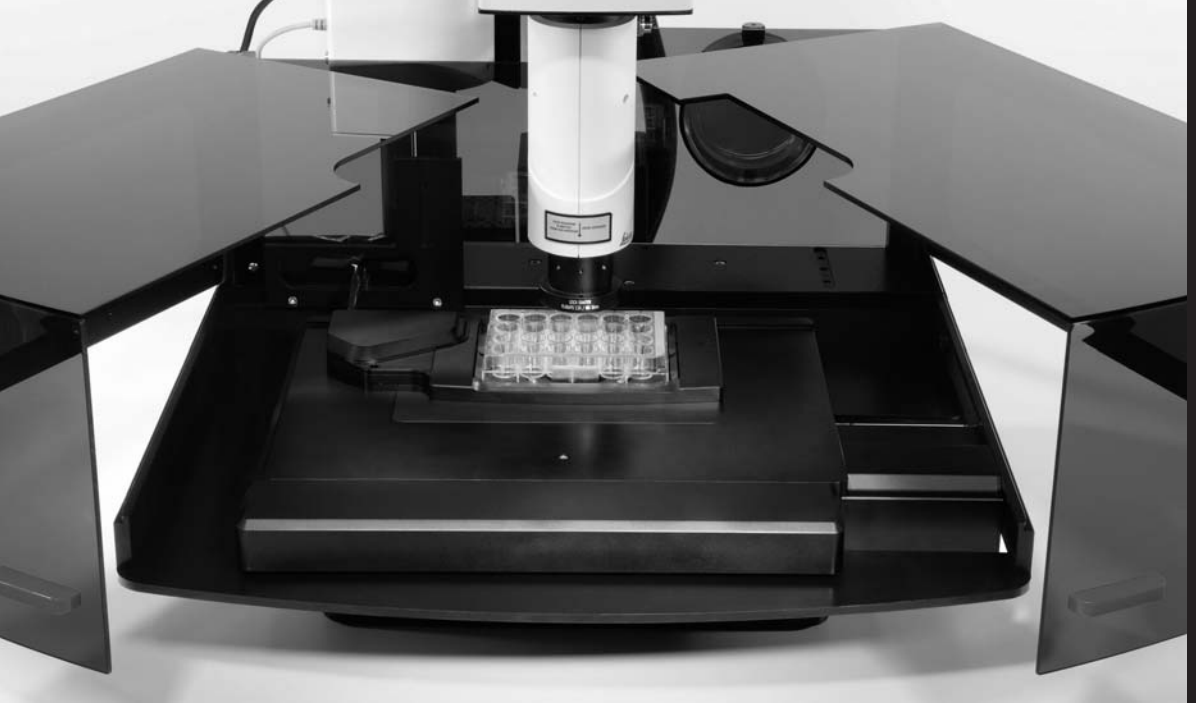


# Leica TCS LSI

**The World's First Super Zoom Confocal!**

Technical Documentation

Leica
MICROSYSTEMS

# Specifications

| | | | | |
|---|---|---|---|---|
| **Scan Head** | Scanner | Method | | true confocal |
| | | Confocal channels | | 1 |
| | | Scanner | | galvo (x,y) |
| | | Sequential scan | | yes |
| | | Channel multiplexing | | 1 – 8 sequential |
| | Resolution | Range (min – max) | [pixel] | $128^2$ – $2048^2$ |
| | | Scan formats | [pixel] | 128, 256, 512,1024, 2048 |
| | | Image depth | [bit] | 8 or 12, switchable |
| | Spectral Detection | Spectral detection | | yes |
| | | Type | | continuously variable |
| | | Spectral resolution | [nm] | 10 nm |
| | | Bandwidth | [nm] | 430 – 750 |
| | Detector | Detector | | 1 |
| | | Detector type | | ultra high dynamic PMT |
| | | Detector connection | | direct |
| | Confocal Zoom | Zoom type | | continuously variable |
| | | Zoom range | [x] | 1x – 16x |
| | | Zoom increment | | 0.1 |
| | Optical Zoom | Zoom type | | motorized/manual |
| | | Zoom range, Z16 APO/Z6 APO | [x] | 0.57 – 9.2x/0.57 – 3.6x |
| | | Zoom increment | | continuously / variable |
| | Pinhole | Pinhole type | | motorized, variable |
| | | Range (min – max) | [µm] | 35 – 600 |
| | | Pinhole adjustment | [%] | 0 – 100 |
| | | Control | | automated via GUI |
| | Beam Splitter | Type | | high performance dichroics |
| | | Beam splitter wavelenght | [nm] | 405/532; 488/635 |
| | | ND-Splitter for TLD | [%] | RT 30/70 |
| | | Beam splitter change | | automated |
| | Scan Modes | 2D: x-y, x-z, x-t | | yes |
| | | 3D: x-y-z, x-y-t, x-y-λ., x-z-y | | yes |
| | | 4D: x-y-z-t | | yes |
| | Speed | Speed mode | | uni/bi-directional |
| | | Line speed | [Hz] | 800 |
| | | Line speed range | [Hz] | 400, 600, 800 |
| | | Max@ $128^2$ | [f/s] | 6.0 |
| | | standard@ $512^2$ | [f/s] | 2.0 |
| | | Min@$2048^2$ | [f/s] | 0.36 |
| **Motorized Zooms** | Z16 APO A | Type | | Z16 APO A |
| | | Magnification range | | 0.57 – 9.2 |
| | | NA-range depending on magnification | [nA] | 0.017 – 0.112 (with Obj. 1x) |
| | | Zoom positioning | | continuously/UMC controlled |
| | | Fine focus optics | yes | motorized |
| | | Diaphragma | yes | motorized |
| | Z6 APO A | Type | | Z6 APO A |
| | | Magnification range | | 0.57 – 3,6 |
| | | NA-range depending on magnification | [nA] | 0.02 – 0.117 (with Obj. 1x) |
| | | Positioning | | continuously UMC controlled |
| | | fine focus optics | yes | motorized |
| | | Diaphragma | yes | motorized |

| | | | | |
|---|---|---|---|---|
| **Supply Unit** | Laser | Laser type | | solid state |
| | | Number of lasers | | max 4 |
| | | Laser options | [nm] | 405, 488, 532, 635 |
| | | Excitation attenuation | | AOTF |
| | | Excitation attenuation control | | automated |
| | | Range | [%] | 0 – 100 |
| | | Typ.power@Zoom 1, Obj 1x | [mW] | > 1 |
| | | Power depending on optical zoom | | yes |
| | Computer | PC integration | | yes |
| | | Processor | | Intel Pentium M |
| | | HD-size | [GB] | 120 |
| | | Operating system | | XP-embedded |
| | Interface | Ethernet | | 1 |
| | | USB | | 4 |
| | | Fire wire | | 2 |
| | | Parallel | | 1 |
| | | Serial | | 1 |
| | Mouse | Type | | optical |
| | Monitor | Monitor resolution | [Pixel] | 1280x1024 |
| | | Monitor size | | 19“ |
| | Power Supply | Power supply integration | | yes |
| | | Type | | autoselect |
| | | Voltage range | [V] | 100 – 240 |
| | | Power consumption | | 800 VA |
| **Z-Drive** | Micro | Z-focus | | Galvanometer-stage |
| | | Z-stepsize | [@500 µm range] | 10 nm |
| | | Max Z-Range | | 1500 µm |
| **Microscope** | Types | Microscope upright | | Base CSQ |
| | | Focussing drive | | motorized |
| | | Max travel range | [mm] | 150 |
| | Laser Safety Chamber | Door angle, open | [°] | 180 |
| | | Material | | lasersafe acrylic glas |
| | | Inside height from ground plate | [mm] | 180 |
| | | Depth min | [mm] | 420 |
| | | Width inside | [mm] | 555 |
| | | Heating unit connection | | yes |
| | | Heating unit connection, diameter | [mm] | 100 |
| | | Holder for micromanipulators | | integrated |
| | Transmitted light | Intensity control | | potentiometer |
| **Objectives** | Macro-Objective | Magnification | | 1x, 2x, 5x |
| | | NA | [mm] | variable |
| | | Working distance | [mm] | 97/39/19 |
| | Micro-Objectives ACS | Magnification | | 10x, 40x, 63x |
| | | NA | | 0.3; 0.8; 1.15 |
| | | Working distance | | 0.3; 0.16; 0.15 |
| **Software** | LAS AF LSI | Basic aquisition license | | system included |
| | | Life Data Mode | | optional |
| | | Colocalisation | | optional |
| | | Deconvolution | | optional |
| | | 3D-visualization | | optional |
| | | Dye Finder | | optional |
| | | Export formats | | lif, tiff, avi, jpg |
| **Environment** | Ratings | Humidity | [%] | 10 – 80 |
| | | Operating temperature | [°C] | 18 – 30 |
| | | Guaranteed stability | [°C/h] | 23 +/- 2 |

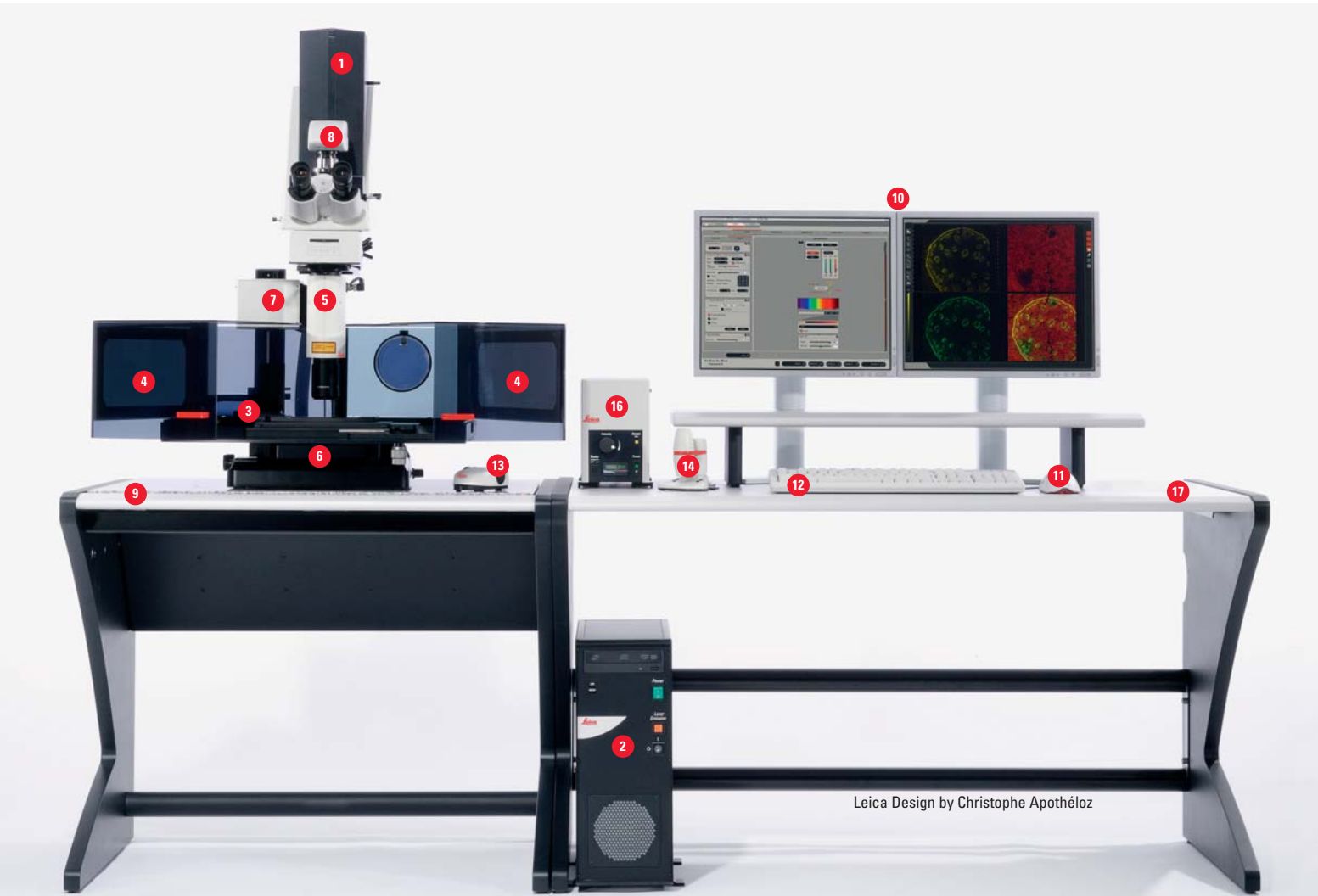
## Zoom/Objective Combinations:

Note: Conditions recommended for confocal applications = green, acceptable = light green, not recommended = white.

| Objective | | Macro | | | | | | Micro | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Zoom Type | | Z16 APO A | | | Z 6 APO A | | | Z16 APO A | | | Z 6 APO A | | |
| Objective | | 1x | 2x | 5x | 1x | 2x | 5x | 10x | 40x | 63x | 10x | 40x | 63x |
| Free Working Distance | [mm] | 97 | 39 | 19 | 97 | 39 | 19 | 0.30 | 0.16 | 0.15 | 0.30 | 0.16 | 0.15 |
| | Zoom Label | Objective Magnification Factor [x] | | | | | | Zoom Label | Objective Magnification Factor [x | | | | |
| | 0.57 | 0.7 | 1.4 | 3.5 | 0.7 | 1.4 | 3.5 | 0.57 | 3.5 | 14.1 | 22.3 | 3.5 | 14.1 | 22.3 |
| | 0.8 | 1.0 | 2.0 | 5.0 | 1.0 | 2.0 | 5.0 | 0.8 | 5.0 | 19.8 | 31.2 | 5.0 | 19.8 | 31.2 |
| | 1 | 1.2 | 2.5 | 6.2 | 1.2 | 2.5 | 6.2 | 1 | 6.2 | 24.8 | 39.1 | 6.2 | 24.8 | 39.1 |
| | 1.25 | 1.6 | 3.1 | 7.8 | 1.6 | 3.1 | 7.8 | 1.25 | 7.8 | 31.0 | 48.8 | 7.8 | 31.0 | 48.8 |
| | 1.6 | 2.0 | 4.0 | 9.9 | 2.0 | 4.0 | 9.9 | 1.6 | 9.9 | 39.7 | 62.5 | 9.9 | 39.7 | 62.5 |
| | 2 | 2.5 | 5.0 | 12.4 | 2.5 | 5.0 | 12.4 | 2 | 12.4 | 49.6 | 78.1 | 12.4 | 49.6 | 78.1 |
| | 2.5 | 3.1 | 6.2 | 15.5 | 3.1 | 6.2 | 15.5 | 2.5 | 15.5 | 62.0 | 97.7 | 15.5 | 62.0 | 97.7 |
| | 3.2 | 4.0 | 7.9 | 19.8 | 4.0 | 7.9 | 19.8 | 3.2 | 19.8 | 79.4 | 125.0 | 19.8 | 79.4 | 125.0 |
| | 3.6 | 4.5 | 8.9 | 22.3 | 4.5 | 8.9 | 22.3 | 3.6 | 22.3 | 89.3 | 140.6 | 22.3 | 89.3 | 140.6 |
| | 4.6 | 5.7 | 11.4 | 28.5 | | | | 4.6 | 28.5 | 114.1 | 179.7 | | | |
| | 5 | 6.2 | 12.4 | 31.0 | | | | 5 | 31.0 | 124.0 | 195.3 | | | |
| | 6.3 | 7.8 | 15.6 | 39.1 | | | | 6.3 | 39.1 | 156.2 | 246.1 | | | |
| | 8 | 9.9 | 19.8 | 49.6 | | | | 8 | 49.6 | 198.4 | 312.5 | | | |
| | 9.23 | 11.4 | 22.9 | 57.2 | | | | 9.23 | 57.2 | 228.9 | 360.5 | | | |
| | | Field of View [mm] | | | | | | | Field of View [mm] | | | | | |
| | 0.57 | 22.0 | 11.0 | 4.4 | 22.0 | 11.0 | 4.4 | 0.57 | 4.40 | 1.10 | 0.70 | 4.40 | 1.10 | 0.70 |
| | 0.8 | 15.7 | 7.8 | 3.1 | 15.7 | 7.84 | 3.14 | 0.8 | 3.14 | 0.78 | 0.50 | 3.14 | 0.78 | 0.50 |
| | 1 | 12.5 | 6.3 | 2.5 | 12.5 | 6.27 | 2.51 | 1 | 2.51 | 0.63 | 0.40 | 2.51 | 0.63 | 0.40 |
| | 1.25 | 10.0 | 5.0 | 2.0 | 10.0 | 5.02 | 2.01 | 1.25 | 2.01 | 0.50 | 0.32 | 2.01 | 0.50 | 0.32 |
| | 1.6 | 7.8 | 3.9 | 1.6 | 7.8 | 3.92 | 1.57 | 1.6 | 1.57 | 0.39 | 0.25 | 1.57 | 0.39 | 0.25 |
| | 2 | 6.3 | 3.1 | 1.3 | 6.3 | 3.14 | 1.25 | 2 | 1.25 | 0.31 | 0.20 | 1.25 | 0.31 | 0.20 |
| | 2.5 | 5.0 | 2.5 | 1.0 | 5.0 | 2.51 | 1.00 | 2.5 | 1.00 | 0.25 | 0.16 | 1.00 | 0.25 | 0.16 |
| | 3.2 | 3.9 | 2.0 | 0.8 | 3.9 | 1.96 | 0.78 | 3.2 | 0.78 | 0.20 | 0.12 | 0.78 | 0.20 | 0.12 |
| | 3.6 | 3.5 | 1.7 | 0.7 | 3.5 | 1.74 | 0.70 | 3.6 | 0.70 | 0.17 | 0.11 | 0.70 | 0.17 | 0.11 |
| | 4.6 | 2.7 | 1.4 | 0.5 | | | | 4.6 | 0.55 | 0.14 | 0.09 | | | |
| | 5 | 2.5 | 1.3 | 0.5 | | | | 5 | 0.50 | 0.13 | 0.08 | | | |
| | 6.3 | 2.0 | 1.0 | 0.4 | | | | 6.3 | 0.40 | 0.10 | 0.06 | | | |
| | 8 | 1.6 | 0.8 | 0.3 | | | | 8 | 0.31 | 0.08 | 0.05 | | | |
| | 9.23 | 1.4 | 0.7 | 0.3 | | | | 9.23 | 0.27 | 0.07 | 0.04 | | | |

Please note: an increase of NA and resolution is achieved up to zoom value 6.3.


1 Confocal scanhead
2 Supply unit
3 Laser safety chamber
4 Wing doors
5 Z-zoom, motorized
6 SuperZ Galvo stage
7 Motor focus drive
8 DFC camera option
9 Anti-vibration table, passive
10 Monitors
11 Mouse
12 Keyboard
13 UMC control
14 XY-stage control
15 Heat pipe adapter
16 EL6000 fluorescence
Ilumination
17 Computer table

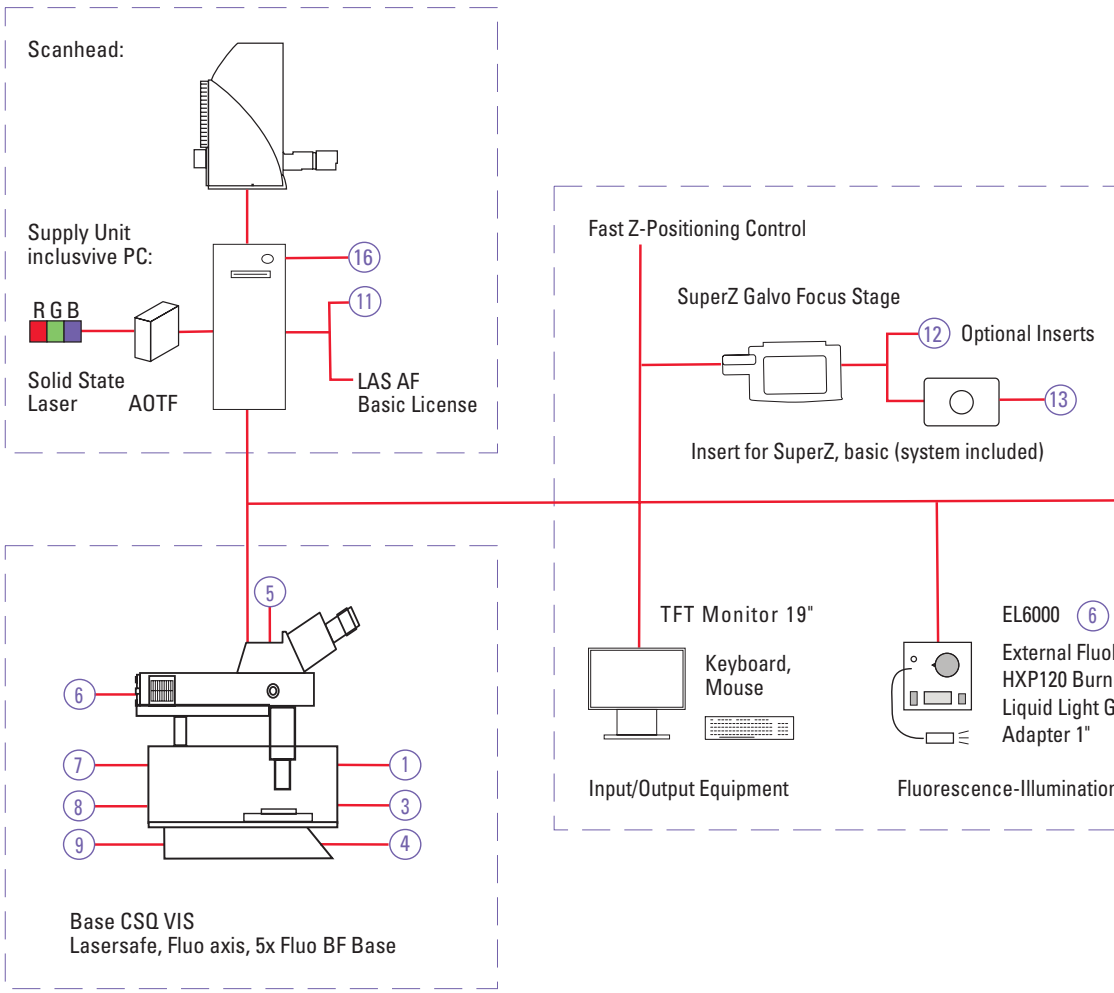



Leica Design by Christophe Apothéloz

# System Overview Leica TCS LSI

Solid State Laser:

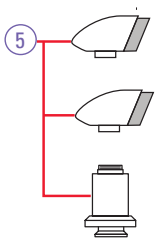
- R: SS 10 mW 635 nm
- G: SS 10 mW 532 nm
- B: SS 10 mW 488 nm
- V: SS 10 mW 405 nm




**15 6901 101** Leica TCS LSI with Base CSQ VIS

## Additional options:

### Digital Camera Kit:



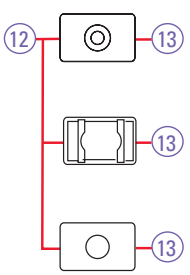

**12 7300 42**
Leica DFC300 FX

**12 7300 43**
Leica DFC350 FX[1]

**15 6905 300**
LSI Camera Kit
for DFC300/350,
Including:
Software,
C-Mount Adapter 1x, Cable

1) 04/2008: DFC 360 FX

### SuperZ Galvo Stage Inserts:




**15 6604 410**
Stage Insert for SuperZ,
rotatable

**15 5935 411**
Stage Insert for SuperZ,
universal

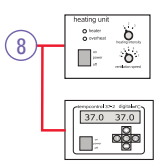
**15 6604 412**
Stage Insert for SuperZ,
basic (system included)

### 13 Plate Inserts:

**15 6604 420** Plate Insert - Microtiter Plate
**15 6604 421** Plate Insert - Willco Dish 35 mm
**15 6604 422** Plate Insert - Willco Dish 50 mm
**15 6604 423** Plate Insert - MatTek Dish 35 mm
**15 6604 424** Plate Insert - Petri Dish 36 mm
**15 6604 425** Plate Insert - Petri Dish 39 mm

### Climate Control:

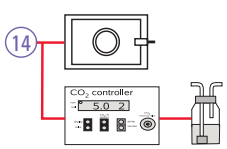
**15 6905 400** Leica LSI Climate Kit




Including Tubing,
Sensor
Heating Control Unit

Including
Temp Control Unit

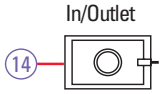
**15 6905 600**
TCS LSI CO2-Control Set 110V/230V



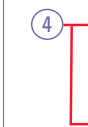

Including:
SuperZ-$CO_2$-Cover

$CO_2$-Controller,
Humidifier

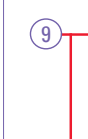
**15 6905 602**
Universal Gas Cover for SuperZ with
In/Outlet

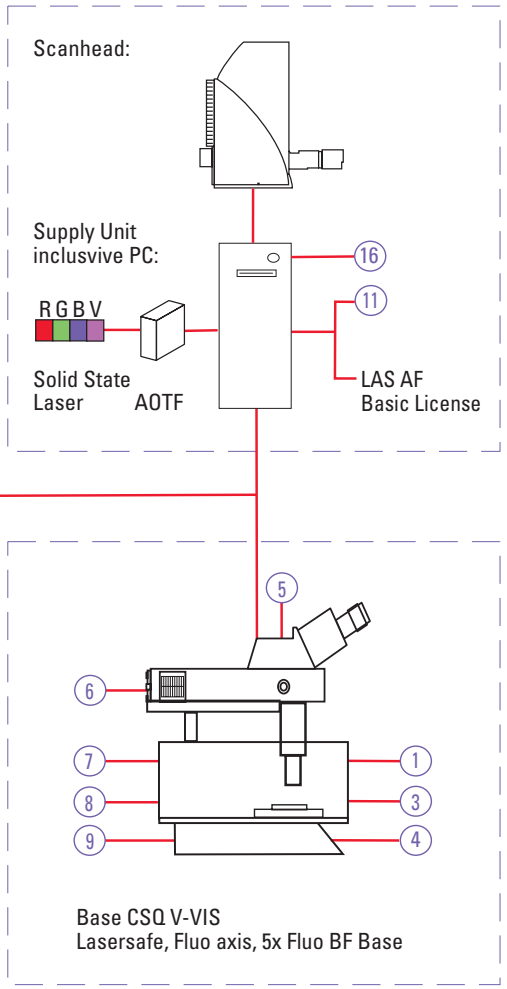



### Man




### Tables




**15 6901 110** Leica TCS LSI with Base CSQ V-VIS

## Zoom-Optics:

1 — 2
- **15 6904 602** Zoom 6x APO motorized Kit
- **15 6904 603** Zoom 16x APO motorized Kit

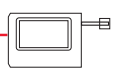
## Macro-Objectives for Zoom Optics

2
- **15 6904 610** Plan APO 1x Objective
- **15 6904 611** Plan APO 2x Objective
- **15 6904 612** Plan APO 5x Objective
- **15 6904 620** Objective Zoom Adapter — 15

## Micro-Objectives for Z16 APO (A)

15
- **15 6904 630** 10x Objective
- **15 6904 631** 40x Objective
- **15 6904 632** 63x W Objective
- **156904633** 63x Oil Objective

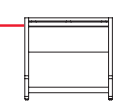
## ual XY-Stage Kits:



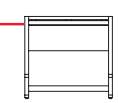
**15 6905 210**
ISO pro Stage manual Kit incl. Cover and Z-adapter

**15 6905 211**
LSI 3-Plate manual Stage Kit incl. Cover

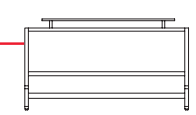
## s:



**15 6906 100**
Microscope Table LSI, passive



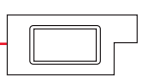
**156906102**
Microscope Table LSI, active



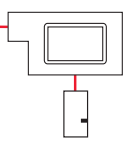
**15 6906 101**
Computer Table

## Motorized XY-Stage Kits:

4

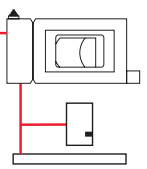


**15 6905 200**
ISO pro Stage mot. Kit with Drive Control, Joy Stick and Z-adapter



**15 6905 201**
LSI 3-Plate mot. Kit

Including
CTR 6500 Drive Control,
Cover Plate



**15 6905 202**
LSI mot. Scanning Stage Kit[2]

Including
CTR 6500 Drive Control
Base Adapters

## Software LAS AF - TCS LSI

11
- **15 69 02 202** LAS AF LSI Life Data Mode
- **15 6902 203** LAS AF LSI Co-Localization
- **15 6902 204** LAS AF LSI Deconvolution
- **15 6902 205** LAS AF LSI 3D Visualization
- **15 6902 208** LAS AF LSI Dye Finder
- **15 6902 211** LAS AF LSI Camera Advanced

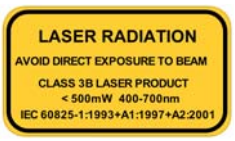
## Monitor-Option

16
- **15 6905 700** Second 19"-TFT Monitor

2) 06/2008

# Room Requirements

visible radiation:




| | | | |
|---|---|---|---|
| **Power Supply:** | Power supply integration | | yes |
| | Type | | autoselect |
| | Voltage range | [V] | 100 – 240 |
| | Power consumption | [VA] | 800 |
| | Independent circuits | [no.] | 1 |
| | Frequency | [Hz] | 50/60 |
| | Fuse: standard | [A] | 10 |

**Note**: The optimal optical performance can only be achieved on stable room floors. Concrete floors are required. Other like e.g. wooden floors are not suitable.

| | | | |
|---|---|---|---|
| **Environment** | Humidity | [%] | 10 – 80 |
| | Operating temperature | [°C] | 18 – 30 |
| | Guaranteed stability | | 23°C +/ – 2°C |
| **Load Capacity and Weight** | Confocal unit, max. | [kg] | 75 |
| | Microscope, max. | [kg] | 45 |
| | System | [kg] | 90 |
| | Static floor load | [kg/m$^2$] | 200 |