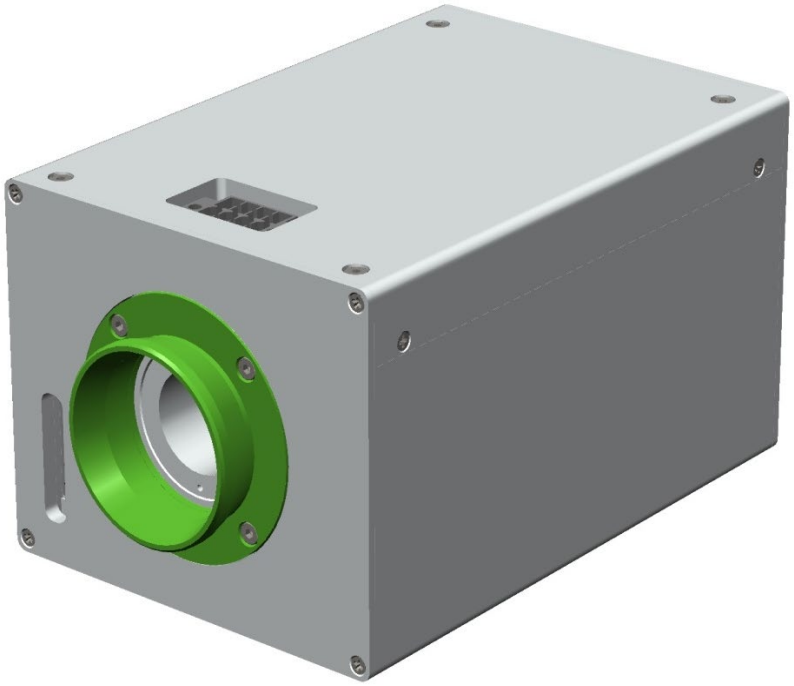
Fetura+

ADVANCED ZOOM IMAGING SYSTEM



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This document outlines the installation (and use) of the Fetura+ Advanced Zoom Imaging System 4401-592-000-22.

The Fetura+ Advanced Zoom Imaging System is a flexible platform for high speed / high reliability machine vision applications. The Fetura+ provides precise and accurate centration and magnification repeatability over an extended lifetime at a speed that is up to 10X faster than conventional cam-driven zoom lenses.

The system provides the ability to magnify a point of interest to capture fine detail, without changing optics or refocusing. Fetura+ is engineered to meet the needs of today's most demanding micro and macro-vision applications.

Effective utilization of every pixel in a vision system maximizes image clarity and yields the most accurate reproduction of the object of interest. Fetura+'s magnification range of 12.5:1 enables today's high resolution imaging systems to achieve image clarity for fields-of-view ranging from a few microns to several millimeters.

Fetura+ is fully compatible with the Optem FUSION micro-imaging platform and works together with common still and video camera components. The system is controlled using a simple serial communication protocol that permits the use of pre-programmed magnification settings and easy changeover of task setups.

Dev. Guide	Firmware	Changes
4401-592-411-00a	0.1	New Version for Fetura+ 4401-592-000-21 – **not** compatible with 4401-572-000-20 or 4401-563-000-20/21 Version. ATTENTION: the features "CZM" and "Joystick" are still under test and are not fully qualified! Please contact Excelitas for further information if necessary.
4401-592-411-00b	0.4	Updated Version for Fetura+ 4401-592-000-22

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1. Unpacking

The Fetura+ Advanced Zoom Imaging System is securely shipped in a form-fitting foam lined container. Upon receipt, examine the contents for damage that may have occurred during shipment. All packaging should be retained until assembly is complete and any hidden damage is revealed. If damage has occurred, contact the carrier immediately. The warranty provided by Excelitas specifically excludes damage resulting from shipment.

Carefully open the container(s). Because of the large variety of system configurations available for the Fetura+ Advanced Zoom Imaging Platform, it is essential that the items shipped correspond with the packing list enclosed with your purchase order. Verify that your order is complete and contact your Fetura+ reseller if the contents of the package do not match the purchase order.

1.1. Waste of Electrical and Electronic Equipment (WEEE)

This symbol on the product or on its packaging indicates that this product must not be disposed of with your other household waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help to conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city office, your household waste disposal service or the vendor where you purchased the product.

1.2 Fetura+ Tampering (voids Warranty)

Fetura+ is equipped with devices that will indicate if the metal cover has been opened or any screws have been purposefully loosened.

Evidence of any tampering with the Fetura+ hardware will void the product warranty and may result in partial or complete performance degradation of the product.

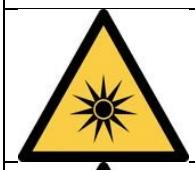
2. Safety / Symbol Definition Installation

The Fetura+ is only shipped with a connector which corresponds to its interface plug.

Therefore, a universal switch mode power supply with the following characteristics is needed:

- Voltage: 16-36 VDC
- Current: min. 2A

Only use power supplies which carries the UL (US & CANADA), GS (GERMAN) and CE (EU) safety compliance marks indicating that the power supply has been tested by an accredited third party.

	DO NOT OPERATE THE FETURA PRODUCT WITH A POWER SUPPLY WHICH DOESN'T MEET THE ABOVE SPECIFICATIONS. SAFE OPERATION OF THE FETURA+ IS NOT GUARANTEED WITH POWER SUPPLIES OUTSIDE THE OPERATION PARAMETERS. THE FETURA+ WARRANTY IS VOID IF A POWER SUPPLY MISSMATCH HAS BEEN MADE. THE MANUFACTURER IS NOT LIABLE FOR ANY DAMAGES INCURRED DUE TO THE USAGE OF WRONG POWER SUPPLIS.
	DEPENDING ON YOUR APPLICATION LIGHT MIGHT BE INTRODUCED INTO THE FETURA+. DO NEVER LOOK INTO THE OPTICAL SYSTEM AS THIS MAY HARM YOUR EYES.
	THE FETURA PLUS IS NOT DESIGNED FOR LASER APPLICATION AND THEREFORE MUST NOT BE USED IN ONE.

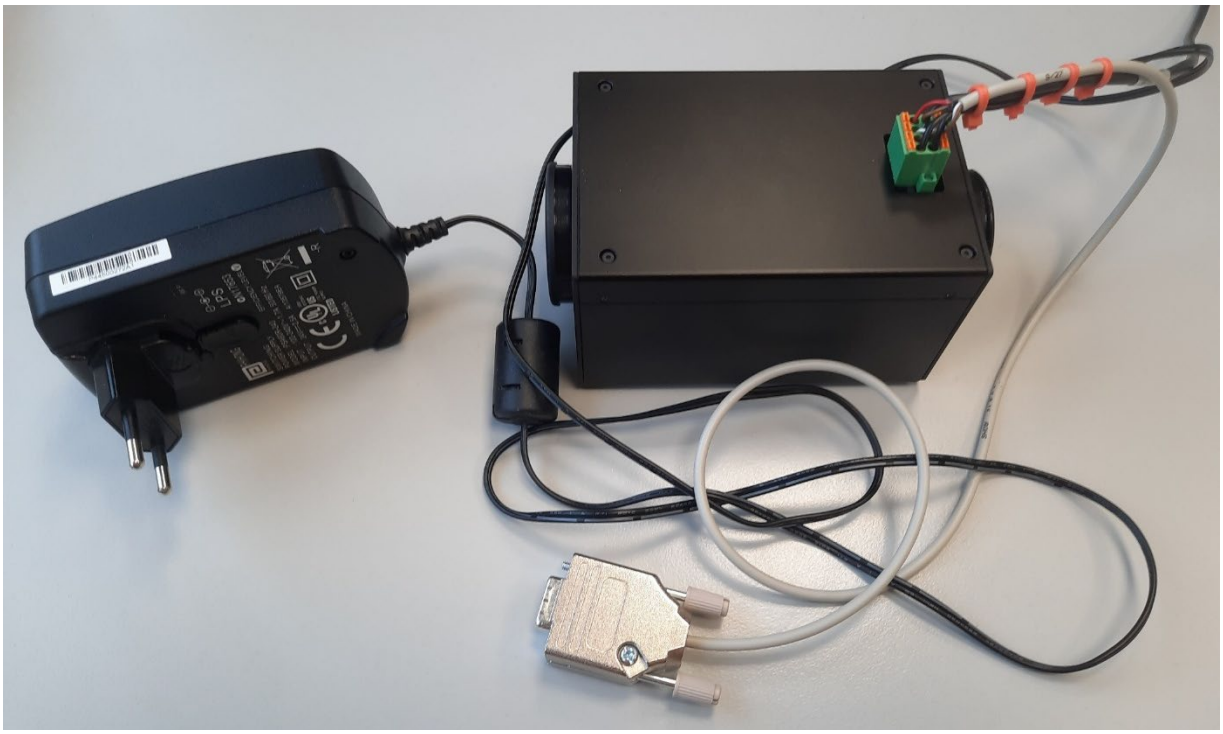
3. Safety / Symbol Definition Installation

To set up the Fetura+ System, you will need the following hardware and documentation listed and pictured below:

3.1. Safety / Symbol Definition Installation

1. Fetura+ Zoom System
2. Phoenix Interface Connector
3. Universal Switch Mode Power Supply
4. RS232 Communication Cable

Example Assembly of the Fetura+ Zoom Imaging using Standard Components:

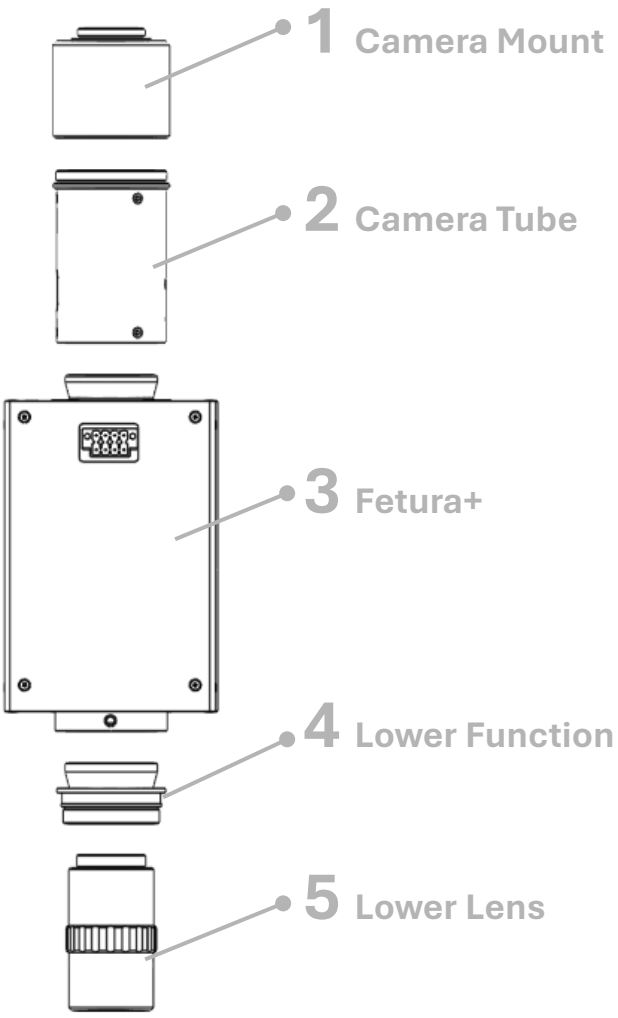


3.2. Fetura+ System Integration

The Fetura+ Advanced Zoom Imaging System integrates with a variety of camera systems via a “C”, “CS”, “F”, “EOS” or “4/” mount coupler. The Fetura+ system can be configured with camera tubes, “fine-focus” modules, illumination systems, and auxiliary lenses that are part of the Optem FUSION product portfolio. Contact your Fetura+reseller to determine what components are optimal for your specific vision system application.

3.3. Fetura+ Setup

The Fetura+ is an optional afocal zoom module that is part of the Optem FUSION Modular Lens System. The Optem FUSION System is an infinity corrected system and requires the selection of five modules to form a functioning imaging system. To build a functioning micro-inspection system with Fetura+, the five required modules are shown below.



For more information, please refer to the **OPTEM® Fusion Specifiers' Guide** available on excelitas.com.

3.4. Illumination Options

Excelitas supplies a variety of **Illumination Systems** which are an optimal addition to the Fetura+.

For more information, please refer to the **OPTEM® Fusion Specifiers' Guide** available on excelitas.com.

OPTEM® FUSION Visible/SWIR Component Matrix

ACCESSORIES

35-07-01-000 50/50 Cube

35-07-00-000 Mirror Cube

35-07-02-000 Mirror Cube Adapter

Note: 35-07-11 uses 65mm working distance. When used below lower lens. Use this combination when placing right Angle below system. Remove dovetail to increase working distance.

35-07-11-000 Inline Mount

35-07-21-000 25.4mm Filter Holder

35-07-20-000 Aperture Set

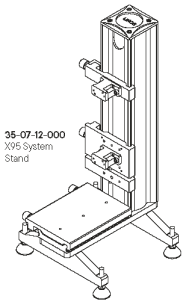
NOTE: Not every combination will present desired results.

35-07-25-000 Adjustable Iris

35-07-04-000 Fluoresence Cube Holder Upper (Note: uses Zeiss type 91029 cube)

35-03-50-000 Tunable Lens Focus Module (Note: attach directly above Lower function module only)

ACCESSORIES



35-07-12-000 X95 System Stand

35-07-10-000 Camera Tube Clamp

35-07-14-000 Tube Clamp Mount, 76mm Dia.

35-07-15-000 Tube Clamp Mount, 82mm Dia.

35-07-16-000 Tube Clamp Mount, 83mm Dia.

35-07-17-000 Tube Clamp Mount, 84mm Dia.

CAMERA

CAMERA MOUNTS

25-60-23-000 EOS Camera Mount

25-60-24-000 F Camera Mount

35-08-70-000 C \ CS Camera Mount

25-60-26-000 4/3 Camera Mount

25-60-27-000 Micro 4/3 Camera Mount

25-60-28-000 Sony Alpha Camera Mount

25-60-29-000 Pentax K Camera Mount

CAMERA TUBES

35-08-00-000 Camera Tube 0.4x \ 80 FL

35-08-01-000 Camera Tube 0.5x \ 100 FL

35-08-02-000 Camera Tube 0.6x \ 120 FL

35-08-04-000 Camera Tube 0.8x \ 160 FL

35-08-11-000 Mini Camera Tube 0.8x \ 160 FL

35-08-06-000 Camera Tube 1x \ 200 FL

MINI CAMERA TUBES

35-08-12-000 Mini Camera Tube 1x \ 200 FL

35-08-13-000 Mini Camera Tube 1.5x \ 300 FL

35-08-14-000 Mini Camera Tube 2x \ 400 FL

35-08-15-000 Mini Camera Tube 2.5x \ 500 FL

35-08-16-000 Mini Camera Tube 3x \ 600 FL

ACCESSORIES

FIXED MAGNIFICATION

7:1 Zoom

35-31-10-000 7:1 Zoom Manual

35-31-40-000 7:1 Zoom Manual Detent

35-31-60-000 7:1 Zoom Stepper Motorized

35-07-20-000 Aperture Set Required For Fixed Magnification Systems

12.5:1 Zoom

35-41-10-000 12.5:1 Zoom Manual

35-41-40-000 12.5:1 Zoom Manual Detent

35-41-60-000 12.5:1 Zoom Stepper Motorized

4401-592-000-22 Fetura+ 12.5:1 Zoom (Self-Controlled)

A CONTROL

ACCESSORIES

A CONTROL

LOWER FUNCTION MODULES

35-03-10-000 15mm Focus Manual

35-07-03-000 Fluoresent Cube Holder Lower

Note: Uses ZEISS Type 91029 cube. Use with 35-01-00-000 Basic Lower Function Module recommended.

35-01-00-000 Basic

35-04-00-000 Coax Illumination

35-04-03-000 Coax Illumination With Analyzer

35-04-10-000 Coax Illumination 5mm Focus Manual

35-04-13-000 Coax Illumination 5mm Focus Manual W/Analyzer

35-04-40-000 Coaxial Illumination 10mm Focus Stepper Motorized

ILLUMINATION

ILLUMINATION

ILLUMINATION

B CONTROL

35-00-03-000 2X \ 100 FL

42-35-41-000 Infinity Macro Lens

LOWER LENSES

ACCESSORIES

ILLUMINATION

35-00-11-000 0.4X \ 500 FL

35-00-10-000 0.5X \ 400 FL

35-00-09-000 0.67X \ 300 FL

35-00-08-000 1X \ 200 FL

35-00-06-000 1.25X \ 160 FL

35-00-05-000 1.43X \ 140 FL

35-00-04-000 1.67X \ 120 FL

35-00-03-000 2X \ 100 FL

35-00-01-000 3X \ 67 FL

35-00-02-000 4X \ 50 FL

NOTE: Coax Illumination has limited field illumination with large FOVs.

ILLUMINATION

LIGHTING ACCESSORIES

35-07-60-000 1.5A High Power LED

35-07-61-000 3.0A Ultra High Power LED

A CONTROL

29-69-02-000 Polarizer

29-69-13-000 Led Coax Right Angle

30-16-02-000 Fiber Optic Lamphouse

30-16-01-000 10mm Fiber Optic Adapter

30-16-60-000 60" Flexible Fiber Optic

COAX

OBLIQUE

29-60-83-000 110V Halogen Illuminator

29-60-84-000 220V Halogen Illuminator

ACCESSORIES

29-69-21-000 53mm O.D. Ring Light Adapter

35-07-40-000 65mm O.D. Ring Light Adapter

A CONTROL

35-05-50-000 System Controller

30-17-37-000 (N. Amer Cord)

30-17-36-000 (Euro Cord)

350550-803 24V Power Supply

30-17-33-000 (Uk Cord)

BB-284031-01 Power/Comms Cable

30-17-03-000 Objective Adapter

30-16-50-000 Objective Ringlight 40 Inches

LWD OBJECTIVES

28-21-02-001 2X M PLAN APO

28-21-05-001 5X M PLAN APO

28-21-10-000 10X M PLAN APO

28-21-11-001 20X M PLAN APO

28-21-50-001 50X M PLAN APO

28-20-44-000 5X HI-RES

28-20-45-000 10X HI-RES

28-20-46-000 20X HI-RES

Certain limitations apply with Hi-Res Objectives. See brochure for details.

NOTE:

- Products listed in **RED TYPE** indicate **SWIR** version available.
- For ordering purposes, VISIBLE components are identified by a "35" prefix, while **SWIR** components use a **"45"** e.g. 35-XX-XX-XXX VISIBLE, and **45**-YY-YY-YYY **SWIR**
- All "35-XX" modules are compatible with one another; and all "**45**-YY" modules are compatible with one another.
- Using "35-XX" and "**45**-YY" modules with one another is not recommended.
- Non-optics mounts/modules are cross-compatible between VISIBLE and **SWIR**

REV: 10-25

4. Installation

This section explains and illustrates how to set up your Fetura+ Advanced Zoom Imaging System with your camera and computer using standard components that are illustrated in the **OPTEM® Fusion Specifiers' Guide** that can be found on the Excelitas website.

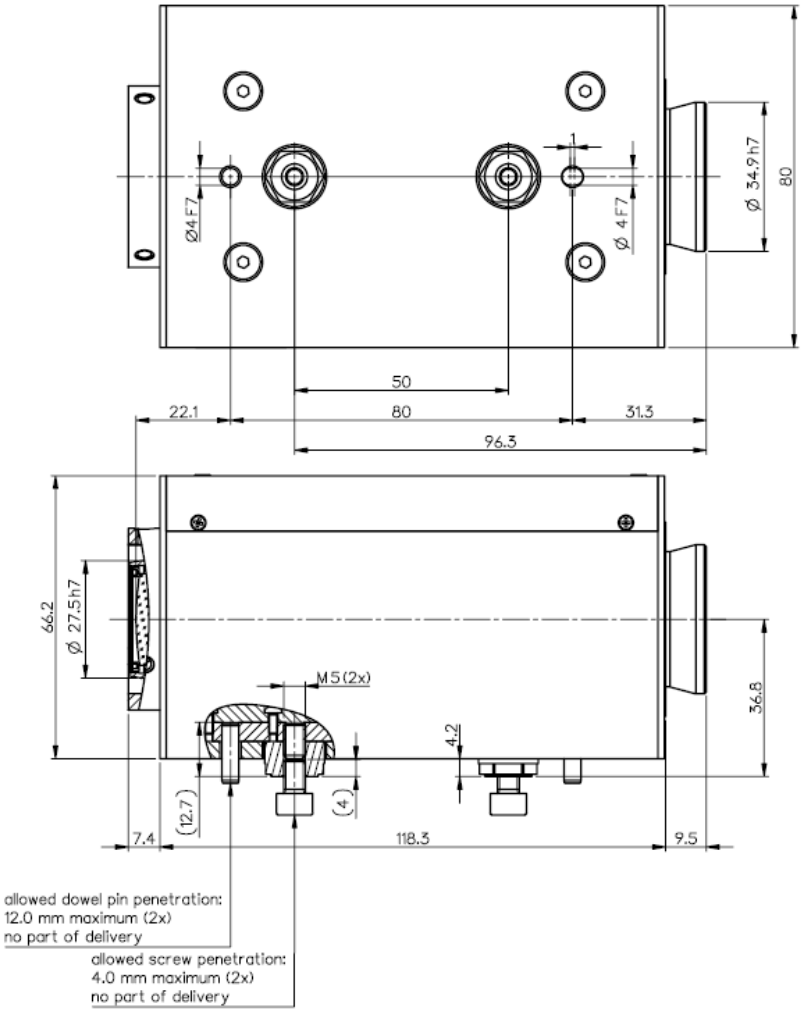
4.1. Mounting

4.1.1. Option 1: Fetura+ Bottom Mounting Holes

The Fetura+ has 2 mounting holes located on the back of the unit that can be used for system mounting flexibility. The M5 screw holes are 50mm apart in the horizontal direction with a maximal allowed penetration length of 4mm. Additionally there are 2 dowel pins with a maximum allowed length of 12mm. The distance between is 80mm.

Mounting to the Fetura+ back cover provides the most stable system setup.

The back cover mounting holes should be used for applications requiring optical stability.



4.1.2. Option 2: Camera Tube Mounting Clamps

Excelitas supplies mounting rings for clamping onto dovetail tubes for many standard microscope stands. Place the camera Tube through the clamp before threading it onto the Fetura+ unit.

4.2. Assembly

Ensure that the support system for the Fetura+ mount has adequate length to provide the working distance required by the lens assembly as shown in the Optical Performance Charts inside the **OPTEM® Fusion Specifiers' Guide**. Lower lenses can be integrated at the bottom of the system to modify magnification or working distance.

All completed assemblies will require the following components:

1. Camera Mount
2. Camera Tube
3. Fetura+
4. Lower Function Module
5. Lower Lens/Objective Lens

4.2.1. Mount the Lower Function Module Below the Fetura+ Unit

Mount the Lower Function Module below the Fetura+ unit using the 3 set screws.

4.2.2. – Add Lower Lenses or Objectives

Lower Lenses all feature M25x0.75 mounting threads and can be threaded directly into the internal mating thread at the end of the Lower Function Modules. Here, the lens moves with the focusing unit, if so equipped, and the magnification remains constant with focus.

Alternatively, microscope objectives can be threaded into the appropriate adapter and then subsequently threaded into the lower function modules to further increase magnification and imaging performance.

4.2.3. Camera Tube / Camera Assembly

The camera mount itself is threaded onto a T-mount thread on the camera tube. There are three set screws that tighten onto a dovetail of the camera tube with clearance between itself and the outside of the dovetail of the camera Tube. The clearance permits centering the camera to the zoom axis by manipulating the set screws. When the set screws are loose, the camera may be rotated to properly orient the image on the monitor.

Loosen the 3 set screws at the lower end of the camera tube and mount the camera tube onto the Fetura+.

4.3. Add the Illumination System

Add a corresponding illumination system to the Fetura+ Advanced Zoom Imaging System.

Suitable components and adapters can be found in the **OPTEM® Fusion Specifiers' Guide** or on the Excelitas website.

4.4. Mounting the Optical System

Note: The Optical System Assembly includes:

1. Camera Mount
2. Camera Tube
3. Fetura+
4. Lower Function Module
5. Lower Lens/Objective Lens

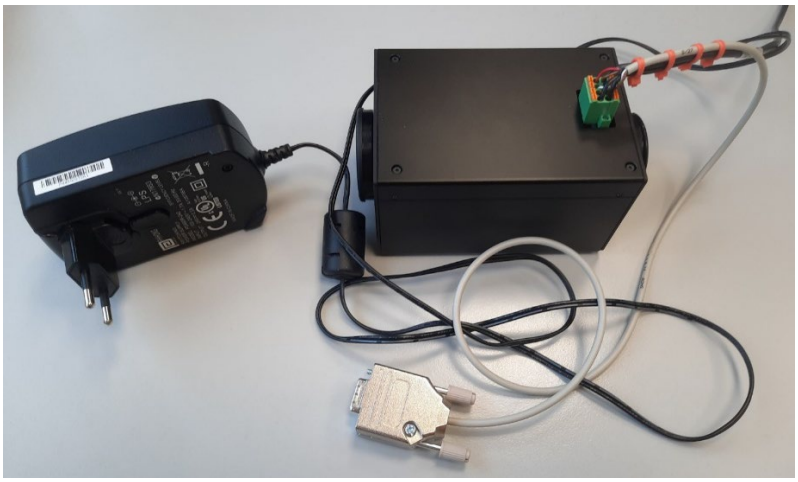
4.4.1. Mounting Using Fetura+ Back Mounting Holes

Mount the Fetura+ to a suitable surface for the application using the two 50mm spaced M5 screws. In addition, the two 80mm spaced dowel pins can be utilized for additional stability.

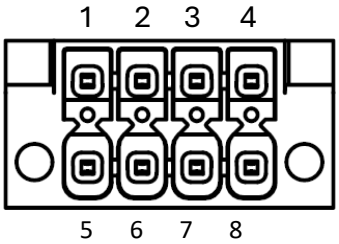
4.4.2. Mounting Using Mounting Clamps

Insert the camera tube through the tube clamp before mounting it onto the Fetura+ unit. Zoom to high magnification and slide the entire system through the clamp until reasonable focus is achieved. Finally, lock the clamp.

5. Fetura+ Power and Serial Connections



Connector (female), unit side:



1: Power: V_in (16-36 VDC / 2A)
2: Communication: Rx
3: Communication: Tx
4: Joystick: +5V out
5: Power: GND
6: Communication: GND
7: Joystick: GND
8: Joystick: Reference in

5.1. Power

The Fetura+ operates at a voltage of 16 to 36VDC, with a minimum current of 2A. A universal input switched mode power supply is needed to convert an AC mains input of 100 to 240 VAC at 47 to 63Hz to the required voltage range

Connect the output of the power supply to the Fetura+ shipped connector.

A green led will light up on the outside of the Fetura+ unit when power is applied.

Only use power supplies which carries the UL (US & CANADA), GS (GERMANY) and CE (EU) safety compliance marks indicating that the power supply has been tested by an accredited third party.

	DO NOT OPERATE THE FETURA PRODUCT WITH A POWER SUPPLY WHICH DOESN'T MEET THE ABOVE SPECIFICATIONS. SAFE OPERATION OF THE FETURA+ IS NOT GUARANTEED WITH POWER SUPPLIES OUTSIDE THE OPERATION PARAMETERS. THE FETURA+ WARRANTY IS VOID IF A POWER SUPPLY MISSMATCH HAS BEEN MADE. THE MANUFACTURER IS NOT LIABLE FOR ANY DAMAGES INCURRED DUE TO THE USAGE OF WRONG POWER SUPPLIES.

5.2. Serial Communication

To use the Fetura+ Serial Communications Interface (SCI), a processor capable of generating serial commands such as a PC or a microcontroller must be connected to the external connector on Fetura+.

The pin assignment is illustrated above.

The interface settings below:

Fetura+ Serial COM Port Settings

Baudrate	9600
Data bits	8
Parity	None
Stop bits	2
Flow control	None

PCs which don’t have any RS232 interface should use an USB to RS232 adapter for communication.

6. Fetura+ Operation

The Fetura+ product is a serial peripheral device that communicates with the host PC via an RS232 interface. The Fetura+ Serial Command Interface (SCI) is a serial protocol that allows users to control Fetura+'s zoom position and monitor status messages through its external serial port.

Fetura+ requires the configuration of the serial port settings (baud rate, parity, data bits, stop bits, and flow control) described in the chapter above.

6.1. Parfocalizing Fetura+

Parfocalizing is the process of maintaining focus when zooming from high magnification to low magnification.

Set the working distance (from the front of the lens to the object) for best focus at high magnification. Then, without changing this distance, set the zoom to low magnification and adjust the back focus distance via the lens group slider located on the camera tube until the image is sharp.

This procedure may have to be repeated until optimal results are achieved.

6.2. Parcentering The Fetura+ Image

To keep an object centered in the field-of-view as the Fetura+ system is zoomed, it is necessary to align the optical zoom center at the center of the camera.

Adjust the position of an object at high magnification such that it is centered on the camera. Then, zoom to low magnification and center the same object by adjusting the "C" mount collar on the TV tube with the 3 set screws.

This procedure may have to be repeated for optimal results.

6.3. Application Software

A demo software for controlling the Fetura+ Advanced Zoom Imaging System is available and was created using the Windows™-based LabView developer environment. Please visit excelitas.com to download the software.

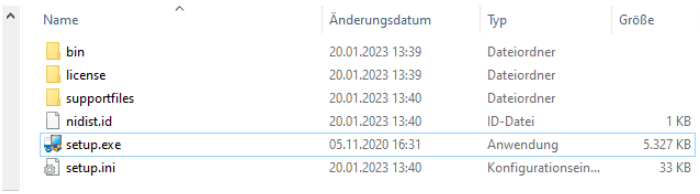
Following a successful serial connection to the hardware, the lenses can be commanded to the desired position following hardware initialization.

The software can identify the connected Fetura+. The status can be monitored and several settings can be modified.

Depending on the firmware version different functionalities are available and activated.

6.3.1. Installing the Software

Open the folder in which the software is located, run the Setup file and follow the on-screen instructions.



6.3.2. Calling the Program

Call the program from the Windows Start menu or using the Windows Explorer.

6.3.3. COM Port Settings

Follow these steps to select the COM port to which the Fetura+ is connected.

You are able to switch ports during operation.

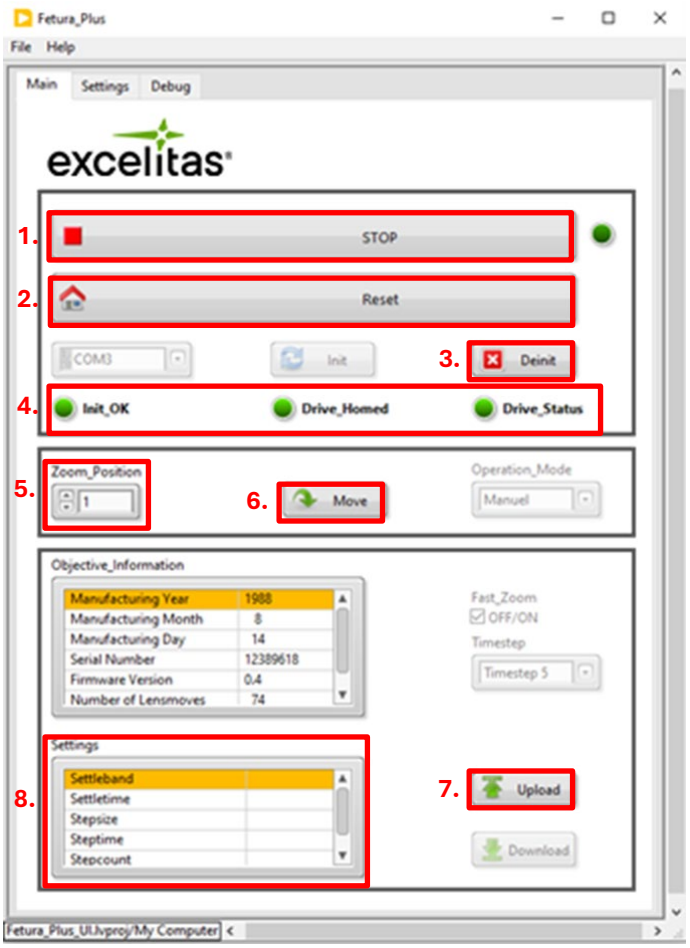
When you use an USB to RS232 adapter for communication, a driver creates a virtual COM port. If you are prompted to specify a driver, stop the setup program and install or select the corresponding one. Once installation has been completed, reconnect the Fetura+ and select the new COM port.

All available interfaces are shown in the drop-down menu. Make sure the Fetura+ can be addressed over the selected port. The default baud rate of 9600 is programmed in the controllers. Then press the ‘Init’ Button.

When communication is established, the ‘Objective Information’ of the corresponding Fetura+ are displayed.

6.3.4. Initializing with the Software

Additional to the ‘Objective Information’ three further LEDs become available which indicates the Status for ‘Initialization’, ‘Homing’ and the ‘Movement’.



1. **‘Stop’:**
   This Button deinitializes the communication to the Fetura+ and terminates the program.
   The window is closed, too.

2. **‘Reset’:**
   In order to reset the device this function can be used. When the reset command has been sent the Fetura+ does a reinit and a homing sequence of both axes. The last action is to go to Magposition 1.

3. **‘Deinit’:**
   For canceling the communication without terminating the program this control can be used. After that the opportunity exists to change the Com Port and to reestablish a new connection.

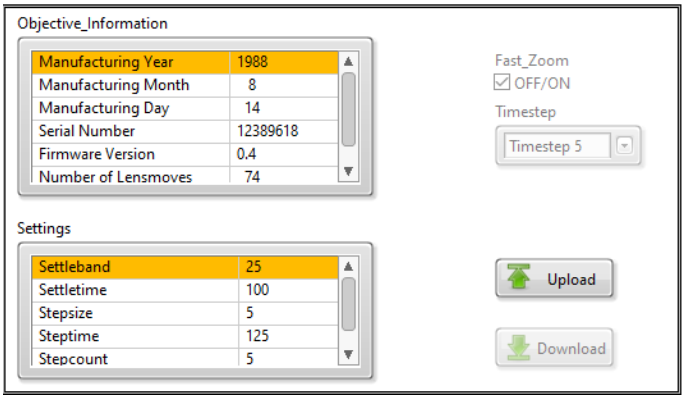
4. **‘Status LEDs’:**
   These LEDs can have two colors. Green for everything *‘OK / Ready’* and Red for *‘NOK / Busy’*.

5. **‘Zoom Position’:**
   Here values between 1 and 1000 can be selected. These values correspond to magnification 0,52 to 6,5.

6. **‘Move’:**
   Action Trigger to start the move lens.

7. **‘Upload’:**
   Read out of current settings configured in the Fetura+.

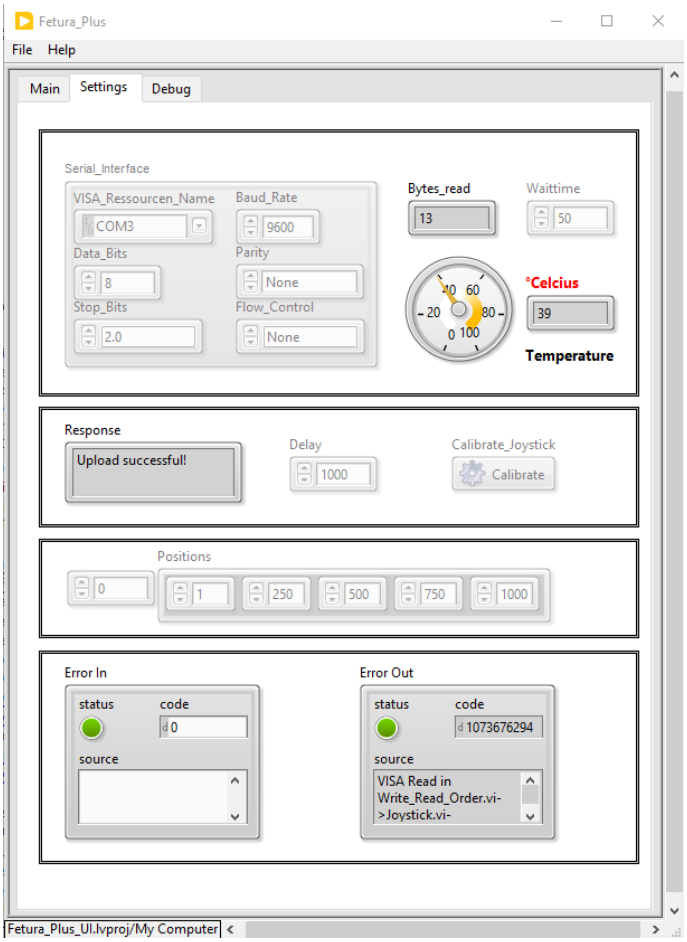
8. **‘Settings’:**
   Table with listed values for the parameters ‘Settleband’, ‘Settletime’, ‘Stepsize’, ‘Steptime’ and ‘Stepcount’.



The tabulator called **‘Settings’** indicates current values and properties. Some refer to the serial interface. Other give the internal temperature inside the Fetura+.

Status messages are displayed in the **‘Response’** cell.

Error indicators are used for error codes and their corresponding descriptions.

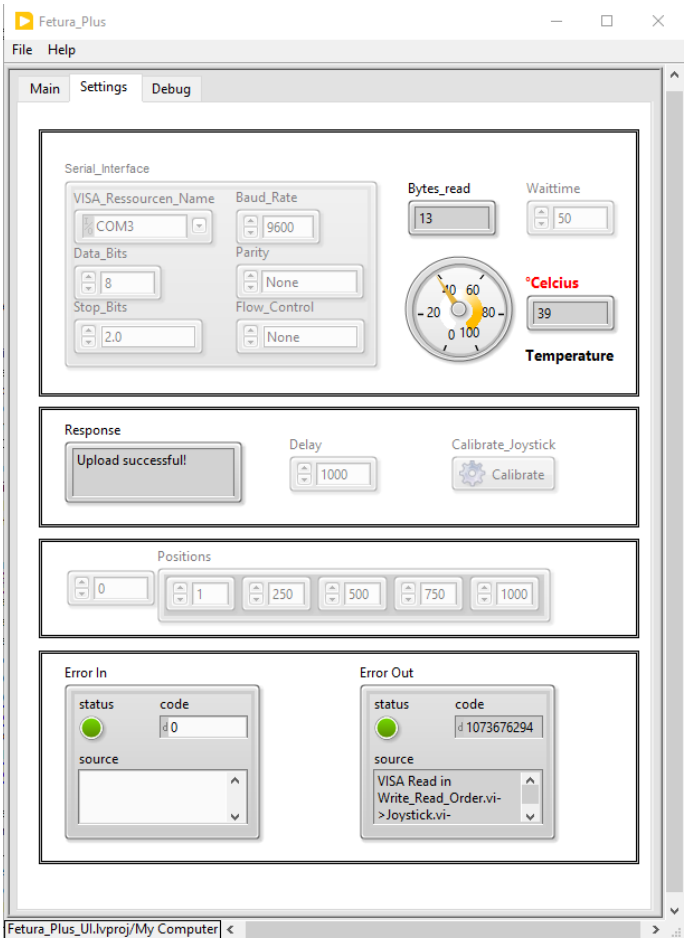


If there is an abnormal behavior of the Fetura+ the opportunity exists to read out status registers.

Therefore, chose the '**Debug**' tabulator.

First select the desired **'Axis'** then press the **'Upload'** Button.

The values can be saved using **'Save to File'** inside a txt file and sent to the Excelitas customer service.

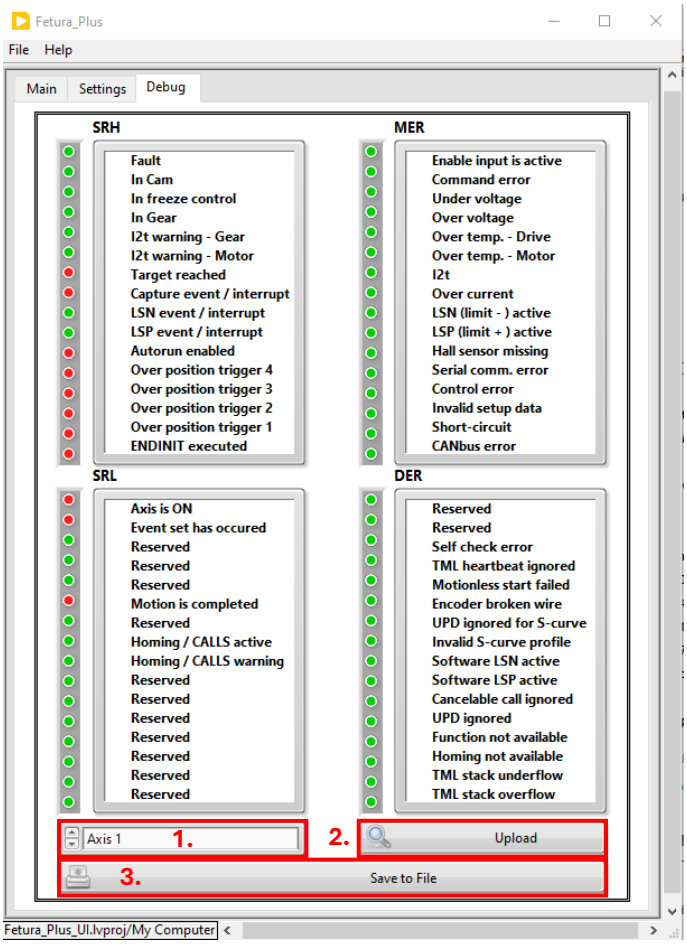


If there is an abnormal behavior of the Fetura+ the opportunity exists to read out status registers.

Therefore chose the '**Debug**' tabulator.

First select the desired **'Axis'** then press the **'Upload'** Button.

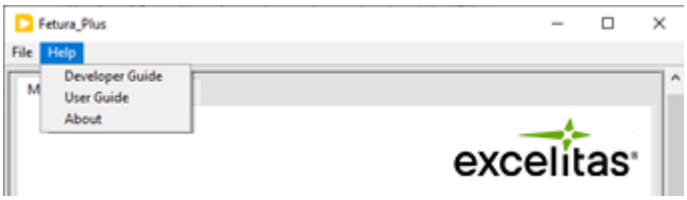
The values can be saved using **'Save to File'** inside a txt file and sent to the Excelitas customer service.



Another way to close the software is to use the **‘Exit’** entry inside the toolbar menu **‘File’**.

‘Developer Guide’ and **‘User Guide’** can be found under the item **‘Help’**.

The software version can be looked up using **‘About’**.



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