Dikablis -
The Eye Tracking System

Dikablis Hardware
Operating Manual

For Dikablis Cable and Dikablis Wireless

Hardware Version 2.0

Revision 9/2011

Ergoneers
Ergonomic Engineers

Contents

Dear customer,

With the Dikablis eye tracking system from Ergoneers, you have chosen innovation, quality, performance and reliability. Dikablis will optimally support you in all your eye tracking test and research endeavors and guarantee a maximum of efficiency and convenience. Ergoneers is supplying you with a complete and consistent hardware and software system for scientific eye tracking. Compatibility problems between hardware components or internal data flow constraints are now a thing of the past.

Dikablis is used to track and experimentally analyze the glance direction, eye and head movement of test persons. By integrating the fundamental system components into the head unit, the system provides the test person with unrestricted freedom of movement. The LiveView integrated in the recording software allows the glance behavior of test persons who can move freely about the room to be recorded and simultaneously monitored on the screen.

The list of possible applications for the Dikablis system is long, ranging from the assessment of design and structural accessories through to the design of behavior-optimized user interfaces, or to the evaluation of glance behavior in critical safety situations. The user does not need to have any previous experience in the field of eye tracking. Both amateurs and experts alike can utilize of the system's full potential.

The purchased package contains analysis software which enables the user to process the test results both intuitively and simply. With the standard software, it is possible to manually edit the data recorded during the test. Optionally, Ergoneers can now offer you the D-LAB software module, an independent module for the automatic analysis and processing of the recorded data. With D-Lab, the data no longer needs to be manually processed. D-Lab offers you the ability to display the recorded glance behavior in a factually concise, high quality graphical display.

Our product portfolio comprises the following Dikablis variants: Dikablis Cable, Dikablis Wireless and Dikablis Wireless Plus. The alternative you have chosen greatly depends on its intended area of usage.

In this manual, you will subsequently find a detailed description of your system's hardware. The basic assembly steps are explained and graphically illustrated.

Thank you for choosing to purchase an Ergoneers product. We hope you enjoy using your new Dikablis eye tracking system.

Your team from Ergoneers

1   General Instructions

1.1   Appearance of the Safety Instructions

The safety instructions included in this operating manual have the following appearance:

Pictogram	**SIGNAL WORD**!
	Type and source of danger. Possible consequence(s) if disregarded. • Measure(s) to avoid danger.

Pictogram	Signal word	Meaning	Consequences if disregarded
Example: General danger	**DANGER!**	Danger posing an immediate threat	Death or grievous bodily harm
 Specific danger, e.g. electric shock	**WARNING!**	Possibly dangerous situation	Death or grievous bodily harm
 Warning because of laser beam	**CAUTION!**	Possibly dangerous situation	Minor bodily harm
	STOP!	Possible material damage	Damage to the equipment or its surroundings
	NOTE	Useful instruction or tip. Makes it easier to work with the equipment.	

1.2 Warranty Claims

The operating manual must be read and observed to guarantee fault-free equipment operation and ensure that any warranty claims can be met. **For this reason, be sure to read the operating manual before working with the Dikablis system!**

Make sure that a legible copy of the operating manual is made accessible to everyone who is working with the Dikablis system under their own responsibility.

1.3 Disclaimer

The observance of the operating manual is a prerequisite for the safe operation of the Dikablis Cable and Dikablis Wireless eye tracking systems and for achieving the specified product characteristics and performance. Ergoneers GmbH does not accept any liability for any personal harm, property or material damage caused due to a failure to observe the operating manual. In such cases, any liability for defects shall be excluded.

1.4 Warranty and After-Sales Service

Our systems undergo stringent quality assurance tests prior to their delivery. However, should the equipment be damaged despite the care and attention exercised during production or transportation, we would ask you to return the device to your retailer. In addition to the statutory warranty claims, the purchaser is also entitled to the following warranty:

We provide a one-year warranty for the purchased Dikablis system, starting on the day of purchase. Within this period, we will eliminate free of charge any defects which can be proven to have originated due to material or manufacturing fault. This shall be done by either repairing or replacing the equipment.

Defects caused due to the improper treatment of the equipment and those caused by intervention or repairs performed by third persons, or the installation of parts not supplied by Ergoneers shall not be included in this warranty.

1.5 General Safety Instructions

	WARNING!
⚠⚡	The failure to observe the following instructions can lead to an electric shock! • Before connection to the mains power supply, check if the type of current and the mains voltage are the same as the information on the plug specification plate. • The power packs must not be used in wet areas (e.g. bathrooms) or in areas where they could potentially get wet. The power packs have no protection against splash water and are not watertight. • The power packs must not be exposed to direct solar irradiation or other heat sources.

	• Never attempt to open the mains plug casing yourself! • Regularly check the mains cables, mains plugs and all of the cables for possible damage. Do not use the power pack if it has been damaged! Contact your customer service representative.

	STOP!
	The failure to observe the following instructions can cause damage to your eye tracking system: • Never attempt to open the equipment casing! • Do not force the plugs into the sockets! Pay attention to the instructions included in this manual. • Do not drop the system components onto the floor!

1.6 Technical Data

The following tables show the technical data of a number of components of the Dikablis system.

1.6.1 Head Unit

Design material	Titanium
Weight	Approximately 120g
Field camera adjustment range	Horizontal adjustment corresponds to 0° + 12° (upward) - 81° (downward)
Eye camera adjustment range	Freely adjustable via the "swan-neck" (only for the left eye)
Head size adjustment range	The head unit can be freely adjusted to suit the size of the test person's head using the cord stopper on the drawstring.
Voltage supply [V]	5V DC
Power consumption [mA]	150mA

1.6.2 Field Camera

Sensor	¼" color CCIQ II camera
Video system	CCIQ II (PAL)
Number of pixels	320k (PAL)
Scanning	2:1 INTERLACE
Synchronization	Internal
Resolution (TV lines)	400 TV lines
S/N ratio	More than 50dB
Shutter electronics	1/50 – 1/6000
Video out	1Vp-p 75 ohm COMPOSITE
Operating temperature	- 10 °C <T< 45 °C
Voltage supply [V]	2.7 V
Power consumption [mA]	100 mA
Lens	Exchangeable, format: 1/3, mount: M12 x 0.5

1.6.3 Eye Camera

Sensor	¼" CMOS camera
Video system	CCIR (PAL)
Number of pixels	352x288 (PAL)
Scanning	2:1 INTERLACE
Synchronization	Internal
Resolution (TV lines)	240 TV lines
S/N ratio	More than 46dB
Shutter electronics	1/50 – 1/6000
Video out	1Vp-p 75 ohm COMPOSITE
Operating temperature	- 10 °C <T< 45 °C
Voltage supply [V]	5V
Power consumption [mA]	20 mA
Lens	3.9mm /F2.8

1.6.4 Infrared LED

In accordance with the guidelines for eye safety specified in the standard EN 60825-1 "Safety of laser products" (under consideration of application briefs I-008, I-009, I-015 and application note 1109), the integrated LED has been classified as a class 1 laser product and is thus safe for the human eye.

Size	Flat top 2x2mm
Opening angle	110°
IR emitter	875 nm TS AlGaAs, 17 mW/sr, 40 ns
IR detector	PIN photodiode high sensitivity speed, 7.5 ns
Current consumption	500A to 500mA

1.6.5 Cable Box with Power Pack (Dikablis Cable)

Video processing	2 channels + 2 channels for monitoring
Video input	2 x CVBS 1Vpp 75 PAL (only via the Ergoneers head unit)
Video output	2 x CVBS 1Vpp 75 PAL
Video monitoring output	2 x CVBS 1Vpp 75 PAL, optional

Power supply pack:

Primary	100 – 240 V AC
Secondary	12 V 2.0 A DC

1.6.6 Transmitter and Receiver with Power Pack (Dikablis Wireless)

Modulation process	COFDM (QAM16, FEC 3/4, guard interval 1/32)
Frequency range	2404 MHz – 2479 MHz adjustable in 16 steps of 5 MHz
Channel bandwidth	8 MHz
Delay	< 40 ms (transmitter signal input – receiver signal output)
Video transmission	2 channels + 2 channels for monitoring
Audio transmission	Stereo, 8 bits/48 kHz
Video input	2 x CVBS 1Vpp at 75 PAL (only via the Ergoneers head unit)
Tuner	Double diversity
Audio input	Stereo, asymmetrical, line level
HF output	100 mW
Video output	2 x CVBS 1Vpp at 75 PAL
Video monitoring output	2 x CVBS 1Vpp 75 PAL
Audio output	Stereo, asymmetrical, line level

Power supply pack:

Primary	100 – 240 V AC
Secondary	12 V 2.0 A DC

1.6.7   Down Converter (Attached to the Dikablis Wireless Antenna Cable)

Input frequency (RF)	2200 – 2700 MHz
RF input power	Max. 1mW
Output frequency	367 – 867 MHz
Gain: type	15 dB
LO frequency	1,833 MHz

1.6.8   Charger for Rechargeable Batteries with Battery Power Pack (Dikablis Wireless)

Please observe the safety instructions in section 3.6.2!

Technical data per charging tray (2 charging spaces provided):

Rechargeable battery technology	Lithium ions
Charging procedure	Current/voltage curves
Supported number of cells	4 cells
End-of-charge voltage	16.4V
Maximum charging current	1.45A
Cut-off phase	PWM step-down switching regulator
Operating voltage range	18...24V

Power pack (for charger with two charging spaces):

Primary	100 – 240 V AC
Secondary	24 V 3.0 A DC

1.6.9 Rechargeable Battery Pack PA-L1014.R002 (Dikablis Wireless)

Rechargeable battery technology	Lithium ions
Cells used per battery	4x Panasonic CGR-18650CF
Voltage [V]	14.4 V nominal (16.8 V - 12.0 V)
Available energy [mAh]	2250 mAh
Maximum charging voltage [V]	16.8 V
Charging current [mA]	Standard, 450mA in the temperature range 0 °C <T< 45 °C Fast, 1570mA in the temperature range 10 °C <T< 45 °C
Discharge current [mA]	Max. continually 2250 mA in the temperature range of - 20 °C <T< 45 °C Max. peak current (brief) 5900 mA in the temperature range 20 °C <T< 45 °C
Weight	242 g (± 5 g)

2 Initial Steps

2.1 Scope of Supply

2.1.1 Dikablis Cable

The following parts are included in the scope of supply of your Dikablis Cable eye tracking system:

- Recording computer including power pack
- Two USB, mini USB cables
- Frame grabber box for the eye camera
- Frame grabber box for the field camera
- Video cable
- Cable box including power pack
- Head unit
- Recording license stick
- Analysis license stick
- Dikablis installation CD

2.1.2 Dikablis Wireless

The following parts are included in the scope of supply of your Dikablis Wireless eye tracking system:

- Recording computer including power pack
- Two USB, mini USB cables
- Frame grabber box for the eye camera
- Frame grabber box for the field camera
- Video cable
- Receiver including power supply pack
- Antennae cables (2 in total)
- Antennae (2 in total)
- Transmitter with antenna
- Rechargeable battery unit
- Rechargeable batteries (number as ordered)
- Shoulder bag for the transmitter
- Recording license stick
- Analysis license stick
- Dikablis installation CD

As an optional power supply in addition to the supplied battery packs, you can also power the Dikablis Wireless transmitter using a cable which you can connect to a power supply. Several power supply options are available:

- Connection cable from the transmitter to a 12V mains adapter (replaces the batteries)

- Connection cable from the transmitter to a 12V car power source (cigarette lighter)
- Connection cable from the transmitter to a 230V mains adapter

2.1.3 Upgrade Options

The Dikablis Cable can be upgraded to a Dikablis Wireless at any time. To do so, you simply need to purchase the digital wireless link which replaces the cable box.

It is also possible to downgrade from a Dikablis Wireless to a Dikablis Cable by replacing the wireless link with the cable-linked solution in the form of the cable box.

2.1.4 Software

The following software is already installed on computer supplied, regardless of whether you have purchased the cable or wireless variant:

- Software for recording the glance data
- Analysis software for the subsequent adjustment of the calibration and pupil detection features
- Player for playing back the recorded glance data

For details on how to operate the Dikablis software, please consult the Dikablis software manual.

2.2 Starting Up the System

2.2.1 Dikablis Cable

A diagram showing how to assemble all of the Dikablis Cable components included in the scope of supply is shown in Figure 2-1. The system is cable-connected meaning that is can only be used within a range of up to 20 meters away from the recording computer. Dikablis Cable is mainly attractive for all applications where it is not so important to use the head unit detached from the recording computer, for example in a localized driving simulator or for usability lab applications. However, if the appropriate power supply is available and when used in connection with a recording laptop, mobile utilization is nonetheless possible (e.g. by carrying the recording laptop in a backpack).

Please note that if you have purchased a customized Dikablis system, this may lead to variations in the standard equipment supplied.

To start up the Dikablis Cable eye tracking system, proceed as follows:

1. Put together the parts of the eye tracking system as illustrated in Figure 2-1.
2. Start up the computer and connect the recording license stick to a USB slot. Wait for approximately 1 minute until the computer's hardware components initialize.
3. Turn on the power supply for the cable box by turning the switch at the front to the "On" position.
4. Start the recording software via the Dikablis recording symbol located on the computer desktop.

5. The recording software user interface will be opened. In the left "application" area, you will see the field or eye camera image. You can select the source of the video using the settings on the right window area. Here it is possible to select between "eye", "field" and "blending".

The eye tracking system is now ready for use. To record glance data, follow the instructions in the Dikablis software manual.

2.2.2 Dikablis Wireless

As illustrated in Figure 2-2, Dikablis Wireless transmits glance data via a digital radio signal to a receiving station that is connected to the recording computer. The use of battery packs ensures flexible use on-site, the digital wireless technology allowing movement radii of up to 500m.

The data transmission works best if there is visual contact between the transmitter and receiver and if there are no, or only minor, speed differences between the two. This makes Dikablis Wireless appealing mainly to those users who require free movement away from the recording computer. The application is excellent for tests in areas with limited space, such as supermarkets, buildings or for the sports sector.

To start up your Dikablis Wireless eye tracking system, proceed as follows:

1. Put together the parts of the eye tracking system as illustrated in Figure 2-2.
2. Start up the computer and connect the recording license stick to a USB slot. Wait for approximately 1 minute until the computer's hardware components initialize.
3. Turn on the power supply to the receiver and transmitter by turning the switch at the front of each to the "On" position.
4. Switch both the transmitter and receiver to the same frequency channel. This can be done by adjusting the channel controller on the front of these two devices. You can now select any of the 16 frequency channels available.
5. Position the antennae at least 1 meter away from the transmitter.
6. Start the recording software by activating the Dikablis recording symbol located on the computer desktop.
7. The recording software user interface will be opened. In the left "application" area, you will see the field or eye camera image. You can select the source of the video using the settings on the right window area. Here it is possible to select between "eye", "field" and "blending".

The eye tracking system is now ready for use. To record glance data, follow the instructions in the Dikablis software manual.

Note: When the recording computer is delivered, it is already pre-configured and has pre-installed recording, analysis and player software. To guarantee that the glance data is recorded perfectly, we recommend that you do not install any other software on this computer.

Two user accounts, Admin and Dikablis, are configured on the computer. At the time of delivery, neither of them is protected by a password. The pre-installed applications are executable under these accounts. If you want to execute a Dikablis application in a newly created user account, proceed as described in section 4 FAQ.

Figure 2-1: Dikablis Cable set-up

Figure 2-2: Dikablis Wireless set-up

3 Dikablis Hardware

The hardware components for the eye tracking system are explained in this section. The system parts which are provided for all versions, such as the head unit and recording computer, are described first. This is then followed by a description of the components provided in the specific Dikablis Cable and Dikablis Wireless versions.

Please make sure that the plugs used are compatible when setting up the connections. Extremely complex plug-in connections, which can be easily damaged if external force is applied, are used. Should you experience strong resistance inside the socket while trying to insert the plug, please check the compatibility and shape of both connectors again.

All of the BNC plugs (see Figure 3-10) used in the system can be connected based on the following principle: insert the plug into the socket provided, turn it 90° to the right until the plug locks in place. This helps prevent loose contacts. To unplug, first turn the plug 90° to the left and then pull it out.

	STOP!
	If you incorrectly connect the BNC cables (antenna cables and video cables for the eye and field video), this can lead to damage to the plug and/or sockets. • Do not plug the antenna cable into the field or eye camera socket! • Do not plug the video cable for the field and eye video into the sockets for the antennae! • Pay attention to the markings. Both the cables and the sockets have been marked accordingly.

The other plugs are designed so that they can be connected only in one way. Each plug has a different number of pins which fits into the pattern of the corresponding socket. The red dots on the plug and socket make it easier to connect them. Make sure that the dots are on top of one another, as shown in Figure 3-1. ***Please make sure that the plug and socket are compatible before attempting to insert the plug!***

	STOP!
	If you attempt to connect the plugs to the wrong sockets, this can lead to damage to the plug and/or socket involved. • Before inserting the plug, check that the number of pins on the plug are the same as the pattern on the socket. • Turn the plug so that the red dots on the plug and socket are in line with one another. It can then be inserted. • To unplug, grip the plug at the grooved area and remove it. Do not pull on the cable!

Ausrichten von Punkt und Kerbe

Zum abstecken Stecker an der Riffelung packen und ziehen, nicht an das Kabel ziehen

Figure 3-1: inserting the plug

3.1 Head Unit

The head unit shown in Figure 3-2 is a part of your Dikablis system and is supplied for all of the system models. It is designed identically for all system variants. The only difference is that its connection to the central system can either be via cable or wireless contact depending on the model chosen. The head unit is made of high-quality titanium and weighs only a few grams.

Stirnauflage

Elastisches Band zur Befestigung

Bügel

Nasenhalterung

Feldkamera

Verbindungskabel zur Cable Box bzw. zum Sender

Flexibles Schwanenhalskabel

Infrarot Diode

Augenkamera

Stecker
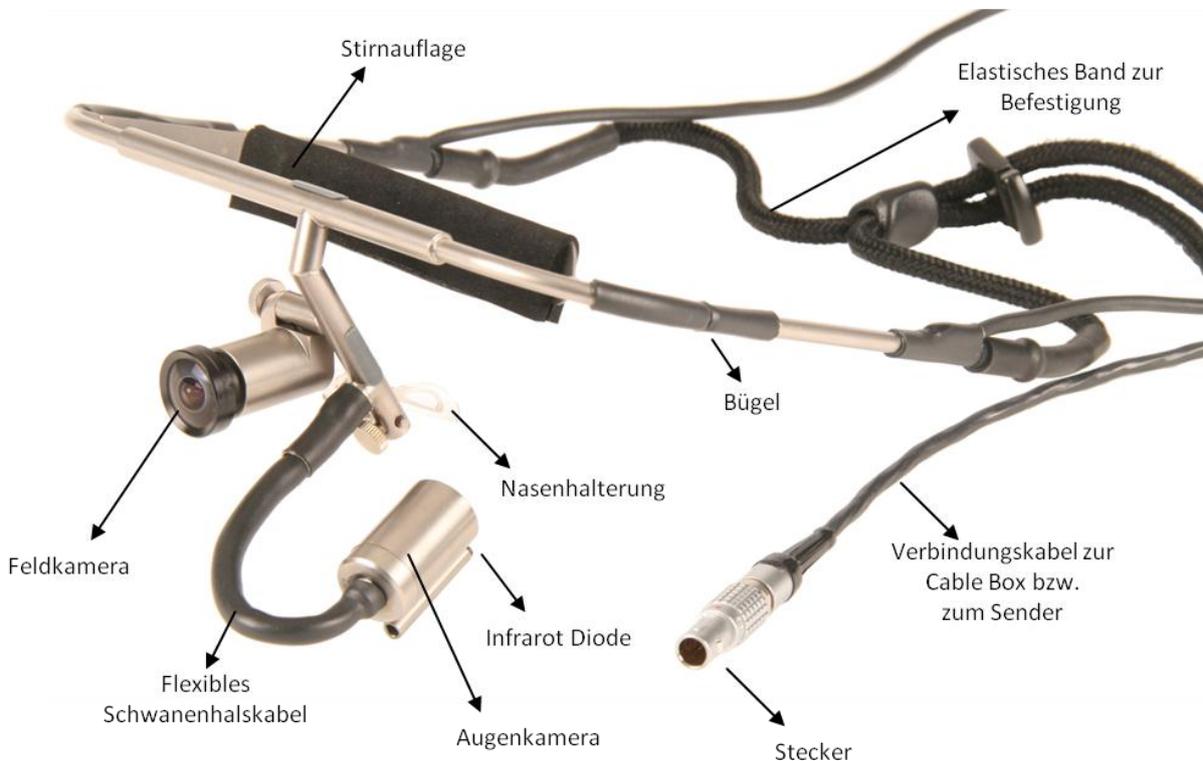
Figure 3-2: head unit

The following information explains the functions of the individual parts on the head unit, as shown in Figure 3-2.

- The eye tracking camera is directed towards the left eye of the wearer and is connected to the head unit frame by an adjustable swan-neck cable. The camera records a black-and-white video of the eye with a resolution of 384x288 pixels, PAL, 25 fps.

- The field camera records a high-resolution, color video of the area surrounding the test person's field of vision at the time the data is recorded. Resolution: 768x576 pixels, PAL, 25 fps

- When combined, the nose and head supports, the frame and the drawstring all guarantee that the head unit fits the test person comfortably.

- The connection cable to the cable box and to the transmitter ensures that power is supplied to the head unit's electrical components and guarantees that data is transmitted to the correct system components.

- In connection with the intensity controller of the cable box and on the transmitter, the infrared diode ensures the optimal illumination of the eye area.

	STOP!
	The eye camera on the head unit is only suitable for monitoring the left eye of the person wearing it. Please do not try to direct the eye tracking camera to the right eye as this can lead to the head unit being damaged and no longer suitable for use. • Only point the eye camera at the wearer's left eye.

	STOP!
	The head unit frame must not be folded inwards as otherwise all of the electronic connections could be damaged, thus making the head unit no longer suitable for use. • Do not fold the head unit frame inwards!

The field camera lens can be swapped. The standard head unit has a field camera lens with a focal distance of 2.1 mm. Other lenses with higher focal distances are available as accessories:

- Lens with a 2.5 mm focal distance

- Lens with a 2.97mm focal distance

- Lens with a 3.5 mm focal distance

⚠️	⚠️ **CAUTION!**
	If the person wearing the head unit (test person) should hit against another object (e.g. automatic airbag, should fall), this can lead to the test person getting injured.
	• Avoid dangerous situations.
	• Inform the test person about any possible dangers and request that he or she pays particular attention. Get the test person's consent.

3.2 Recording Computer and USB Grabber

An important part of your eye tracking system is the recording computer. Regardless of your Dikablis system design, the recording computer is the central piece of equipment for receiving and processing eye tracking data. The software needed for data recording has already been installed in the factory.

The standard recording computer supplied is a portable laptop. However, if the customer requests it, the computer can also be supplied as a stationary desktop PC or as a purpose-built design.

Please make sure that no other programs or data are installed on the recording laptop. The laptop is configured for real-time eye tracking and the internal data flow is optimized for this purpose. Should you install additional software on your laptop, we can no longer guarantee that your system will function properly.

The data on the computer is processed on the basis of appropriate interfaces. The following interfaces are needed to record the glance data:

- USB interface for receiving the video data from the field camera (Figure 3-3).
- USB interface for receiving the video data from the eye camera (Figure 3-4).
- Standard audio input for 3.5 mm jack plug for voice recording (Figure 3-5).

Figure 3-3: connection for field camera data

Figure 3-4: connection for eye camera data

Figure 3-5: audio connection

First of all, the recording computer must be connected to the two USB grabber boxes (Figure 3-8). These are responsible for receiving the video data (from the eye and field cameras), and for converting this data into a format which can be understood by the computer. Use the two USB cables (Figure 3-6) to connect the computer to the grabbers. Connect the normal USB plug to the computer (Figure 3-3 and Figure 3-4) and the mini USB plug to the grabber box (Figure 3-7).

Figure 3-6: USB, mini USB cable

Figure 3-7: grabber box with connected mini USB cable

3.3 Video Cable

The video cable is needed for transmitting the videos taken with the eye and field cameras to the grabber boxes. It comprises two individual cables with a BNC plug on one end and a cinch plug on the other, as shown in Figure 3-10. Connect each of the cinch ends of the cable (always to the yellow socket!) to a grabber box, as shown in Figure 3-8. Connect the BNC ends to the cable box (Figure 3-9).

Figure 3-8: frame grabber box for the field and eye camera

Figure 3-9: cable box with connected BNC plugs   Figure 3-10: video cable with BNC and cinch plugs

3.4 Microphone and Audio Settings

Dikablis allows you to make synchronous audio recordings while recording the glance data. The comments made by the test persons are recorded and can be listened to both live and at a later stage. The audio channel is recorded together with the video taken by the field camera. To play back and examine the recorded sound, the D-Lab audio module must be used. Alternatively, if you open the field camera video with the media player, you can hear what was said during the recording.

Audio recording is possible with both the Dikablis Cable and Dikablis Wireless system. For voice recording, you will require a high quality microphone which can be purchased separately. We cannot provide you with any support should you choose to use microphones other than those recommended by us. To configure the microphone, please proceed as follows:

- If you own the Dikablis Cable version, connect the microphone plug directly to the recording computer's audio input. See Figure 3-11.

- In the Dikablis Wireless, an audio input is located on the back of the transmitter. Connect the microphone here, as shown in Figure 3-12. In a similar way to the glance data, the audio signal is transmitted via a wireless connection to the recording computer.

Figure 3-11: audio cable connection   Figure 3-12: wireless audio connection (on the left)

In order to achieve optimal sound recording quality, the audio settings on the recording computer must be correct. Make the following adjustments to achieve optimal sound quality:

- Double click on the audio symbol in the menu bar on the bottom right of the screen (see Figure 3-13).

Figure 3-13: audio symbol

- The loudness control window will be opened, as shown in Figure 3-14. In the "Options" menu, activate the "Extended settings" item and then select "Properties".
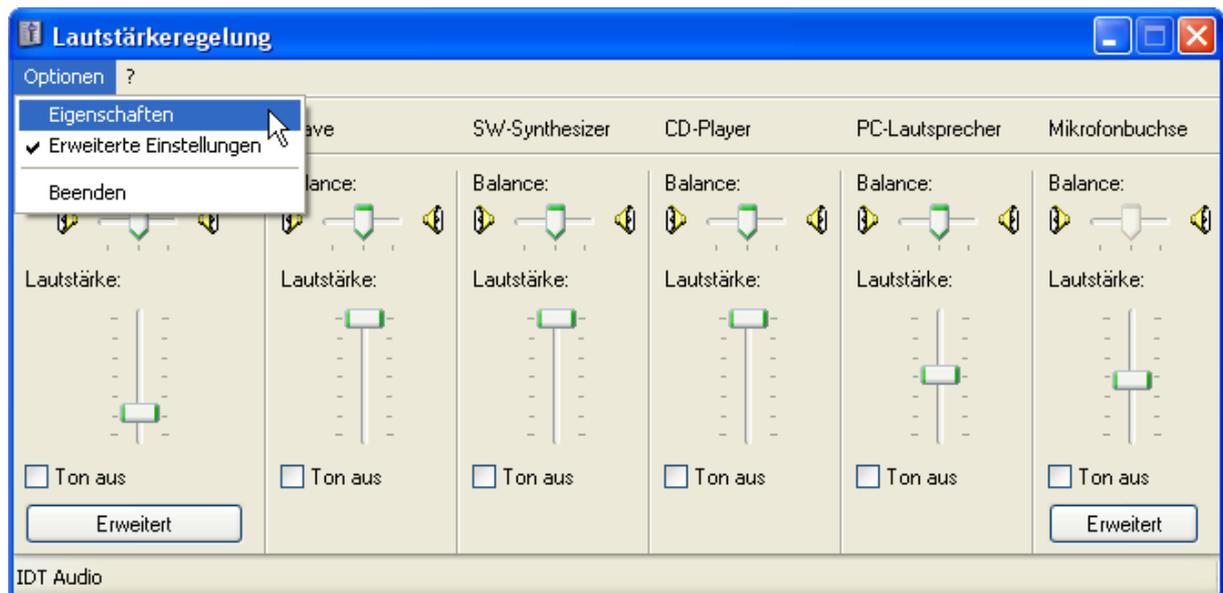
Figure 3-14: loudness control

- In the "Properties" window which has now been opened, select the "Recording" entry in the "Control loudness for" area. Make sure that the "Microphone connection" has been selected in the loudness controller list and confirm the dialog with "OK" (see Figure 3-15).

Figure 3-15: recording properties

- The "Recording" window will now open. Select "Microphone connection" here, as shown in Figure 3-16 and position the loudness controller at a medium level. Then press the "Expand" button.
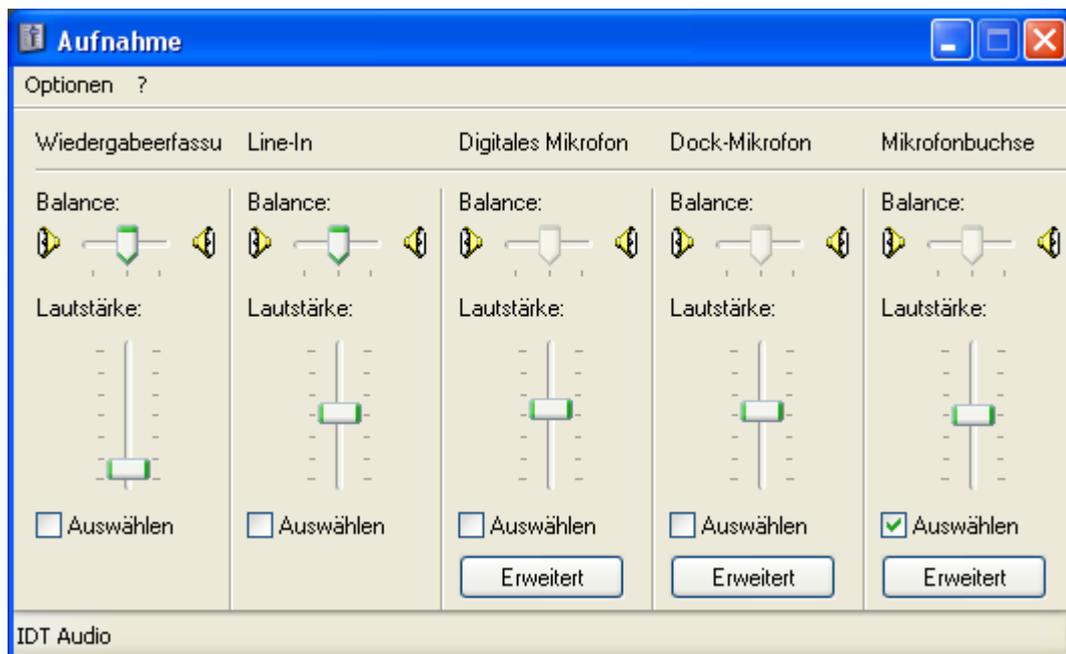
Figure 3-16: recording controller

- A window for configuring the expanded settings for the microphone connection will now open. If the "microphone amplifier" check box has not been activated, please do so to achieve optimal sound quality. Then close all of the audio windows.

For test purposes, you can also use the microphone integrated in the laptop for voice recording. To do so, select "Digital microphone" in Figure 3-16 and make sure that the microphone amplifier is active in the expanded settings (Figure 3-17).

The audio recorder integrated in the computer's operating system is suitable for generally checking the voice recording settings. It allows a voice recording to be made separately from the Dikablis recorder.
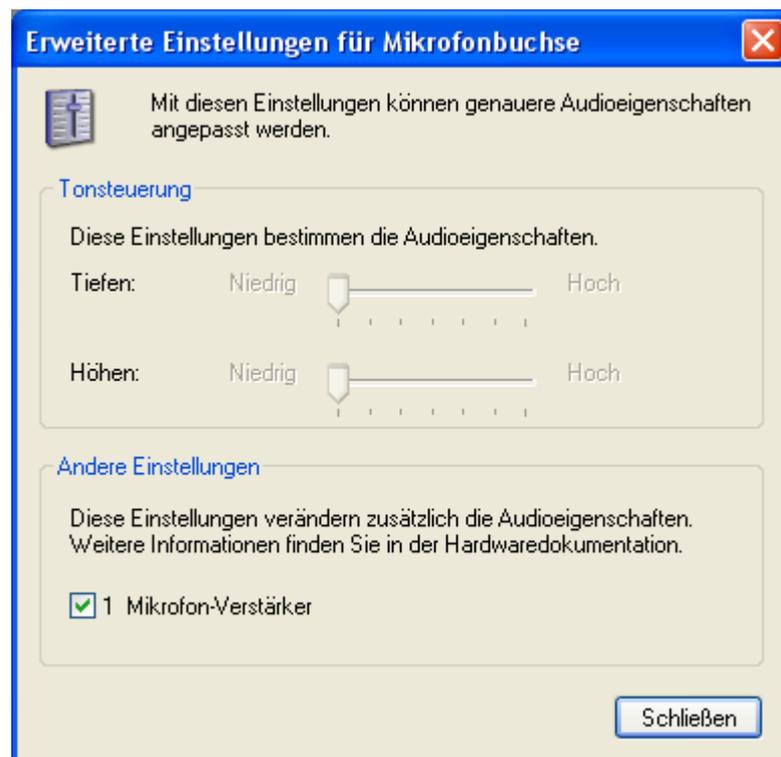
Figure 3-17: expanded microphone connection settings

3.5 Dikablis Cable

3.5.1 Cable Box

The cable box contains the Dikablis Cable electronic components and is shown together with the mains adapter in Figure 3-18 . The subsequent Figure 3-19 shows a detailed picture of the front and Figure 3-20 of the back of the cable box. The connections are labeled according to their functions and are explained in the following.

Figure 3-18: cable box and mains adapter

Front view:

- On/Off toggle switch for turning the power supply on and off
- Status LED as an optical confirmation of the device's current operating status
- Controller for adjusting the intensity of the infrared LED included in the head unit
- Socket for connecting the head unit

Figure 3-19: front view of the Dikablis Cable electronic unit

Rear:

- BNC connection for transmitting the eye camera data to the recording computer
- BNC connection for transmitting the field camera data to the recording computer
- Socket for connecting a portable monitor for displaying the data from the eye or field camera
- Socket for connecting the mains adapter to supply power to the electronic unit.

Figure 3-20: rear view of the Dikablis Cable electronic unit

Please make sure that the plugs used are compatible when setting up the connections. Extremely complex plug-in connections are used which can be easily damaged if external force is applied. Should you experience strong resistance inside the socket while trying to insert the plug, please check the compatibility and shape of both connectors again. All plugs are designed so that there is

only one way to connect them. The red dots on the plug and socket make it easier to connect them; make sure that the dots are on top of one another.

3.6 Dikablis Wireless

3.6.1 Transmitter

The Dikablis Wireless system transmitter receives the video data recorded by the head unit via the connection cable and transmits it wirelessly via a digital link to the system receiver. The transmitter is shown in Figure 3-21. The glance data is transmitted from the head unit through the cable connection to the transmitter. From here it is transmitted via a digital wireless signal over a distance of up to 500m to the receiver and then passed from the receiver to the recording computer.

Figure 3-21: front of the transmitter

The supplied lithium polymer batteries provide the test person with unrestricted mobility when using the Dikablis Wireless system. They are located in a separate casing which is connected to the transmitter by a connection cable. Details regarding this can be found in the next section.

The connections and the transmitter's operating controls are labeled according to their functions and are explained in the following.

Front view (Figure 3-21):

- On/Off toggle switch for turning the power supply on and off
- Status LED as an optical confirmation of the device's current operating status
- Controller for adjusting the intensity of the infrared LED included in the head unit
- Socket for connecting the head unit
- Controller for setting the transmission channel. 16 channels are available. They are marked 0-9 and A-F.
- Connection for the transmitter antenna

Rear view (Figure 3-22):

- Audio socket for connecting a microphone
- Socket for connecting a portable monitor for displaying the data from the eye or field camera
- Socket for connecting the transmitter power supply. The battery holder is connected to this socket. Alternatively the system can be powered using an external power source.
- Two indicators for displaying the battery status. The green indicator will be lit if the battery is charged to 10% or above. If the battery capacity is under 10%, the red diode will light up and acoustic warning signals will be transmitted. Please replace the battery now.

Figure 3-22: transmitter rear view

Instruments on the side:

- Digital battery capacity display. If the battery is fully charged, 100% will be displayed. If the capacity falls below 20%, we recommend that you replace the battery. If the battery capacity falls below 10%, the transmitter will send acoustic warning signals.
- Clip for attaching the transmitter to clothing, e.g. to a belt.

Figure 3-23: the remaining battery capacity is shown

To guarantee optimal data transfer, the transmitter channel must be set to the same channel as the receiver. The optimum channel configuration is already set at the time of delivery. Nonetheless, signal interference may result if there are other wireless systems in the vicinity (e.g. wireless LAN). If this is the case, the transmission channel can be changed by switching the corresponding controllers on the transmitter and receiver. Please make sure that the same channel is set on both units!

3.6.2 Batteries, Holder and Recharger

The supplied lithium polymer batteries (Figure 3-24 on the right), which are responsible for supplying power to the transmitter, provide the test person with unrestricted mobility when using the Dikablis Wireless system.

Figure 3-24: battery holder and batteries

The holder for the batteries is shown on the left of Figure 3-24. A battery is inserted into the battery holder which is then connected via the cable on the casing to the "DC In" socket of the transmitter, as can be seen in Figure 3-25.

Figure 3-25: connection between the transmitter and the battery holder

Before using the batteries for the first time, please remove the protective film (if provided) positioned over the battery's electronic contacts. Insert the battery in the holder so that the battery contacts are aligned with the contacts in the casing. Then push the battery into the casing until it snaps into place. To replace the battery, open the holder by pressing the red button on the front of the casing and remove the battery. A clip is attached to the side of the casing and can be used to clip the unit onto a belt, for example.

⚠️🔥	**⚠️ CAUTION**!
	Avoid the following situations as they can lead to the rechargeable battery becoming defective, going up in flames, or exploding: • Only use the rechargeable batteries with the Dikablis Wireless system. • No longer use batteries which have been dropped. There is a risk that the battery could ignite or explode. Protect the battery from excessive shaking and do not drop it. • Only use the charging tray intended when recharging the batteries. • Do not disassemble the batteries, the holder or the charging tray. • Do not throw the batteries into a fire or water. • Do not damage the cables on the battery and the charging tray. If the cables are faulty, stop using them! • Do not short circuit the batteries.

⚠️	**⚠️ STOP**!
	To protect the environment, only dispose of faulty bottles at a suitable collection point or return them to us (you can find our address in the address list at the end of the manual)!

Figure 3-26: wireless shoulder bag

Figure 3-27: battery recharger

A special shoulder bag was designed so that the test persons could carry around the transmitter and battery as easily as possible. See Figure 3-26. It allows optimal access to the transmitter's operating controls and quick battery replacement.

Please use the supplied recharger to charge the batteries, see Figure 3-27. It can recharge two batteries simultaneously and has a charge indicator for each battery. The display diode flashes during the charging process and the green light is lit continuously when the battery is completely charged.

3.6.2.1 Battery Charger Function and Indicators

Status	LED color			Note
	Red	Yellow	Green	
Original state	Off	Off	Off	No battery inserted, mains adapter connected
Rechargeable battery check	Off	Flashing	Off	Up to approx. 30 sec. after the batteries have been inserted
Charg-ing	Off	On	Flashing	Quick charging with constant current
	Off	Off	Flashing	Full charging with constant voltage after approx. 80% battery capacity
	Off	Off	On	Charged, trickle charging
Error display	On	Off	Off	If charging which is suitable for the battery's charging condition does not begin within approximately 7.5 min. → the battery is faulty (short circuit)
	On	Off	Off	If quick charging does not

				change to full charging within 110 min. → the battery is faulty (capacity loss)
Battery temperature	Unchanged	Unchanged	Unchanged	The battery temperature is too high, charging is interrupted and will be continued once the battery temperature is back to normal.

3.6.3 Receiver

As the name implies, the receiver is responsible for receiving the data (signals from the eye camera, field camera and audio data) which the transmitter sends digitally by wireless communication. It is also responsible for passing this data on to the recording computer and is shown in Figure 3-28. The receiver's power supply cable is shown in Figure 3-29. The following Figure 3-30 shows a detailed rear view of the receiver. The connections are labeled according to their functions and are explained in the following.

	NOTE
	Signal interference can occur if the transmitter and receiver are too close to one another. • Make sure that there is a distance of at least 2 meters between the transmitter and receiver.

Figure 3-28: front view of the receiver

Figure 3-29: power cable for the receiver

Front view (Figure 3-28)

- On/Off toggle switch for turning the power supply on and off
- Status LED as an optical confirmation of the device's current operating status
- Controller for setting the receiver channel. 16 channels are available. They are marked 0-9 and A-F. Please always make sure that the same channel is set on both the transmitter and receiver.

Figure 3-30: rear view of the receiver

The following can be found on the rear of the device (Figure 3-29):

- Two BNC sockets for connecting the reception antenna to the receiver
- BNC connection for transmitting the field camera data to the recording computer
- BNC connection for transmitting the eye camera data to the recording computer
- Audio socket for connecting a microphone
- Socket for connecting the mains adapter to supply power to the receiver.

3.6.4 Receiver Antennae

The eye tracking and audio data is received via two antennae which are connected to the receiver by a BNC cable, see Figure 2-31.

	NOTE
	To guarantee optimal reception, we recommend that you position the antennae as far away from each another as possible in the test environment. If possible, there must always be "visual contact" between the transmitter and receiver antennae.

Figure 3-31: antennae

3.7 Dikablis Wireless Plus Tailored Solution

Should you wish, we can develop a system which is tailored to suit your needs and can support you when setting up the scene for your experiment. If you request it, the recording computer can be supplied in a portable version (laptop), as a stationary PC or as a design which is purpose-built to suit your requirements. We can offer you variable cable lengths for the connections between the system components and a range of power supply options.

The Dikablis Wireless Plus system can achieve a transmission range of up to 5 km and offers you exceptional freedom of movement when designing your test scenario. It is mainly suitable for bridging longer distances, such as on a vehicle testing ground. To guarantee the transmission performance, directional aerials are installed for the receiver, as shown in Figure 3-32. Figure 3-33 shows a rack for the Wireless Plus system which was purpose-built to suit the client's requirements.

Figure 3-32: directional aerials

Figure 3-33: rack

4 FAQ

I cannot run the Dikablis applications under my user account

To be able to run one of the Dikablis applications with a user account which is different to the one it was installed under, a number of user-defined configurations must be made. Proceed as follows:

On the supplied Dikablis installation CD, in the "ffdshow" folder, you will find the "ffdshow.reg" file. Log on to the computer using the user name for which the application is to be configured and then execute the file with a double click. The Dikablis software packages can now be run under the configured user account

Glossary

Adapter cable

Cable which sets up a connection between the frame grabbers in the recording computer and the video cable.

Eye camera

The camera attached to the head unit which films the test person's left eye. The camera can be positioned manually using a flexible cable.

Recording computer

Computer supplied with the eye tracking system with pre-installed hardware and software.

Recording software (also referred to as the Dikablis recorder or simply recorder)

Application for recording the glance data.

Analysis software (Dikablis Analysis)

Application for the subsequent adjustment of the calibration settings and pupil detection feature for an eye tracking experiment.

Blending mode

A display option for the eye tracking video in which a semi-transparent image from the eye camera is superimposed over the field camera video.

Eye tracking experiment (experiment, subject)

Eye tracking data for a person taking part in an eye tracking study.

Cable box (in Dikablis Cable only)

Device which receives the signals from the head unit, processes them and then passes them on to the recording computer via the video cable.

Receiver (Dikablis Wireless only)

Device which receives the glance data transmitted by wireless link and passes it on to the recording computer. Two antennae are used for the reception. Each is connected to the receiver by a cable.

Field camera

Camera mounted at the middle of the head unit which is used for recording the surroundings. The camera lens is replaceable. The sharpness range of the camera can be adjusted by turning the lens.

Grabber box

Box containing the integrated USB grabber. The grabber is needed to digitalize the video signal from the eye and field cameras. The USB grabber is connected to the recording computer and the cable box/the receiver.

Head unit

Unit worn like a pair of glasses by the person taking part in the eye tracking experiment. Two cameras which film the eye of the test person and the surroundings are attached to the head unit.

License stick

Allows applications to be executed and contains licensing data. The corresponding stick must be connected to a USB port of a recording computer before the applications (recording software, analysis software) can be started.

Player software (Dikablis Player)

Application for the subsequent observation of the glance data recorded using the recording software.

Transmitter (Dikablis Wireless only)

Device which receives glance data from the head unit and transmits it by wireless link to the receiver.

Video cable

Cable for transmitting the video signals from the eye and field cameras. Is connected between the cable box and the adapter cable.

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