SENSOPART

System manual

Optical anti-collision device
for suspension tracks

FR 85-2 ILLG-POL5
FR 85-2 ILLG-S1L5

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1.0 RailPilot FR 85 anti-collision sensor

The sensor's task is to prevent the collision of vehicles on rail-mounted tracks, primarily suspension tracks; RailPilot is the reliable solution for this task. Breaking distances and distances between vehicles differ according to the type of goods being carried and the speed of travel. This requires a flexible adjustment of switching distances. Constantly changing objects around the vehicles and the presence of other sensors does not impair RailPilot's reliable anti-collision function.

In order to maintain the reliable anti-collision function and ensure accurate switching points regardless of the surroundings and conditions of the vehicles themselves, a reflector is fitted to the rear of every vehicle present in the installation. RailPilot is fitted to the front of each vehicle and thus always points at the reflector on the vehicle ahead. Should the vehicle come closer than the currently selected breaking distance, the breaking system is activated and the vehicle slows down. Should the vehicle come closer than the stopping distance, it comes to a complete standstill. Once the vehicle in front moves further away, the signals are enabled one after the other and the vehicle travels forward again.

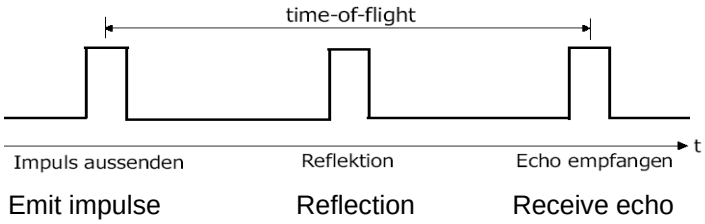
When using vehicles of variable length, e.g. due to overhanging loads, the distances maintained in the installation can be varied. This RailPilot function enables optimum use of congested areas.

1.1 RailPilot FR 85 sensor technology

Railpilot FR85 works on the principle of optical time of flight measurement.
Distance measurement uses the physical principle that light always spreads at a constant speed of c=299,792 kilometres per second.
In other words, light travels a distance of 1 m in 3.335 ns (0.000,000,003,35 s).

RailPilot uses the principle of pulsed time of flight measurement:

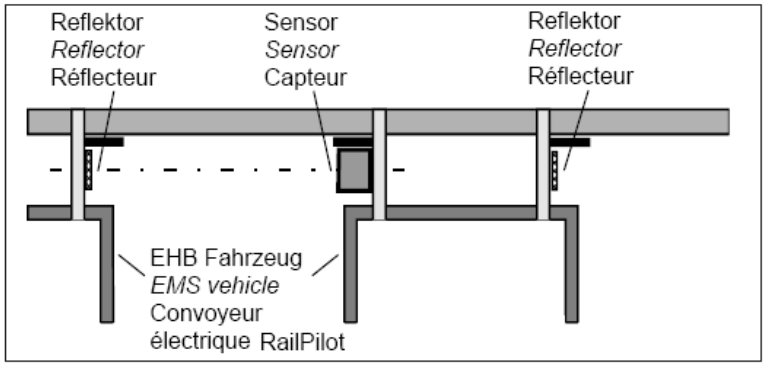
With pulsed time of flight measurement, a very short light impulse is emitted, reflected and registered by the receiver; measured time is stopped at that very same moment.
The emitted impulse triggers a clock which is stopped by the received impulse. The time elapsed (time of flight) is always proportional to the optical path length.



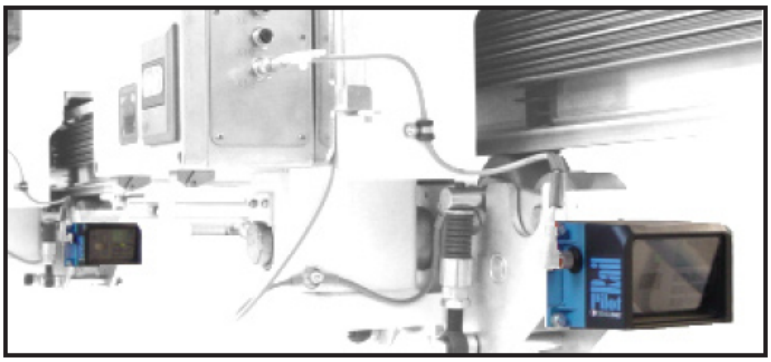
Use of this physical principle makes RailPilot ideal for optical anti-collision distance measurement.

Aligning RailPilot in a conveyor system (EMS)

X55-00187



X55-00188



RailPilot versions

RailPilot is available in three different versions. Their sensor technology is virtually identical, as each version **only** detects **reflectors** within its detection range. Machines or rail components which may also be in the field of vision do not affect the RailPilot.
Close-up at distances **of less than 0.3 m,** the RailPilot detects **every object.** This function acts as an emergency cut-out in the event of an obstacle being directly in front of the sensor.
The sensor versions differ in signal function and detection range.
Here are the most important distinguishing features of the two versions:

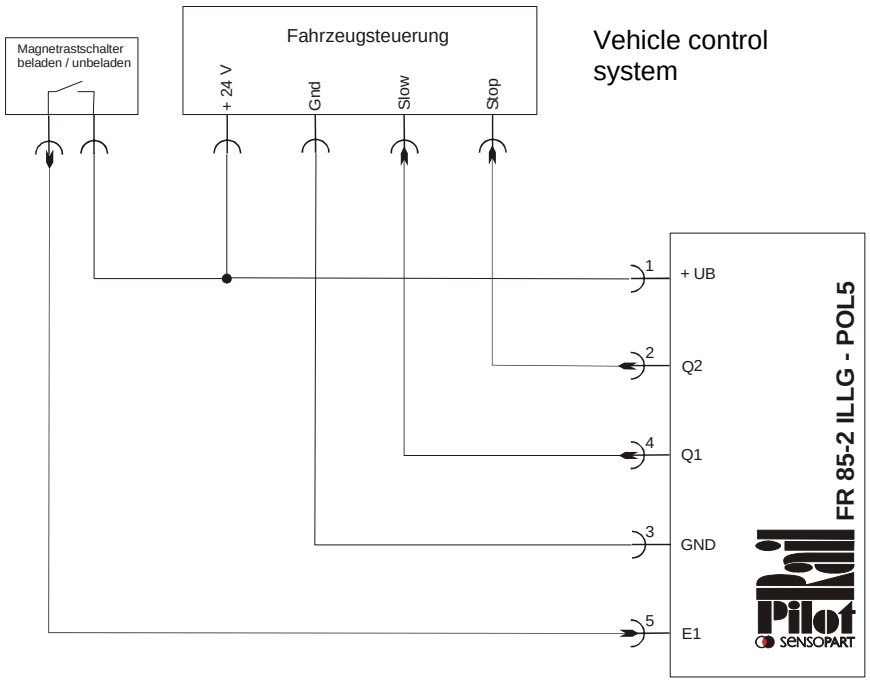
FR 85-2 ILLG – POL5

- Detection range 0 – 6 m
- Aperture angle horizontal ± 7.5 degrees; vertical ± 3.5 degrees
- 2 PNP N.C outputs Q1, Q2
- 1 “range change“ input

The FR 85-2 ILLG – POL5 sensor is connected to the vehicle control system via the 2 PNP signal outputs; a switching signal (Q1) can thus be used to change the speed of travel to slow, the second switching signal (Q2) acts as a stop signal.
It is possible to switch between two pre-set pairs of switching distances for Q1 and Q2 via the E1 “range change“ input.
This function is of help when positioning vehicles carrying greatly overhanging loads. The vehicles can thus travel close up when unloaded but keep to a greater distance when loaded.
Both signal outputs are N.C. so that there is protection from breakage in the connection cable. The four signal points (close / far for both Q1 and Q2) are programmed via a set-up box (part no. 533-11016).
The set-up box is connected between the RailPilot and connection cable for sensor programming and has a serial RS232 interface. A set-up box with IR interface is also optionally available. Distance values for switch points can be programmed using parameter software currently available for PC (Windows), PocketPC (Windows mobile) and Palm. This software is available free of charge.
Advantages:
It is very simple to install in existing installations.
Sensor settings are easy to reproduce and can be recorded.
Sensors can be easily pre-set outside the installation (short commissioning time)

Connection example:

Magnetic switch loaded/unloaded

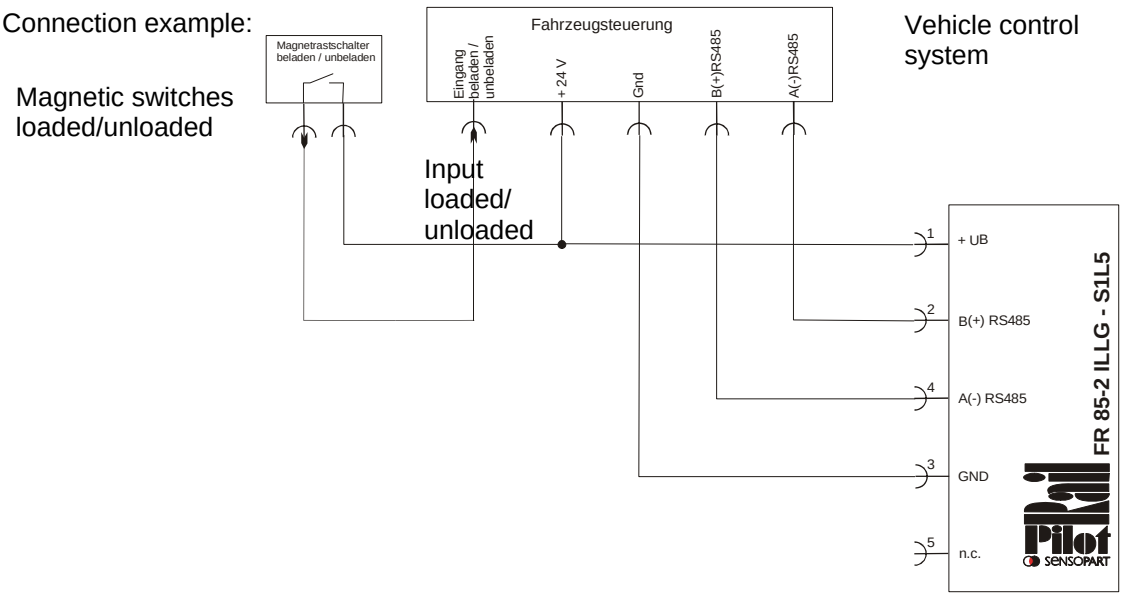


FR 85-2 ILLG – S1L5

- Detection range 0 – 6 m
- Aperture angle horizontal ± 7.5 degrees; vertical ± 3.5 degrees
- RS 485 serial interface

FR 85-2 ILLG – S1L5 only communicates with the vehicle control system via the RS485 interface. (Control systems with this function are currently available from DETO and LJU).
In this application, RailPilot acts as an actual value indicator for the distance to the vehicle in front. The control system continuously interrogates the sensor for the distance to the reflector in front. If the reflector is within detection range, RailPilot sends the distance value to the control system, otherwise the signal sent indicates “no reflector detected”.
The vehicle control system can position the vehicle as required on the basis of this information.
Advantages:
Parameter settings are carried out via the control system. Should it be necessary to replace the RailPilot, no adjustments are necessary to the sensor.

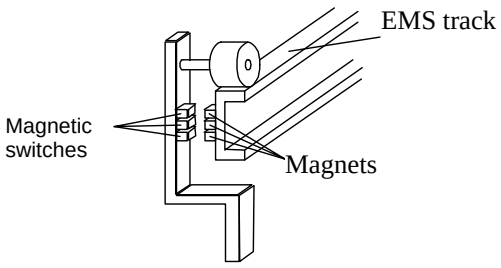
Connection example:



1.2 Example of change-over of safety ranges

Bi-stable magnetic switches are commonly used for switching between close/far safety ranges.

Schematic diagram of change-over system using bi-stable magnetic switches



Serial communication
FR 85-2 ILLG – S1L5

FR85-2 ILLG – S1L5 only communicates with the vehicle control system via the RS485 interface. When installing with a suitable vehicle control system (currently DETO and LJU), it is simply necessary to set the correct baud rate.
The **factory setting** is **57.6 kBaud**.
This setting makes the FR 85-2 ILLG – S1L5 sensor suitable for immediate use with the DETO control system. When used with the **LJU control system**, the baud rate must be set to **62.5 kBaud**.
(See transmission protocol data sheet and description of test software).

Test *FR 85-2 ILLG – S1L5* on a *PC* with *FR85ILL_tester.exe software*

RailPilot FR 85-2 ILLG – S1L5 can be connected to a PC for test and adjustment purposes via a RS485 – RS232 interface converter.

The sensor is available with preset Baud rates:

Type / order reference	Baud rate	suitable for control system	Part no.
FR 85-2 ILLG-S1L5	62.5 kB	LJU	529-11014
FR 85-2 ILLG-S1L5	57.6 kB	DETO	529-11008

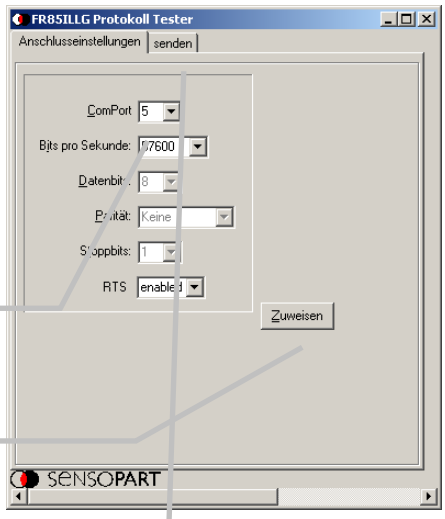
PC Software *FR85ILL_tester.exe*

The software must first be successfully installed on the PC.
RailPilot FR 85-2 ILLG – S1L5 is connected to the PC as previously described.

Once the software has been started-up, the following window appears:

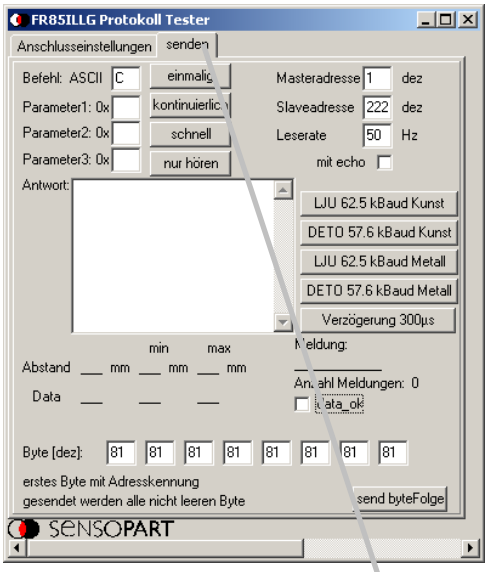
Then the ComPort number must be set to that of the ComPort in use.

The other settings should not be altered for the time being.



1. Enter the number of the ComPort in use here.
2. Activate the "Zuweisen" button.
3. It is then possible to switch to the "Send" menu.

The following window appears when the "Send" menu is selected:



Special feature:

There is the problem that it is possible to set a baud rate which cannot be processed on a PC. In order to bypass this problem, the following function has been integrated in RailPilot FR 85-2 ILLG – S1L5:

Once the power supply has been switched on, the sensor monitors its RS485 interface with a baud rate of 57.6 kBaud for 100ms and tries to receive the command "C".

If the command "C" is received within 100ms, the sensor knows that it is connected to a system which operates with 57.6 kBaud. The sensor maintains the baud rate of 57.6 kBaud.

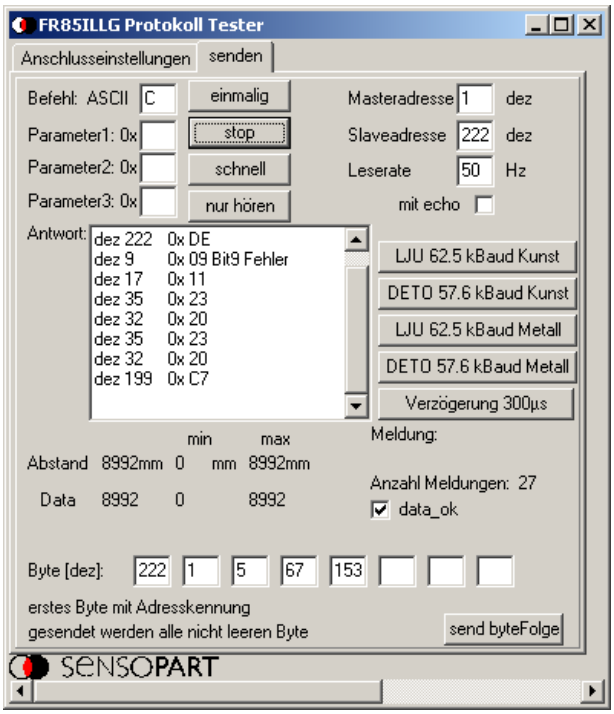
If the command "C" is not received within 100 ms, the sensor knows it is not connected to a system operating with 57.6 kBaud. It then switches to its pre-set baud rate.

In order to create a serial connection to RailPilot FR 85-2 ILLG – S1L5, proceed as follows:

1. Disconnect FR 85-2 ILLG – S1L5 from the power supply.
2. Activate the "continuous" button (the command "C" is continuously sent)
3. Reconnect FR 85-2 ILLG – S1L5 to the power supply.

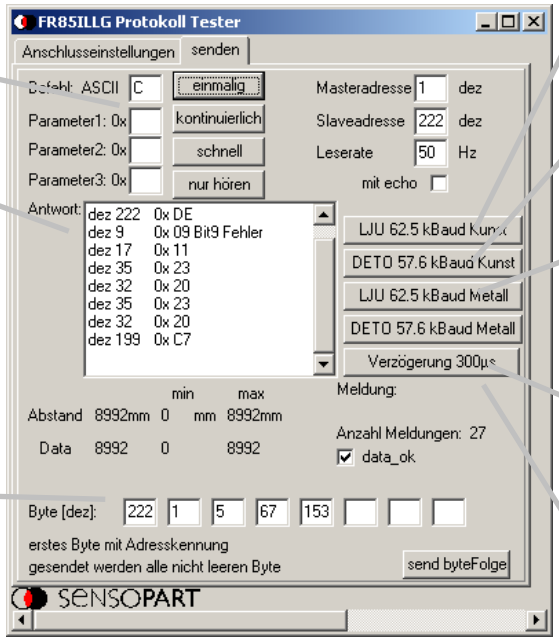
Should no connection be made, repeat steps 1-3.

Once a connection is made, the following windows appear:



Here communication can be tested by holding an object less than 30 cm in front of the sensor; the distance value displayed alters accordingly. (Only reflectors are detected beyond 30 cm)

Once a connection exists, all the protocol commands can be tested. The following functions are available in the FR85 ILLG protocol tester:



Input boxes for command and parameters (command in ASCII; parameters in hex)

Displays the last strings sent by FR 85 ILLG – S1L5; in bytes in dec and hex.

Displays the last string sent by the PC; in bytes in dec

Automatic setting of baud rate for LJU control systems FR 85-2 ILLG-S1L5 (new version)

Automatic setting of baud rate for DETO control systems FR 85-2 ILLG-S1L5 (new version)

Automatic setting of baud rate for LJU control systems FR 85-1 ILLG-S1L5 (previous version)

Automatic setting of baud rate for DETO control systems FR 85-1 ILLG-S1L5 (previous version)

Automatic delay of 300 µs between the sensor receiving a command and sending a reply.

Order data

Sensor

Type / Description		Part no.
FR 85-2 ILLG POL5	(1 field of vision. 2 x PNP 1x E)	529-11010
FR 85-2 ILLG S1L5	(1 field of vision. 1x RS485)	529-11008

Accessories

Type / Description	Part no.
L5 connection cable 5 pin 2m straight	902-51652
Adapter cable for POQ8 (previous version of FR85)	902-51686
Reflector set R10/2 (straight)	904-51636
Setup box FR85-2ILLx	533-11016

Use of software with FR 85-2 ILLG – POL5

Switch points can be optionally programmed from a PC, Palm Organizer or PocketPC.
RailPilot parameter software must be successfully installed on the appropriate device and a SensoPart FR85 set-up box is required.
The FR85 setup box is connected to a PC or Palm Organizer via RS232 interface. An infrared connection exists between the FR85 setup box and a PocketPC.

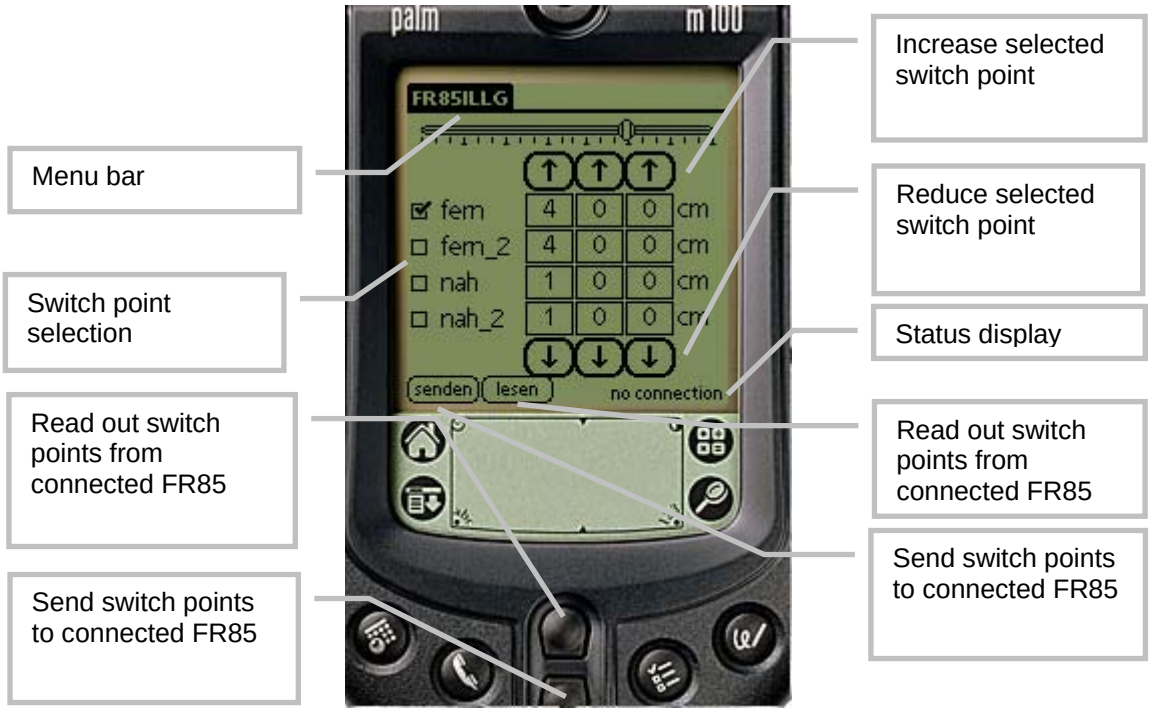
Different programmes are available for downloading:

PC: http://www.sensopart.net/downloads/software/PROGSENSOR_2_10_5.exe
Palm Organizer: http://www.sensopart.net/downloads/software/RailPilot_FR85_palm_2_5_2.prc
PocketPC: http://www.sensopart.net/downloads/software/RailPilot_FR85_Pocket_PC.exe

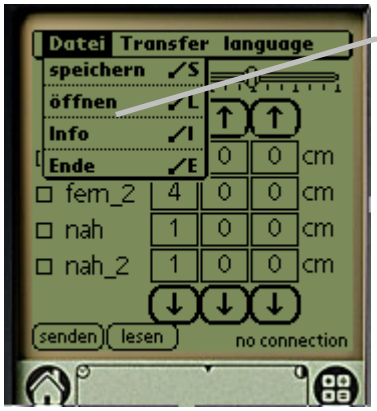
The switch point programming procedure is similar for all three systems.

Example: Programming sensor with a Palm Organizer

All inputs are made using the Palm touch screen.
- The switch point to be adjusted is selected from the switch point selection.
- Switch points are positioned using the graphic position bar or the arrow buttons.

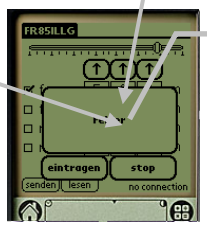


Function selection
Functions are selected via the menu titles listed below



File: Files can be opened and saved. Quit is used to close the programme.
Info gives information on the programme version.

Read current setting from sensor; send setting from Palm to sensor.
Read measured values:
In **online mode,** the sensor periodically transfers measured data, which then appears in the display.

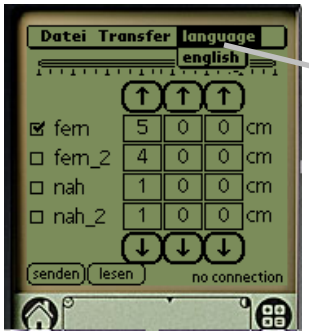


Enter adopts the current value in the selected box

Stop: Ends online mode

In order to programme parameters for the FR85ILLG via the serial connection, the following interface parameter must be set!

Baud rate: 38400
Bit/bByte: 8
Parity: E
Stopbits: 1



Language setting.
Currently available in German and English

Example: Programming sensor with a PocketPC

All entries are made via the touch screen.
- The switch point to be adjusted is selected from the switch point selection.
- Switch points are positioned using the graphic position bar or the arrow buttons.

Increase selected switch point

Field of vision

Reduce selected switch point

Switch point selection

Send switch points to connected FR85

Read out switch points from connected FR85

Menu bar

Read current setting from sensor; send setting from PocketPC to sensor.
Read measured values:
In **online mode,** the sensor periodically transfers measured data, which then appears in the display.

Example: Programming sensor with a PC

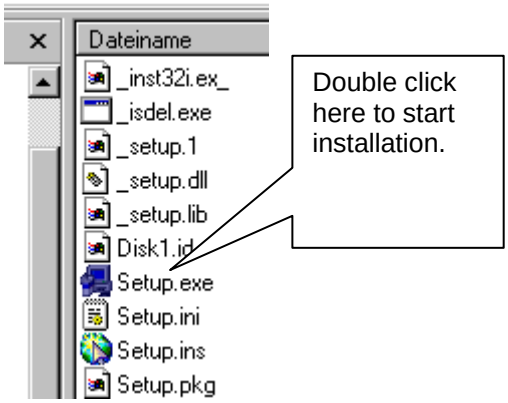
System requirements:

A PC installed with WINDOWS98SE or WINDOWS XP. A free serial interface is required (COM).

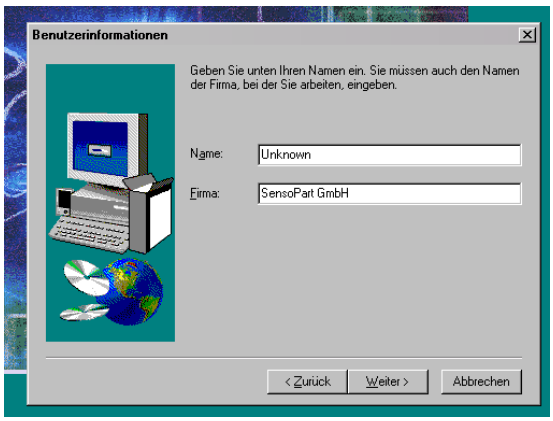
SensoPart's ProgSensor software was developed exclusively for the setting of parameters on SensoPart sensors. SensoPart takes no responsibility for damage which may occur when installing or operating the ProgSensor programme.

Installation

In order to use ProgSensor software, it must be installed under Windows. Installation is started by starting the setup.exe programme in the installation file.



Once setup.exe has started, the following window appears:



Follow the instructions on the screen until installation of ProgSensor has been completed.

Once ProgSensor has been successfully installed, the programme can be started e.g. via the Windows Start button.

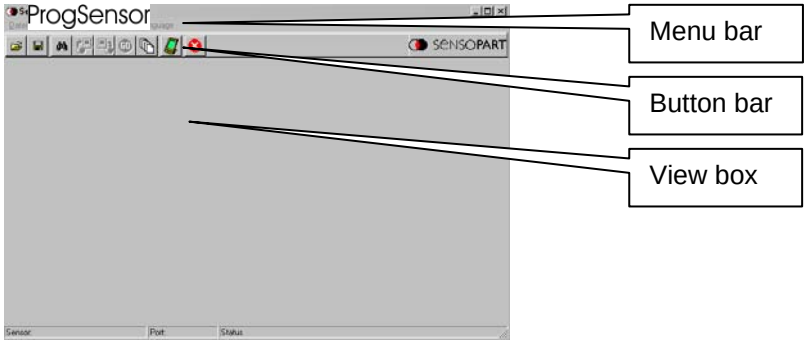
Programming FR 85-2 ILLG with ProgSensor

In order to programme settings on the FR85-2 ILLG, ensure that
1. FR85-2ILLG is connected to the power supply.
2. FR85-2ILLG is connected to a free COM interface on the PC using the SensoPart programming adapter.
3. ProgSensor is installed on the PC.

Once 

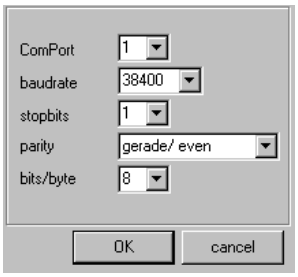
has been started, the main ProgSensor window appears:

The main window consists of the menu bar, button bar and view box.



Menu bar

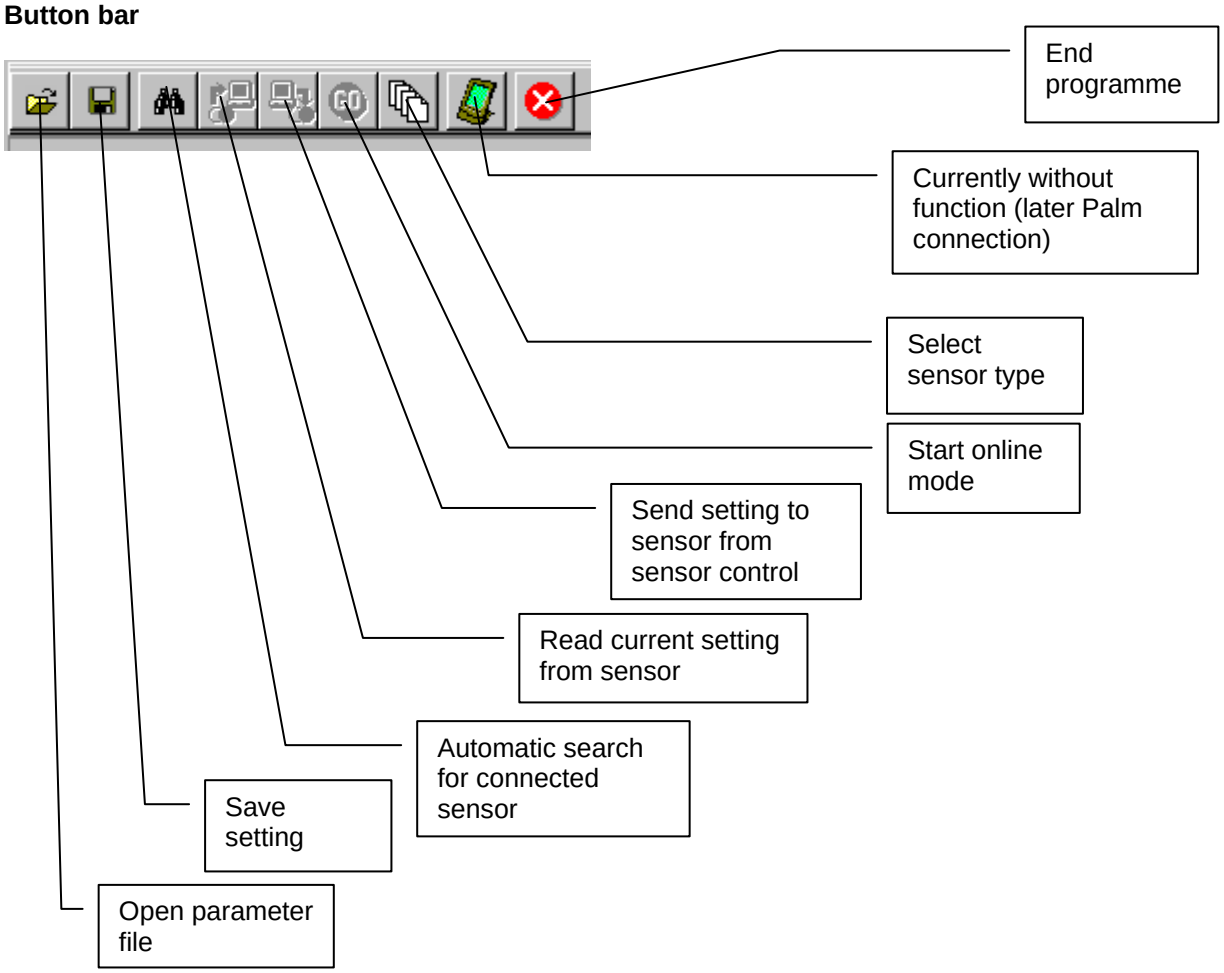
- **File:** Files can be opened and saved. Quit closes the programme.
- **Sensor:** The connected sensor type is selected here. Automatic or manual search are available as options. For manual search, the following parameters must be entered for FR85-2ILLG:



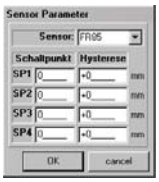
- **Sensor data:** Read current setting from sensor; send setting from ProgSensor to FR85-2ILLG. Sensor online mode can be started. In **online mode,** the sensor periodically transfers measured data, which then appears in the display. If the option “continuously“ is not activated, only one measured value is sent.
- **Help:** This displays the ProgSensor version along with error messages in the event of transmission errors.
- **Language:** Choice of language; current options: German / English

Use of ProgSensor is based on the usual functions of Microsoft Windows and is thus mainly intuitive. Alterations in appearance are thus possible at any time in the course of an update or as the result of other Windows adjustments.

Button bar



Procedure for programming FR85ILLG with data input

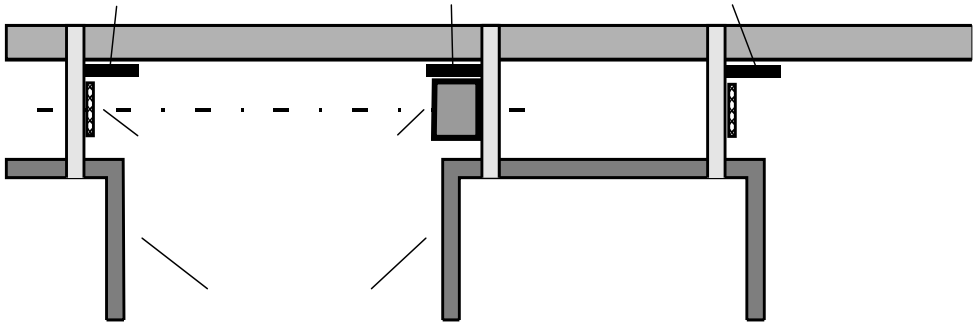
1. Select sensor type and enter parameters directly. ⇨  ⇨ 
2. Transfer parameters to sensor ⇨ 

Procedure for programming FR85ILLG with settings from another sensor

1. Connect sensor with required setting using serial connection
2. Carry out automatic sensor search ⇨ 
3. Read-out setting from sensor ⇨ 
4. Disconnect sensor that has been read and connect sensor to be programmed in its place
5. Transfer parameters to sensor ⇨ 

(Steps 4 and 5 can be repeated as many times as required without reconnecting sensor to be read)

Installation/Mounting suggestion



The illustrated frame protection prevents damage occurring to sensors and reflectors when the EMS vehicles are pushed up close together during service interventions.

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