

Measuring System for  
Pressure Distribution Measurement

# PDM/PDM mobile

Specifications  
and Operating Instructions



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# 1 Introduction

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Illustrations of this manual may differ.

## 1.1 Manufacturer Information

### Manufacturer

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## Sales / Support

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88316 Isny im Allgäu	E-Mail	<a href="mailto:support@zebris.de">support@zebris.de</a>
Germany	Web	<a href="http://www.zebris.de">www.zebris.de</a>



Please always provide the serial number of the product for inquiries!



NOTE

In order to facilitate the readability of the text, further on instead of PDM/PDM mobile the term PDM-System is used. Nevertheless, if not noted otherwise, all information is valid for both versions.

## 1.2 Structure of the PDM System user manual

The measuring system PDM consists of the force distribution measuring sensor technology as well as the corresponding application software including a PC.

Therefore, the user manual of the PDM measuring system consists of several parts:

Part 1 - PDM technical specifications and user manual

Part 2 - User manual for the zebris FDM application software

Part 3 - User manual of the accessories, like e.g. projector or PC



NOTE

**Please closely observe the user manuals with initial operation, use or maintenance as well as transport of the PDM measuring system.**

Part 1 - PDM technical specifications and user manual primarily contains information on technical data and the operation of the PDM pressure distribution measuring sensor technology as well as on their safe operation.



WARNING

The precise adherence to the instructions in all sections of the operating Instructions for the measuring system is a precondition for its intended use.

## 1.3 Symbols Used



The green markings in the margin of the User Manual denote new information about the product safety.



**WARNING** symbols indicate a potential hazard to the health and safety of the users and/or patients. The warnings describe the risks involved and those can be avoided.



**NOTE** symbols indicate a potential risk which could lead to damaging of the device. These NOTE symbols describe the risks involved and how those can be avoided.



CE mark according to EC Directives 2014/30/EEC and 2014/35/EEC (Low Voltage Directive and EMC Directive).



Manufacturer



Symbol for the connection of the external power supply unit.



USB-Interface



HF-transmitter (Bluetooth-Interface)



This symbol shows that pursuant to the Directive on Waste Electrical and Electronic

Devices (2012/19/EU) and national legislation, a product cannot be disposed of via the household waste



Refer to instructions for use.



Item Number



Serial Number

## 2 Safety

### 2.1 Environmental conditions

PDM Measuring Systems are suitable for application in dry interiors with level ground such as those in hospitals, doctors' surgeries and laboratories.

Temperature	10°C to 40°C
Relative humidity	30% to 70%, non condensing
Air pressure	700 to 1100 hPa



WARNING

PDM systems must NOT be operated in wet zones, wet rooms (swimming pools, saunas) or climatic chambers.

Direct contact with liquids must always be avoided, as the measuring system is not protected against the entering of liquids. Liquids entering the device can cause fire, electrical shock or other severe accidents.

The PDM system is NOT specified for the operation in vacuum, hyperbaric or altitude chambers.

The measuring systems are not intended for operation in potentially explosive atmospheres of medically used rooms or oxygen-enriched atmospheres.

The devices must not be operated in proximity to e.g. engines or transformers with a high connected load as well as mains current lines, as electrical or magnetic interference fields can falsify correct measurements resp. turn them impossible.

### 2.2 Storage and Transport

Storage and transport of the measuring system are only to be effected in the original packaging provided by zebris.

Temperature	-20°C to +70°C
Relative humidity	max. 95%, non condensing
Protect from moisture	

## 2.3 User Obligations



- The relevant, general guidelines and/or national laws, national regulations and technical rules for the commissioning and the operation of measuring systems must be applied and fulfilled corresponding to the indicated purpose of the zebris product.
- Users are obliged to:
  - ✓ Observe all safety guidelines of the user manual.
  - ✓ Carry out any inspection and maintenance works on a regular basis as stipulated in the user manual.
  - ✓ Only use work equipment that is free of defects.
  - ✓ Check the functional safety and the proper condition of the device before operating.
  - ✓ Make all user manuals that are included in delivery and part of the measuring system accessible to all users at all times and keep the manuals in close proximity of the measuring system.
  - ✓ Protect him-/herself, the patient or third parties against dangers.
  - ✓ Avoid a contamination through the product.
- When using the system, national legal regulations must be observed, in particular:
  - ✓ The valid industrial safety regulations.
  - ✓ The valid accident prevention.
- For the safety, reliability and performance of the components delivered by zebris, responsibility is assumed, if:
  - ✓ Assembly, extensions, re-settings, changes or repairs were carried out through zebris or third parties authorised by zebris, trained technicians or employees of authorised dealers. Storage and transport are only to be effected in the original packaging delivered by the manufacturer.
  - ✓ The device is operated in accordance with the user manual.
  - ✓ In case of repair, the regulations of the VDE 0751-1 “Recurrent test and test before commissioning of medical electrical equipment – general regulations” are fully complied with.
  - ✓ The components of information technology provided by the operator correspond to the technical requirements of hard and software included in this user manual and also were installed and set up according to the relevant descriptions in this user manual.
  - ✓ The set-up room corresponds to the given environmental conditions of the measuring system and the valid installation regulations.
  - ✓ The PDM system including accessories is connected to the mains socket with a protective grounding conductor and is operated with the correct mains voltage.
  - ✓ Exclusively the software provided by zebris as well as the components and accessory parts listed in this user manual are used together with the system.



## 2.4 General safety instructions



- The application and operation of the system and also the evaluation of the measuring data and their interpretation may only be carried out by trained qualified personnel. The manufacturer assumes no liability for any injury to persons, damage to property, or loss of data due to improper use of the software, the device or its component parts.
- Measuring data may only be copied, moved, or deleted using the data-base function provided by the zebris application programs. In the case of data being changed intentionally without using the database functions, the user alone bears full responsibility for all risks involved.
- Should there be any detectable damage to the device or component parts, they should be returned to the manufacturer for a safety check. It is not permissible to continue using the device or its component parts, as severe damage and serious injuries - even lethal injuries - may result. The manufacturer or authorized sales partner must always be contacted in all cases of fault or doubt.
- If any fluids should penetrate the device, it is mandatory for the device to undergo a technical safety test. Damaged plug connectors and leads are to be replaced by an authorized service technician. The device must be put out of operation immediately, marked as "Not working" and prevented from being used by removing the mains cable.
- The measuring system must be checked at regular intervals to make sure it is functioning properly. More details on this can be found in the section, "Maintenance of the Device" in this User Manual
- Be sure that all the mains and connection cables are laid safely and that they are protected against stepping on, so that nobody can trip over them. Check all the cables and the connection plug regularly for any damage. Damaged power supplies and cables have to be replaced before further operation
- Never try to service the measuring system in any other way as described in the provided user manual. When removing the covers, you may expose yourself to lethal voltages or other risks.
- We also point out that if any changes are made to this certified device or its accessories without the prior written consent of zebris, your legal right to operate the device will be nullified.

## 3 Product description

### 3.1 System components

In its basic configuration the PDM measuring system consists of the following components:

- PDM platform
- Netzteil
- USB Cable (Type A/mini-B, 3 m length)
  - Application software zebris FDM
  - Windows compatible computer or notebook
- User Manual for PDM Platform, accessories and zebris FDM software

### 3.2 Technical specifications


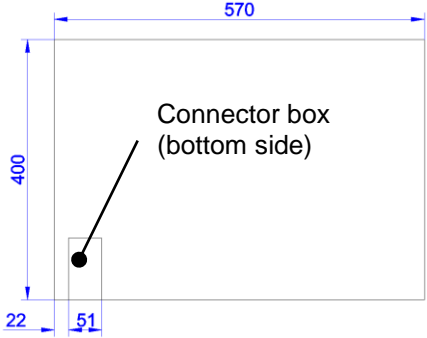
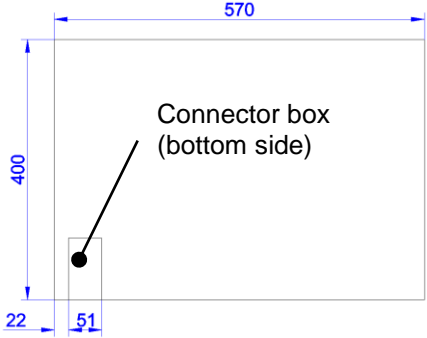
#### 3.2.1 PDM Sensor


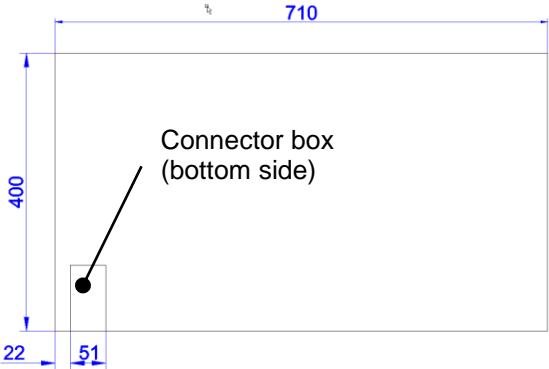
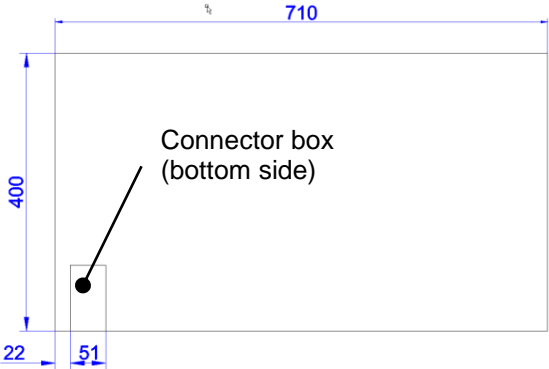
The sensors of the different PDM system only vary in size of the measuring area, the number of single sensors included in the sensor module and the supported sampling frequency.

All other technical data is identical:

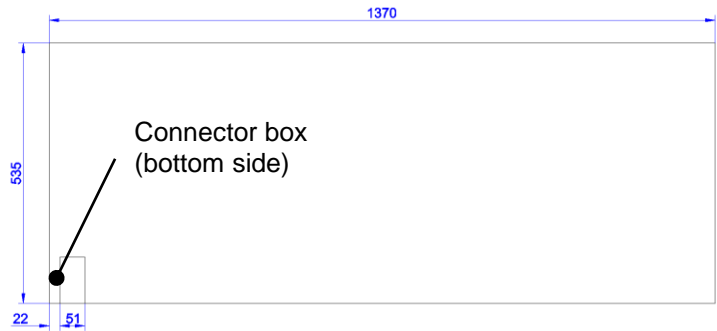
Interfaces	USB Bluetooth (optional) Synchronization input/output (optional) Video synchronization Infrared synchronization (optional) Inter-PDM synchronization (PDM-L only)
Connection	Interface box in bottom of housing frame
Measuring principle ment	capacitive pressure distribution measure-
Operating voltage	16-18V DC
Power consumption	max. 60W (depends on type)
Power supply (external power supply unit)	100-230V AC / 50-60Hz
Measuring Range	1-120N/cm <sup>2</sup>
Accuracy of the calibrated measuring range	(1-120N/cm <sup>2</sup> ) ±5% (FS)
Mechanical crosstalk	-25dB
Pressure threshold	1N/cm <sup>2</sup>

### 3.2.2 PDM-Platform Types

Type	PDM-XS	PDM-XS mobile
		
REF.-Nr.	01233010	01233010
Dimensions (L x B x H)	570 x 400 x 15 mm	570 x 400 x 15 mm
Weight	3,51 kg	3,56 kg
Measuring frequency	200 Hz	200 Hz
Number of sensors (Columns x Lines)	1920 (40 x 48)	1920 (40 x 48)
Sensor surface (L x B)	406 x 339 mm	406 x 339 mm
Resolution	1/3 Inch   1,4 Sensors / cm <sup>2</sup>	1/3 Inch   1,4 Sensors / cm <sup>2</sup>
PC Interface	USB 2.0	USB 2.0 / Bluetooth

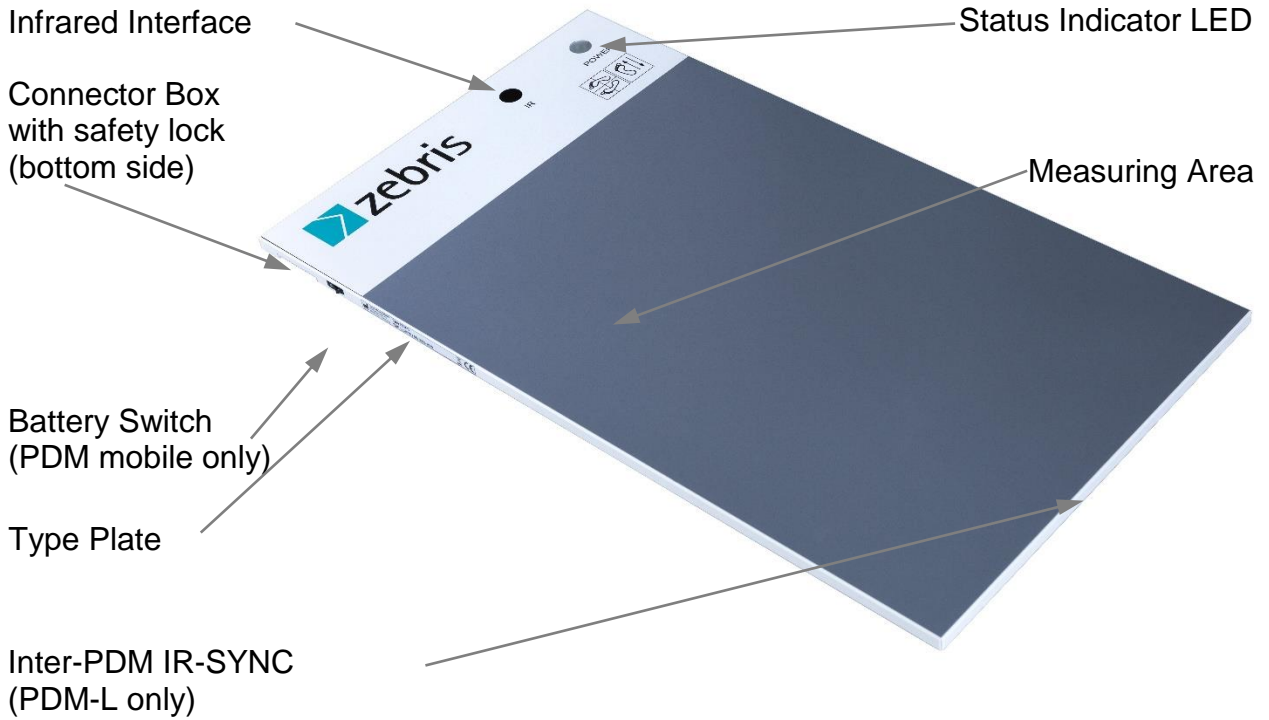
Type	PDM-S	PDM-S mobile
		
REF.-Nr.	01233020	01233020
Dimensions (L x B x H)	710 x 400 x 15 mm	710 x 400 x 15 mm
Weight	4,37 kg	4,42 kg
Measuring frequency	200 Hz	200 Hz
Number of sensors (Columns x Lines)	2560 (40 x 64)	2560 (40 x 64)
Sensor surface (L x B)	542 x 339 mm (L x B)	542 x 339 mm (L x B)
Resolution	1/3 Inch   1,4 Sensors / cm <sup>2</sup>	1/3 Inch   1,4 Sensors / cm <sup>2</sup>
PC Interface	USB 2.0	USB 2.0 / Bluetooth

Typ	PDM-L	PDM-L mobile
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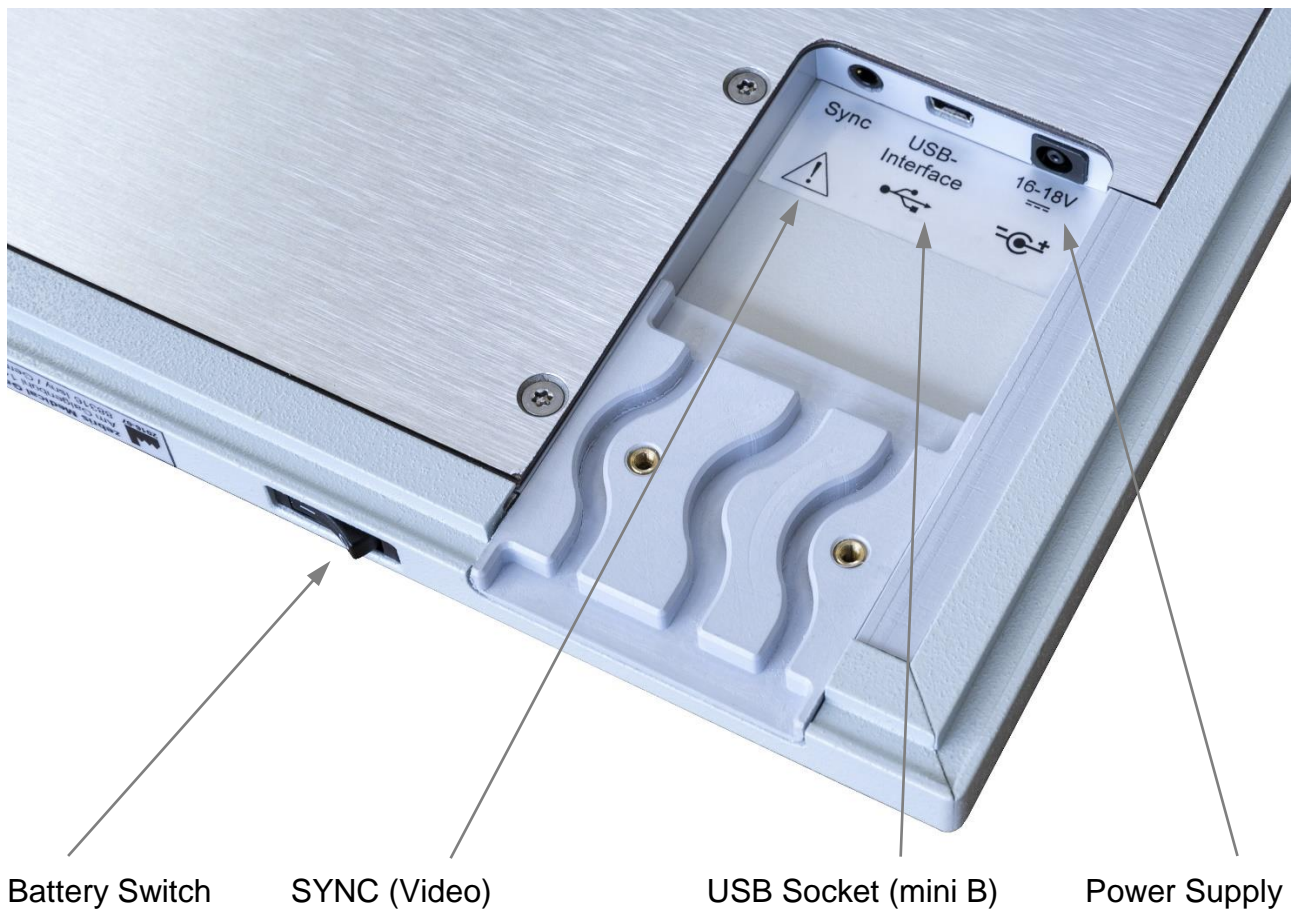


REF.-Nr.	01233030	01233030
Dimensions (L x B x H)	1370 x 535 x 15 mm	1370 x 535 x 15 mm
Weight	11,4 kg	11,5 kg
Measuring frequency	120 Hz	120 Hz
Number of sensors (Columns x Lines)	8046 (56 x 144)	8046 (56 x 144)
Sensor surface (L x B)	1220 x 474 mm (L x B)	1220 x 474 mm (L x B)
Resolution	1/3 Inch   1,4 Sensors / cm <sup>2</sup>	1/3 Inch   1,4 Sensors / cm <sup>2</sup>
PC Interface	USB 2.0	USB 2.0 / Bluetooth
Inter-PDM IR-SYNC	Yes	Yes

### 3.3 Controls and Connectors



All cable connections between platform and PC will be established by the connector box located at the bottom of the platform.



### 3.4 Status indicator LED

LED	Battery Switch (PDM mobile only)	Meaning
<b>Green / Operational Status Indicator</b>		
flashes	on	Platform ready for measurement, NO USB connection with PC.
on	on	Platform ready for measurement, USB connection with PC established
<b>Yellow / Battery Charging (PDM mobile only)</b>		
flashes	on	Battery is charging
<b>Orange / Measurement</b>		
on	on / off	Measurement is in progress
<b>Blue / Bluetooth Connection (PDM mobile only)</b>		
on	on / off	Platform is connected to PC by Bluetooth interface.

### 3.5 zebris SYNC

The **zebris SYNC** is the standard solution for the synchronization of the PDM-System with zebris camera and lighting systems.

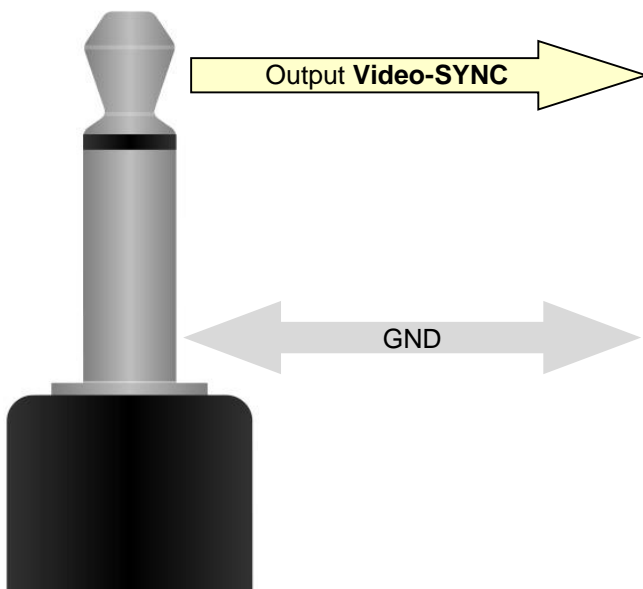


#### 3.5.1 Specification SYNC Interface

Connection will be set up by a 3.5 mm stereo jack.



2 Pins:



### 3.5.2 Synchronization of Video Recordings

The **Sync socket** provides synchronization of platform measurements and videos recorded with zebris SYNCCam or SYNCLightCam available as accessories.

For connection of SYNCCam or SYNCLightCam the Video Sync-Control Cable is required:

REF-No        21030316 / Video Sync-Control Cable,  
                  cable length 5



#### Video-SYNC

Signal Direction: Output (from platform to connected device)

The Video-SYNC signal controls the function of SYNCCam / SYNCLightCam synchronized with the measurement of the PDM-Platform:

- Activates / deactivates illumination of SYNCLightCam
- Synchronization of video signal

#### Electrical Specification

Output Resistance	47 $\Omega$
High-Level	$\geq 3.0V$
Low-Level	$\leq 0.8V$

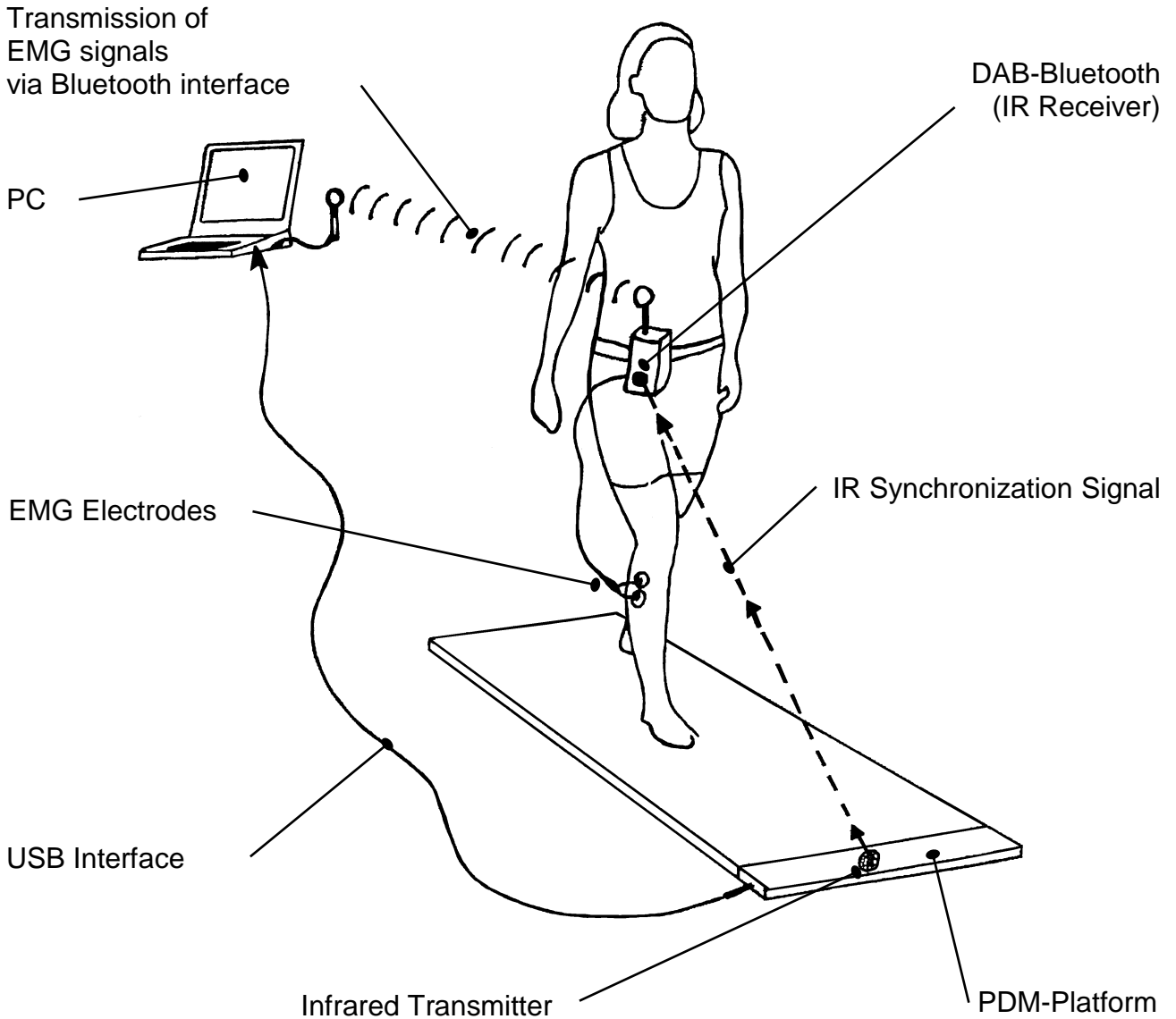


### 3.5.3 Infrared synchronization with zebris DAB-Bluetooth (EMG)

For synchronizing the PDM system with the zebris DAB-Bluetooth the optionally available IR interface which can be integrated within the platform housing is required.

PDM platform and DAB-Bluetooth are synchronized automatically as soon as both devices have been switched on and a measurement is started.

#### Schematic of PDM-Platform und DAB-Bluetooth connection



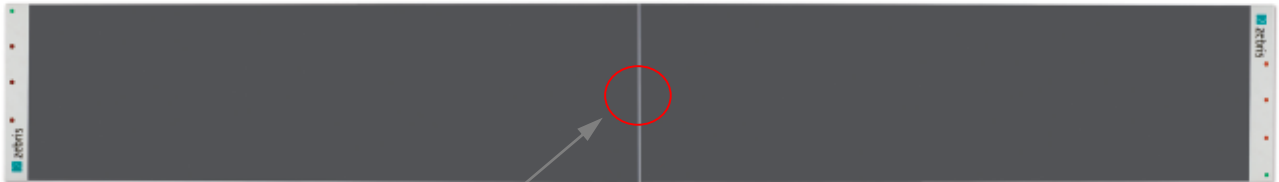
### 3.5.4 Connection of two PDM-L Platforms (Inter-PDM IR-SYNC)

Two platforms of type PDM-L can be coupled (Master – Slave) in order to double usable walking range. For this purpose an infrared interface (Inter-PDM IR-SYNC) is integrated in the housing at the end of each platform.



NOTE

For connection arrange both platforms as shown in the picture below. The front ends must point the outer side.



Inter-PDM IR-SYNC  
(PDM-L only)

Both platforms must be connected to separate USB sockets of the same PC. The zebris FDM software will recognize the platforms automatically and display the extended measurement area accordingly.



NOTE

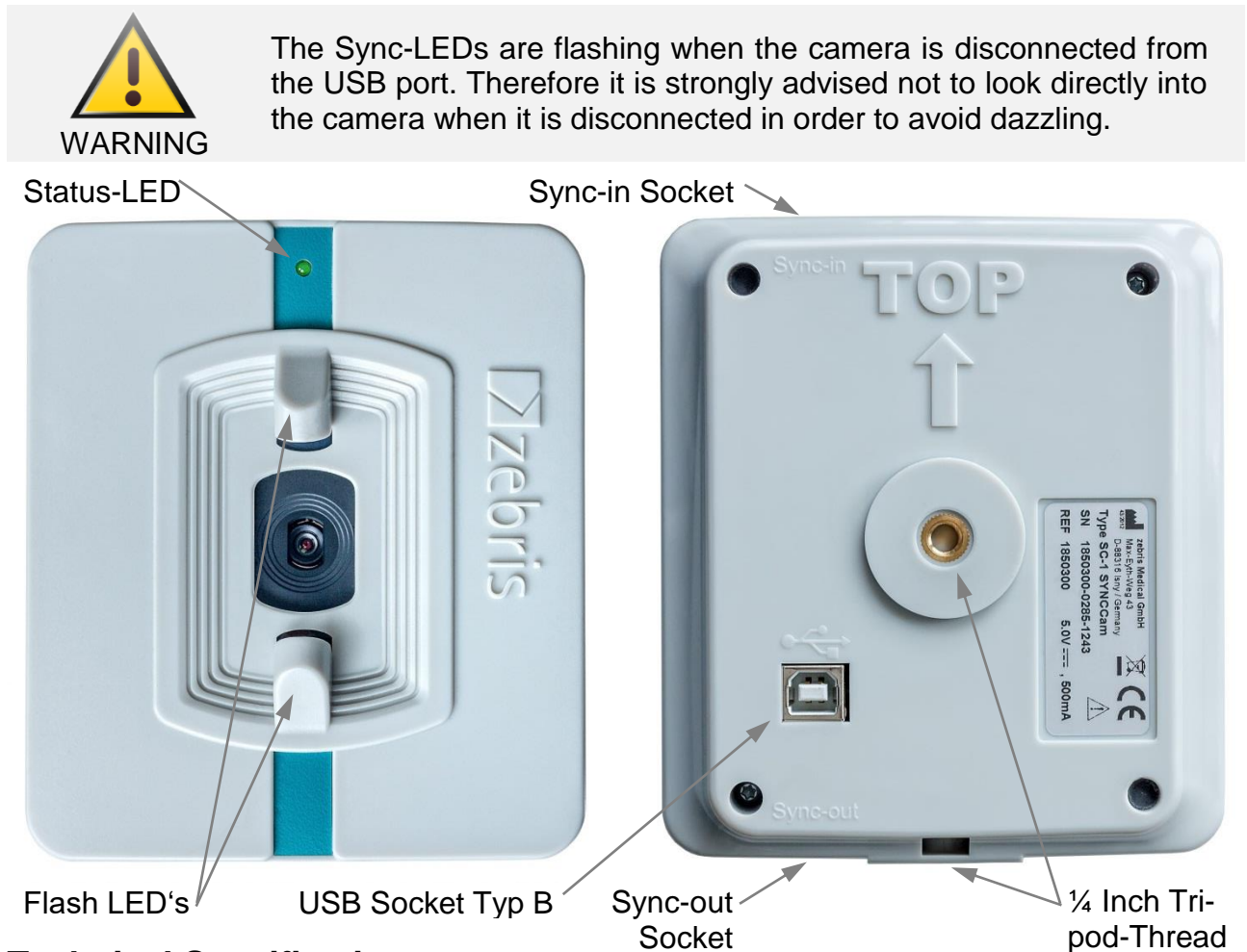
In connected mode zebris SYNC Cam and SYNC Light Cam must be connected to the SYNC socket of the master platform.

## 4 Video-Modul

### 4.1 SYNCam

The **SYNCam** is an accessory of the PDM system and perfectly adapted to be used in combination with the force distribution measurement. All adjustments of the camera are carried out via hardware setup integrated to the zebris FDM Software. The camera is connected to the PC by a USB cable of type A-B included within the shipment.

The camera is equipped with ¼ inch tripod threads and can be adapted to zebris tripods as well as commercially available camera tripods.



### Technical Specifications

REF-No.	01540190
Dimensions	110 x 125 x 15mm (L x W x H)
Weight	approx. 190g
Power Supply	USB (5V DC / 500mA)
Resolution	1920 x 1080 Pixel (Full-HD) / Autofocus
Frame Rate	30Hz
Synchronization	LED-Flash triggered by Sync-IN socket
Mounting	¼ Inch tripod-thread at bottom and back side



**NOTE**

In order to maintain undisturbed transmission of the video signal it is mandatory to use high quality USB cables.

Please, only use cables supplied or recommended by zebris for connecting SYNCam and PC.

## 4.2 SYNCLightCam

The **SYNCLightCam** is an accessory of the PDM system and perfectly adapted to be used in combination with the force distribution measurement. All adjustments of the camera are carried out via hardware setup integrated to the zebris FDM Software. The camera is connected to the PC by a USB cable of type A-B included within the shipment.

The **SYNCLightCam** is equipped with ¼ inch tripod threads and can be adapted to zebris tripods as well as commercially available camera tripods.



**WARNING**

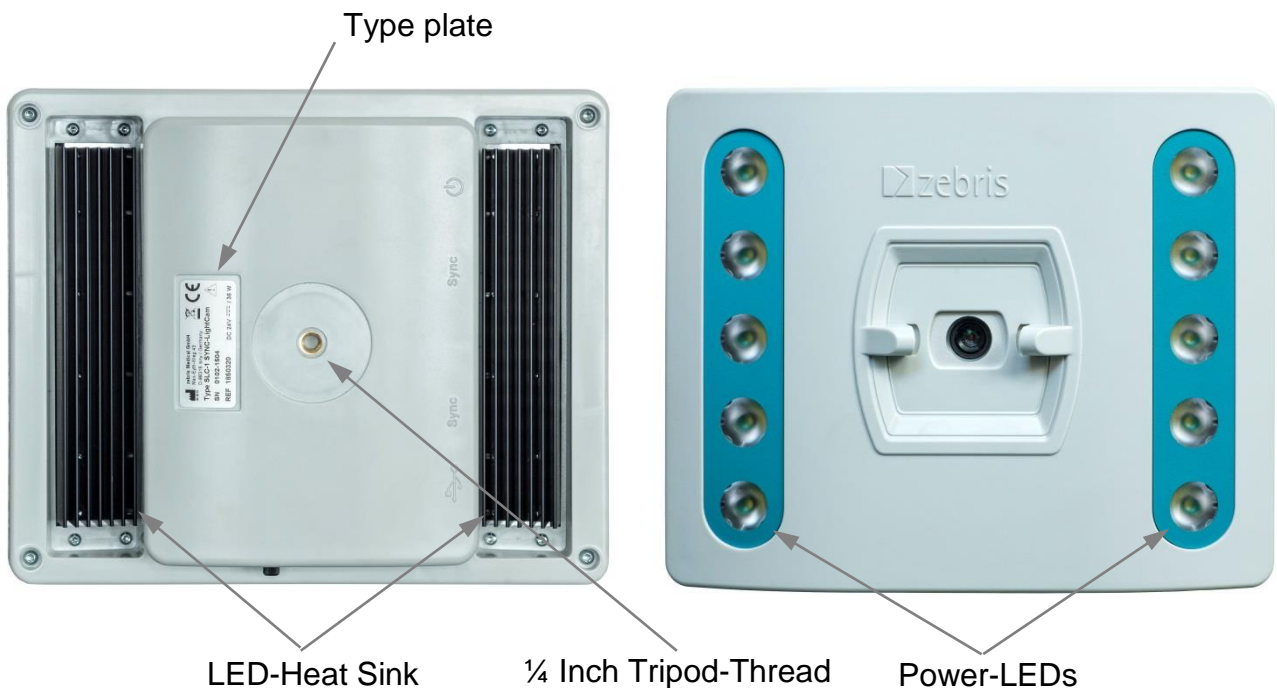
The Sync-LEDs are flashing when the camera is disconnected from the USB port. Therefore it is strongly advised not to look directly into the camera when it is disconnected in order to avoid dazzling.

Furthermore contains the SYNCLightCam as an integral solution, the LED video illumination.

In order to produce well lighted and tack sharp video captures it is essential to maintain perfect lighting conditions at the patient's side. Only with adequate lighting conditions video cameras can work with shutter times short enough to freeze fast movements and capture sharp images.

This solution is perfectly matched on the interaction with the PDM system and can be regulated infinitely in its brightness.

The integrated synchronization unit automatically switches the lights on at the start of a measurement and turns them off again after stopping it.

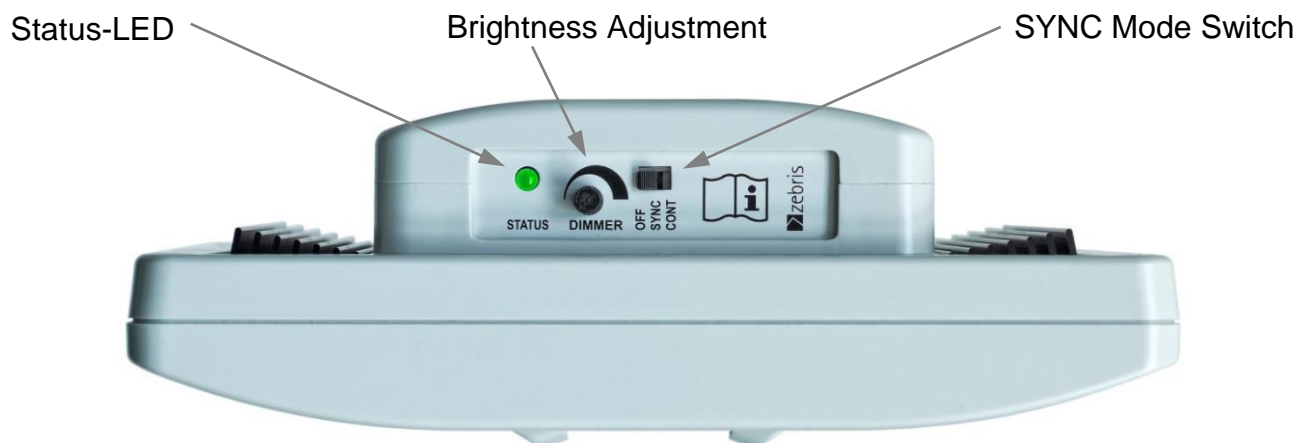


**NOTE**

In order to ensure save operation of the SYNCLights it is mandatory to keep the black heat sinks at their back side uncovered and well air circulated at all times.

## Technical Specifications

REF-No.	01540194
Dimensions	220 x 183 x 80mm (L x W x H)
Weight	ca. 790g
Power Supply	24V / 36W
Resolution	1920 x 1080 Pixel (Full-HD) / Autofocus
Frame Rate	30Hz
Light Colour / Light Current	6200 K / 1550 Lumen
Auto On/Off	Light switched on-/off by platform measurement
Video Synchronization	LED-Flash triggered by SYNC socket
Mounting	¼ Inch tripod-thread at back side



NOTE

In order to maintain undisturbed transmission of the video signal it is mandatory to use high quality USB cables.

Please, only use cables supplied or recommended by zebra for connecting SYNCcam and PC.

## Interpretation of the STATUS-LED

- Green** Device is ready for use or in operation.
- Orange** Indicates when the maximum operation temperature has been reached. At this point the operation current is reduced automatically (which results in reduced brightness) in order to prevent the SYNCLight plus from being damaged by excessive heat.

## Power Supply Unit

For operation of the SYNCLight plus a power supply unit needs to be connected.

REF-No. 33102220

Input	Output	Connector
100 – 240 V AC	24 V DC	DC-Lead 1.7 m
50 – 60 Hz	40 W	Mains Lead Plug Adapter

## SYNC Socket

### Characteristics

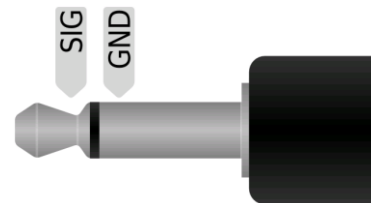
ESD - protected, voltage reversal proof input

Input resistance: 38 k $\Omega$  (AC)

Signal-Level: AC

Trigger Level: 15 mV

### Pin Assignment



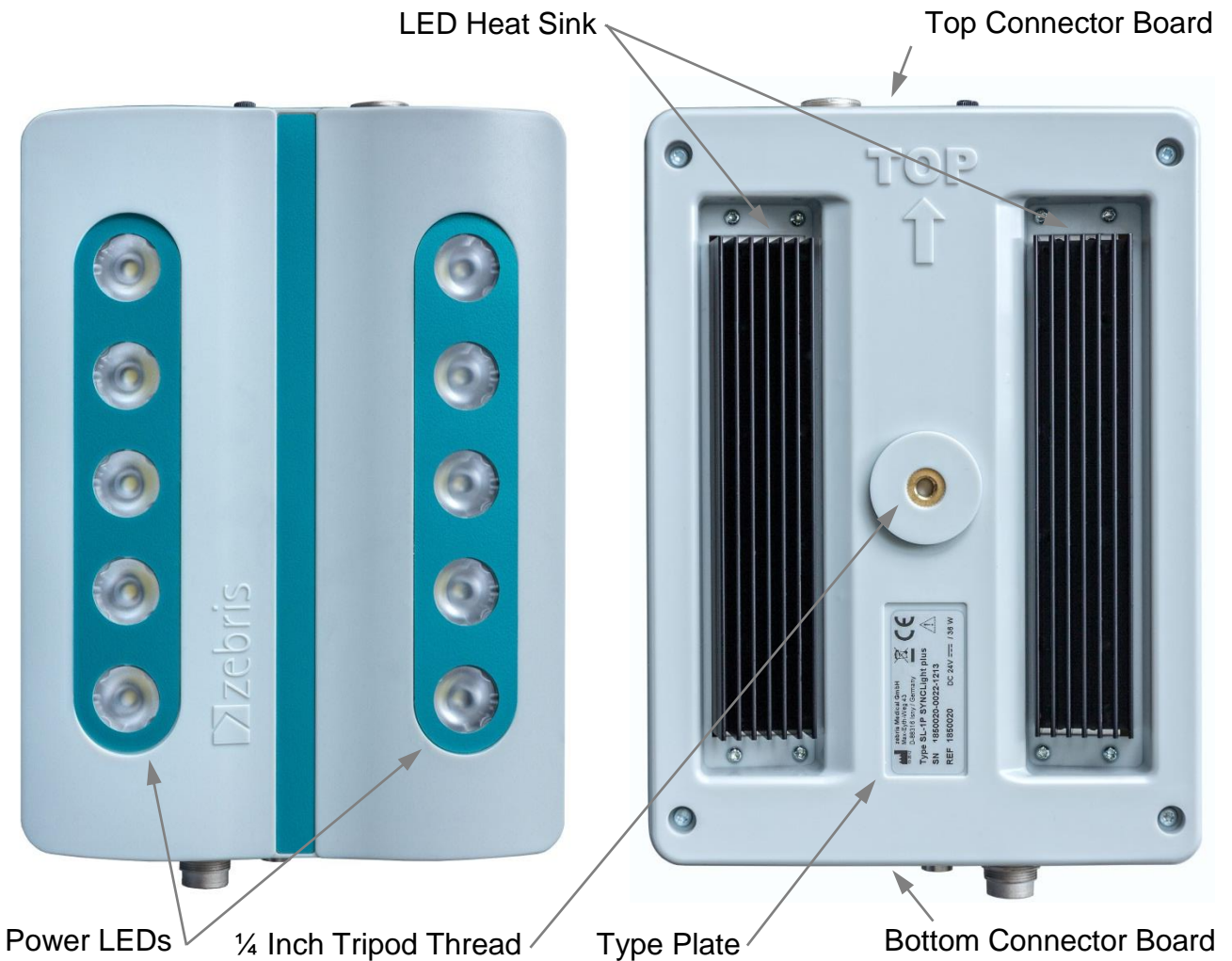
### 4.3 LED Video Lights (SYNCLight / SYNCLight plus)

In order to produce well lighted and tack sharp video captures it is essential to maintain perfect lighting conditions at the patient's side. Only with adequate lighting conditions video cameras can work with shutters times short enough to freeze fast movements and capture sharp images.

The LED video lights **SYNCLight** and **SYNCLight plus** are accessories of the PDM system and perfectly adapted for use in combination with zebris **SYNCCam** as well as the force distribution measurement. Their brightness can be adjusted infinitely.

The integrated synchronization unit automatically switches the lights on at the start of a measurement and turns them off again after stopping it.

Both SYNCLights are equipped with ¼ inch tripod threads and can be adapted to zebris tripods as well as commercially available camera tripods



In order ensure save operation of the SYNCLights it is mandatory to keep the black heat sinks at their back side uncovered and well air circulated all the time.

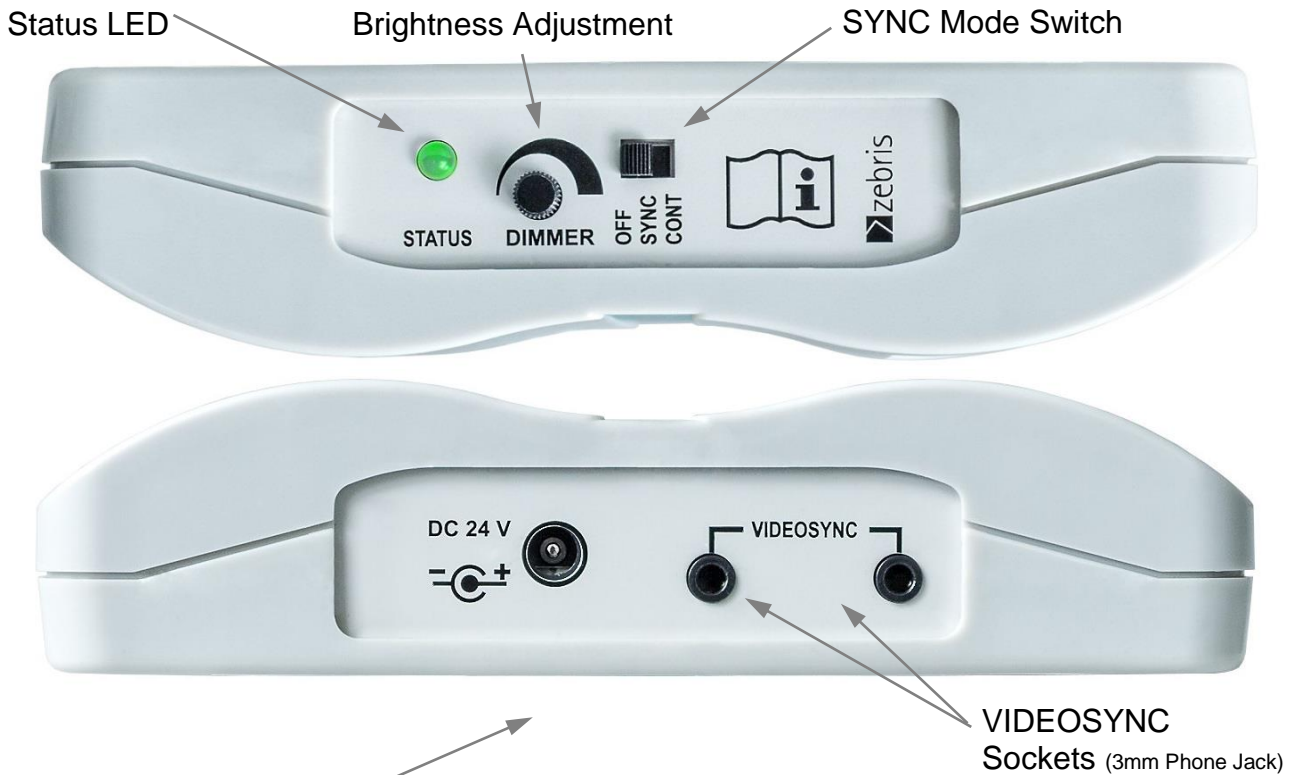
### 4.3.1 SYNCLight

If the synchronization signal from SYNC of the PDM Platform is connected to the **VIDEOSYNC** socket the SYNCLight will be automatically turned on and off when a measurement is started or stopped.

In order to use the synchronization set the **SYNC Mode switch** to position SYNC. At position **CONT** the SYNCLight is switched on permanently. The **DIMMER** can be used to adjust the light brightness individually no matter which operation mode is set.

### Technical Specifications

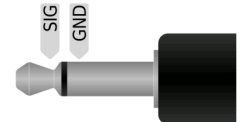
REF-No.	01540110
Dimensions / Weight	155 x 210 x 38mm (L x W x H) / approx. 640g
Power Supply	24V DC / 36W
Light Colour / Light Current	6200K / 1550 Lumen
Auto On/Off	Light switched on-/off by platform measurement
Mounting	¼ Inch tripod thread at back side



### Interpretation of the STATUS-LED

**Power Supply** Device is ready for use or in operation.

**Orange** Indicates when the maximum operation temperature has been reached. At this point the operation current is reduced automatically (which results in reduced brightness) in order to prevent the SYNCLight plus from being damaged by excessive heat.



### Power Supply Unit

For operation of the SYNCLight a power supply unit needs to be connected.

REF-No. 3310.2220

Input	Output	Connector
100 - 240V AC	24V DC	DC-Lead 1.7m
50 - 60Hz	40W	Mains Lead Plug Adapter



### 4.3.2 SYNCLight plus

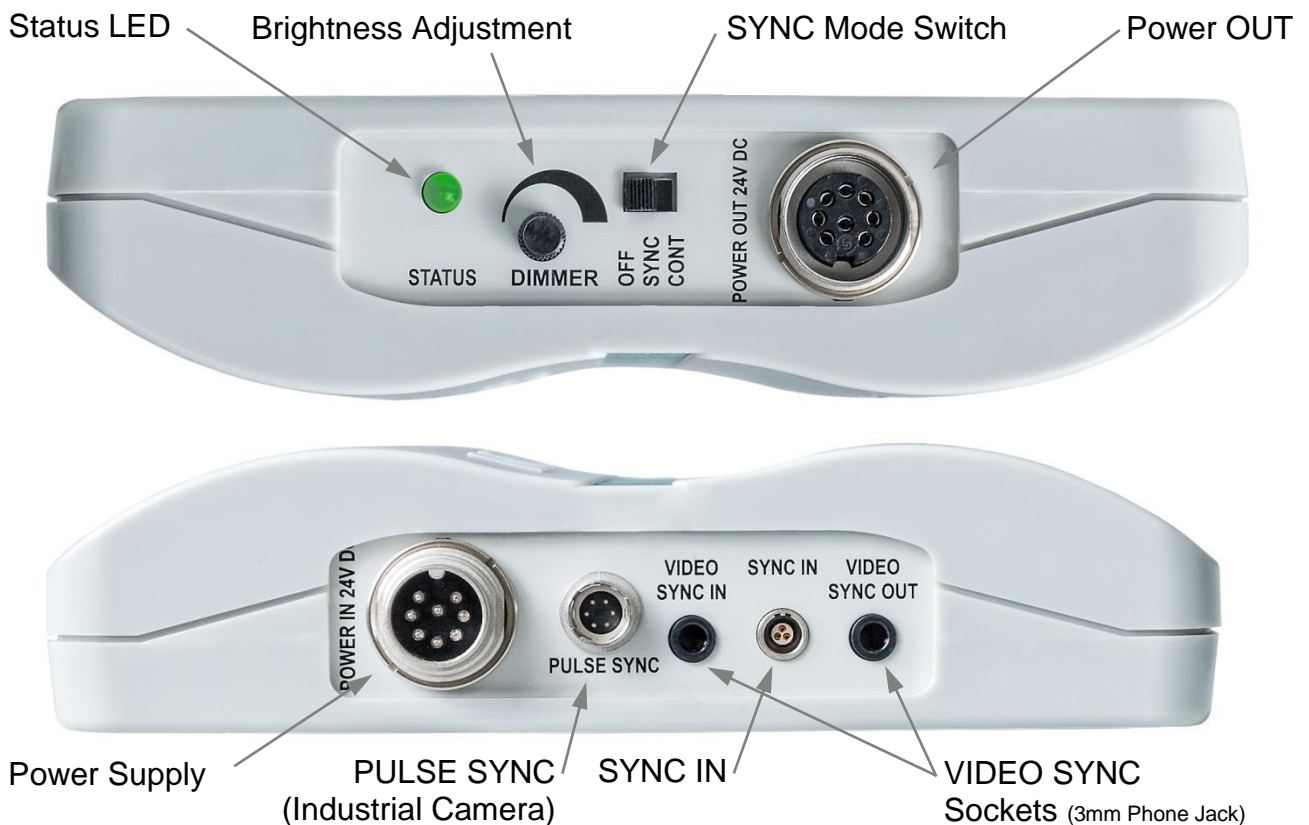
The SYNCLight plus supports the zebris VIDEOSYNC as well as more complex synchronization modes that may be required for use of industrial cameras.

In order to use the synchronization modes set the **SYNC-Mode switch** to position SYNC. At position **CONT** the SYNCLight plus is switched on permanently. The **DIMMER** can be used to adjust the light brightness individually no matter which operation mode is set.

Up to 3 SYNCLight plus can be combined into a lighting unit. Therefore they have to be connected with an adapter cable. The adapter cable provides power supply as well as transmission for the synchronization signals.

### Technical Specifications

REF-No.	01540120
Dimensions / Weight	155 x 210 x 38mm (L x W x H) / approx. 640g
Power Supply	24V DC / 36W
Light Colour / Light Current	6200K / 1550 Lumen
Synchronization	VIDEO SYNC → On/Off with force measurement PULSE SYNC → Shutter Sync for industrial cameras SYNC IN → Standard zebris synchronization (Compatible with SYNC IN/OUT platform)
Mounting	¼ Inch tripod thread at back side
Master – Slave Operation	off max. 3 SYNCLight plus by adapter cable 185.0011/SL-C1



### Interpretation of the STATUS-LED

- Green** Device is ready for use or in operation.
- Orange** Indicates when the maximum operation temperature has been reached. At this point the operation current is reduced automatically (which results in reduced brightness) in order to prevent the SYNCLight plus from being damaged by excessive heat.

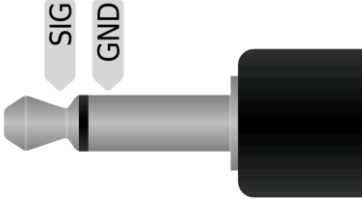
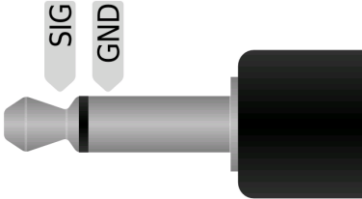
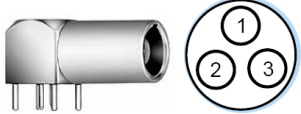
### 4.3.3 Power Supply Unit SYNCLights

For operation of the SYNCLight plus a power supply unit needs to be connected.

REF-No. 33102210

Input	Output	Connector	
100 - 240V AC	24V DC	Mains Lead	1.7m
50 - 60Hz	110W	DC-Lead	1.7m

### SYNC-Modes

Modes	Characteristics	Pin Assignment
<b>VIDEO SYNC IN</b>	ESD - protected, voltage reversal proof input Input resistance: 38K $\Omega$ (AC) Signal-Level: AC Trigger Level: 15mV	
<b>VIDEO SYNC OUT</b>	ESD - protected, voltage reversal proof input The signal from the VIDEO SYNC IN is directly transmitted to VIDEO SYNC OUT and can be used for control of additional devices.	
<b>SYNC IN</b>	ESD - protected, voltage reversal proof input Input resistance: 38K $\Omega$ (Pull-Up) $V_{IH}$ (High-Level Input Voltage): $\geq 3.7V$ $V_{IL}$ (Low-Level Input Voltage): $\leq 3.0V$ Both Signals can be used as Trigger input ("AKTIV" as well as "CLK") and possess the same effect. The signal switches the LED light on to the brightness level pre-selected by the DIMMER The SYNC IN is the standard synchronization tool (zebris SYNC) of all zebris measuring systems and intended to be used to synchronize the lighting system with the measuring signal of other zebris measuring systems (e.g. CMS). In order to use SYNC IN the <b>SYNC mode switch</b> has to be set to position <b>SYNC</b> .	 <b>3-Pin Socket</b> Pin1: CLK Pin2: AKTIV Pin3: GND <b>Socket Type</b> LEMO- Part No. FGA.00 303.CLADxxxx

**Modes Characteristics**

**PULSE SYNC**

ESD - protected, voltage reversal proof input

Input resistance: 2KΩ (Pull-Up)  
 VIH (High-Level Input Voltage): 2.0V  
 VIL (Low-Level Input Voltage): 0.8V  
 Polarity: Lo Active

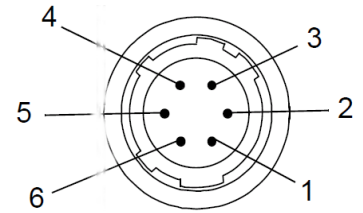
When mode PULSE SYNC is used LED brightness is set to 150%.

The shutter output of industrial high speed cameras can be used as trigger signal for the PULSE SYNC.

By utilizing pulsed light optimal lighting conditions for industrial cameras can be accomplished without being too bright or disturbing for the human eyesight.

In order to use PULSE SYNC the **SYNC mode switch** has to be set to position **SYNC**.

**Pin Assignment**

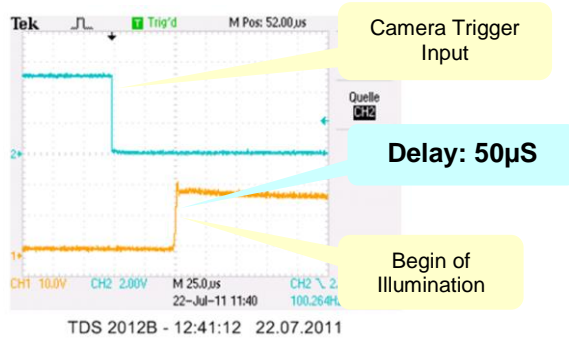


**6-Pin Socket**

Pin4: Input  
 Pin5: GND

**Socket Type**

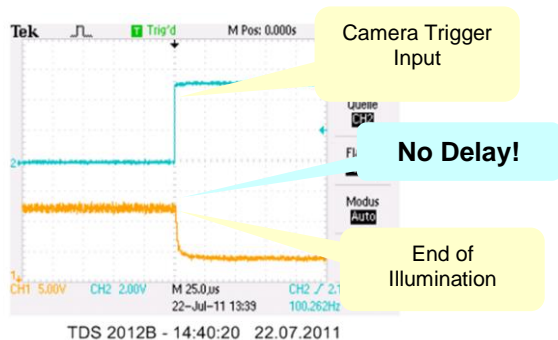
HIROSE HR10A-7P-6S



Timing Properties when switching the Light **ON**:

**Delay of 50µS**

The cameras Trigger-Output should be preset to this Value.



Timing Properties when switching the Light **OFF**:


**No Delay (0µS)**

No adjustment of Trigger-Output necessary!

## 4.4 Replacement Parts PDM System

REF- No.	Description	Illustrations
33102020	<b>Power Supply Mascot/2020</b> 60W/16VDC for PDM-L complies with EN 60601-1 & UL	
33102010	<b>Netzteil MASCOT/2126</b> 15W/18VDC for PDM-XS, PDM-S complies with EN 60601-1 & UL	
07200011	<b>zebris FDM Software</b> for operating systems Windows 7 and Windows 10 32/64 Bit	
79010100	<b>Hardware User Manual / English version</b> Please contact zebris support for free PDF version. Print version is liable to be charged.	
79010181	<b>User Manual zebris FDM Software / English version</b> Please contact zebris support for free PDF version. Print version is liable to be charged.	
21030057	<b>USB-Cable A to mini-B, 3m length</b> Data connection between PDM Platform and PC	
21030152	<b>Bluetooth USB-Stick</b> with Plug & Play functionality	

## 4.5 Accessoires PDM-System

REF- No.	Description	Illustrations
01540191	<b>SYNCCam</b> Camera with USB-Cable, synchronization-cable, tripod, inclusive software extension	

- 01540194 **SYNCLightCam**  
 Combined solution with Camera and illumination, USB-Cable, synchronization cable, tripod, includes software extension
- 21030321 **SYNCCam USB-Kabel A-B**  
 USB-Cable for HD-video signal with high quality plugs, EMC-shielding and ferrites length 5m
- 21030312 **Video Sync-Control Extension Cable**  
 Length 5m, phone jack & socket 3.5mm
- 21030316 **Video Sync-Control Cable 5**  
 Length 5m, both sides phone jack 3.5mm
- 01830041 **Video Sync-Control Cable 2.5**  
 Length 2.5m, both sides phone jack 3.5mm
- 01540110 **SYNCLight**  
 with 10 high power LEDs, power supply unit, light intensity infinitely variable, SYNC
- 01831105 **SYNCLight Power Supply Unit**  
 Mains adapter 40W / 24V DC
- 01540120 **SYNCLight Plus**  
 with 10 power LEDs, power supply unit, light intensity infinitely variable  
 VIDEO SYNC, PULSE SYNC, zebris SYNC  
 up to 3 SYNCLight Plus can be combined into a lighting unit
- 33102210 **SYNCLight plus Power Supply Unit**  
 Mains adapter 110W / 24V DC,  
 Supports up to 3 SYNC Light plus.
- 01850011 **SYNCLight plus Adapter Cable**  
 for Master-Slave connection  
 of up to 3 SYNCLight plus, length 1m



## 5 Operation of the PDM System

### 5.1 Set up the measuring System

For the commissioning of the PDM platform the suitable power supply, a USB cable type A-mini B as well as the installation CD with the zebris FDM software are necessary. All components are included in the scope of delivery of the PDM measuring system.

- The underground of the set-up location must be plain and horizontal.
- The platform must be set up on a slip-proof underlay or installed in a catwalk, so as to exclude any danger to the test person caused by the platform sliding.
- Do not set up the platform near a source of heating or in direct sunlight in front of a window as a rise in temperature can lead to inaccurate measuring results.
- Set-up the measuring system in a way, that the socket for the mains connection is accessible easily at all times and that the device can be separated from the power supply without obstacles.
- Once the measuring system is set up safely and horizontally, it can be connected to the power supply and put into operation.



**WARNING**

Be sure that all the mains and connection cables of the PDM Platform are laid safely and that they are protected against stepping on, so that nobody can trip over them. Check all the cables and the connection plug regularly for any damage.

The cables therefore can be laid under a cable protection or fixed to the floor using a tape if necessary.

## 5.2 Connection of the measuring system to mains supply

For the connection of the PDM platform with the mains, connect the power supply with the mains socket and the power socket in the connector compartment.



WARNING

Exclusively use the power supply unit approved by zebris for the operation of the PDM platform, which is suitable for the power supply of your platform.

**Netzteil MASCOT/2126**

REF-No. 33102010

For the following platforms:

PDM-XS, PDM-S

### Technical Data

Input	Output	Connector	Length
100 - 240 V AC	18V DC	Plug Adapter	---
50 - 60 Hz	15 W	DC Cable	6m

### Pin arrangement / polarity



Pin arrangement and polarity is identically to Mascot/2020

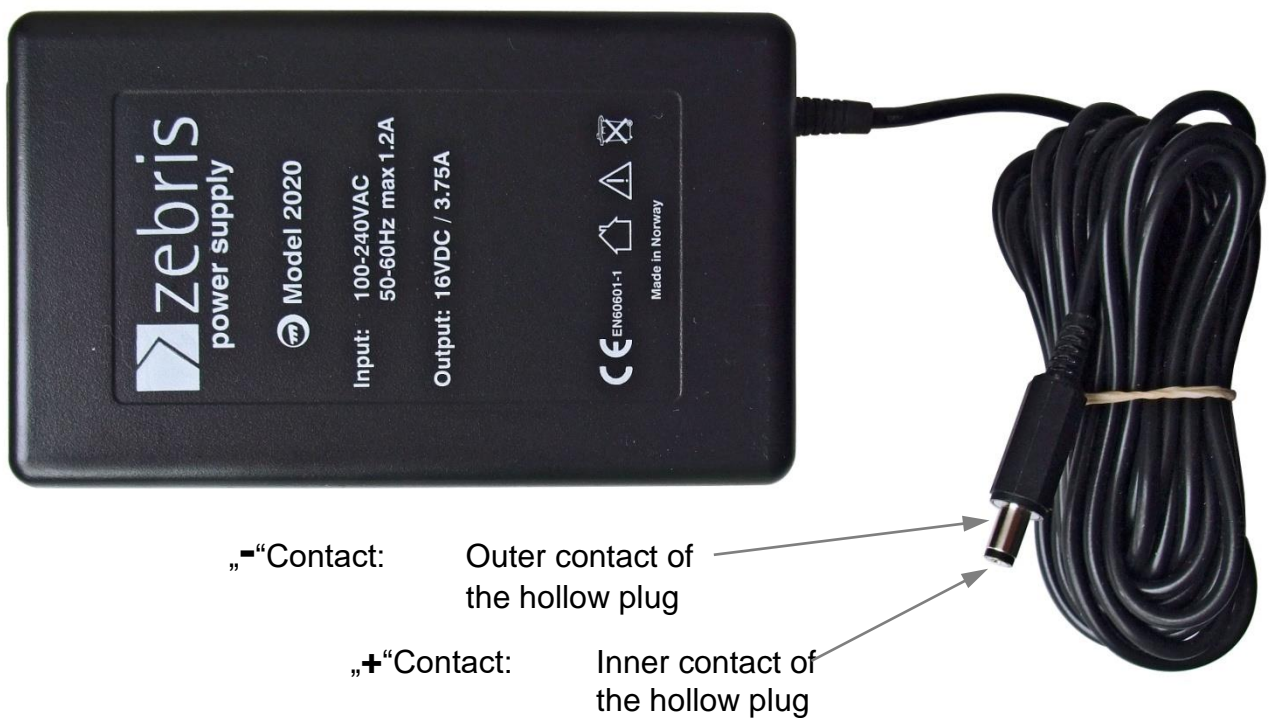
For the following platforms:

PDM-L

**Technical Data**

Input	Output	Connector	Length
100 - 240 V AC	16V DC	AC Cable	1,7 m
50 - 60 Hz	60 W	DC Cable	5 m

**Pin arrangement / polarity**



Before connecting the measuring system to the mains, compare the type plate indications of the power supply and the platform in terms of mains voltage and mains frequency with the local characteristics. Only connect when they are in accordance.



WARNING

Carry out a visual examination of power supply, mains connection voltage and socket as well as ground contacts before connecting resp. commissioning the measuring system. Damaged power supplies, cables or connection sockets immediately must be replaced by a person authorised to do so.



## 5.3 Anschluss an den PC

As a rule, the measuring system PDM is supplied together with a computer. If the system is to be operated using other computers or components, the user must then inquire whether the intended coupling guarantees the necessary safety for the test person, the operator and the surroundings by consulting the manufacturer, the authorized zebris sales partner or by asking a specialist.

Please refer to the zebris FDM Software Manual for information on PC requirements.



WARNING

If the computer is not supplied with the measuring system, the manufacturer shall not be held liable for any damage or malfunctions arising from a faulty coupling. Should additional hardware be built into the computer or software installed, the manufacturer shall not be liable for any malfunctions or damage occurring.

The computer must be CE marked and fulfil the requirements of DIN EN 60950 resp. DIN EN 60601-1.



WARNING

The PDM measuring system is not designed for the operation within a network/data network. The connection of the system with a network/data network can cause unforeseen risks for patients or third parties. If the zebris FDM software shall be installed in a network/data network, the operator is obliged to determine, analyse, evaluate and control the risks that are connected with doing so – particularly with regard to the aspects data protection, virus security, updates of the operating system and regular backups. Risk considerations have to include subsequent changes of the network/data network, like e.g. update/upgrade of devices and components that are connected to the network.

## 5.4 Installing the zebris FDM software

If your measuring system is delivered without PC/laptop, please install the application software before connecting the measuring system to the computer. Please find information on the installation in the user manual of the zebris FDM software.



NOTE

**Please make absolutely sure that you have installed the zebris software before connecting the PDM platform to the computer using the USB cable.**

If the platform is connected without installing the software before, problems when installing the device driver may occur and the system does not work.



NOTE

### **How to solve problems with the hardware driver**

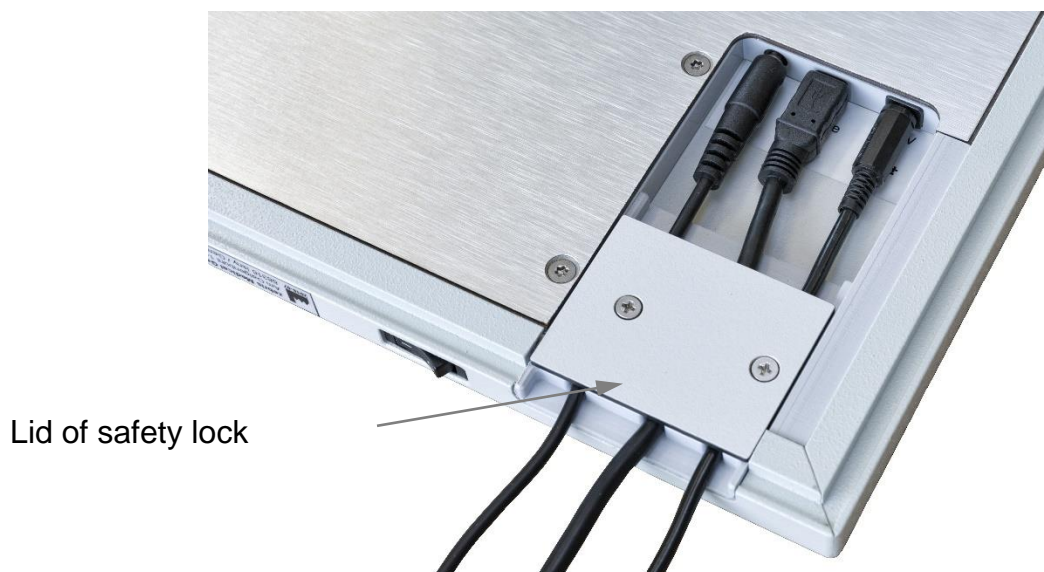
Should problems with the hardware driver of the PDM platform occur then disconnect the platform from the PC and restart it. Now proceed with installing the zebris FDM software another time and reconnect the platform when the installation procedure has been finalized.

## 5.5 Closing the safety lock of the plug tray

Finally connect the USB socket in the connector compartment and a free USB interface of your computer by using the provided USB cable of type A to mini-B.



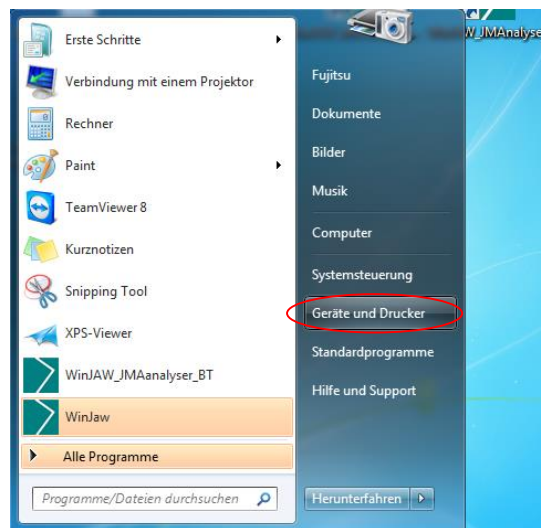
If the power supply unit and the USB cable are connected to the sockets of the platform, please close the lid of the safety lock and fasten it to the housing by means of the two screws supplied with the platform.



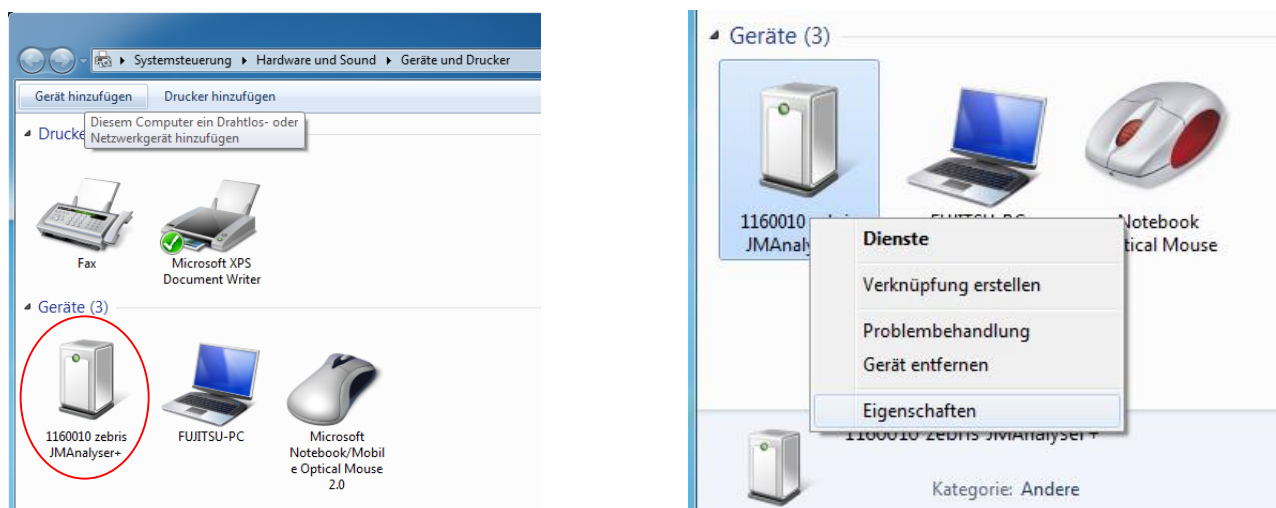
Now the measuring system is ready for us. A measurement is controlled completely by the zebris FDM software. Before starting and in case of any doubts in use of the software please thoroughly read the user manual of the zebris FDM software.

## 5.6 Connection of the platform via Bluetooth Interface (mobile only)

Select the “Start” button on the desktop and then select "Devices and printers".



Under “Control Panel” > “Devices and Printers” you will find the button “Add device”. Through the recognition of the “12330x **PDM mobile**” this device can now be paired with your PC and added to the Bluetooth capable systems.



When clicking on the **PDM mobile** symbol, it is highlighted. Click on the symbol again with the left mouse button and select “Settings” under the section “Services”, so that the following system configuration information is read out.

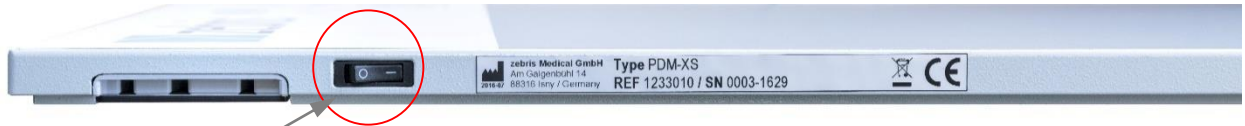
In addition, the “COM port” for the **PDM mobile** to which the device is connected has to be selected within the device settings. This one can be found, as described under “PC settings with **PDM mobile**, in the system configuration. Confirm by clicking “OK”. The operational readiness of the device is confirmed through the flashing blue bluetooth LED.

## 5.7 Switch the PDM Platform On/OFF

The platform is switched on and off by software control as soon as the zebris FDM software on the PC is started.

If the platform is connected properly the green status Led will be illuminated constantly.

The battery switch of mobile platforms which is located on the left-hand side of the platform is designated for switching the battery on and off when the device is operated in wireless mode.



Battery Switch  
(PDM mobile only)

## 5.8 Charging the battery (PDM mobile only)

Two modes of operation are available for charging the battery:

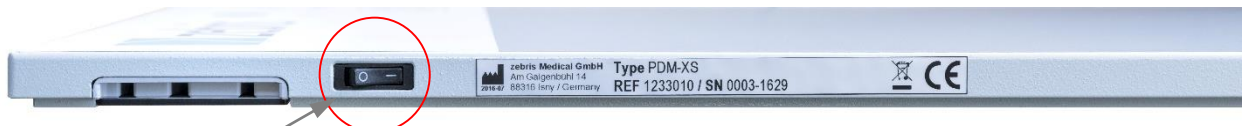
- **Fast charging by means of the power supply unit.** If the power supply unit is connected the battery will be charged as long as the battery switch is set to position I. With the power supply unit connected a measurement and battery charging can be performed simultaneously.
- **Reduced charging via USB cable** and the connected PC. If the platform is connected to a PC by its USB interface a relatively slow charging process is active as long as the battery switch is set to position I. In respect of charging current limited by USB specifications the charging process is slower. Without a power supply unit connected to the platform simultaneous measurement and charging is not possible.

## 5.9 Setting the system out of operation

In order to set the system out of operation please close the zebris FDM software first, then exit the Windows operating system and shut down the PC.

Then disconnect the power supply unit of the PDM platform from mains supply.

To switch off the battery of PDM mobile set the battery switch located on the left hand side of the platform to position O.



Battery Switch  
(PDM mobile only)

## 5.10 Recommendations for recording data

In order to gain significant data from PDM platforms some principle guidelines should be followed. This chapter describes the ideal conditions for recording measurement data: The following points refer to the data reception of a person walking and describe the ideal measurement situation.

### 5.10.1 Walking range

The best conditions for measurements with PDM platforms will be achieved by integration of the system in a walking range. The complete walking range must be plane with the surrounding floor. This way the test person won't know the position of the platform and gives a workaround to the tendency that test persons try to walk exactly on the sensor area. The width of the stage should be about 1,20m. We recommend a distance of about 4m from start to PDM platform and no less than 3m behind. With such a walking stage it is easier to measure normal walking without acceleration or deceleration.

Of course the same set up can be used to measure with the method of first step. The first step method is described as follow: The patient stands on one side of the platform in a distance to reach the platform by the first step. For measurement the patient hits the sensor area by the first step and moves on. This kind of measurement guaranties reproducible steps and results. Notice: These results differ more or less from these by normal walking.

### 5.10.2 Data recording

Please observe the exercise of the patient strictly. Only steps where the complete ground contact of the foot is located on the sensor area may be used for evaluation. If not the complete foot area was measured by the system (foot did partially not hit the sensor area) the step can not be evaluated.

### 5.10.3 Gait velocity

For the measurement a normal (individual) and constant walking velocity is necessary. Ideally an additionally measurement, e.g. by photo sensors, can proof the velocity for notice. Naturally the patients adapt to the measurement situation within a few minutes. After a few trials, walking seems normal. A change in velocity of about 5 % is non-effective.

### 5.10.4 Posture

A visual control of the behaviour pattern of normal gait is recommended. Trials with atypical behaviour pattern should be deleted from interpretation. The patient has to look straight ahead and must not be disturbed by paying attention to the platform or monitor. Marks on the wall in front of the patient can provide orientation to hit the platform.

### 5.10.5 Acrosclerosis

Different measurements (e.g. P.R. Cavanagh, *The Foot* (1994) 4, 123-135) show an increase of plantar pressure peaks of about 30 % by acrosclerosis (e.g. weals). The interpretation of measurement data has to include the existence of plantar acrosclerosis.

## 6 Control measures, Preparation, Disposal



- Scheduled maintenance of the system is essential in order to prevent damage and guarantees the safety of the device. All methods concerning the system's maintenance and disinfection mentioned in this user manual should be carried out on a regular basis.
- Should any malfunctions and/or defects be determined or suspected, the device must be put out of operation immediately, marked as "Out Of Service" and prevented from being used by removing the mains cable. In such case be sure to contact the manufacturer or an authorized sales partner.
- The maintenance of the device or its accessories, going beyond the procedures described in this user manual, must exclusively be carried out by zebris Medical GmbH or a person who has been explicitly authorized by zebris to do this.
- Be sure to switch off the measuring system and disconnect it from mains supply before starting any maintenance work.

### 6.1 Mandatory periodic inspections



- For maintaining the correct state of the electrical equipment, checks and technical safety inspections have to be carried out repeatedly (e.g. within Germany, acc. to BGV A3, and accident prevention regulations and technical safety tests according to the Medical Device Operating Regulations). Here it should be noted that standard regulations for electrical devices are concerned here and not measures that are specific to zebris.
- For safety reasons it is recommended before each use of the measuring system, to check the correct state of all the connection leads, as well as the mains cable, mains plug and mains socket. Should certain parts be damaged, these must be replaced before continuing to use the measuring system.
- Immediate maintenance measures are to be carried out if:
  - a) Fluid enters the device
  - b) Cable or cable connections have been damaged
  - c) Parts of the sensors were damaged
  - d) Covers have been damaged
  - e) A malfunction or a fault is suspected or has been detected
- If the type plate or other important labels (warning notices) are damaged or obliterated they have to be replaced by the manufacturer for safety reasons.

## 6.2 Checking the PDM Platform

### 6.2.1 Control measures



WARNING

The correct measuring function of the PDM Platform must be checked at regular intervals to ensure that the measuring system is functioning properly.

Should any damage to the measuring surface become evident (e.g. something fell hard on the measuring surface), no further measurements must be taken. If visible damages are detected no further measurements are permitted.

After carrying out a baseline measurement, no measuring values may be shown for a condition without any load. In addition, the force distribution images are to be checked regularly for untypical measuring patterns. These include above all, line or column-shaped measuring patterns deviating from the surrounding values.

Whenever faults occur or in case of doubt, the manufacturer or sales partner authorized by zebris must always be contacted.

### 6.2.2 Calibration measures

The measuring accuracy of the sensors for the force distribution measurement is to be checked from time to time using a defined application of force.

To do this, the user, knowing the body weight, can stand on the platform on one foot. The platform must show the approximate body weight, taking the force of gravity, the sensors at the edges that may not be subject to the full pressure, and the measuring tolerance into consideration.

In case of deviations larger than  $> \pm 5\%$  of max range a recalibration at manufacturers side is required.

In case of any doubts about the accuracy of the measurement it is highly recommended to send the platform to zebris premises for recalibration.

## 6.3 Troubleshooting

Please check the following points if technical malfunctions should occur:

- ✓ Is the PDM platform properly connected to the mains?  
(green status LED is turned on, battery is fully charged (mobile version) and external power supply unit or USB cable is connected)
- ✓ Is the USB or Bluetooth connection between platform and PC established properly?
- ✓ Are all further components of the measuring system (infrared synchronisation with zebris DAB-Bluetooth, video camera) properly connected?



NOTE

Please find further information on error messages and troubleshooting in the user manual of the zebris FDM software.

### Checklist for the reception of error messages



NOTE

In order to support you the best way possible in case of malfunction of your PDM measuring system, our service employees need the following information:

- ✓ Device type + serial number of the PDM platform  
Serial number is located on the type plate on the left-hand side of the platform
- ✓ Version of the zebris FDM software
- ✓ Version of the operating system of your measuring PC  
e.g. Windows 7 Professional Service Pack 1  
(Call under Windows 7: Windows Start button → Control Panel → System)
- ✓ Further components being connected to the measuring system  
e.g. Infrared synchronisation (IR) with zebris DAB-Bluetooth, video camera
- ✓ List of all USB devices that are connected to the measuring PC  
e.g. mouse, printer, other measuring systems etc.
- ✓ Screenshot of the error message, or exact wording  
e.g. "EMG adapter not found."
- ✓ Precise and detailed description of the procedure that lead to the error message.  
e.g. Measurement "Type A" started, then clicked on button "B", afterwards carried out movement "C", switched to function "D", when switching back, the error message xyz occurred etc.



## 6.4 Cleaning and disinfection

### 6.4.1 Cleaning

The platform and accessories are cleaned with a moist cloth while the device is switched off and the mains plug taken out.



NOTE

Do not use any aggressive agents to clean the measuring system.



WARNING

Please be absolutely sure to switch off the device and pull the mains plug out of the socket before you commence disinfecting and cleaning.

### 6.4.2 Manual Disinfection

The platform can be disinfected by wiping over with suitable agents. To clean, wipe the platform with a cloth soaked in disinfection liquid.



WARNING

#### No spray disinfection!

Spray disinfection can destroy the highly precise measurement sensors of the platform.



#### Recommended disinfection agent

Composition approx. 25% ethanol, 35% Propanol

E.g. Mikrozyd Liquid / Schülke & Mayr or similar agents



NOTE

If you apply disinfection agent be sure to follow the recommendations given by the manufacturer of the disinfection agent strictly. Especially consider the rules concerning the recommended application time of the agent.



WARNING

Due to danger of confusion, chemicals that are necessary for the disinfection or cleansing exclusively must be stored, prepared and provided in containers that are appropriate for this purpose.



NOTE

In order to demonstrate that disinfection was successfully done, it is recommended to put up a sign on the platform, saying "disinfected".

## 6.5 Disposal

### 6.5.1 Packaging

All transport packaging delivered by zebris can be recycled within Germany via the local recycling depots. In order to provide the reuse of the recyclable material contained in the packaging, the zebris Medical GmbH takes part in the dual ZENTEK system that takes over the proper disposal of packaging.



### 6.5.2 Disposal of electronics

This symbol states that according to the directive on waste electrical and electronic equipment (2012/19/EEC) the product must not be disposed by means of the domestic waste system. Within Europe this device must be forwarded to a specific waste disposal system.

Therefore regular disposal is carried out by the manufacturer. For this purpose the system should be shipped to the manufacturer and will be forwarded to regular disposal by zebris.



The improper interaction with electronic waste could lead to negative effects for the environment and the public health because of potential hazardous materials which are frequently contained within electric and electronic devices. Additionally with the proper disposal of this product you will contribute to the effective use of natural resources.



### Accumulators and batteries

Accumulators and batteries must not be disposed of with domestic waste! In the interest of environmental protection, the consumer is legally obliged (battery regulation) to return old and used batteries. Used accumulators and batteries can be disposed of at the collecting points of the community or where batteries of the relevant kind are sold. For consumers, the batteries are taken back free of charge.