appropriate (incl. safety supplement). Recommended reflector heights are 500 mm (19.69 in) for a measurement distance up to 30 m (98.43 ft), 750 mm (29.53 in) for a measurement distance up to 46 m (150.92 ft) and 1000 mm (39.37 in) for a measurement distance up to 70 m (229.66 ft).

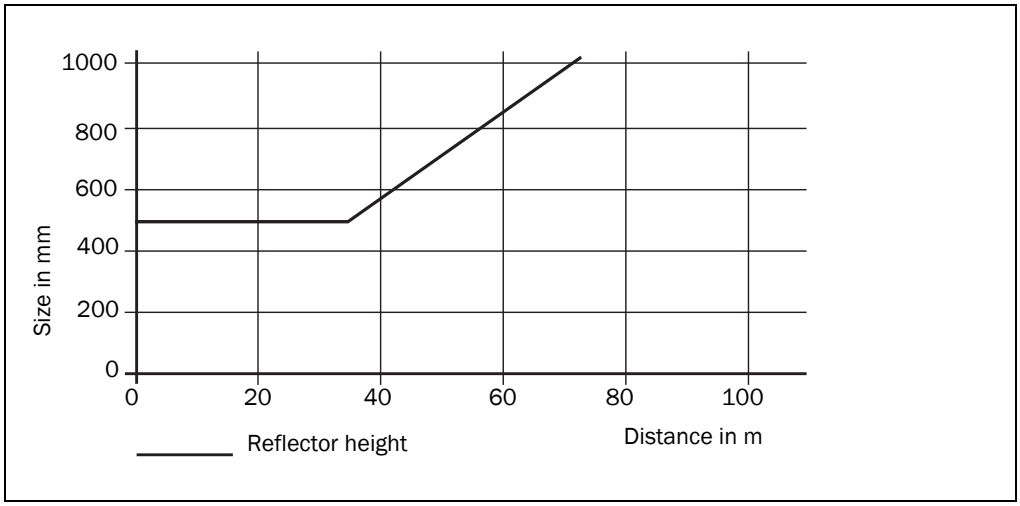


Fig. 13: Reflector height as a function of the distance from 0 to 70 m

Important The values stated in *fig. 13* apply without taking into account unevenness on the ground and tipping of the AGV by the load!

reflector diameter

The recommended diameter of cylindrical reflectors is 80 mm (3.15 in).

4 Assembly

Important Do not open the housing for the NAV310. If the housing is opened, any warranty claims against SICK AG will be rendered void.

4.1 Overview of the mounting steps

- select mounting method for the NAV310
- mounting and adjusting the NAV310

4.2 Preparations for mounting

4.2.1 Components to be mounted

- NAV310 (weight approx. 2.4 kg (5.29 lb)

4.2.2 Material and accessories necessary

- Fixing bracket by the user:
  - Stable mounting bracket that provides adjustable alignment of the NAV310 in the X and Y axis
  - 3 screws M6 for the NAV310, screw length dependent on the wall thickness of the fixing bracket used

4.3 Mounting and adjustment of the device

NOTICE

Risk of damage to the device!

The maximum screw length in the M6 blind threaded hole is 12 mm (0.47 in). Longer screws will damage the NAV310.

➢ Use screws of suitable length.

The NAV310 has three M6 blind thread holes and is fastened using 3 M6 screws (see *section 9.2.1 "Dimensional drawing NAV310" on page 51*).

For secure mounting at least 3 M6 screws with washers and locking washers are required. The supply of power must be switched off.

The NAV310 can be fitted in any position.

1. Prepare surface from mounting the fixing bracket for the NAV310 as described in *section 4.2 "Preparations for mounting" on page 29*.
2. Insert screws in the holes in the bracket and screw into the blind threaded hole in the NAV310. Only tighten screws lightly.
3. The scanner head on the NAV310 must be free to rotate.
4. Align the NAV310.
5. Tighten screws.
6. Check the alignment.

4.4 Dismantling the NAV310

1. Switch off the supply voltage.
2. Remove the connection cables.
3. Undo screws for mounting the NAV310 to the fixing and remove device.

5 Electrical installation

NOTICE

Only authorised personnel are allowed to perform the electrical installation work.

- ➢ Do not open the housing.
- ➢ Observe the current safety regulations when working on electrical systems.

Switch the entire machine/system offline!

The machine/system could inadvertently start up while you are connecting the device.

- ➢ Ensure that the entire machine/system is disconnected during the electrical installation.

5.1 Overview of the installation steps

1. Wire switching outputs (application-dependent).
2. Temporarily connect PC (configuration).
3. Wire data interface for operation.
4. Connect supply voltage to the NAV310.

5.2 Connections of the NAV310

5.2.1 Connections of the NAV310

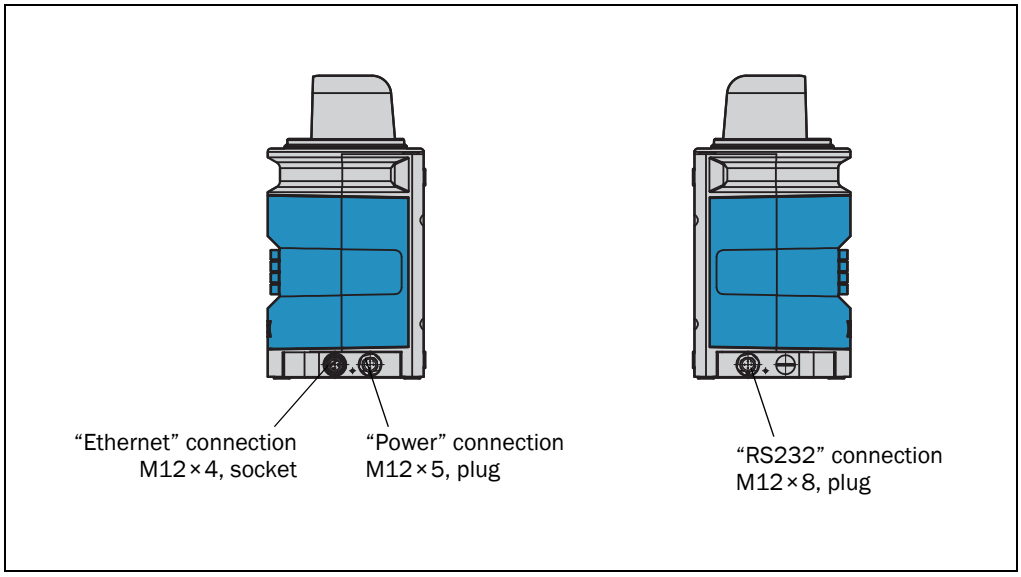
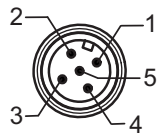


Fig. 14: Connections of the NAV310

The NAV310 has three round multi-pin M12 plug connectors.

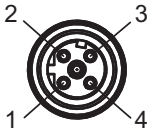
“Power” connection M12×5, plug, A coded



Pin	Signal	Function
1	V_S	Supply voltage NAV310
2	V_S	Supply voltage NAV310
3	GND	Ground
4	OUT 24 V	Digital output 1
5	GND	Ground

Tab. 8: Pin assignment of the “Power” connection on the NAV310

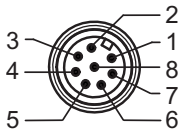
“Ethernet” connection M12×4, socket, D coded



Pin	Signal	Function
1	Ethernet_TX+	Ethernet interface
2	Ethernet_RX+	Ethernet interface
3	Ethernet_TX–	Ethernet interface
4	Ethernet_RX–	Ethernet interface

Tab. 9: Pin assignment of the “Ethernet” connection on the NAV310

“RS232” connection M12×8, plug, A coded



Pin	Signal	Function
1	RxD	Serial RS232 host interface (receiver)
2	TxD	Serial RS232 host interface (sender)
3	–	Do not use
4	–	Do not use
5	GND RS-232	Ground RS-232
6	OUT 24 V	Do not use
7	OUT 24 V	Do not use
8	OUT 24 V	Do not use

Tab. 10: Pin assignment of the “RS232” connection on the NAV310

5.3 Preparing the electrical installation

5.3.1 Supply voltage

DC 24 V ±15% as per IEC 60364-4-41 (pay attention to permitted cable lengths in *tab. 11 on page 33*)

The NAV310 draws the following power:

- on switching on without switching outputs wired maximum 36 W
- in operation typically 12 W, plus a maximum of 12 W with switching output wired

The supply of power/the external power supply for the supply of power must be able to provide at least 40 W continuous power, if the switching output is wired at least 48 W continuous power.

WARNING

Use safety transformer!

The output circuit of the power supply must be safely electrically isolated from the input circuit, this feature is normally provided by a safety transformer in accordance with IEC 742 (VDE 0551).

5.3.2 Wire cross-sections

- ➢ Wire all connections with copper cables!
- ➢ Use the following wire cross-sections:
  - supply voltage at least 0.25 mm² (0.01 in²), if local supply of power (power supply) in the immediate vicinity
  - supply voltage at least 0.5 mm² (0.04 in²) at maximum length of 10 m (32.81 ft), if connection is made to an existing DC 24 V supply
  - data interface minimum 0.25 mm² (0.01 in²)
- ➢ Lay all cables such that there is no risk of tripping and all cables are protected against damage.

On the usage of a typical power supply with a nominal voltage of DC 24 V ±5%, the following maximum cable lengths are allowed for the supply of the operating voltage:

Wire cross-section	Cable length
0.25 mm² (0.01 in²)	5 m (16.4 ft)
0.5 mm² (0.02 in²)	10 m

Tab. 11: Maximum cable lengths for the supply voltage

5.3.3 General conditions for the data interface

The table below shows the recommended maximum length of cable as a function of the data transmission rate selected.

Interface type	Transmission rate	Maximum cable length
RS-232	115,200 Bd	10 m

Tab. 12: Maximum length of cable for the data interface

Important

- Use screened cable (twisted-pair) with at least 0.25 mm² (0.01 in²).
- To prevent interference, do not lay data cable in parallel with power supply and motor cables over a long run, e.g. in cable ducts.

5.4 Undertaking electrical installation on the NAV310

5.4.1 Equipment

- Tool
- digital multimeter (current/voltage measurement)

NOTICE

Only connect in electrically isolated state!

- ➢ Ensure the power supply to which the NAV310 is connected is switched off.

5.4.2 Connecting supply voltage

Pre-assembled cables with flying leads are available for the supply to the NAV310.

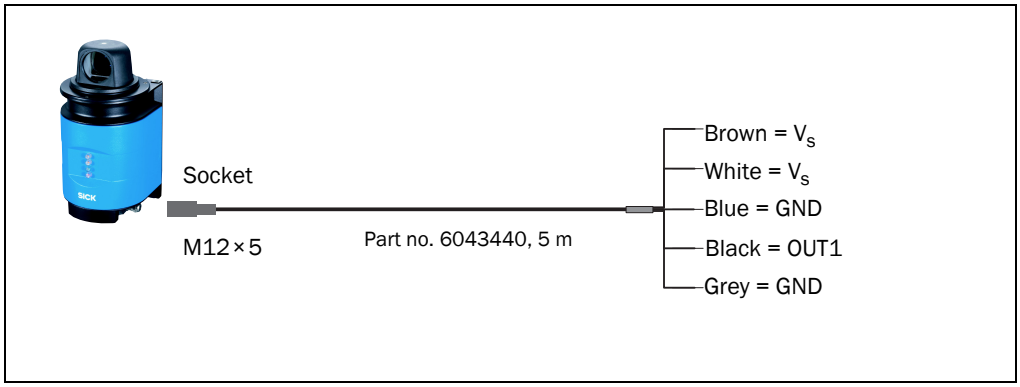


Fig. 15: Connection of the voltage supply

5.4.3 Connection to the Ethernet interface

Pre-assembled cables are available to configure the NAV310 via the Ethernet interface.

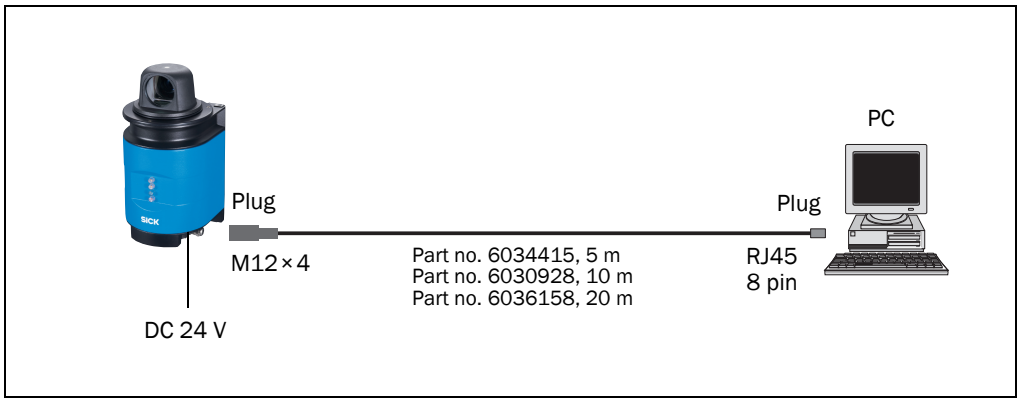


Fig. 16: Ethernet connection

5.4.4 Connection at the RS-232 interface

A screened cable is required for the wiring of the RS232 interface.

➢ Pay attention to max. cable length as per *section 5.3.3 "General conditions for the data interface" on page 33*.

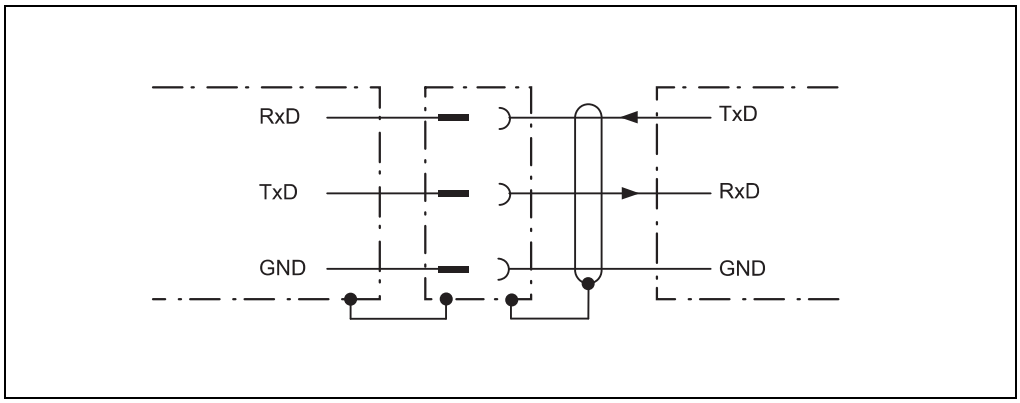


Fig. 17: Wiring the RS232 interface

Pre-assembled cables are available for the configuration of the NAV310 via the RS-232 interface.

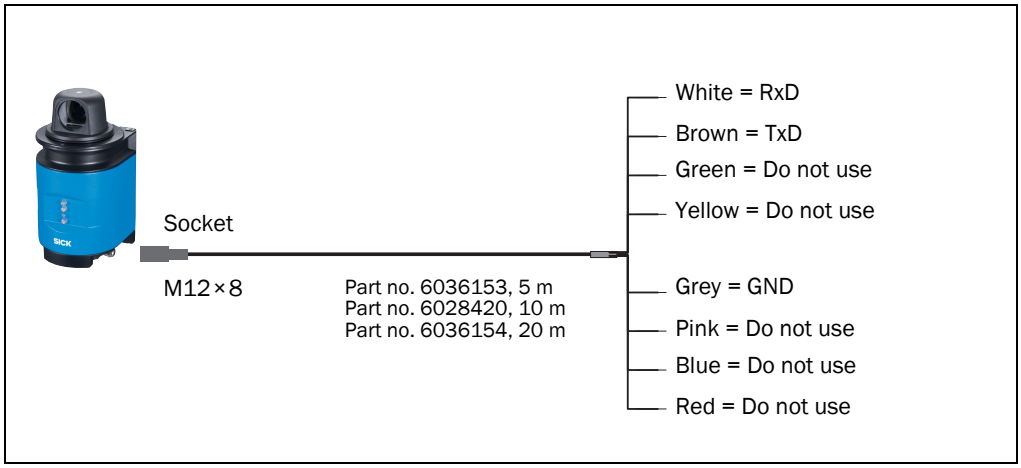


Fig. 18: RS232 connection

6 Commissioning and configuration

⚠ WARNING

The NAV310 must be commissioned only by adequately qualified personnel.

Before you operate a machine/system equipped with the NAV310 for the first time, make sure that the system is first checked and released by qualified personnel. On this issue, observe the notes in *chapter 2 "For your safety" on page 10*.

Commissioning, configuration and diagnostics are undertaken using the SOPAS ET configuration software supplied.

6.1 Overview of the commissioning steps

- Mounting and electrical installation must be undertaken.
- Install SOPAS ET configuration software.
- Establish communication with the NAV310.
- Create a custom parameter set using SOPAS ET and save in non-volatile memory in the NAV310.
- Test NAV310 for correct function.

6.2 SOPAS ET configuration software

The interactive configuration is carried out using SOPAS ET. Using this configuration software, you can configure and test the measurement properties, the analysis behaviour and the output properties of the NAV310 as required. The configuration data can be saved as a parameter set (project file) on the PC and archived.

Help for the program user interface as well as for the different options can be found in SOPAS ET:

- menu HELP, HELP F1: comprehensive online help for the program interface and for the different options
- HELP window (on the bottom left in the program user interface): context sensitive help for the visible dialog
- tool tips: Move the mouse pointer over an input field. A short text ("tool tip") with information about valid entries appears.

Primary functions are:

- selection of the menu language (German/English)
- establishment of the communication with the NAV310
- password-protected configuration with different operating levels
- diagnostics of the NAV310

6.2.1 Installation of SOPAS ET

Download the latest SOPAS ET software on the internet www.sick.com. The download's size is about 150MB. It includes the setup.exe installing the SOPAS Engineering Tool.

To complete the installation, follow the instructions.

6.2.2 SOPAS ET default setting

Parameter	Value
Language for the user interface	English (the software must be re-started after a change)
Units of length	Metric
User group (operating level)	Machine operator
Download the parameters to the NAV310	Immediate on change, temporary in the NAV310 RAM
Upload the parameters from NAV310	After switching online, automatic
Window layout	3 (project tree, help, working area)
Serial communication	COM1: default: 115.200 Bd, 8 data bits, no parity, 1 stop bit

Tab. 13: SOPAS ET default setting

6.3 Establish communication with the NAV310

Important For communication via TCP/-IP, the TCP/-IP protocol must be active on the PC.

On the connection of PC/host, following this sequence:

1. Switch on the PC.
2. Connect PC to the NAV310 using data cable.
3. Switch on the supply voltage for the NAV310.
   The NAV310 performs a self-test and initialises itself.

6.3.1 Connect the data interfaces

➢ Connect the PC to the NAV310 using the Ethernet cable (see *fig. 16 on page 34*)

or

➢ Connect the PC (serial interface) to the NAV310 (see *fig. 17 on page 34*)

6.3.2 Starting SOPAS ET and opening the scan assistant

1. Start SOPAS ET.
   By default SOPAS ET opens the program window with the English user interface.
2. To change the language setting, in the start dialog box click CANCEL and using the menu TOOLS, OPTIONS change the language for the user interface to GERMAN.
3. If the language setting has been modified, quit SOPAS ET and re-start.
4. In the dialog box, choose the option CREATE NEW PROJECT and confirm with OK.
5. In the main window in SCAN ASSISTANT click the CONFIGURATION button.
   The SCAN ASSISTANT dialog box appears.

6.3.3 Configuring the serial connection

1. In the SCAN ASSISTANT dialog box, under SERIAL CONNECTION, STANDARD PROTOCOL, activate the ACTIVATE SERIAL COMMUNICATION checkbox.
2. Click ADVANCED... button.
3. In COLA DIALECT choose the ASCII option.
4. Choose following PORT SETTINGS: 8 data bits, no parity, 1 stop bit.
5. Confirm the settings with OK.
   The ADVANCED SCAN SETTINGS dialog box is closed.

6. Confirm the settings in the SCAN ASSISTANT dialog box with OK.
   The SCAN ASSISTANT dialog box is closed.

6.3.4 Configuring the Ethernet connection

The factory setting for the Ethernet interface of the NAV310 is as follows:

- IP address: 192.168.1.10
- subnet mask: 255.255.255.0
- TCP/ IP port for SOPAS ET: 2112
- CoLa- A (ASCII) and CoLa-B (binary) selectable

Configuring with fixed IP address

Important Deactivate all programs on your PC/notebook that access Ethernet or TCP/IP.

1. From the START MENU, click CONTROL PANEL and choose NETWORK CONNECTIONS.
2. Right-click the LOCAL AREA CONNECTION icon, and then choose PROPERTIES.
3. On the GENERAL tab, highlight INTERNET PROTOCOL (TCP/IP), and then click PROPERTIES
4. Select USE THE FOLLOWING IP ADDRESS, and enter the following IP address: 192.168.1. x (e.g. 1)
5. Confirm with OK

Then adjust the IP configuration for the NAV310 in SOPAS ET.

1. In the NETWORK SCAN ASSISTANT dialog box, under INTERNET PROTOCOL, INTERNET PROTOCOL,
   activate the ENABLE IP COMMUNICATION checkbox and deactivate ENABLE AUTOIP checkbox
2. Click ADD button.
3. Enter in SINGLE ADRESS 192.168.1.10
4. Confirm the settings in the NETWORK SCAN ASSISTANT dialog box with OK.
   The ADD ADRESS dialog box is closed.

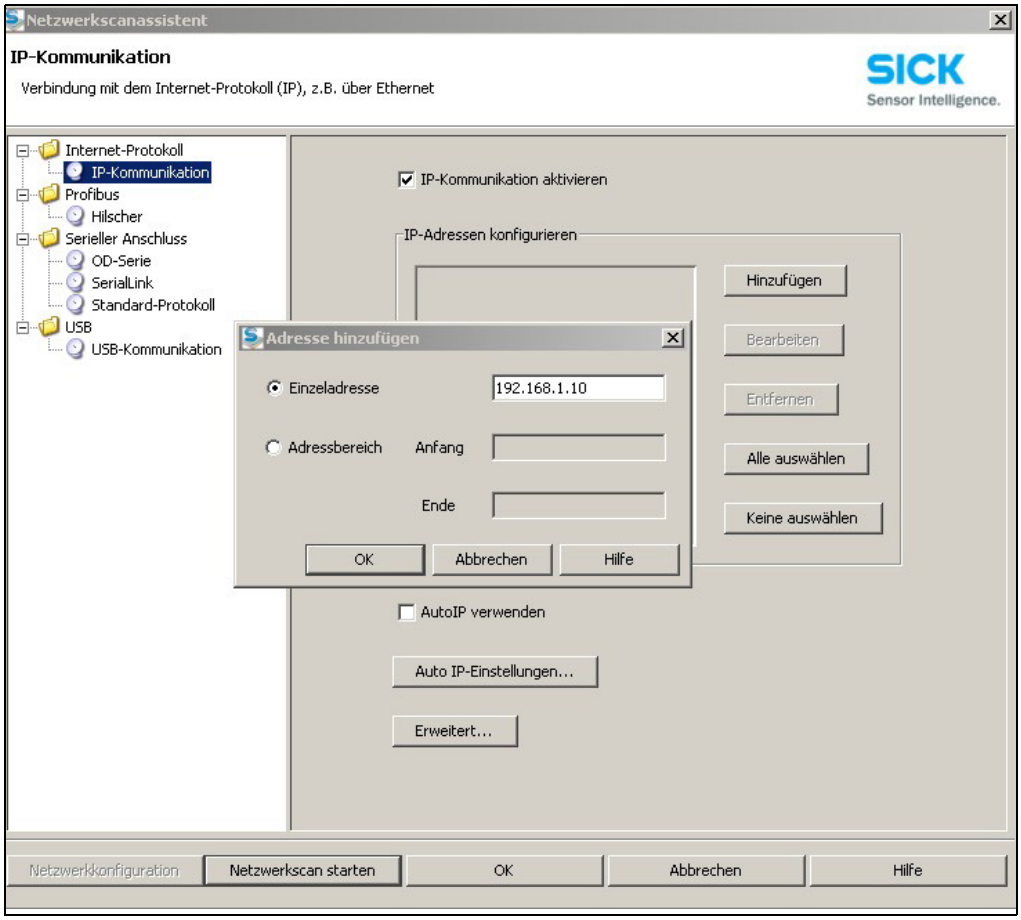


Fig. 19: IP communication with fixed IP address

5. Click ADVANCED... button
6. Under TCP PORT(S) activate port 2112 and confirm with OK.

Configuring with AutoIP

Important Deactivate all programs on your PC/notebook that access Ethernet or TCP/IP.

1. In the NETWORK SCAN ASSISTANT dialog, under INTERNET PROTOCOL, IP COMMUNICATION, select the ACTIVATE IP COMMUNICATION checkbox and the USE AUTOIP checkbox.
2. Click AUTO IP CONFIGURATION Button
3. Click SEARCHING FOR SENSORS Button to verify that the device is CONNECTABLE
4. If the status is NOT CONNECTABLE , highlight the device and follow instructions 5.-7. If the status is CONNECTABLE, close the dialog box with OK and start the NETWORK SCAN
5. Click CHANGE IP CONFIGURATION

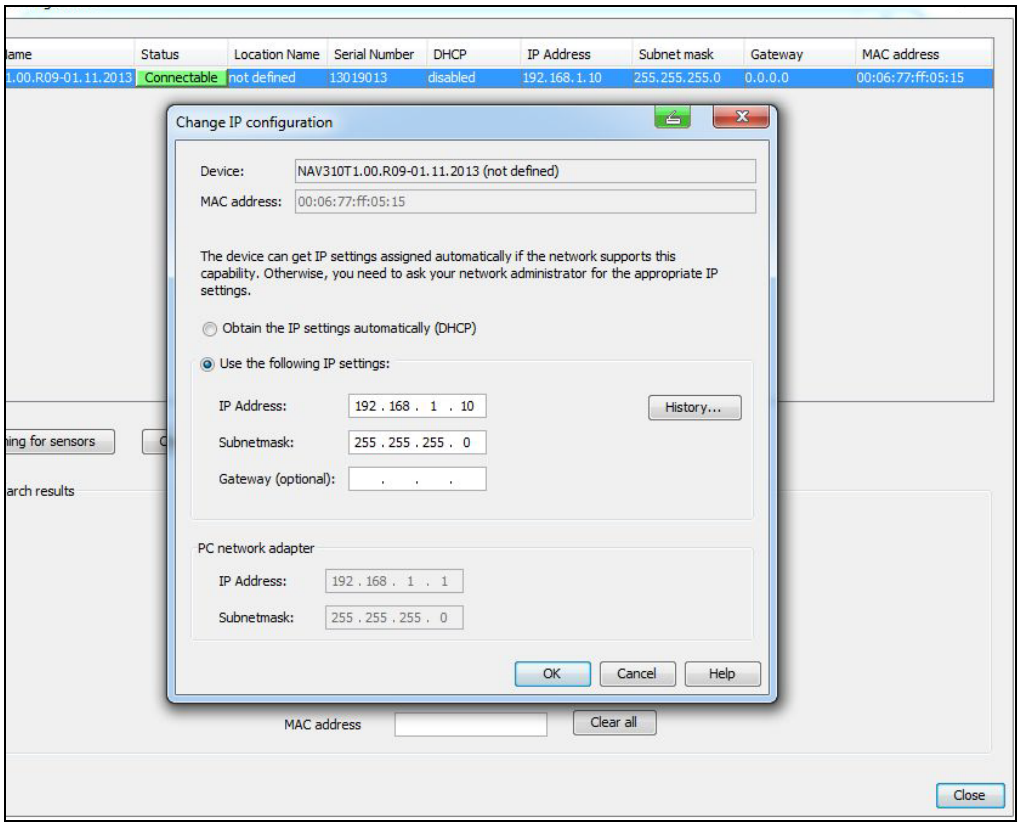


Fig. 20: Configuring with AutoIP

6. Enter the IP ADRESS of your PC NETWORK ADAPTER incremented by one in IP ADDRESS under USE THE FOLLOWING IP SETTINGS, e.g.:
   IP address under PC Network adapter = 169.192.88.120
   IP ADDRESS under USE THE FOLLOWING IP SETTINGS = 169.192.88.121
7. Confirm the settings in the NETWORK SCAN ASSISTANT dialog box with OK. The SCAN ASSISTANT dialog box is closed.

6.3.5 Performing scan

1. In the NETWORK SCAN ASSISTANT dialog box, click on the NETWORK SCAN button.
2. Choose devices listed and accept using ADD.
   A scan is performed for devices connected via the connection. SOPAS ET adds the devices found to the project tree and uploads the actual parameter set from the device.

6.4 Initial start-up

The NAV310 is adapted to the local measurement situation using SOPAS ET. For this purpose a custom parameter set is created using SOPAS ET.

The parameter set is then loaded into the NAV310 (download). This action is performed either immediately (SOPAS ET option IMMEDIATE DOWNLOAD) or manually (SOPAS ET command DOWNLOAD ALL PARAMETERS to the device).

Important Once the configuration has been completed, the parameter set must be saved in non-volatile memory in the NAV310. In addition, the parameter set should be saved as a project file (spr file with configuration data) on the PC and archived.

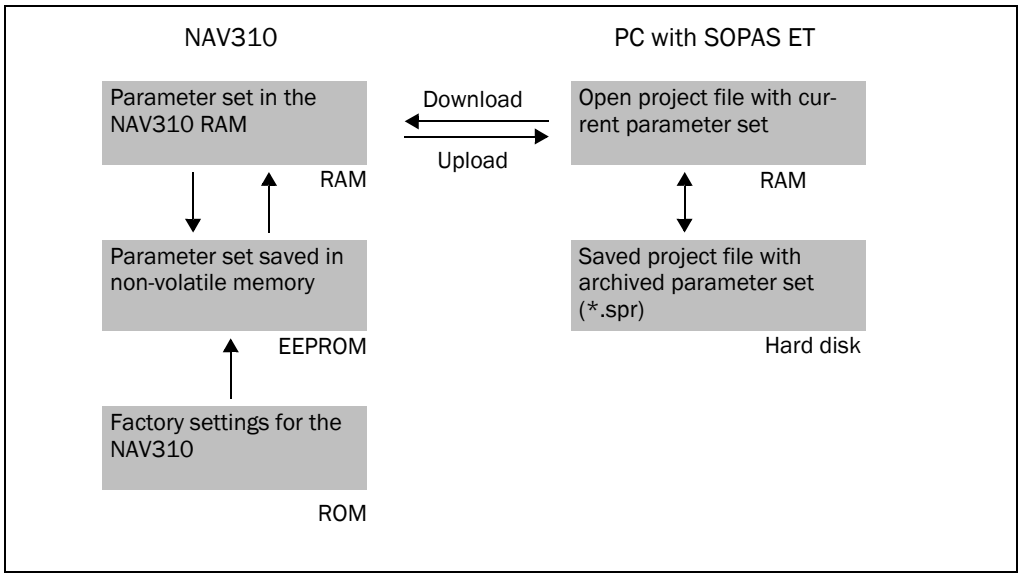


Fig. 21: Principle of data storage

6.4.1 Configuring the NAV310

You can configure the NAV310 in two ways:

- interactively using SOPAS ET
  This section describes the interactive configuration.
- using configuration telegrams
  On this subject please read *section 3.7.2 “Data communication using telegrams” on page 23*.

Interactive configuration using SOPAS ET

All parameters that can be configured for the NAV310 are combined into a corresponding device description (sdd file) for SOPAS ET. You can open this file using the device description project tree.

The function of each parameter is explained in a context-sensitive online help (F1 key). The valid range of values and the default are listed in the PARAMETER INFO window (right mouse button when the pointer is positioned over the parameter).

Important Software access to the NAV310 is password protected. You should change the password after successful configuration for it to retain its security function.

User level	Password
Authorised client	client

Tab. 14: Password NAV310

Use the project tree in SOPAS ET to configure the parameters necessary for your application.

NOTICE

Do not switch off the voltage supply during configuration!

Switching off the voltage supply during configuration causes all parameters already configured to be lost.

1. From the OPTIONS menu select the LOGIN DEVICE command and log in to the system using the password “client” as AUTHORISED CLIENT.
2. Configure the NAV310 for the required application with the aid of the parameters in SOPAS ET.

Help for the program user interface as well as for the different options can be found in SOPAS ET.

6.5 Connection and test measurement

Use the graphic scan view in SOPAS ET to verify the generated measured values and to verify the measurement area online.

1. Select NAV310, MONITOR, SCAN DISPLAY in the project tree.
2. To start the measurement, click the PLAY button.
3. Compare the measurement line with the required result.

Important

– The SCAN VIEW in the MONITOR is dependent on the available computing power of the PC and is **not** output in real-time. For this reason not all measured values are displayed. The same limitation also applies when saving measured values displayed in a file.

4. After completing the test measurement successfully, save the configuration permanently to the NAV310: Menu NAV310, PARAMETER, SAVE PERMANENT.

7 Maintenance

Important **Claims under the warranty rendered void!**

The housing screws of the NAV310 are sealed. Claims under the warranty against SICK AG will be rendered void if the seals are damaged or the device opened. The housing is only allowed to be opened by authorised service personnel.

7.1 Maintenance during operation

The NAV310 is maintenance-free apart from the maintenance measures listed below. No maintenance is necessary to ensure the retention of laser class 1.

Recommendation To obtain the full optical power of the NAV310, the window in the scanner head of the NAV310 should be regularly checked for contamination. This applies particularly in harsh operating environments (dust, powder, moisture).

NOTICE

Damage to the optics in the NAV310!

The window in the scanner head on the NAV310 is made of glass. The optical power is reduced by scratches and smearing on the front screen.

- ➢ Do not use aggressive detergents.
- ➢ Do not use abrasive cleaning agents.
- ➢ Only use fabric cleaning cloths or paper towels free of wood and fluff.
- ➢ Avoid scratching and scouring movements on the window.

NOTICE

Performance reduction due to contamination of the window in the scanner head!

Static charges cause dust particles to be attracted to the window of the NAV310. You can prevent this effect by using the antistatic plastic cleaner (part no. 5600006) and the SICK lens cloth (part no. 4003353).

Fig. 22: Window in the scanner head on the NAV310

How to clean the window in the scanner head on the NAV310:

1. Switch off the NAV310 while performing cleaning, as otherwise the scanner head will rotate.
2. Use a clean and soft brush to remove dust from the window.
3. Then wipe off the optics using a clean and damp cloth.

Important If the optics are scratched or damaged (crack, fracture), the optics must be replaced. Contact SICK service.

7.2 Exchanging a NAV310

As all external cable connections end in the plug connectors, it is not necessary to re-install the device electrically on a device replacement. The replacement unit can then be simply connected.

If the NAV310 is to be replaced, proceed as follows:

1. Switch off the voltage supply for the NAV310.
2. Remove the connection cables from the NAV310.
3. Mounting the replacement device (see *chapter 4 "Assembly" on page 29*).
4. Open project file (spr file with configuration data) using SOPAS ET and transfer configuration to the device (see *fig. 21 on page 41*).

8 Troubleshooting

Important **Claims under the warranty rendered void!**

The housing screws of the NAV310 are sealed. Claims under the warranty against SICK AG will be rendered void if the seals are damaged or the device opened. The housing is only allowed to be opened by authorised service personnel.

This chapter describes how to identify and rectify errors and malfunctions during the operation of the NAV310.

8.1 In the event of fault

⚠ WARNING

Cease operation if the cause of the malfunction has not been clearly identified!

Stop the machine/system if you cannot clearly identify or allocate the error and if you cannot safely rectify the malfunction.

8.2 Monitoring error and malfunction indications

The NAV310 monitors itself in operation:

- After switching on the supply voltage the NAV310 runs through a self-test prior to initialisation (loading the parameter set and initialisation of the device functions); during this self-test the device checks important hardware components.
- During operation the NAV310 continuously monitors the function of the rotation of the scanner head.
- If the NAV310 detects a device error during the self-test, it indicates this situation using the LEDs.

8.3 Troubleshooting and rectification

Fault	Possible cause	Remedy
1. All LEDs are off and the scanner head is not rotating.	• No supply voltage at the connection terminals	➢ Check supply voltage (see *section 9.1 "Data sheet NAV310" on page 49*). ➢ Check whether supply cables are correctly fitted in the connection plug. ➢ Check whether cables are connected to the correct terminals.
2. No LED is illuminated. The scanner head only rotates briefly.	• Excessively low supply voltage	➢ Increase wire cross-section.
3. Red LED is illuminated.	• Scanner head does not rotate and is locked.	➢ Disconnect supply voltage and re-connect. If the red LED is still illuminated, inform SICK
4. SOPAS ET cannot communicate with the NAV310.	• Supply voltage for the NAV310 not switched on	➢ See fault 1., 2. and 3.
	• PC not connected to NAV310	➢ Connect PC to NAV310 (use data cable to suit interface type).
	• Wrong interface selected	➢ Select interface in SOPAS ET as per the connection made to the PC.
	• Another application on the PC is already accessing the interface.	➢ Check assignment of the interface, if necessary quit related application.
	• Pay attention to sequence when switching on the NAV310 and the PC connected.	➢ 1. Switch on the PC. 2. Connect PC to NAV310. 3.Switch on NAV310.
5. Measurements in the near field with no objects present	• Contaminated or scratched optics	➢ Carefully clean optics using soft, fluff-free cloth. If the optics are scratched, contact SICK service.
6. The NAV310 is not detecting existing objects.	• Smoke and dust	➢ Check whether the scanner head is clean and dry.
7. The NAV310 is not transmitting a measured result.	• Wiring fault in the data connection	➢ Check wiring.
8. Frequent CRC error on the RS232 interface.	• Data transmission time critical	➢ Increase the baud rate.

Tab. 15: Troubleshooting and rectification

8.4 Detailed error analysis

Communication errors can occur on the transfer of telegrams to the NAV310. The NAV310 then returns an error code that you can evaluate (see ""Telegram listing CoLa-A/B", part no.: 8016855, "Telegrammlisting UPS", article no.: 8016687).

8.5 SICK support

If a fault cannot be rectified with the measures stated, the NAV310 may be faulty. The NAV310 cannot be repaired or its functionality restored by the user after a failure.

However, quick replacement of a NAV310 by the user is possible. On this subject see *chapter 7.2 "Exchanging a NAV310" on page 45*.

In case of a fault that cannot be rectified, please contact SICK service:

- In Germany: Technical support hotline of SICK Vertriebs-GmbH

  Phone +49 211 5301-301

  Fax. +49 211 5301-302

E-mail: kundenservice@sick.de.

- Please contact your local SICK branch or SICK subsidiary when not in Germany.
  - For telephone number and e-mail addresses see rear of these operating instructions.
  - For postal addresses see also **www.sick.com**.

➢ Do not send device without consultation with SICK service.

Important Repairs to the NAV310 are only allowed to be undertaken by trained and authorised service personnel from SICK AG.

8.5.1 Monitor

Using the monitor you can display the measured data, the detected reflectors and the position of the NAV310.

PROJECT TREE, NAV310, MONITOR, SCAN DISPLAY

9 Technical data

9.1 Data sheet NAV310

Characteristic	NAV310
Output of measured values	
Measuring range[1) 2)]	0.5 ... 35 m, at 10% remission 0.5 ... 120 m, at 90% remission maximum 0.5 ... 250 m
Usable scan angle[3)]	max. 360°, field evaluation 300°
Angular resolution (step width)	0.125°; 0.1875°; 0.25°; 0.375°; 0.5°; 0.75°; 1° (Interlaced: 0.0625°)
Scanning frequency	5-20 Hz, rotational direction CW
Measurement resolution	3.9 mm up to 250 m in USP interface 4 mm up to 250 m
Systematic error at 25 °C	+/- 10 mm (25 °C) with reflective tape up to 50 m +/- 15 mm (25 °C) at 90 % remission +/- 25 mm (25 °C) at 20 % remission
Statistical error distance (1 sigma)	25 mm at 20 ... 90 % remission 15 mm with reflective tape
Temperature drift typ.	typ. ±0,6 mm/K
General data	
Beam divergence	5.0 mrad
Laser diode (wavelength)	Infrared light (λ = 905 nm)
Pulse frequency	max. 14.4 kHz (max. 12 kHz above 360°)
Laser class of the device	Class 1 as per EN 60825-1:2014+A11:2021, IEC 60825-1:2014, EN/IEC 60825-1:2007, eye safe, 21 CFR 1040.10 and 1040.11 expect for deciations pursuant to Laser Notice No. 50, dated June 24, 2007.
RS-232 data interface	19,200; 38,400; 57,600; default: 115,200 Bd
Data format	Variable; default: 8 data bits, 1 stop bit, no parity
Output signal switching device	100 MBit/s, TCP/IP
Ethernet Protokolle	CoLaA-/B (Port: 2112)
Serielle Protokolle	CoLa-A(Port: 2111), USP (Port: 49152)
Switch outputs	1 × (OUT1 for synchronisation); Semiconductor output, active high, maximum output current 0.5 A at DC 24 V
operating voltage	DC 24 V ±15%/IEC 60364-4-41 (VDE 0100 part 410)
Housing	AccordingtoEN 61000-6-2(2005-08)/EN 61000-6-4(2007-01)
Housing	Aluminium die-cast
Enclosure rating	III according to EN 61140 (2002-03)
International protection rating	IP 65 according to EN 60529 (1991-10); A1 (2002-02)
Vibration test	According to IEC 60068-2-6, table 2c (frequency range 10 ... 150 Hz, amplitude 0,35 mm or 5 g)
weight	Approx. 2.4 kg
Ambient operating temperature/storage temperature	0 ... +50 °C/–20 ... +80 °C
Max. relative air humidity	5 ... 85 %, non-condensing

Tab. 16: Data sheet NAV310

1) Condition: laser spot completely on the target, warm-up time min. 30 min.

2) Reflective tape 983-10 (part no. 5320565) , cylinder with 80mm diameter.
3) You can choose between different combinations of scan angle, scan frequency, and angular resolution.

9.2 Dimensional drawings

9.2.1 Dimensional drawing NAV310

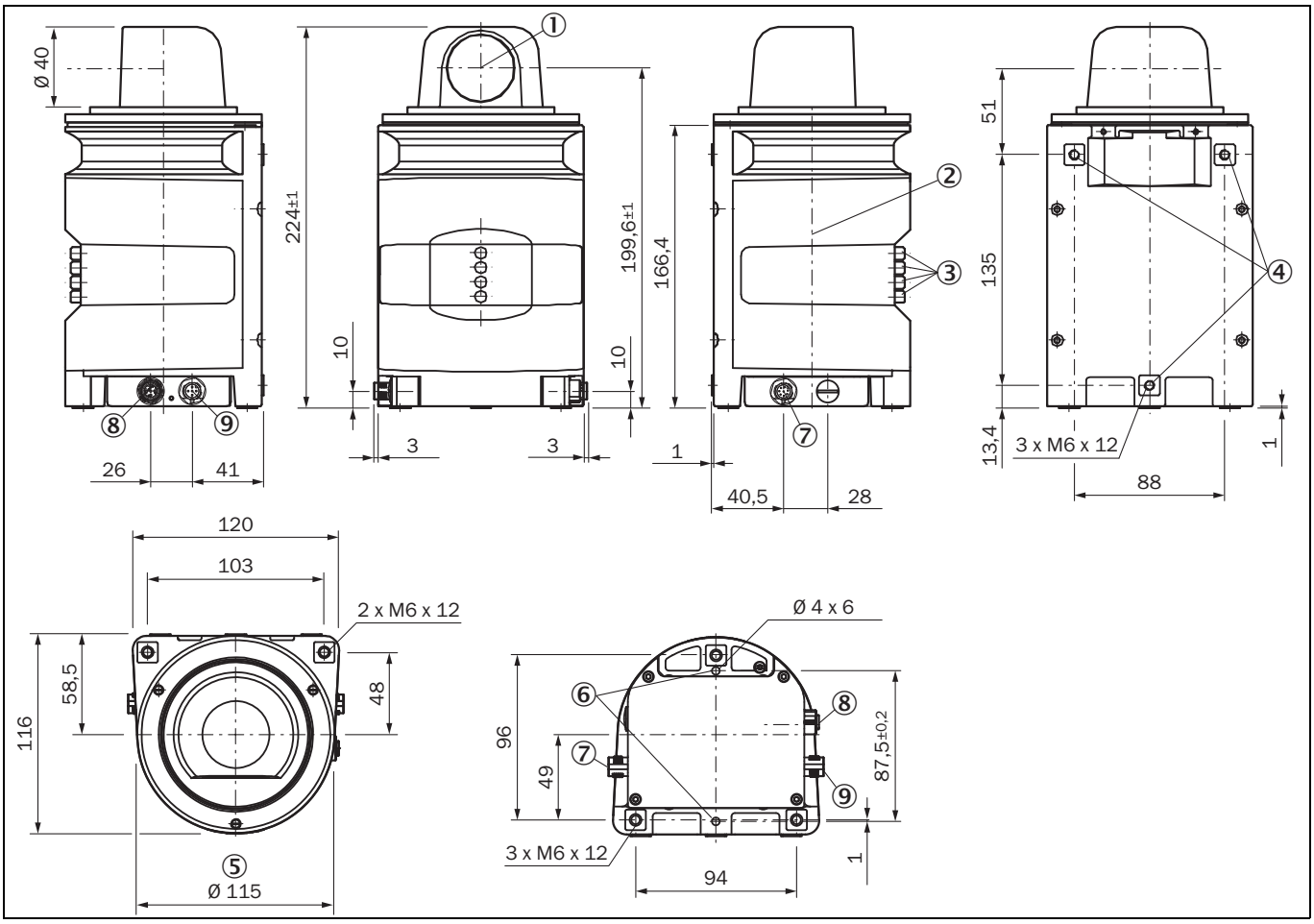


Fig. 23: Dimensions NAV310

① Optical axis
② Zero level
③ LED (from top: yellow, yellow, green, red)
④ Mounting hole (M6x12)
⑤ Rotating diameter
⑥ Aligning pin
⑦ RS232 connection (M12x4, plug)
⑧ Ethernet connection (M12x4, socket)
⑨ Power connection (12x5, plug)

10 Annex

10.1 Overview of the annexes

The annex contains the following supplementary information:

- Ordering information
- Glossary
- Link to Declarations of conformity and certtificates

10.2 Ordering information

You can find the ordering information for the NAV310 (part no.: 1060834), and for accessories on the product page under www.sick.com.

10.2.1 Consumables

Article number	Article	Description
4003353	Lens cloth	Special cleaning cloth for proper cleaning
5600006	Plastic detergent	Antistatic, mild detergent solution

Tab. 17: Consumables

10.3 Glossary

Download

Transmission of the parameter set that has been modified offline in the SOPAS ET configuration software from the PC to the NAV310. SOPAS ET transmits either always a complete copy to the memory (RAM) of the NAV310 (menu COMMUNICATION, DOWNLOAD ALL PARAMETERS TO DEVICE) or only the parameter that has just been edited (menu COMMUNICATION, DOWNLOAD MODIFIED PARAMETERS TO DEVICE). With menu NAV310, PARAMETER, SAVE PERMANENT, the parameter set is saved permanently in the EEPROM of the NAV310.

Parameter set

Data set using which the functions implemented in the NAV310 are initialised and activated. Is transmitted from the NAV310 to SOPAS ET and in the reverse direction using UPLOAD or DOWNLOAD respectively.

Remission

Remission is the quality of reflection at a surface. The basis is the Kodak standard, known worldwide in, among other areas, photography. The surface-related magnitude of the remission is the remission value.

Scan

A scan includes all measured values determined related to the scan angle.

SOPAS ET

Configuration software, used for the offline configuration (adaptation to the read situation on-site) and the online operation of the NAV310 in dialog mode.

Upload

Transmission of the parameter set from the NAV310 to the PC into the SOPAS ET configuration software. Prerequisite for the modification of the current parameter set.

10.4 EC declaration of conformity

At the following address you will find the declarations of conformity and certificates valid for the product:
www.sick.com/NAV3xx

10.5 Cybersecurity

To protect against cybersecurity threats, it is necessary to continuously monitor and maintain a comprehensive cybersecurity concept. A suitable concept consists of organizational, technical, procedural, electronic, and physical levels of defense and considers suitable measures for different types of risks. The measures implemented in this product can only support protection against cybersecurity threats if the product is used as part of such a concept.

You will find further information at **www.sick.com/psirt**, e.g.:

- General information on cybersecurity
- Contact option for reporting vulnerabilities
- Information on known vulnerabilities (security advisories)

8016535/1MJA/2024-01-19 · 8M_SH· A4 4c int47

Australia
Phone +61 3 9457 0600
1800 334 802 – tollfree
E-Mail sales@sick.com.au

Austria
Phone +43 22 36 62 28 8-0
E-Mail office@sick.at

Belgium/Luxembourg
Phone +32 2 466 55 66
E-Mail info@sick.be

Brazil
Phone +55 11 3215-4900
E-Mail marketing@sick.com.br

Canada
Phone +1 905 771 14 44
E-Mail information@sick.com

Czech Republic
Phone +420 2 57 91 18 50
E-Mail sick@sick.cz

Chile
Phone +56 2 2274 7430
E-Mail info@schadler.com

China
Phone +86 20 2882 3600
E-Mail info.china@sick.net.cn

Denmark
Phone +45 45 82 64 00
E-Mail sick@sick.dk

Finland
Phone +358-9-2515 800
E-Mail sick@sick.fi

France
Phone +33 1 64 62 35 00
E-Mail info@sick.fr

Germany
Phone +49 211 5301-301
E-Mail info@sick.de

Hong Kong
Phone +852 2153 6300
E-Mail ghk@sick.com.hk

Hungary
Phone +36 1 371 2680
E-Mail office@sick.hu

India
Phone +91 22 6119 8900
E-Mail info@sick-india.com

Israel
Phone +972 4 6881000
E-Mail info@sick-sensors.com

Italy
Phone +39 02 274341
E-Mail info@sick.it

Japan
Phone +81 3 5309 2112
E-Mail support@sick.jp

Malaysia
Phone +6 03 8080 7425
E-Mail enquiry.my@sick.com

Mexico
Phone +52 (472) 748 9451
E-Mail mario.garcia@sick.com

Netherlands
Phone +31 30 2044 000
E-Mail info@sick.nl

New Zealand
Phone +64 9 415 0459
0800 222 278 – tollfree
E-Mail sales@sick.co.nz

Norway
Phone +47 67 81 50 00
E-Mail sick@sick.no

Poland
Phone +48 22 539 41 00
E-Mail info@sick.pl

Romania
Phone +40 356 171 120
E-Mail office@sick.ro

Russia
Phone +7 495 775 05 30
E-Mail info@sick.ru

Singapore
Phone +65 6744 3732
E-Mail sales.gsg@sick.com

Slovakia
Phone +421 482 901201
E-Mail mail@sick-sk.sk

Slovenia
Phone +386 591 788 49
E-Mail office@sick.si

South Africa
Phone +27 11 472 3733
E-Mail info@sickautomation.co.za

South Korea
Phone +82 2 786 6321
E-Mail info@sickkorea.net

Spain
Phone +34 93 480 31 00
E-Mail info@sick.es

Sweden
Phone +46 10 110 10 00
E-Mail info@sick.se

Switzerland
Phone +41 41 619 29 39
E-Mail contact@sick.ch

Taiwan
Phone +886 2 2375-6288
E-Mail sales@sick.com.tw

Thailand
Phone +66 2645 0009
E-Mail Ronnie.Lim@sick.com

Turkey
Phone +90 216 528 50 00
E-Mail info@sick.com.tr

United Arab Emirates
Phone +971 4 88 65 878
E-Mail info@sick.ae

United Kingdom
Phone +44 1727 831121
E-Mail info@sick.co.uk

USA
Phone +1 800 325 7425
E-Mail info@sick.com

Vietnam
Phone +84 945452999
E-Mail Ngo.Duy.Linh@sick.com

Further locations at **www.sick.com**

SICK AG | Waldkirch | Germany | www.sick.com

SICK
Sensor Intelligence.