

October 2017

Lightsheet Z.1
Installation requirements

Knowledge of this manual is required for the operation of the instrument. Would you therefore please make yourself familiar with the contents of this manual and pay special attention to hints concerning the safe operation of the instrument.

The specifications are subject to change; the manual is not covered by an update service.

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CONTENTS

	Page
1	Space Requirement 2
2	Power Requirements 3
3	Physical Dimensions 5
4	Dimensions of Shipment Crates 5
5	Environmental Requirements 6
6	Vibrations 6
7	Main System Module Lightsheet Z.1 6
8	Sample Positioning 7
9	Illumination Optics 7
10	Detection Optics 7
11	Solid State Lasers 8
12	Reflector Turret 8
13	Detection Modules 9
14	Incubation 9
15	Lightsheet Z.1 System Overview 10

1 Space Requirement

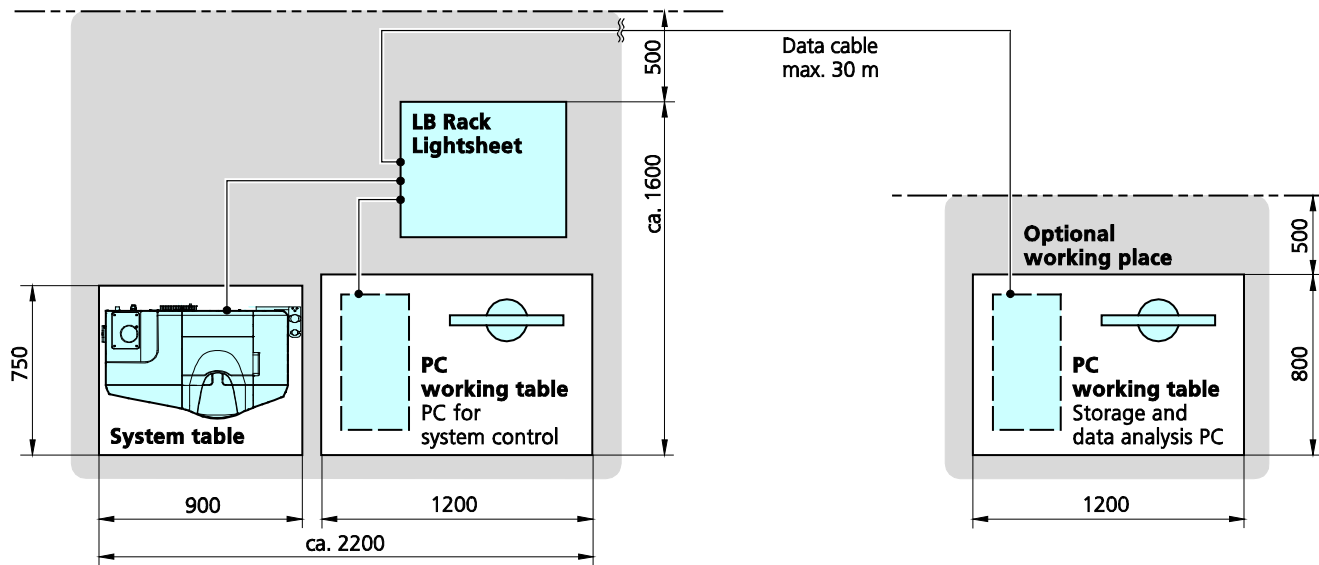


Fig. 1 Space requirement for Lightsheet Z.1 with a storage and data analysis PC (measurements in mm)

- ☞ The PC for system control and the storage and data analysis PC are located below the computer table. The laser electronics can be accommodated beneath the system table.


2 Power Requirements


The Lightsheet Z.1 system must be connected to the AC network via the central power supply and control unit LB Rack Lightsheet (LB = Laser Bench) by a country-specific mains power cable.

In addition the LB Rack Lightsheet must be securely connected to an earthing point of the building installation using the supplied earth conductor.

The storage and data analysis PC and respective monitor must be separately connected to the AC network by further power cables.

Mains voltage	220 V AC to 240 V AC ($\pm 10\%$)	100 V AC to 125 V AC ($\pm 10\%$)
Supply frequency	50 to 60 Hz	50 to 60 Hz
Lightsheet		
Max. current	Single 3.5 A phase	Single 8 A phase
Power consumption	800 VA max.	750 VA max.
Storage and data analysis PC		
Power consumption	400 VA max.	400 VA max.
Protection class	I	I
Ingress protection mode	IP 20	IP 20
Overvoltage category	II	II
Pollution degree	2	2

-  EMC inspection according to DIN EN 61326-1 (07/2013)
 1. Emitted interference according to CISPR 11/DIN EN 55011 (04/2011)
 2. Interference immunity as specified in Table 2 (industrial applications)

-  The Lightsheet Z.1 system meets the EMC requirements for EN 55011 Class A (intended use in industrial environment). If the Lightsheet Z.1 is operated in a residential area or in a small trade area other devices may be influenced by conducted or radiated disturbance. In this case special EMC measures are required. In the rare case of a voltage surge on the power supply line (e.g. from indirect lightning stroke), a momentary interruption of the acquisition system's functionality is possible. This is no defect. Acquisition can be continued after starting the ZEN software again. Sample position is maintained and no damage occurs to the system. A possible protective means to minimize the probability of a temporary disruption is a transient voltage protector in your facility's power system.

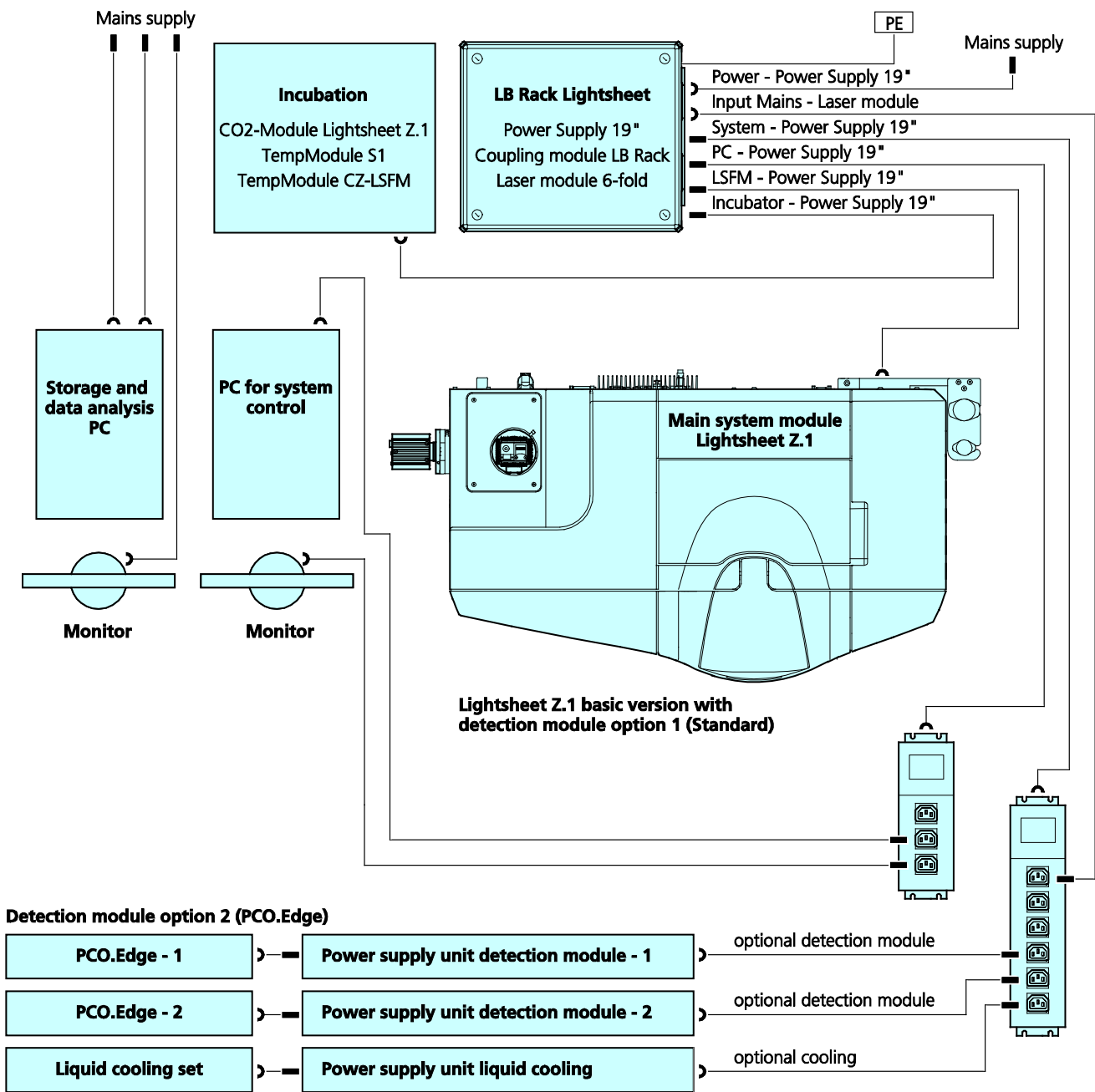


Fig. 2 Mains connection for Lightsheet Z.1 and components. Free or reserve connections may be used for supplying power to auxiliary equipment. Maximum 1 A can be provided per connection.

3 Physical Dimensions

Component	Length (cm)	Width (cm)	Height (cm)	Weight (kg)
System table, small, air damped, level regulated	90	75	77	90
Main system module Lightsheet Z.1	80	45	50	75
LB Rack Lightsheet	60	70	55	80

4 Dimensions of Shipment Crates

Box contents	Length (cm)	Width (cm)	Height (cm)	Weight (kg)
System table, small, air damped, level regulated	90	75	111	100
Main system module Lightsheet Z.1	117	77	120	110
LB Rack Lightsheet	97	87	104	48
PAL box, two	120	80	130	>50

5 Environmental Requirements

For operation the system must be installed in an enclosed space.

1. Operation, specified performance	T = 22 °C ± 3 °C without interruption (24 h per day, irrespective of whether the system is in operation or switched off)
2. Operation, reduced performance	T = 15 °C to 35 °C, all conditions deviating from 1. and 5.
3. Storage	T = -20 °C to 55 °C
4. Temperature gradient	±0.5 °C/h
5. Warm-up period	1 h, for high precision and/or long-term measurements ≥ 3 h
6. Relative humidity	<65 % at 30 °C
7. Operation altitude	max. 2000 m
8. Heat loss	System Lightsheet Z.1 = 700 W, storage and data analysis PC = 350 W

6 Vibrations

It is recommended that the Lightsheet Z.1 be operated in conformance with Vibration Class C. VC-C, 12,5 µm/s RMS amplitude of frequency band 8 – 80 Hz (RMS = root mean square) according to ISO 10811.

7 Main System Module Lightsheet Z.1

The Lightsheet Z.1 system is suitable for imaging fluorescent, living specimens.

The fluorescent dyes are excited by a laser light sheet (with wavelengths of 405–640 nm). The light sheet thickness can be adjusted between approx. 2 µm–ca. 16 µm (depending on sample, at 488 nm).

It is an eyepieceless microscope with a closed system cavity which houses the sample chamber. The sample chamber consists of screw-in cover glasses with sealing rings, detection optic adapters, guide rail, connections for exchanging the medium and a syringe with cannula.

The sample is moved by a fully motorized four-axis multi-coordinate stage.

The sample is checked by means of an overview camera. Transmitted light images are produced with an infrared sample chamber illumination (no Köhler illumination setup). The spectral domain of the detection lies between 400–740 nm and can be performed simultaneously in two channels. Using the optical zoom of 0.36–2.5× the magnification can be adjusted continuously.

8 Sample Positioning

The sample is positioned by means of a four-axis multi-coordinate stage with stepper motors. The x- and y-axes are provided with a position measuring system.

- Travel range
 $x/y/z/\alpha = 10 \text{ mm}/50 \text{ mm}/10 \text{ mm}/360^\circ$
- Reproducibility
 $x/y/z/\alpha = 200 \text{ nm}/650 \text{ nm}/200 \text{ nm}/0.1^\circ$
- Positioning accuracy
 $x/y/z/\alpha = 5 \text{ }\mu\text{m}/5 \text{ }\mu\text{m}/5 \text{ }\mu\text{m}/0.1^\circ$
- Smallest increment
 $x/y/z/\alpha = 50 \text{ nm}/1 \text{ }\mu\text{m}/50 \text{ nm}/0.05^\circ$

9 Illumination Optics

Lightsheet Z.1 Illumination Optics 5×/0.1

Lightsheet Z.1 Illumination Optics 10×/0.2

10 Detection Optics

Lightsheet Z.1 Detection Optics 5×/0.16

Lightsheet Z.1 Detection Optics 20×/1.0

Lightsheet Z.1 Detection Optics 40×/1.0

Lightsheet Z.1 Detection Optics 63×/1.0

Clr Plan-Neofluar 20×/1.0 Corr nd=1.45

Clr Plan-Apochromat 20×/1.0 Corr nd=1.38

11 Solid State Lasers

Six lasers with different wavelengths can be combined in one system.

Lasers	Class	Power rating*
405 nm	3B	20 mW
405 nm	3B	50 mW
445 nm	3B	25 mW
488 nm	3B	30 mW
488 nm	3B	50 mW
515 nm	3B	20 mW
561 nm	3B	20 mW
561 nm	3B	50 mW
638 nm	3B	75 mW

* Typical laser fibre output power $\pm 5\%$

12 Reflector Turret

Reflector Turret for Emission Selection

Reflector Turret for Laser Blocking Filters

13 Detection Modules

Up to two detection modules of the same type can be connected to the existing detector ports:

- Lightsheet Z.1 detection module "Standard", 1388×1036 pixels
- Lightsheet Z.1 detection module "PCO.Edge", requires liquid cooling, 1920×1920 pixels

14 Incubation

As an option the sample can be temperature controlled and supplied with CO₂. All variations require a TempModule S1.

- Heatingblock Sample Chamber Lightsheet Z.1 for heating the Sample Chamber Lightsheet Z.1, adjustment range up to 42 °C
- Set TempModule CZ-LSFM, consisting of a Peltier Block S for the Sample Chamber Lightsheet Z.1, Temperature Sensor Lightsheet Z.1 and TempModule CZ-LSFM. Adjustable temperature 10 °C–42 °C, temperature stability ±0.1 °C.
- CO₂-Module Lightsheet Z.1, requires CO₂ supply, adjustable concentration 0 %–10 %
- Heating device humidity S1

15 Lightsheet Z.1 System Overview

