Installation Manual

USERMANUAL

ICA Turn-Assist AI40 Turn-Assist

Blind Spot Information System

AXION camera systems comply with current CE and EMC regulations. Copyright © 2020 AXION AG

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General

General Notes

This document describes the function, installation, operation, maintenance and troubleshooting of the ICA Turn-Assist AI40 turn system.
This document is intended for professional workshops and specialist personnel with appropriate background knowledge in the handling of vehicle electronics and electronic components. Installation must always be carried out by trained personnel. The document is also intended for instructed drivers who have the qualification and suitability to drive the motor vehicle.
Make sure you have read and understood the complete instructions and all safety information before installing and using this product. Failure to follow these instructions may result in minor or serious injury.

Explanation of the safety instructions

Please read and observe all warnings, notes and instructions in these operating instructions. The following types of warning symbols are used:

	"Danger" indicates an imminently hazardous situation which, if not avoided, could result in death or serious injury.
	"Warning" indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	"Caution" indicates a hazard that, if not avoided, may result in minor or moderate injury.
	Indicates information that is important but not related to potentially dangerous situations.

Storage instructions

These installation and operating instructions, as well as the general operating permit, must always be kept gribble and accessible in the vehicle.
A current version of the documentation is available on the following website:
www.axionag.de
Documentation, user instructions and technical information can be requested by e-mail:
service@axionag.de

Intended use

The ICA Turn-Assist AI40 is designed exclusively for use in closed vehicles with 12V/24V power supply.

	Qualification and suitability for driving the vehicle cannot be compensated or replaced by using the turn assistance system!
	The road traffic regulations must always be followed in full. The system does not replace the driver's duty to use the exterior mirrors and the shoulder view when turning, changing lanes or turning! The vehicle driver must always assess the situation himself and evaluate whether driving maneuvers are possible without danger!
	Physical system limits can influence the system in its proper function. This applies in particular to higher speeds and external influences such as direct sunlight, heavy rain, snow or contamination of the sensor system, as well as absolute darkness. To ensure the complete functionality of the turn assistance system, the sensor system must not be covered and should be kept free of ice, snow and dirt.
	The turn assistance system supports the driver by providing information and warnings about vulnerable road users in the danger zone next to the vehicle. It serves to supplement the usual safety precautions when driving the vehicle. The driver is still obliged to pay attention to road users, vehicles and objects in the danger zone next to the vehicle and should never rely solely on the turn assistance system.

When used as intended and in compliance with all prerequisites, notes and warnings in the operating instructions, the system does not present any hazards.

Disclaimer

The manufacturer accepts no liability for damage in the following cases:
- Mounting or connection errors
- Mechanical damage to the product
- Damage due to reverse polarity or incorrect connection voltage
- Modifications to the product not approved by the manufacturer
- Use for purposes not described in this manual

AXION AG makes no representations or warranties with respect to this manual and, to the extent permitted by law, limits its liability for breach of any implied warranty to the replacement of this manual with another manual. AXION AG also reserves the right to revise this publication at any time without notice to any party.

The information provided in this documentation includes general descriptions and/or technical characteristics of the performance of the equipment described herein.
This documentation cannot serve as a proper assessment of the suitability or reliability of the equipment for a specific application by a user and must not be used as a substitute for such an assessment.

It is the responsibility of each such user or installer to perform an appropriate and complete risk assessment, evaluation and testing of the equipment with respect to its specific application. Neither AXION AG nor any of its affiliates or subsidiaries shall be held responsible or liable for any misuse of the information contained herein.

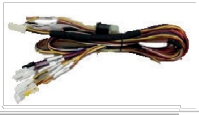
All relevant state, regional and local safety regulations must always be observed when installing and using this device. For safety reasons and to ensure compliance with the documented system data, only the manufacturer is authorized to perform repairs on components. Failure to observe this information may result in injury or damage to the equipment.

Warranty

The warranty for the turn assist system is 24 months. System components must not be opened, changed or manipulated. In the event of non-compliance, safe functioning can no longer be ensured. This will void both the warranty and the operating permit.

Product information

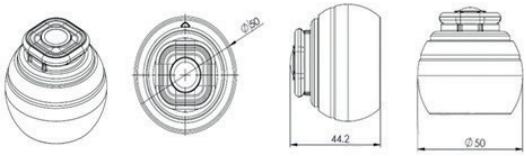
Scope of delivery

Figure	Description	Item number
	AI camera	DBC-AI40
	Control unit (MCU)	ICA-MCU40
	LED warning light	ICA-WLED40
	Warning buzzer (Buzzer)	ICA-WBZ40
	Connection cable set	ICA-MCC40
	Y-connection cable	ICA-MCY40
	Extension cable 10m	WPC-4010
	GPS module	ICA-GPSM40
Screws + nuts	Mounting material	-

Technical Data

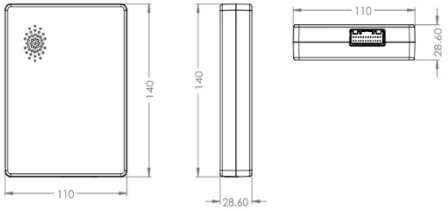
Camera Specifications - DBC-AI40:

Dimensions	50 mm x 46 mm (WxD)
Operating voltage	9-36 Vdc
Current consumption	~200mA @ DC 12V
Sensor format	CMOS
Resolution	1280x960 (720p)
HDR dynamic range	>100dB
Minimum brightness	0.1 lux
Video format	CVBS / AHD
Viewpoint	H: 165° V: 130°
Waterproof	IP69K
Operating temperature	-40°C - 85°C
Storage temperature	-40°C - 105°C



Control unit specifications - ICA-MCU40:

Dimensions	110 mm x 140 mm x 28.6 mm (WxHxD)
Operating voltage	10-36 Vdc
Power consumption	< 15 W
Interfaces	RS232 / LED / Alarm / Button / UART / Analog
Operating temperature	-40°C - 75°C
Storage temperature	-40°C - 75°C



Operating and Display elements

The system can be operated via the button included in the scope of delivery. A distinction is made between two operating options:
Short press (<1s): Quick adjustment of buzzer volume, move to next menu item.
Long press (>3s): Opens the settings menu / selection or confirmation of a menu item, a short tone is played as feedback.
The LED warning light is used as a display element for the system status and for all visual indications and warnings:

	LED lights yellow LED flashes yellow	Error condition detected, system function disturbed Speed signal not calibrated
	LED lights orange LED flashes orange	Object in the coverage area with low collision risk (if vehicle detection is activated: vehicle detected in the adjacent lane). Object in the coverage area during the turning process
	LED lights red LED flashes red	Object in the danger zone with elevated-tem collision risk Object in the danger zone with a high risk of collision

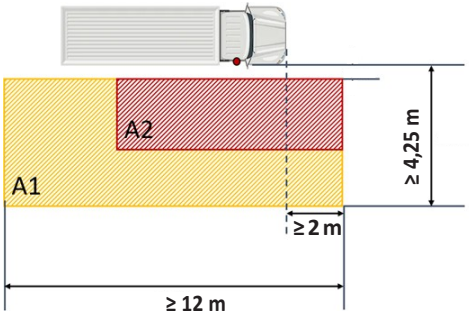
Area of use

The system is designed for commercial vehicles (classes N2 and N3) and buses (classes M2 and M3) with more than nine seats including the driver's seat, which meet the following installation conditions. The system can also be used for vehicles with <3.5T weight, if the possible installation position allows it.

- The system must be completely installed on the vehicle in which the driver receives the warning.
- The sensor positions listed in these operating instructions must be observed for proper functioning.
- The camera can be positioned within the limits both on the passenger compartment and on the body of the vehicle.
- Care must be taken to ensure that no component protrudes more than 100 mm beyond the edge of the vehicle.
- The system can be operated under all load conditions of the vehicle.

Functional description

The ICA Turn-Assist AI40 turn assistance system is a camera-based system. It consists of a side camera with integrated AI algorithm for observing the coverage area, a control unit for signal processing and the warning device consisting of LED and buzzer.
The system is active when the ignition is switched on. When switching on, the LED lights up briefly and the buzzer sounds once. The camera continuously checks the **coverage area (A1, yellow)** and classifies the detected objects. As soon as unprotected road users (=VRU) are located in the coverage area, the driver is visually alerted via the LED warning light.



If a turning process is initiated by switching on the turn signal and VRUs are in the coverage area or enter the **danger zone (A2, red),** the driver is warned visually by the flashing LED warning light. If VRUs are in the danger zone, the buzzer also sounds an acoustic warning tone while the vehicle is moving (<40 km/h).
The color of the LED corresponds to the respective range (A1 = LED orange, A2 = LED red).

This multi-stage warning concept helps the driver to gain a better overview of the situation at hand and to better assess its dangerousness. The turn assistance system has a self-diagnosis function. During operation, it continuously checks itself for faults. As soon as a connection or component is faulty or its function is restricted, the warning LED lights up yellow to alert the driver to the restricted function. This also applies if the camera is covered or dirty. As soon as the fault is eliminated, the system automatically switches back to normal operation after a short time.
Furthermore, the system can also be used as a lane change assistant. To do this, vehicle detection must be activated in the settings with the speed threshold selected. If a vehicle is detected in the coverage area when changing lanes with the turn signal activated, the LED lights up orange as a warning for the driver.
An auxiliary monitor, available separately, is required for system installation and calibration. In normal operation, the system is used without a monitor. If a camera image is required during operation, this can be realized by connecting and mounting a suitable monitor. The camera has a video output that is compatible with AHD, PAL or NTSC compatible monitors. The following models are recommended for this purpose:

- AXION CRV7105 M HD
- AXION CRV7005 M
- AXION CRV7270 QUAD HD
- AXION CRV7200 QUAD
- AXION CRV7012 M

Assembly and commissioning

Safety instructions for assembly

Observe the safety instructions and requirements specified by the vehicle manufacturer and the automotive trade!

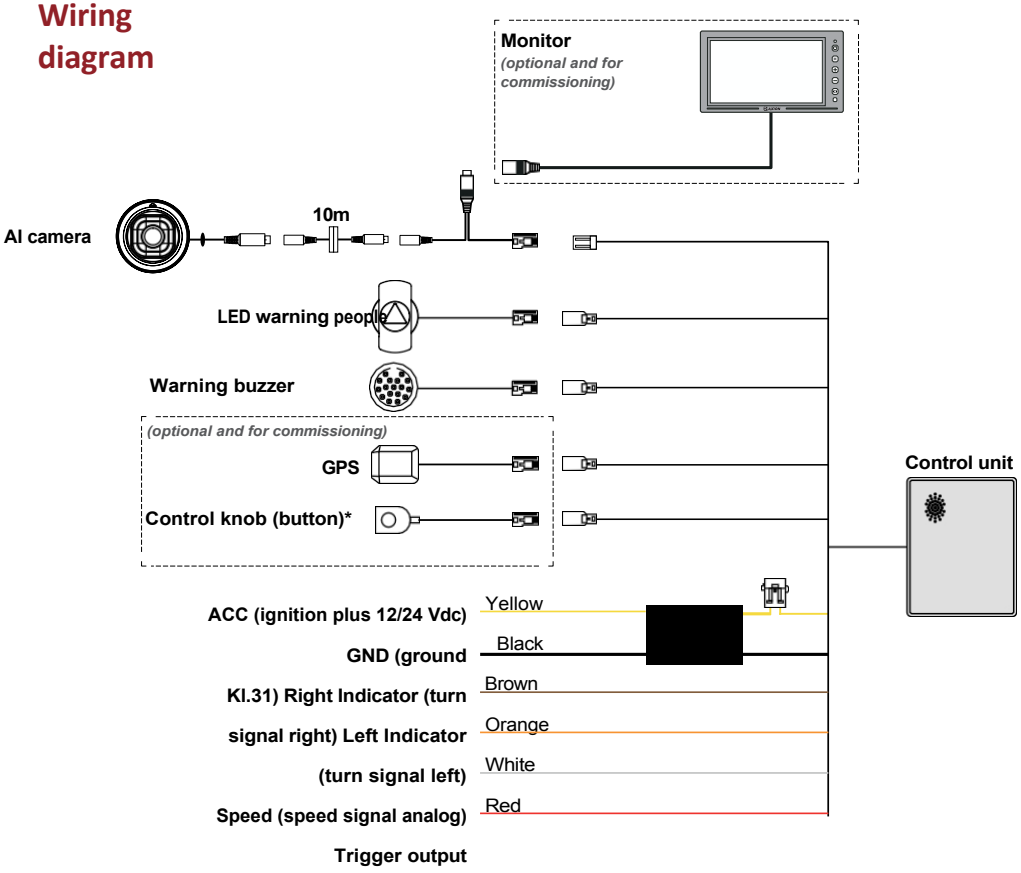
	Make sure you have read and understood the instructions and all safety information before using this product. Failure to follow these instructions can result in serious injury or death.
	• Always disconnect the negative terminal on the battery before working on the vehicle electrical system to prevent damage to the electrical system. • On vehicles with an auxiliary battery, this must also be disconnected. • Insufficiently insulated or improperly connected cables can cause malfunctions and short circuits in the vehicle's electrical system.
	Especially when working on the following lines, make sure that all connections are made properly and that all cables and connections are sufficiently insulated: • Terminal 15 (battery plus, switched) • Terminal 31 (vehicle ground, battery minus) Use only a diode test lamp or voltmeter to test the voltage in electrical lines. Use crimping pliers to connect the cables or solder the cables properly. When laying the electrical connections or cables, ensure that they are not bent or twisted, that they do not rub against corners or edges and that they are not laid through sharp-edged bushings without protection. Do not pull on the lines and connections. Protect installed cables against mechanical and thermal stress by taking appropriate protective measures and insulate all connections and terminals. For any connections to terminal 31 (ground), connect the cable with cable lug and toothed lock washer to a suitable ground screw or with cable lug and self-tapping screw directly to the body. Ensure good ground transfer here. When disconnecting the negative terminal of the battery, all volatile memories of the comfort electronics may lose their stored data. In this case, please have any data (e.g. radio code) required for re-setting ready.

WARNUNG	• Never use the device outside the specified tempera- ture range • Do not use the device if the relative humidity is above the specified limit. • Do not use the device if it interferes with safe driving of the vehicle. • Make sure that the device, as well as all components connected to it, are not damaged. • Check the operating environment.
WARNUNG	• Ensure the correct connection voltage of the device. • Do not open the housing of the device. • Do not make any changes to the device. • Immediately take the device out of operation in case of visible damage. • Persons who, because of their physical, sensory or mental capabilities, are not capable of operating or installing the equipment safely should operate or install this product only under supervision.
WARNUNG	Installation and commissioning must be carried out by a suitably qualified and trained fitter in compliance with the applicable regulations and laws. The installer is responsible for employing experienced and qualified personnel

Mounting material

Figure	Designation	Article	Usage
	Monitor	any	necessary
	Control knob (button)	ICA-EBT40	necessary
	GPS module	ICA-GPSM40	necessary (included in delivery)
	Calibration auxiliary mat	ICA-MM1100	recommende d

Wiring diagram



Notes:

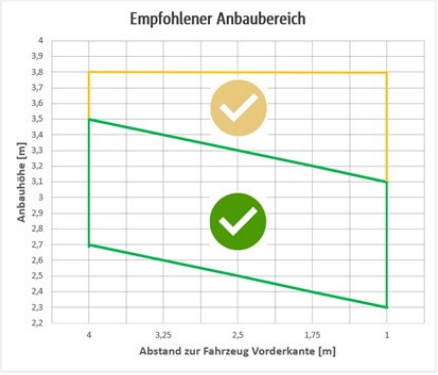
* Control knob exclusively for commissioning, not for remaining in the vehicle
- Speed signal: Optionally the enclosed GPS antenna can be used
- Blinker signal: Can be present as a pulse signal. It must be ensured that no test or residual voltage is present (usually 3V). This can lead to errors in the signal processing. If necessary, use an additional relay circuit.
- All plug connections outside the driver's cab and all open plug connections must be additionally sealed with insulating tape to protect them from dirt and moisture.

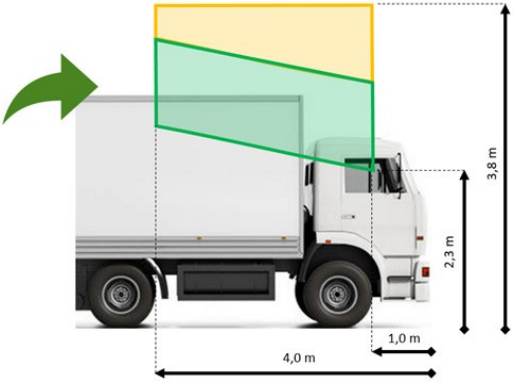
Assembly instruction

The camera must be mounted in the attachment area provided. Measurements are taken from the floor to the camera lens.

Distance to the front edge: from 1.0 m to 4.0 m
Possible mounting height: from 2.3m to 3.8m

The recommended mounting height is within the green marked area, if necessary the camera can be mounted within the yellow marked area. Mounting outside the specified areas is not permitted. The limits can be seen in the graphical representation. Mounting within the yellow area leads to changes during the alignment of the camera.





Depending on the condition of the car body, a mounting bracket is necessary. Available versions:

Figure	Designation	Article
	Camera holder roof mount Mercedes Benz Citaro	ICA-CB301
	Camera holder roof mount Mercedes Benz eCitaro	ICA-CB302
	Camera holder roof mounting Setra S 418 Business	ICA-CB303
	Camera holder roof mounting MAN Lion's City (e.g. A26)	ICA-CB304
	Camera holder universal	ICA-CSR16

Housing variants

Standard housing ICA-CB401	Design Case ICA-CB402
	
Design housing ICA-CB202B	**Spacer ICA-CB203C** suitable for ICA-CB402, ICA-CB202B
	

Camera mounting

1. (If bracket is necessary) Firmly attach camera mounting bracket to the body of the vehicle
2. Connect camera cable with extension cable WPC-4010
3. Pre-mount the camera with the screws
4. Align camera based on coverage area
5. Screw the camera firmly into the housing

Mounting the LED warning light

Display must be easily perceived by the driver. The LED warning light **must be** mounted **at least 30° away from the** driver's **line of vision.**

- Mounting position on the passenger side, preferably A-pillar
- Fasten warning light with screws or adhesive pad
- Fasten the cover of the warning light with one click

Fastening the control unit

The ICA-MCU40 control unit is mounted in the cockpit area, e.g. with an adhesive strip in a water-protected area. The mounting position and orientation can be freely selected.

Alignment of the camera

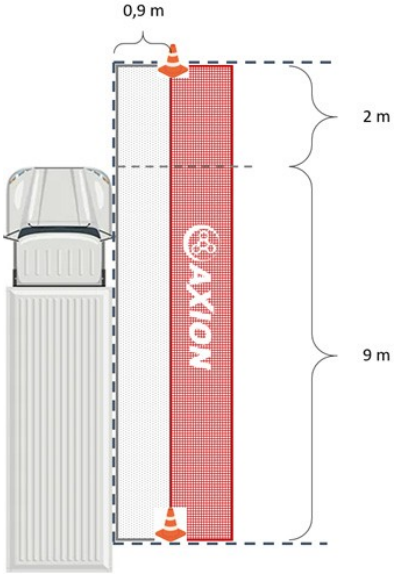
An auxiliary monitor must be connected for the setup. The camera supports various image formats (PAL, NTSC, AHD). A monitor with a suitable mini-DIN connector is required. The image is used to check the coverage area.

The coverage area of the system is within the blue dashed lines. The setup is done by turning the camera lens. To do this, loosen the screws on the camera holder slightly and tilt the lens manually. The coverage area must start at least 2 m in front of the technical front edge of the vehicle and include the area up to at least 9 m behind the technical front edge. The long, horizontally dashed line is used to align the camera along the outer edge of the vehicle.

AXION recommends the ICA calibration mat MM1100 as a simple and quick solution: place the calibration mat along the outer edge of the vehicle, so that
the red mark coincides with the technical leading edge of the vehicle. Align the camera lens so that the blue dashed lines cover the entire field
include and the red area is not obscured by vehicle parts or similar.

If the mounting height is within the yellow marked field (see previous figure), the camera has a larger field of view.
The camera must be aligned in this way:

- Detection area within the blue dashed lines
- Blue crosshairs as perpendicular to the ground as possible
- No horizon visible in the image on the axis of the lower blue dashed line



Alternatively: Measure areas manually and mark them out with pylons: one pylon at a distance of 90 cm from the vehicle and 2 m in front of the technical leading edge. Place another at a distance of 90 cm from the vehicle and 9 m behind the technical leading edge. Align the camera lens so that the two pylons are within the blue dotted lines and are not obscured.

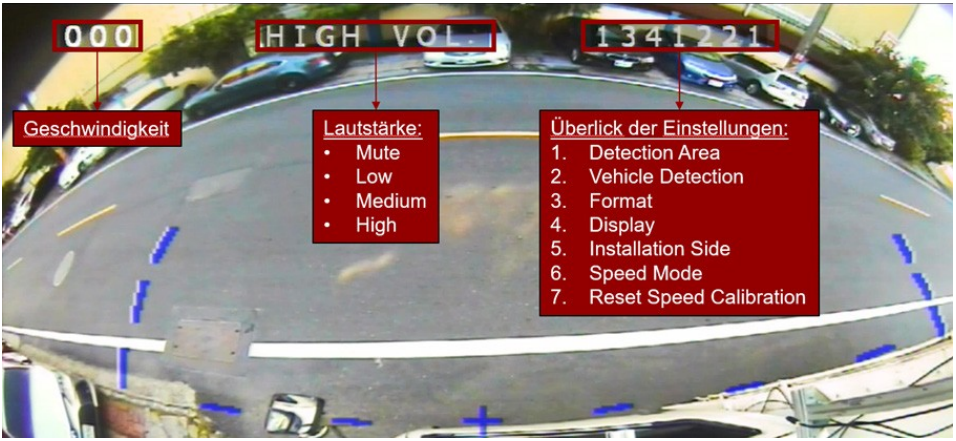
Operation and Settings

An external button is required for operation (ICA-EBT40). This is not part of the scope of delivery and can be purchased as mounting material. A distinction is made between two operating options:

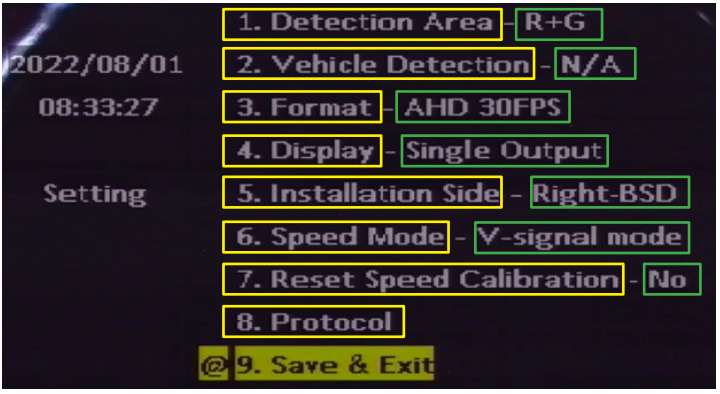
Short press (<1s):
- Quick buzzer volume adjustment
- Go to the next menu item

Long press (>3s):
- Opens the settings menu
- Selection or confirmation of a menu item
- During pressing, a short confirmation tone is played back as feedback

Display in operating mode:



Setting options:



Menu item	Description	Possible settings
Detection Area	Indicates the coverage area. Distinction between low (LP) and high (HP) mounting position.	1: LP (Standard) 2: HP
Vehicle Detection	For setting vehicle detection as lane change assist. N/A means vehicle detection is OFF. Otherwise, the vehicle detection starts but the set speed.	1: N/A (default) 2: 40 km/h 3: 60 km/h 4: 80 km/h
Format	Setting of the image output format. The setting becomes active only after saving via **Save & Exit**	1: NTSC 2: PAL (Standard) 3: AHD 25 FPS 4: AHD 30 FPS
Display	Setting the image output between single and dual image format	1: Single Output (Standard) 2: Dual Output
Installation Side	Information on which side of the vehicle the system is installed	1: Left BSD 2: Right BSD (default)
Speed Mode	Setting which source is used as speed signal	1: GPS Mode (default) 2: V-Signal Mode
Reset Speed Calibration	Used to reset the calibrated speed	1: No 2: Yes
Protocol	Overview protocol with the system properties	-
Save & Exit	Save the settings made and exit the menu	-

Notice:
For correct functionality within the scope of these assembly instructions, the system must be used in "Right BSD" mode.

Notice:
The selected settings are only active and saved after the settings are saved via **Save & Exit.** If no input is made for one minute, the settings menu is automatically exited without saving.

1141224	The stored settings are displayed in the operating mode in sequence as a numerical code.

Calibration of the speed

The turn assistance system requires a speed signal for full functionality. The speed signal from the vehicle is used as the source. Alternatively, the enclosed GPS receiver can be used permanently for operation. When using the GPS receiver, no calibration is necessary.

Note: Ensure good reception when using the GPS module. Operate and mount the GPS module in the open air and uncovered by objects.

The optional GPS module must be connected temporarily for calibration. It is used as a reference to store the vehicle signal correctly. To start the calibration, select **Speed Mode -> V-Signal in** the settings menu and then save the setting using **Save & Exit.** The calibration is then started immediately. Tip: If available, a cruise control is recommended to keep the respective speed constant.

Calibration procedure:
1) Warning LED flashes yellow
2) Drive at a constant 30 km/h for a few seconds
3) As soon as the system has saved the value, the LED starts flashing yellow faster
4) Drive constantly 40 km/h for a few seconds
5) As soon as the system has saved the value, the LED stops flashing
6) Normal operation is switched on again. The GPS module is no longer required

Reset calibration of the speed
If the control unit is rebuilt or the calibration has gone wrong, it can be reset in the settings menu with the **Reset Speed Calibration** item. To do this, change the value to **Yes** and then save the setting via **Save & Exit.** The LED starts to flash yellow and the calibration procedure can be carried out as described.

Assembly protocol
After installation:

- Open settings menu
- Display and photograph the system status under "8. Protocol

Note: Date and time refer to V-calibration

- Recommendation: Photo of the monitor with visible calibration mat ICA-MM1100
- Fill in the assembly protocol (see appendix)

Troubleshooting

Error pattern	Possible causes	Solution
System does not start	• Faulty connection	• Check connections according to connection diagram • Check voltage supply
Warning LED does not light up at system startup	• Plug connection or cable damaged • LED board damaged	• Check plug connection and lines • Request spare part
Warning buzzer does not sound at system startup	• Plug connection or cable damaged • Warning buzzer damaged	• Check plug connection and lines • Request spare part
No video image visible on the auxiliary monitor + LED lights yellow	• Plug connection to camera faulty • Camera video output and monitor input set differently	• Check plug connection and lines • Adjust video settings of Kamera and monitor (PAL/PAL,NTSC/NTSC, AHD/AHD) • By pressing the button 10 times, the camera can be reset to PAL video output.
LED lights up permanently yellow	• Camera signal not available • Camera lens dirty or covered • GPS selected and not connected	• Check plug connections and cables • Clean camera lens
LED flashes yellow	• The speed signal is set to the vehicle signal and not cali- brated	• Recalibrate speed signal according to operating instructions

If the above steps do not remedy the situation, please contact the manufacturer's service department or your specialist dealer.

Repairs

The product may only be repaired by a qualified and trained person. Contact the manufacturer (see reverse side) or your specialist dealer for repair.

More information

Disposal of packaging waste

The packaging is made of environmentally friendly materials that may be disposed of through your local recycling facilities. By properly disposing of the packaging and packaging waste, you will help prevent potential hazards to the environment and public health.

Disposal of electronic equipment

The symbol on the product, accessories or packaging indicates that this device must not be disposed of as unsorted waste, but must be taken to a special collection point! Dispose of the device at a collection point for recycling and disposal of waste electrical and electronic equipment that has systems for separate collection of electrical and electronic equipment if you live within the EU and other European countries. By disposing of the device correctly, you will help to avoid potential hazards to the environment and health that may be caused by improper handling of waste equipment. The recycling of materials contributes to the conservation of natural resources.

Simplified EU Declaration of Conformity

AXION AG hereby declares that the ICA Turn Assist AI40 is in compliance with EU Directive 2014/30EU. The full text of the EU Declaration of Conformity under the following mail: **service@axionag.de**

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