

# BALLUFF

## BAE PD-VS-014-05

### SmartVision Controller

User's manual



english

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## 2 USER INSTRUCTIONS

### 2.1 Introduction

These operating instructions describe the Balluff SmartVision Controller from the Balluff Vision Solutions family BVS and the startup for an immediate operation.

The Balluff SmartVision Controller is a powerful inspection system, which runs BVS Cockpit. BVS Cockpit is a browser-based software package that enables you to create and configure inspection programs, without the need for any programmer or detailed knowledge of image processing. As the "eye" for the inspection system, you can connect both GigE Vision as well as USB3 Vision compliant industrial cameras like the Balluff *Camera* BVS CA to the Balluff SmartVision Controller and operate them simultaneously.

The manuals for the BVS Cockpit and the Balluff *Camera* BVS CA are available in the product download area on the Balluff product website via [www.balluff.com](http://www.balluff.com)

The Balluff SmartVision Controller is an inspection system for automated industrial environments. Some outstanding properties are:

- Closed system based on an industrial PC
- Fieldbus connection (PROFINET, EtherNet/IP)
- Simultaneous operation of up to four industrial cameras and thus four inspections programs
- Suitable for a cabinet installation
- Support of Industry 4.0

These operating instructions apply to the following variants of the Balluff SmartVision Controller:

Ordering code	Product name	Description
BAE0103	BAE PD-VS-014-05	Balluff SmartVision Controller

### 2.2 Typographical conventions

The following conventions are used in this manual:

#### 2.2.1 Bulleted Lists

Enumerations are shown as a list with an en-dash.

- Entry1
- Entry 2

#### 2.2.2 Actions

Action instructions are indicated by a preceding triangle. The result of an action is indicated by an arrow.

1. Action instruction 1
  - a. Action result
2. Action instruction 2

#### 2.2.3 Numbers

- Decimal numbers are shown without additional indicators (e.g. 123).
- Fixed-point numbers are shown with a period (e.g. 0.123).
- Hexadecimal numbers are shown with the additional indicator hex (e.g. 00<sub>hex</sub>).

#### 2.2.4 Parameters

Parameters are shown in italics (e.g. *CRC\_16*).

#### 2.2.5 Directory paths

Path information for saving data is shown with fixed font width (e.g. Projekt:\Data Types\Benutzerdefiniert).

#### 2.2.6 ASCII code

Characters transmitted in ASCII code are set in apostrophes (e.g. 'L').

## 2 USER INSTRUCTIONS

### 2.2.7 Symbols

#### NOTE

A **note** indicates important information that helps you optimize usage of the products.

#### WARNING

A **warning** indicates how to avoid either potential damage to hardware or loss of data.

#### ATTENTION

An **attention** indicates a potential for property damage, personal injury, or death.

## 2 USER INSTRUCTIONS

### 2.3 Abbreviations

ADC	Analog-to-digital converter
BVS	Balluff Vision Solutions
CA	Balluff <i>Camera</i>
CMOS	Complementary metal-oxide-semiconductor
DHCP	Dynamic Host Configuration Protocol
EEPROM	Electrical Erasable and Programmable ROM
EMC	Electromagnetic compatibility
FCC	Federal Communications Commission
FPGA	Field Programmable Gate Array
GenlCam	Generic Interface for Cameras
GigE Vision	Image processing standard for Gigabit Ethernet interfaces
GND	Ground
HDMI	High Definition Multimedia Interface
I/O-Port	Digital input / output port
IO	Input / Output
IP	Internet Protocol
LAN	Local Area Network
LLA	Logical Link Address
MAC	Media Access Control
MTBF	Mean Time Between Failures
NC	Not connected
PC	Personal Computer
PLC	Programmable Logic Controller
RGB	Red Green Blue
RX	Receiver
SSD	Solid-State-Drive
TX	Transmitter
USB3 Vision	Image processing standard for USB 3.0 interfaces

### 2.4 Copyright

Copyright © Balluff GmbH, Neuhausen a.d.F., Germany, 2018. All rights reserved. In particular: Right to duplication, modification, dissemination and translation into other languages. Please note that all texts, graphics and images contained in these operating instructions are protected by copyright and other protection laws. Commercial duplications, reproductions, modifications and disseminations of any type require the prior written approval of Balluff GmbH. All information and notes in these operating instructions, particularly the chapter Safety Instructions, must be observed.

## 2 USER INSTRUCTIONS

### 2.5 Legal requirements

The General Terms and Conditions of Balluff GmbH in their respective current version and the conditions in these operating instructions exclusively apply to all deliveries of products and to all other services of Balluff GmbH (henceforth referred to as "GTC"). The provisioning of the software is exclusively subject to the respective current GTC, the conditions in these operating instructions as well as the regulations of the "Balluff Enduser Licensing Agreement". You may use the software only in compliance with these provisions. If they should not yet be available, Balluff GmbH will gladly provide the current GTC upon request.

The driver of the Balluff *Camera* uses a variety of freely available tools which were published under various open source licenses. Some licenses require that the source code and modifications be published. These sources are published on the Product homepage.

The license texts for all software products used can be downloaded from the web interface along with the manuals. They are available as ZIP files.

### 2.6 Updates and upgrades

Balluff GmbH is authorized – but not obligated – to make updates or upgrades of the firmware available via the website of Balluff GmbH or in any other form. In such a case, Balluff GmbH is authorized – but not obligated – to inform you about the updates or upgrades. The use of such upgrades or updates assumes that you accepted the validity of the current GTC as well as the additional conditions in the operating instructions.

### 2.7 Trademarks

The product, trade, company and technology designations used (e.g. Microsoft®, Windows 7®, Internet Explorer®, Google Chrome®, Mozilla Firefox® and HALCON®) are trademarks of the respective owners.

## 3 SAFETY

### 3.1 Intended use

The Balluff SmartVision Controller is an inspection system for creating inspection applications for different industrial areas. The inspection system provides a user interface for connecting the camera via your web browser over network. Furthermore you create and configure inspection programs with the user interface software "BVS Cockpit". You can monitor and analyze the results of the inspection program.

The user interface is kept simple and understandable in order to enable a fast learning process and to allow intuitive working. You will find more details in the "**BVS Cockpit Manual**".

The intended use also includes that you have read these operating instructions in their entirety and follow all the information – particularly the section "Safety".

### 3.2 General safety notes

#### WARNING

Manufacturer's guarantee, warranty and liability are void for damage caused by unauthorized tampering or unapproved use, installation or handling in violation of the specifications of this user's guide. The operator must ensure that appropriate safety and accident prevention regulations are observed

When connecting the Balluff SmartVision Controller to an external controller, observe proper selection and polarity of the connection as well as the power supply (see "Connections and control elements").

#### 3.2.1 General safety information

1. Please ensure secure standing when installing the Balluff SmartVision Controllers.
2. Please always let the inner components cool down before touching them to avoid physical injury or property damage.
3. Ensure that the Balluff SmartVision Controller is supported correctly or fixed upright before you install new accessories.
4. Ensure that no loose objects remain in the enclosure after maintenance work.
5. Set-up of the Balluff SmartVision Controller and maintenance work may only be carried out by trained persons.
6. The Balluff SmartVision Controller is fitted with one replaceable battery. There is a risk of explosion when replacing the battery improperly. Only replace the batteries with the type recommended by the manufacturer or with an equivalent. Used batteries have to be disposed of according to manufacturer's directions.

### 3 SAFETY

#### 3.2.2 Electrical safety notes

1. Prior to connecting the device to the power supply, check if it complies to the values stated on the equipment.
2. This device is designed for electricity from an earthed plug socket. The mains plug with earthing device is an important safety feature. Do not switch off the earth to ensure protection against electric shock or property damage.
3. This system can be connected to an IT power supply. In any case, ensure that your Balluff SmartVision Controller is also connected to the mass.
4. Please consider the positions of the power on/off button of the device and the safety switch for the room to ensure fast switch off in case of an emergency.
5. Ensure that the device is always disconnected fully from the power supply before opening the enclosure.

#### 3.2.3 Safety notes for assembly

1. Increased operating ambient temperature - If the system is installed in an enclosed module, then the operating temperature may be higher than the ambient temperature in the room. Therefore, you have to consider to install the Balluff SmartVision Controller in an area which is compatible with the maximum ambient temperature specified by the manufacturer.
2. Reduced airflow - The installation of the Balluff SmartVision Controller should be completed in such a way that the air flow quantity which is required for equipment operation is not impaired.
3. Mechanical load - The Balluff SmartVision Controller assembly should be carried out in such a way that there are no hazardous operational conditions in the event of uneven mechanical loads.
4. Circuit overload - The connection of the Balluff SmartVision Controller to the supply current and the effect an overload of power circuits has on the overcurrent protection device and supply circuit cabling should be checked and considered carefully. When dealing with this aspect, please carefully check specifically the load information on the name plate of the device.
5. Reliable grounding - The Balluff SmartVision Controller has to be earthed reliably. It is specifically important to consider the power connection cables and to a lesser degree the direct connections to the sub-circuits (e.g. by using adapter strips).

#### 3.2.4 Safety notes for operation

1. Please shut down the operating system before disconnecting the Balluff SmartVision Controller from the power supply in order to prevent any data loss.
2. Create free space in front of and behind the Balluff SmartVision Controller.

#### 3.2.5 Conformity

The Balluff SmartVision Controller conforms to the relevant safety regulations IEC, VDE, and EN. If you have questions about the validity of the installation in the planned environment, please contact your service representative.

#### 3.2.6 Repairs

Repair on the Balluff SmartVision Controller may only be carried out by authorised specialist personnel.

#### ATTENTION

Unauthorised opening and unprofessional repairs will cause fatal shock hazard. Always disconnect device from power circuit (pull power plug out) before touching components.

- Always pull the mains plug before opening the Balluff SmartVision Controller.
- Only install system expansions which are intended for the Balluff SmartVision Controller. Installation of additional expansions may damage the system or safety instructions and regulations for radio interference suppression may be violated. Information as to which system expansions are suitable for installation can be obtained from the technical customer service or from your outlet.

The warranty is void if you cause defects to the Balluff SmartVision Controller due to installing or replacing system expansions.

## 3 SAFETY

**WARNING**

Please observe ETUC information.

**NOTE**

In the interests of product improvement, Balluff GmbH reserves the right to change the technical data of the product and the content of this manual at any time without notice.

**Limitation of liability**

All technical data and certifications are only valid for expansions.

No liability is accepted for functional losses when using third party equipment and components.

**Tools**

You can carry out all assembly work on the equipment with a Phillips screwdriver type PH1 and PH2.

### 3.2.7 Maintenance

**Replace CMOS (CR2032) battery**

Batteries are consumables and should be replaced every 3 years in order to ensure PC functionality.

**Please check the following prior to replacing****WARNING**

Risk of explosion if battery is replaced by an incorrect type. Dispose of used batteries according to the instructions.

**ATTENTION**

Risk of explosion and contaminant release! Therefore, do not throw lithium batteries into fire, do not solder the cell body, do not open, do not short circuit, do not switch poles, do not heat above 100°C, dispose off according to regulations and protect against direct sunlight, humidity and condensation.

## 3 SAFETY

**Preparation**

BIOS settings, which deviate from optimised settings, will be lost. Date and time will have to be set again after replacement.

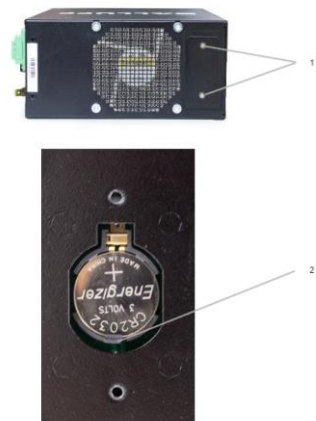
1. Note down the current BIOS set-up settings.
2. Disconnect the equipment from the grid and pull off all connection cables from it.

**ATTENTION**

The battery replacement must not occur if the equipment is still running. Disconnect the equipment from the mains voltage!

**Work steps**

1. Open the revision cover.
  - a. Loosen two screws (1) using a crosstip screwdriver.
2. Remove the battery from the holder.
  - a. Press the latching catch (2) downwards using your finger.
3. Insert the new battery.
  - a. In reverse order.
4. Close the cover.
5. Adjust the BIOS set-up settings.

**Replace the dust filter**

The dust filter can be replaced as needed.

**ATTENTION**

The dust filter replacement must not occur if the equipment is still running. Disconnect the equipment from the mains voltage!

**Work steps**

1. Loosen the side cover (knurled screw).
2. Open the side cover.
3. Remove the dust filter.
4. Insert a new dust filter.
5. Close the side cover.



## 3 SAFETY

### 3.3 Disposal



This product is covered by WEEE Directive 2012/19/EU on waste electrical and electronic equipment.

Dispose of the product properly and not as a part of the regular waste stream. The regulation of the respective country are to be observed. Information is provided by the national authorities.

## 4 PRODUCT DESCRIPTION

The Balluff SmartVision Controller is an inspection system, which application areas are optical identifications, inspections for quality assurance, and the measurement of objects. With the LAN interfaces you can integrate the Balluff SmartVision Controller into an existing network. Additionally, the Balluff SmartVision Controller offers two fieldbus connectors. Via USB 3.0 and Gigabit Ethernet ports you can connect USB3 Vision and GigE Vision compliant industrial cameras.

The Balluff SmartVision Controller works with the Balluff BVS Cockpit interface developed specifically for camera systems. Here, the Balluff SmartVision Controller makes it possible to run Balluff BVS Cockpit and independent inspections simultaneously.

**Figure 1 Balluff SmartVision Controller**



### 4.1 Product variants

The Balluff SmartVision Controller is developed according to the latest industrial standards:

CPU	Intel® Core i7-6700TE
Chipset	Intel® Q170 Chipset
iAMT	11.0
Memory	16 GB DDR4
Graphics	Intel® HD graphics 530
Drives	1x 256GB 2,5" SATA SSD (changeable via tray)
LAN	2x Gigabit Ethernet (Intel® i211AT / i219LM / i350)
For industrial cameras	4x Gigabit Ethernet (Intel® i211AT / i219LM / i350)
Fieldbus	Profinet

## 4 PRODUCT DESCRIPTION

Cooling	Active
Front I/O	4x USB 3.0 for industrial cameras
	4x Gigabit Ethernet for industrial cameras
	4x USB 2.0
	1x Support port (DisplayPort)
	2x Support port (RS232)
	2x LAN RJ45
	2x Fieldbus RJ45
	1x SSD Tray
	Switch / LED
	DC in
Power supply	19 - 28V DC in (Phoenix plug)
Dust protection	1x dust filter
Mounting options	Wall and DIN Rail mounting
MTBF	@25°C 54515h, @45°C 48804h

### 4.2 Scope of delivery

Included in the scope of delivery

- Balluff SmartVision Controller
- HALCON dongle
- Wall mount and DIN Rail holder
- Quick Start Guide
- General Safety Notes

#### NOTE

Visit [www.balluff.com](http://www.balluff.com) for more information on available software and accessories.

## 4 PRODUCT DESCRIPTION

### 4.2.1 Transport

Despite the solid design of the Balluff SmartVision Controller, the fitted components are susceptible to strong vibrations and impacts. Therefore, protect the PC during transport against great mechanical stresses.

Only use the original packaging when shipping and transporting the Balluff SmartVision Controller.

#### WARNING

**Risk of equipment damage!**

For transports in cold weather, when the PC is subjected to extreme temperature differences, you have to ensure that no humidity can deposit on the Balluff SmartVision Controller (condensation).

In case of condensation, the Balluff SmartVision Controller may only be switched on after approx. 12 hours.

### 4.2.2 Unpack and check supply unit

Please consider the following points during unpacking.

- We recommend that you keep the original packaging. Please keep it for possible future transport.
- Please keep the accompanying documentation. You need this for initial commissioning and they are part of the Balluff SmartVision Controller.
- Please check the packaging and packaging content for any visible transport damage.
- Check that the delivery and any extra accessories are complete.

If you notice any transport damage or any irregularities, then please inform us.

### 4.2.3 Identification data of the device

The Balluff SmartVision Controller can be identified clearly in case of necessary repairs thanks to the identification data.

Figure 2 Name plate



Figure 3 Serial number



Furthermore, the MAC addresses of the LAN connectors are noted:

Figure 4 MAC-Adressen



## 4 PRODUCT DESCRIPTION



### 4.2.4 Ambient and environmental conditions

Please observe the following points for operational planning:

- Consider the climate and mechanical environmental conditions in the system features.
- The Balluff SmartVision Controller was designed for use in a normal industrial environment. Without additional measures (supply of clean air), you cannot use the Pyramid IPC in places with difficult operational conditions due to corrosive vapours or gases.
- The free space in the area around the air vents has to be at least 10 cm to ensure sufficient ventilation for the IPC.
- The air vents of the enclosure must not be covered.
- It is imperative to consider the permissible installation positions when assembling the Balluff SmartVision Controller.

#### Permissible installation positions

The following installation positions have to be observed:

Vertical, fixing points on the front	Horizontal, fixing points on the front
	

#### WARNING

Be sure, that there is sufficient air circulation available at the fan and the filter inlet for cooling of the device.

### 4.3 Wall mount

The Balluff SmartVision Controller features suitable mounting possibilities for installation in a control cabinet.

To mount the Balluff SmartVision Controller at a wall, there are two possibilities:

1. Mounting via mounting bracket
2. Mounting via profile rail (only if the rail is pre-assembled)

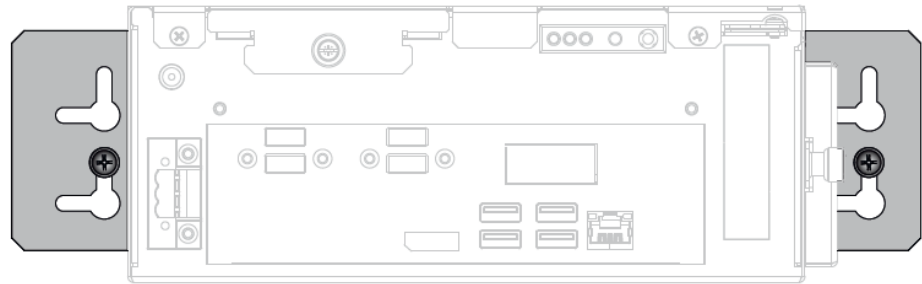
## 4 PRODUCT DESCRIPTION

### 4.3.1 Mounting via mounting bracket

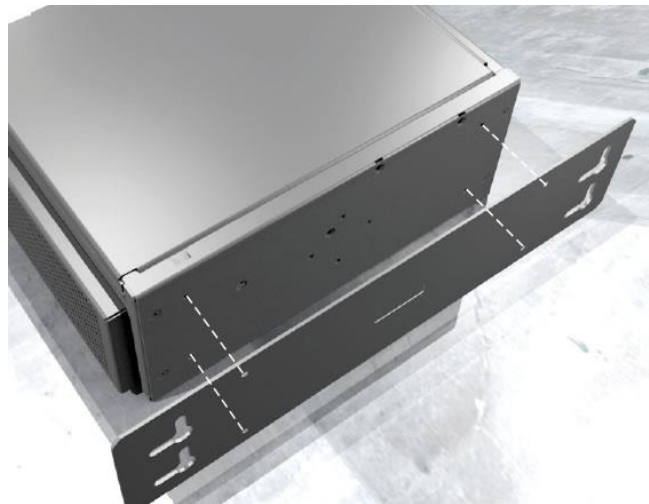
Use the supplied mounting bracket (see gray area below).

1. First, fasten the bracket on the back of the Balluff SmartVision Controller using 4 supplied screws.
2. Use the additional 2 screws, to mount the Balluff SmartVision Controller at a wall.

**Figure 5 Front view with assembled mounting bracket**



**Figure 6 Rear view with screwing points**



### 4.3.2 Mounting via profile rail (only if the rail is pre-assembled)

Use the supplied profile rail (see image below) and assemble it on the back of the Balluff SmartVision Controller. The profile rail can be assembled vertically or horizontally. Afterwards, you can mount the Balluff SmartVision Controller in a control cabinet.

**Figure 7 Profile rail top view**



## 4 PRODUCT DESCRIPTION

**Figure 8 Profile rail side view**



**Figure 9 Rear view with vertical screwing points**



**Figure 10 Rear view with horizontal screwing points**



## 4 PRODUCT DESCRIPTION

### 4.3.3 Installation of the device with wall-mounting kit

With the wall-mounting kit you have the possibility to realize a space saving assembly.

Material	Bore diameter	Mounting
Concrete	8 mm	Dowel 8M, 50 mm Screws 5 mm x 60 mm
Gypsum (min. 13 mm thick)	14 mm	Toggle bolts  Diameter 4 mm Length min. 50 mm
Metal (min. 3 mm thick)	5 mm thread	Metal screws  Diameter 5 mm Washer $\varnothing$ 10 mm Length min. 10 mm

**WARNING**

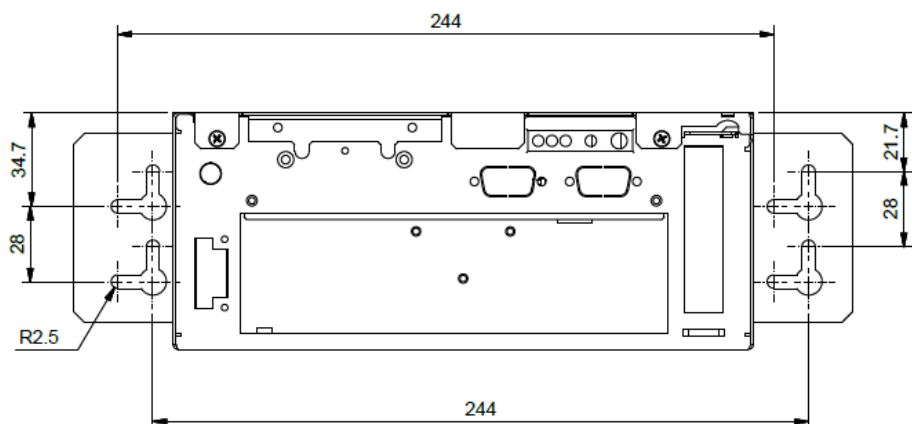
Ensure that the wall can hold at least 4 times the total weight of the equipment (including mounting brackets and additional expansion modules). The total weight is approx. 2.7kg.

## 4.4 Product specification

### 4.4.1 Mechanical data

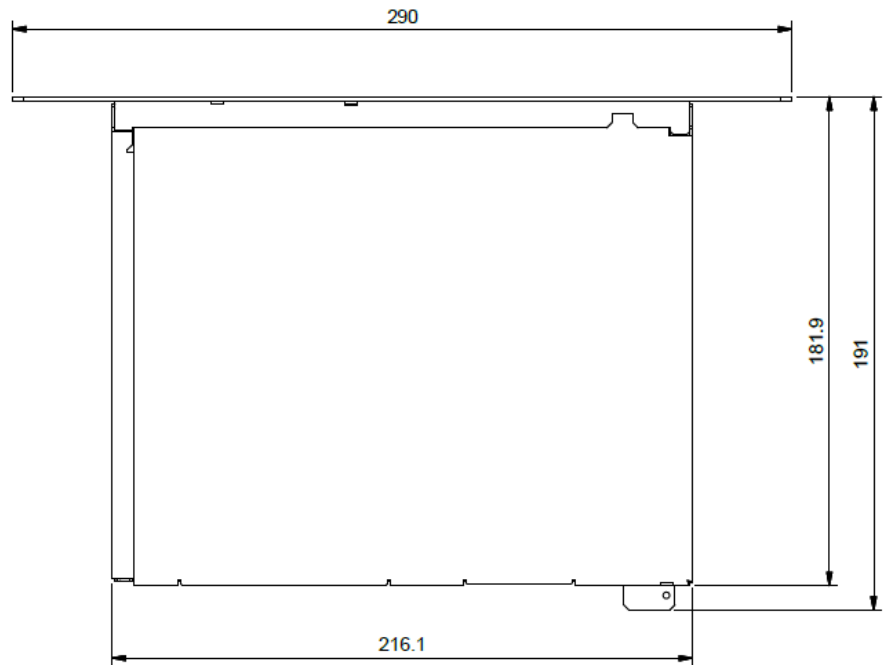
Housing material	Sheet steel galvanised; powder coated black
Degree of protection	IP20
Weight	approx. 2.7 kg
Dimensions (W x D x H)	216 x 191 x 88 mm

Figure 11 Dimensional drawing back



4 PRODUCT DESCRIPTION

Figure 12 Dimensional drawing top



4.4.2 Electrical data

Supply voltage	19V - 28V DC
Max. current consumption without external load	85 W

**WARNING**

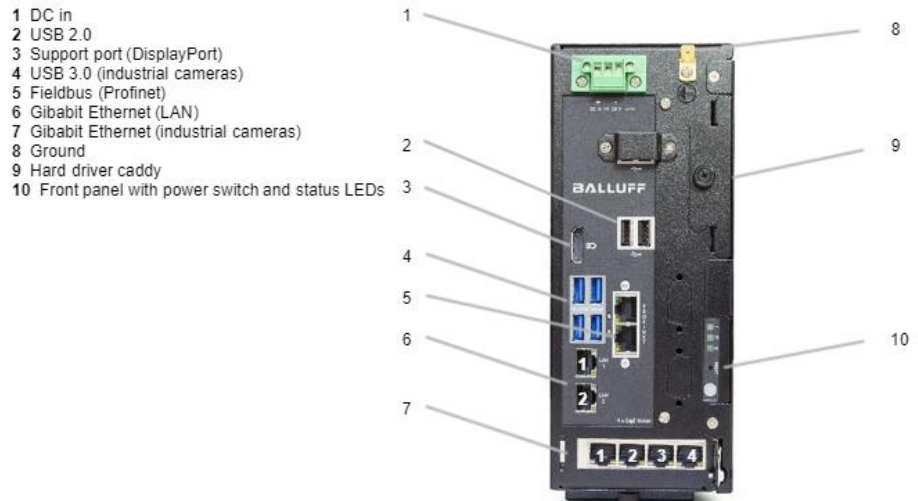
The Balluff SmartVision Controller and accessories must be supplied by Limited Power Source (LPS) according to UL/IEC 60950-1 or Class 2 source according to UL 1310.

4.4.3 Operating conditions

Ambient temperature	10 .. 50 °C / 10 .. 80 % relative humidity
Storage temperature	-10 .. 70 °C / 10 .. 95 % relative humidity
Operation	Internally

## 4 PRODUCT DESCRIPTION

### 4.5 Connections and control elements



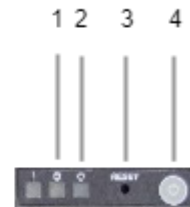
Connector / Control elements	Function
DC in	Voltage supply of the Balluff SmartVision Controller
USB 2.0	Four USB 2.0 interfaces
Support Port	Support access of the manufacturer (DisplayPort)
USB 3.0 (industrial cameras)	Four USB 3.0 interfaces for connecting USB3 Vision compliant industrial cameras
Fieldbus (Profinet)	Profinet interface
Gigabit Ethernet (LAN)	Two Gigabit Ethernet interfaces for integrating the Balluff SmartVision Controller in a local network
Gigabit Ethernet (industrial cameras)	Four Gigabit Ethernet interfaces for connecting GigE Vision compliant industrial cameras
Ground	Chassis ground
Hard drive caddy	For changing SSD hard drives
Front panel with power switch and status LEDs	Status display of the Balluff SmartVision Controller and power switch to turn the Balluff SmartVision Controller on and off

## 4 PRODUCT DESCRIPTION

### 4.6 Display elements

#### 4.6.1 Status LED

- 1 HDD Activity LED
- 2 Power LED
- 3 Reset switch
- 4 Power switch



#### ATTENTION

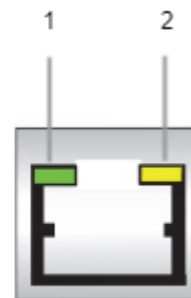
Power switch does not disconnect the equipment from the grid!

#### WARNING

If you keep the switch held down for more than 4 seconds during operation, then the system executes a forced shut-down; data may be lost in the process.

#### 4.6.2 Gigabit Ethernet Status LED

- 1 Link LED
- 2 Activity LED



LED	Status	LED color
Link LED	No connection	Off
	100 MB/s	Green
	1000 MB/s	Yellow
Activity LED	Activity	Yellow flashing

## 4 PRODUCT DESCRIPTION

### 4.6.3 Cleaning

The outside of the Balluff SmartVision Controller *Camera* can be cleaned with a soft cloth. Persistent dirt can be removed with a cloth that is first moistened with a soap solution and wrung out.

→ After wiping off the dirt spots, wipe the camera with a dry cloth.

## 5 FIRST STEPS

Three simple steps are required to initially start up and configure the Balluff SmartVision Controller. Besides the Balluff SmartVision Controller, the following is required:

- 24V power supply with cold-device cable
- LAN cable
- Optionally: Industrial camera with suitable accessories

### 5.1 Step 1: Establishing a network connection with the Balluff SmartVision Controller

Connect the Balluff SmartVision Controller via the Gigabit Ethernet (LAN) port 1 with the network. The Balluff SmartVision Controller is set to get the IP address from a DHCP server automatically

### 5.2 Step 2: Switching on the Balluff SmartVision Controller

**WARNING**

The Balluff SmartVision Controller and accessories must be supplied by Limited Power Source (LPS) according to UL/IEC 60950-1 or Class 2 source according to UL 1310.

Connect the power supply via DC-In.

## 5 FIRST STEPS

### 5.2.1 Connecting the DC power supply (19-28 V) via terminal clamp

Before connecting the power supply:

#### ATTENTION

It is not allowed to unplug or remove the input wires and wire clips of this model. The disconnection from the power supply should be made at the end of the supplied input wires.

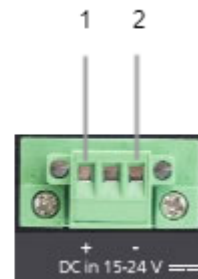
#### ATTENTION

It is only allowed to connect the device to a DC 19 - 28V electricity grid, which complies with the requirements of a secure low voltage (SELV). The cable sizing must comply with the short circuit current of the 19 - 28V DC power supply, so that a short-circuit leads to no damage caused by the cable. Only use cables with a core diameter of at least 1 mm<sup>2</sup>.

#### Steps to connect the device to the DC supply 19 - 28V

1. Turn of the DC 19 - 28V power supply.
2. Connect the DC supply (screw terminal).

- 1 DC positive polarity  
2 DC negative polarity



### 5.3 Step 3: Opening the BVS Cockpit software

Industrial cameras connected to the Balluff SmartVision Controller are being configured via the BVS Cockpit. This web interface is being opened and operated via web browsers.

The following commercially available web browser are being supported:

- Google Chrome version 32.0 and above
- Mozilla Firefox version 24.0 and above
- Microsoft Internet Explorer version 11 and above
- Microsoft Edge version 40 and above

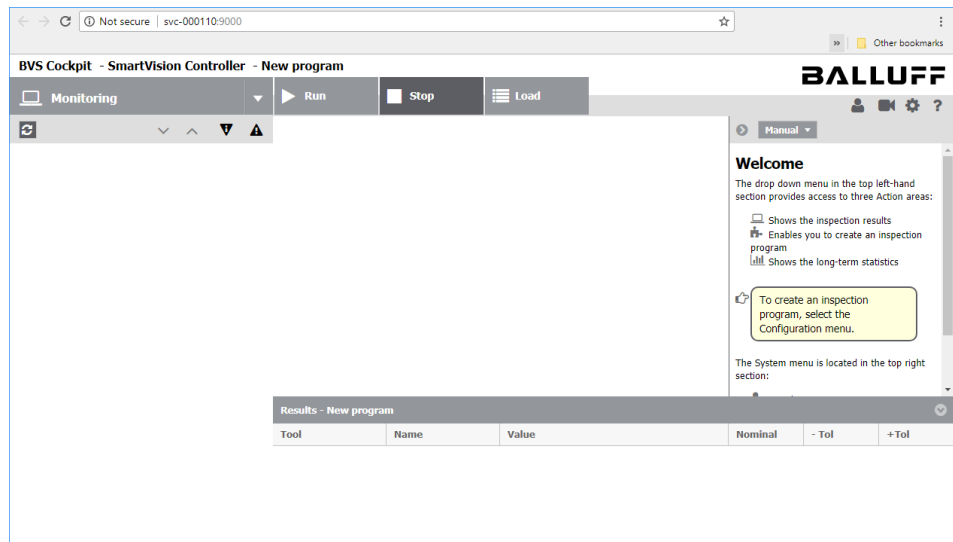
#### NOTE

JavaScript must be enabled in the web browser.


## 5 FIRST STEPS

1. Insert the address or URL of the Balluff SmartVision Controller.  
This address can look like this: "<http://svc-000110:9000/>". The port number indicates, which instance of BVS Cockpit you want to open. Four instances of BVS Cockpit are available and are numbered consecutively from 9000 to 9003.
2. Confirm your entry.  
Now, the start window of BVS Cockpit will be loaded in the web browser.

Figure 13 SmartVision Controller - Start window



Alternatively, you can use Windows Explorer to find the smart camera or the PC in the network. To do this,

- select the network folder  **Network** to display all connected network devices or
- press **Windows + R** and enter the address of the Balluff SmartVision Controller (e.g. `\\svc-000110`).

As soon as you have chosen a Balluff SmartVision Controller, the shared folders of the Balluff SmartVision Controller are displayed:

- *images*  
Here you can drop \*.*bmp* images, which can be opened using the camera simulation ("File Device") (see chapter "Tool Box" → "Image capturing tools" → "Set up camera" → "Active camera" in the "**BVS Cockpit Manual**").
- *logs*  
Here you can find the log files of the Balluff SmartVision Controller (see chapter "User Interface" → "System Menu" → "System Settings" → "System" in the "**BVS Cockpit Manual**").
- *updates*  
For updating the Balluff SmartVision Controller drop the update file in this folder (see chapter "Startup" → "Updating software").

**NOTE**

In order to access these folders you have to use the following credentials:

- Login: *expert*
- Password: *expert*

## 5 FIRST STEPS

**NOTE**

If you cannot access the shared folders, please have a look at the appendix "Troubleshooting Table" → "Accessing the shared folders is not possible".

### 5.3.1 Setting up a camera

To configure an industrial camera, start BVS Cockpit and select in the action menu "Configuration" the "Set up camera" tool.

Figure 14 Set up camera

Parameter	
Use for inspection processing:	<input checked="" type="checkbox"/>
Active camera:	160400087DE
▲ Image section	
startX:	0 - +
startY:	0 - +
Width:	1280 - +
Height:	1024 - +
Mirroring:	deactivated
Exposure time [ms]:	20 - +
Flash enabled:	<input checked="" type="checkbox"/>
Trigger mode:	continuous
Frame rate [fps]:	20 - +
Use calibration for:	nothing

**NOTE**

More information about the configuration interface of the BVS Cockpit can be found in the software manual ("**BVS Cockpit Manual**") on the Balluff website.

## 6 STARTUP

### 6.1 Updating software

The Balluff website regularly offers new software updates on our website. The updates contain bug fixes, performance optimization, or functional extensions.

**NOTE**

We recommend updating the SmartVision Controller from time to time to derive maximum benefit from the SmartVision Controller.

Please follow these steps to update the SmartVision Controller:

1. Download the latest update file from our website (<https://www.matrix-vision.com/>) and save it locally on your computer.
2. If an inspection program is running, please **stop** it and make sure that the camera is not acquiring new images.
3. Press the keys **Windows + R**, enter the address of the update directory (e.g. `\\gemini-000110\updates`), and confirm with **Enter**.

**NOTE**

In order to access this folder you have to use the following credentials:

- Login: *expert*
- Password: *expert*

**NOTE**

If you cannot access the shared folders, please have a look at "Appendix → Troubleshooting Table → Accessing the shared folders is not possible".

4. Copy the update file into the folder *updates*. The update process will start automatically, which can take up to two minutes.

**ATTENTION**

Do not switch off the SmartVision Controller during the update process. This may cause irremediable damage to the SmartVision Controller.

## 6 STARTUP

## 6.2 Updating Balluff Camera firmware

If the Balluff SmartVision Controller software was updated, you can update the firmware of connected Balluff *Cameras*.

1. Insert the address or URL of the Balluff SmartVision Controllers.
2. Select in the action menu "**Configuration**" the tool "**Set up camera**".
3. Select the camera in "*Active Camera*".
4. Click on "**Show**" in "*Device Control*".

Figure 15 Set up camera

The screenshot shows the 'Set up camera' dialog box. At the top, there is a title bar with a back arrow, a wrench icon, the text 'Set up camera', and a refresh icon. Below the title bar, there is a section titled 'Parameter'. Under 'Parameter', there is a checkbox for 'Use for inspection processing:' which is checked. Below that is a dropdown menu for 'Active camera:' with 'GX315332' selected. Below the dropdown is a 'Device Control:' label followed by a 'Show' button, which is highlighted with a red box. Below the 'Device Control' section is a 'Camera list:' label followed by a 'Refresh' button. At the bottom, there is an 'Image section' with four input fields: 'startX:' (0), 'startY:' (0), 'Width:' (1280), and 'Height:' (960), each with minus and plus buttons for adjustment.

A dialog will appear and you will see the information about the camera including the firmware version. Additionally, there will also be a button "**Update**".

Figure 16 Firmware Update

The screenshot shows the 'Device Control' dialog box. It has a title bar with the text 'Device Control' and a close button. The main content is a table with the following data:

Device ID	GX315332
Device Model	BVS CA-M1456Z0031
Device Serial	GX315332
Device Version	2.10
Device User ID	
Device Vendor Name	Balluff GmbH
Device Manufacturer	FW=2.13.460.0
Device Color Mode	BayerMosaic
Device IP Address	192.168.200.158
Device Subnet Mask	255.255.255.0
Device Gateway	192.168.200.1
Device Firmware Version	2.13.460.0
Device Firmware Build	Sep 21 2016 18:39:36
Device Firmware Source	ProgramSection
Device Firmware FPGA	4.0.7.20

At the bottom of the dialog, there are two buttons: 'Update' (highlighted with a red box) and 'Close'.

## 6 STARTUP

- Click the button and the firmware update will start.

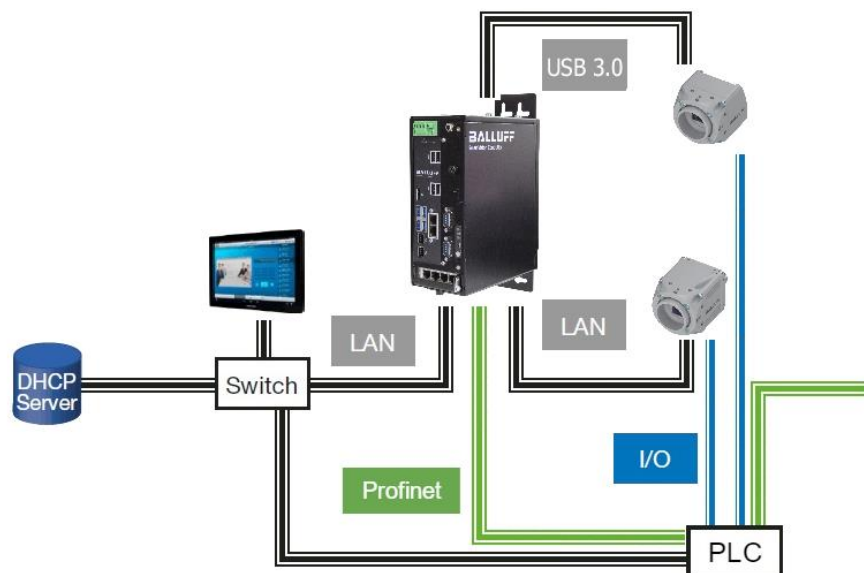
**WARNING**

Do not turn of the Balluff *Camera* during the update process. All current camera settings will be lost when updating the firmware. Network configuration settings will not be affected.

### 6.3 Network topologies

For the startup of the Balluff SmartVision Controller, it is first integrated in the network environment. The different options are described in the following examples. This covers a large part of the application cases. To operate the Balluff SmartVision Controller requires that the supply voltage is provided via the power connection in any case.

The example shows the integration of the Balluff SmartVision Controller into an existing network with DHCP via the Gigabit Ethernet (LAN) female connector 1. The IP address is dynamically assigned. GigE Vision cameras can be connected using the Gigabit Ethernet (industrial cameras) connectors and / or USB3 Vision cameras using the USB 3.0 (industrial cameras) connectors. The interaction of the industrial cameras with the system and the analyzing of a control is done via the digital I/Os; the interaction of the Balluff SmartVision Controller via the Gigabit Ethernet (LAN) connector or the fieldbus. This allows, e.g. to initiate the trigger or query the status of the Balluff SmartVision Controller or the industrial camera.



The integration of the Balluff SmartVision Controller into an existing network can be made using fixed IPs. However, please keep in mind, that IP addresses can only be used once.

## 6 STARTUP

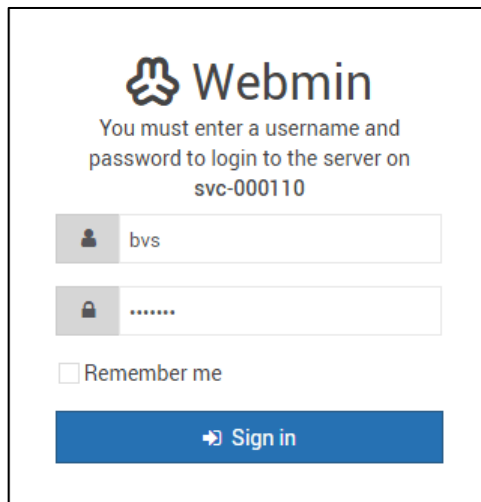
## 6.4 System settings

You can change system settings of the Balluff SmartVision Controllers with the tool "Webmin", which you can access the following way:

**NOTE**

Webmin supports the browsers Chrome, Firefox, Opera, Safari, and Edge.

1. Open a browser and enter the address or URL of the Balluff SmartVision Controller adding port 10000 at the end.  
This address can look like this: "https://svc-000110:10000/". Please take care of the "https", because it is a secured connection.  
The certificate is a self-created one and for this reason your browser will show a warning. Please ignore this warning and open the site.

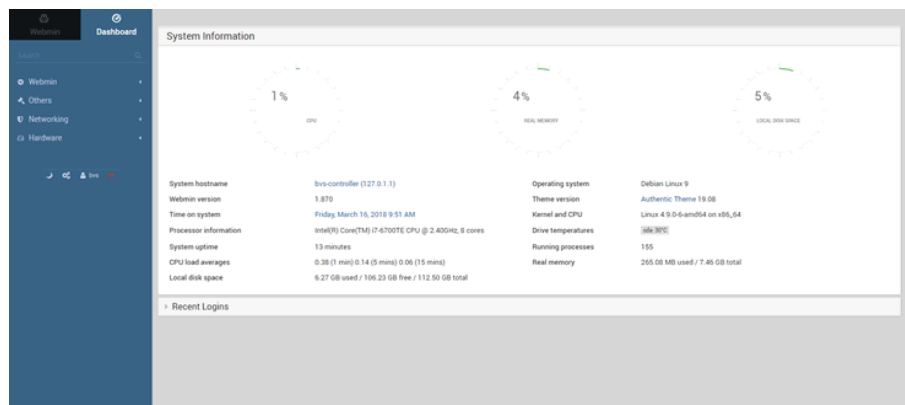


2. Insert the account data:

User: *bvs*

Password: *cockpit*

You will be forwarded to the dashboard of the Balluff SmartVision Controller with information about the system.

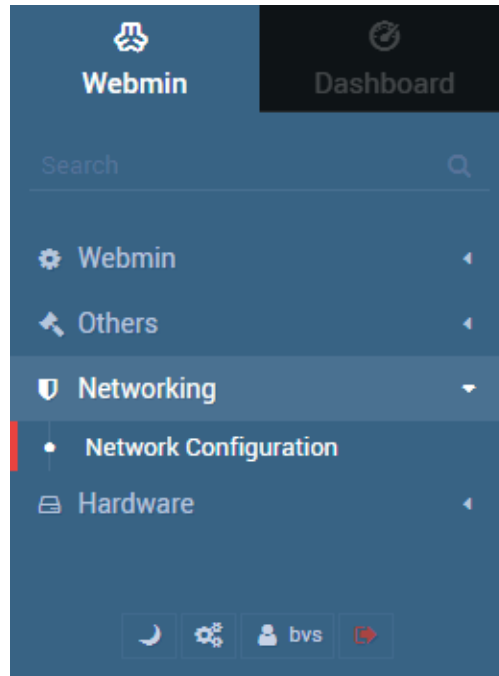


Now, you are able to set the network settings and the system time.

## 6 STARTUP

## 6.4.1 Adapting the network settings

You can enter the network settings via the menu item "Networking → Network Configuration".



Afterwards, please select "Network Interfaces" and you will reach the overview of the network interface settings.

←
☆ Network Interfaces
⌵

Active Now
Activated at Boot

Interfaces listed in this table will be activated when the system boots up, and will generally be active now too.

Select all
 Invert selection

	Name	Type	IPv4 address	Netmask	IPv6 address	Active
<input type="checkbox"/>	enp0s31f6	Ethernet	From DHCP	From DHCP		Yes
<input type="checkbox"/>	enp8s0	Ethernet	192.168.82.83	255.255.255.0		Yes
	lo	Loopback	No address configured	None		Yes

Select all
 Invert selection

⌵ Apply Selected Interfaces

By default, the Gigabit Ethernet (LAN) female connector 1 (internally mentioned as enp0s31f6) is set to get the IP address automatically assigned during the boot process via DHCP. By default, the second Gigabit Ethernet (LAN) connector is configured with 192.168.82.83/255.255.255.0.

Via the tab "Active Now" you reach the overview of the current network values.

6 STARTUP

←
☆ Network Interfaces
▼

Active Now

Activated at Boot

Interfaces listed in this table are currently active on the system. In most cases, you should edit them under the **Activated at Boot** tab.

Select all
  Invert selection

Name	Type	IPv4 address	Netmask	IPv6 address	Status
<input type="checkbox"/> enp0s31f6	Ethernet 1000Mb/s	192.168.164.214	255.255.254.0		Up
enp0s31f6:avahi	Ethernet 1000Mb/s	169.254.6.61	255.255.0.0		Up
enp1s0f0	Ethernet	192.168.200.1	255.255.255.0		Up
enp1s0f1	Ethernet	192.168.201.1	255.255.255.0		Up
enp1s0f2	Ethernet	192.168.202.1	255.255.255.0		Up
enp1s0f3	Ethernet	192.168.203.1	255.255.255.0		Up
<input type="checkbox"/> enp8s0	Ethernet	192.168.82.83	255.255.255.0		Up
lo	Loopback	127.0.0.1	255.0.0.0		Up

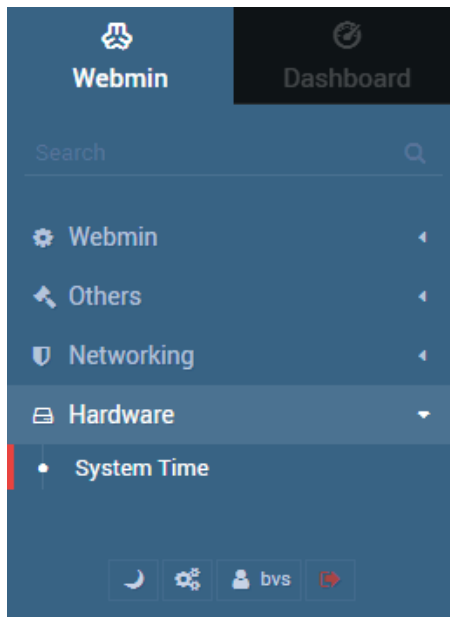
Select all
  Invert selection

De-Activate Selected Interfaces

The four Gigabit Ethernet (industrial cameras) female connectors have a fixed IP from 192.168.200.1 to 192.168.203.1. Each connector has its own DHCP server. If you connect a GigE Vision industrial camera, which is set to get an IP address assigned via DHCP, will get an IP address automatically. No further actions are necessary and you will reach the camera via BVS Cockpit.

**6.4.2 Setting the system time**

You can set the system time via "Hardware → System Time".



According to your needs, you can set the system time manually or via time server.

## 6 STARTUP

⚙️ ⌂
☆ System Time

Set time
Change timezone
Time server sync

This form is for changing the system's current time, which is used by all running processes. On operating systems that have a separate hardware clock, it can be used to set that too.

System Time

Date	16 ▾	Month	March ▾	Year	2018 ▾
Hour	10 ▾	Minute	18 ▾	Second	12 ▾

⌂ Apply
Set system time according to hardware time

Hardware Time

Date	16 ▾	Month	March ▾	Year	2018 ▾
Hour	10 ▾	Minute	18 ▾	Second	12 ▾

⌂ Save
Set hardware time according to system time

### 6.5 Selecting the communication interface for the process data

The exchange of the process data (results of image analysis, control of image acquisition, ...) can be performed either via fieldbus or LAN interface.

→ The operating principle and communication protocol of the fieldbuses are described in the separate software manual ("BVS Cockpit Manual") under "Connection to the customer control system → Communication via fieldbus".

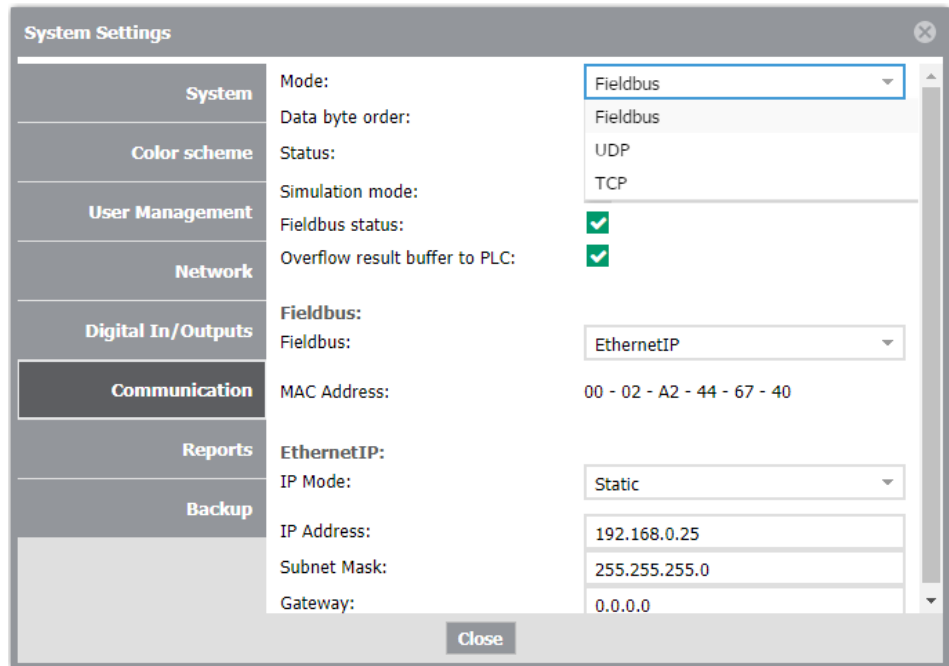
The data are transferred as TCP or UDP packets via the LAN interface.

→ The pertinent protocol is described in the separate software manual ("BVS Cockpit Manual") under "Connection to the customer control system → Communication via UDP and TCP".

## 6 STARTUP

The communication interface is set in the System settings under Mode on the Communication tab. Available options for the selection are Fieldbus, TCP and UDP. If TCP or UDP is selected, the camera uses port 36701. The controlling system can use any available port.

Interfaces that are not selected are deactivated!



The screenshot shows the 'System Settings' dialog box with the 'Communication' tab selected. The 'Mode' dropdown is set to 'Fieldbus'. The 'Fieldbus status' and 'Overflow result buffer to PLC' are both checked. The 'Fieldbus' dropdown is set to 'EthernetIP'. The MAC Address is '00 - 02 - A2 - 44 - 67 - 40'. The 'EthernetIP' section shows 'IP Mode' set to 'Static', 'IP Address' as '192.168.0.25', 'Subnet Mask' as '255.255.255.0', and 'Gateway' as '0.0.0.0'. A 'Close' button is at the bottom right.

Category	Parameter	Value
System	Mode:	Fieldbus
	Data byte order:	Fieldbus
Color scheme	Status:	UDP
	Simulation mode:	TCP
User Management	Fieldbus status:	<input checked="" type="checkbox"/>
	Overflow result buffer to PLC:	<input checked="" type="checkbox"/>
Network	Fieldbus:	EthernetIP
	Fieldbus:	EthernetIP
Digital In/Outputs	MAC Address:	00 - 02 - A2 - 44 - 67 - 40
	MAC Address:	00 - 02 - A2 - 44 - 67 - 40
Communication	EthernetIP:	
	IP Mode:	Static
Reports	IP Address:	192.168.0.25
	Subnet Mask:	255.255.255.0
Backup	Gateway:	0.0.0.0
	Gateway:	0.0.0.0

## 6 STARTUP

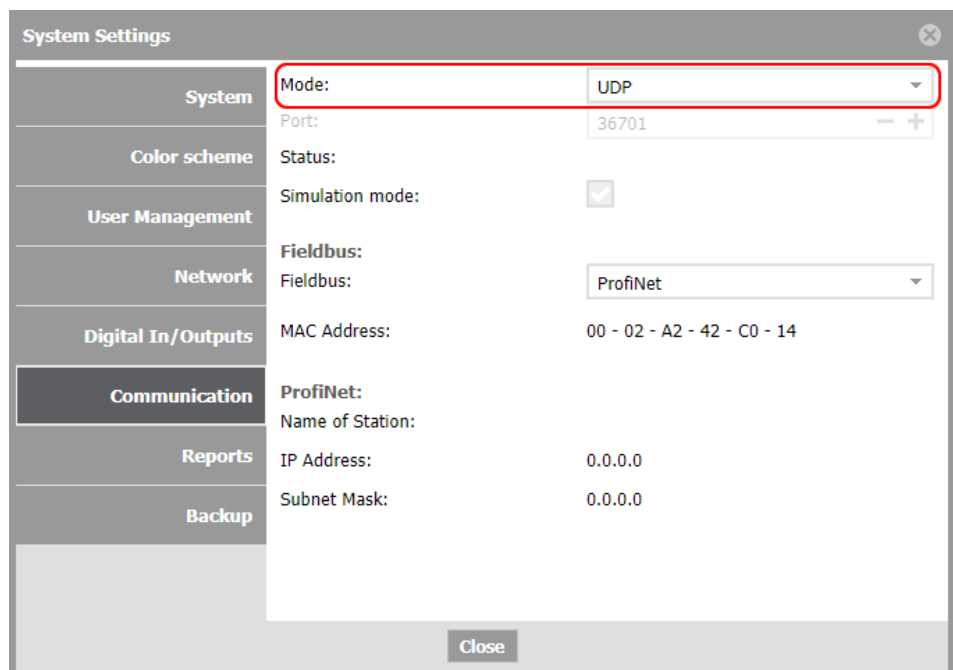
### 6.6 LAN Interface

The data are transferred as TCP or UDP packets via the LAN interface. For each instance following ports are used:

Instance	Port
1	36701
2	36702
3	36703
4	36704

#### 6.6.1 LAN parameters in BVS Cockpit

To communicate via UDP, you have to set the *Mode* in the system menu ("System settings -> communication") to "UDP". To communicate via TCP, this *Mode* must be set to "TCP".

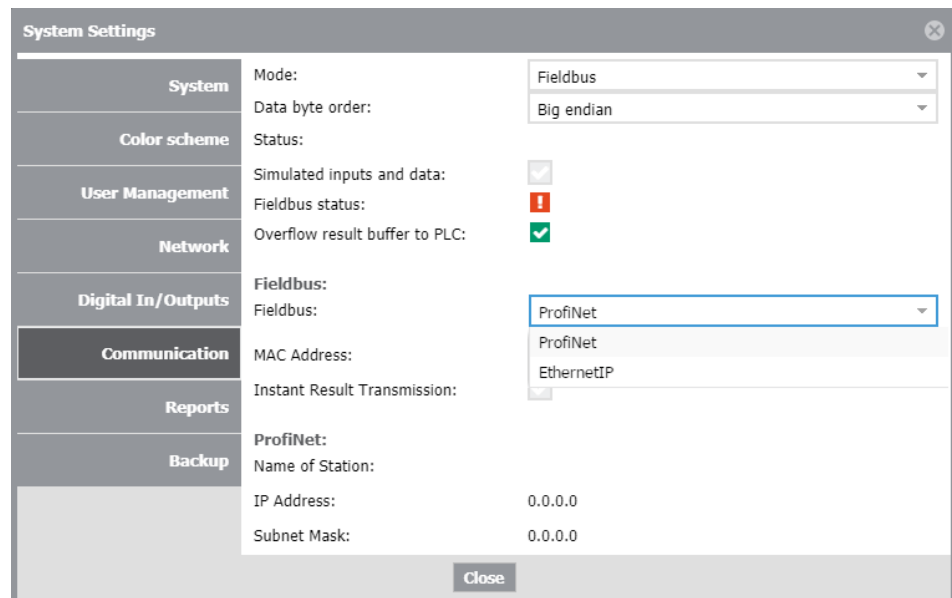


## 6 STARTUP

### 6.7 Fieldbus interfaces

#### 6.7.1 General fieldbus parameters in BVS Cockpit

The fieldbus parameters are set in the System settings on the Communication tab. Here the selection is also made between PROFINET or EtherNet/IP. PROFINET is preselected by default. The fieldbus can be changed at any time between PROFINET and EtherNet/IP.



The Communication tab contains various parameters to choose from depending on the fieldbus selected.

#### 6.7.2 PROFINET fieldbus

The communication between the Balluff SmartVision Controller and the host system is done via PROFINET IO.

The system PROFINET IO consists of the following components:

- IO controller (e. g. PLC)
- IO device (here the Balluff SmartVision Controller)

In a PROFINET network, IO controllers and IO devices are connected to each other using all common network topologies: star, line, ring or tree type topologies are possible.

##### Device master data

To parameterize the IO controller true to type, the device master data in form of a GSDML file are needed. The file is located on the Balluff website (see [www.balluff.com](http://www.balluff.com)).

##### Input/output buffer

The data exchange with the host system takes place in the input and output buffer. The size of these buffers must be configured by the master (IO controller).

##### NOTE

The possible buffer sizes are stored in the GSDML file. A minimum of 16 and maximum of 1280 bytes can be set in different combinations of input/output buffers.

##### Device name and IP address

The Balluff SmartVision Controller and the host system communicate via the PROFINET protocol. This means an IP address and a unique device name are required. The device name and the IP address can be edited using the respective project planning software used, e.g. "Siemens TIA Portal" and the IO device.

## 6 STARTUP

**NOTE**

The Balluff SmartVision Controller is delivered without a device name. The GSDML file has the prepared device name "SVC01".

**Configuration**

In project planning for PROFINET devices, a device is mapped as a modular system that consists of a "SVC01" header module and multiple data modules.

**GSDML file**

The device data required for project planning is stored in GSDML files (General Station Description). The data module of the Balluff SmartVision Controller is represented slot-based in the project planning software. The GSDML file makes the possible data modules (inputs/outputs for the Balluff SmartVision Controller) available. For the configuration of the Balluff SmartVision Controller, the matching data modules are assigned to a specific slot.

- Slot 0 must always be populated with the "SVC01" header module.
- Slot 1 - 4 may host a data module for the Balluff SmartVision Controller.

Slot	Module	Function
0	Header module of SmartVision Controller	Parameter configuration, no process data
1	SmartVision Controller	Process data of 1st instance at port 9000
2	SmartVision Controller	Process data of 2nd instance at port 9001
3	SmartVision Controller	Process data of 3rd instance at port 9002
4	SmartVision Controller	Process data of 4th instance at port 9003

**Integration into Project Planning Software**

The connection of a Balluff SmartVision Controller to a Siemens S7 controller is shown with the "Siemens TIA Portal". The exact procedure depends on the project planning software used.

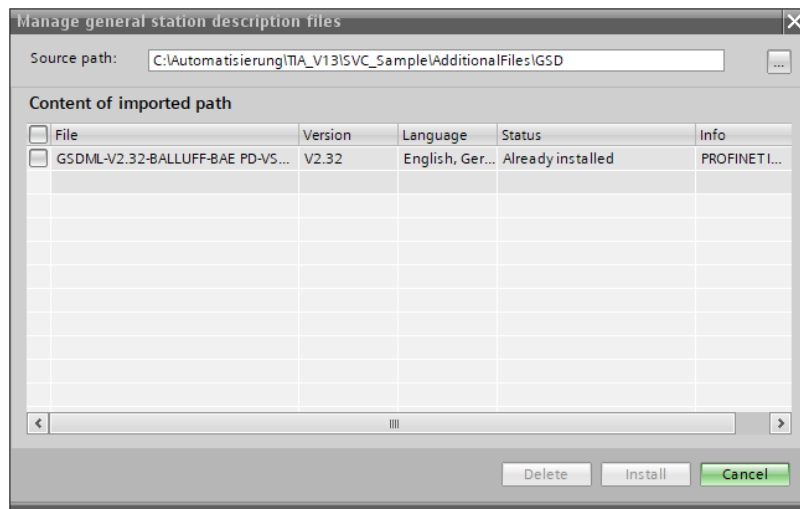
**Installing the GSDML file**

To perform project planning on the PC, the GSDML file for the module must be installed:

1. Open a new project.
2. Select the "**Manage general station description files**" menu command.  
⇒ An "Manage general station description files" dialog will appear.

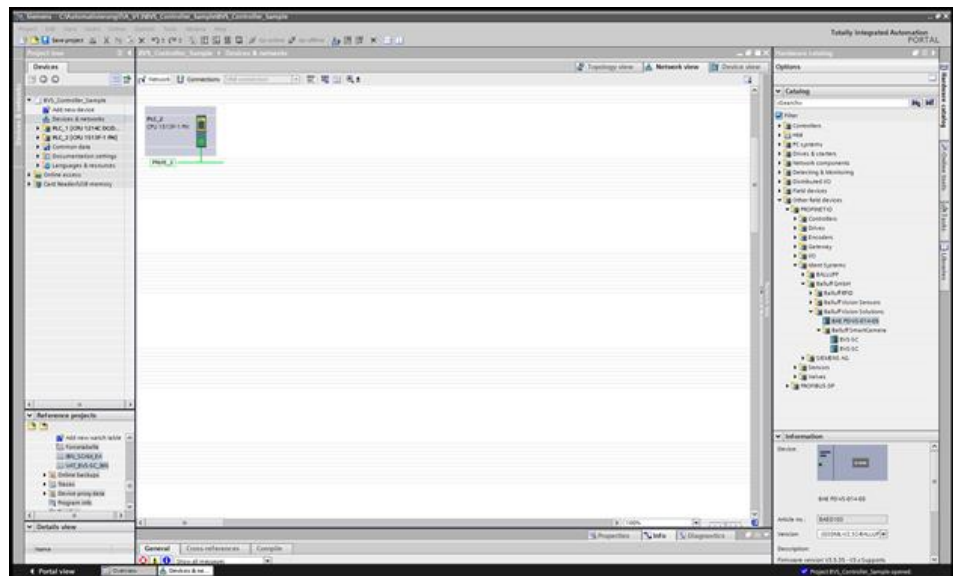
## 6 STARTUP

Figure 17 Manage general station description files



3. Select directory and GSDML file.  
⇒ The [Install] button becomes active only if a GSDML file is selected.
4. Click on **[Install]**.  
⇒ The GSDML file is being installed.  
⇒ A message appears once the process has finished.
5. Confirm the message and close the window.
6. Select the dialog "**Devices & networks**".  
⇒ The devices are displayed in the product tree.

Figure 18 Installing the GSDML file



### Adding a PROFINET device

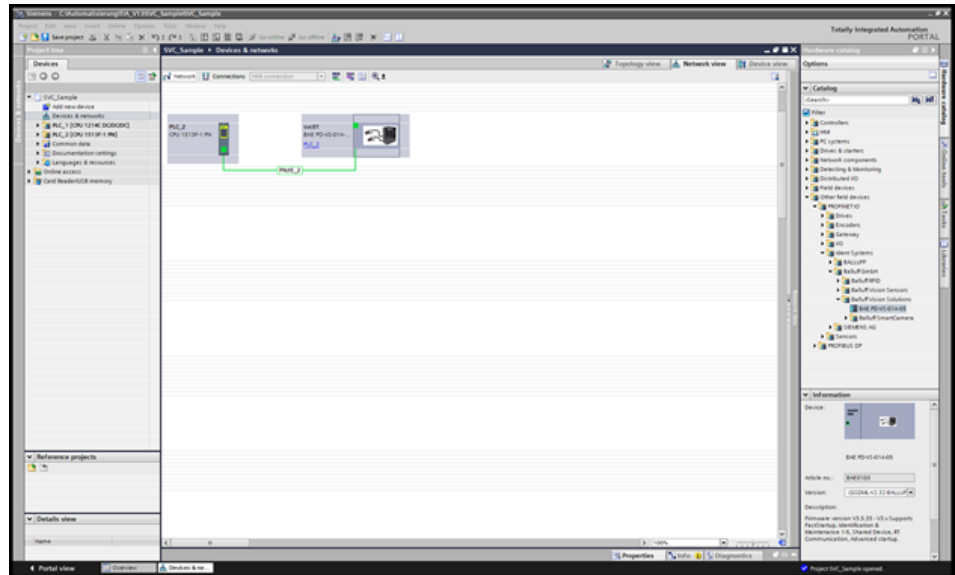
The devices are located in the hardware catalog under "Other field devices", "Ident systems", "Balluff Vision Solutions", "SmartVision Controller". The module is added as PROFINET IO.

1. Open the dialog "**Devices & networks**".
2. Select "**Network view**".

6 STARTUP

3. Assign Balluff SmartVision Controller to PROFINET IO controller.  
 ⇒ The slots are assigned the default settings.

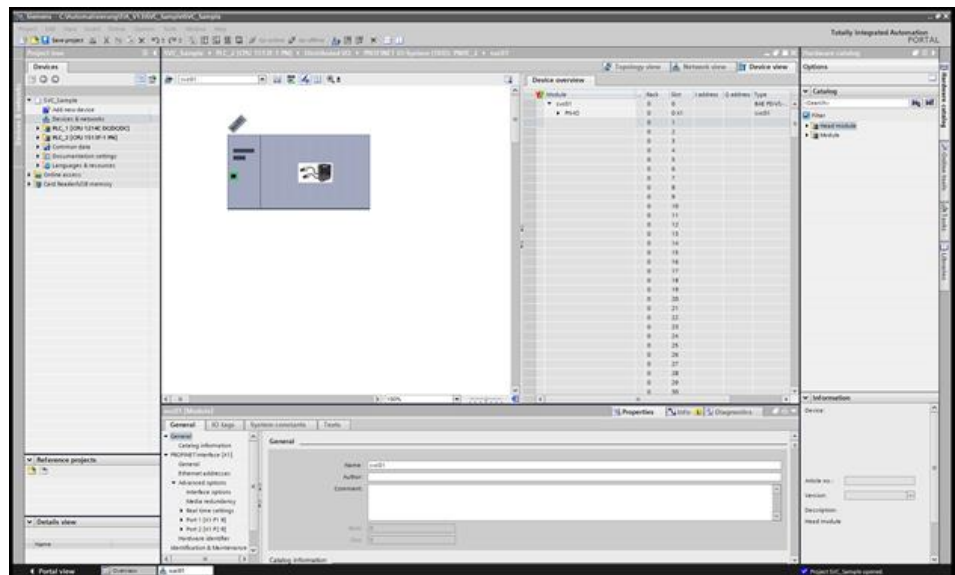
Figure 19 Assign Balluff SmartVision Controller to PROFINET IO controller



Determining the station name in Device view

1. Define the PROFINET station name of the device.

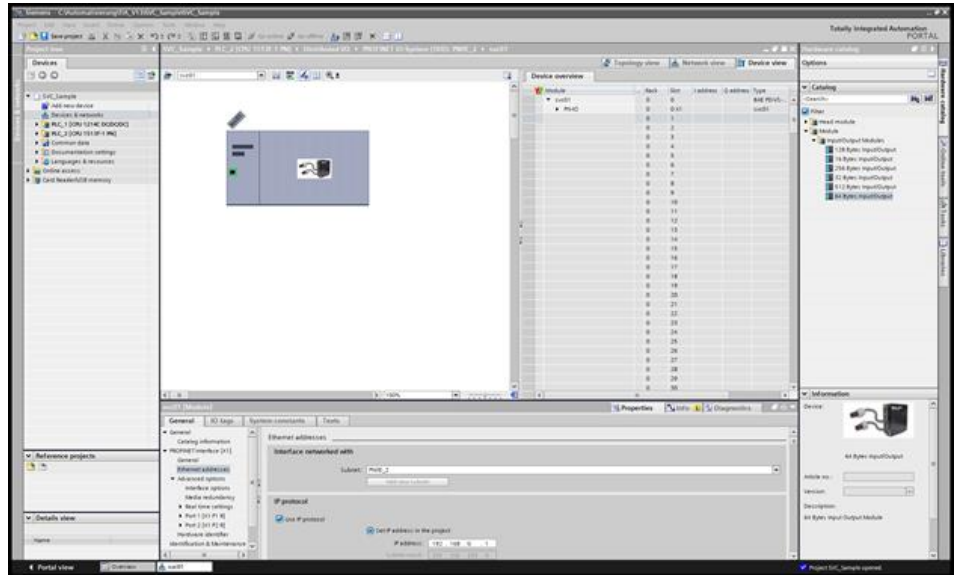
Figure 20 Determining the station name



6 STARTUP

Changing the device's IP address

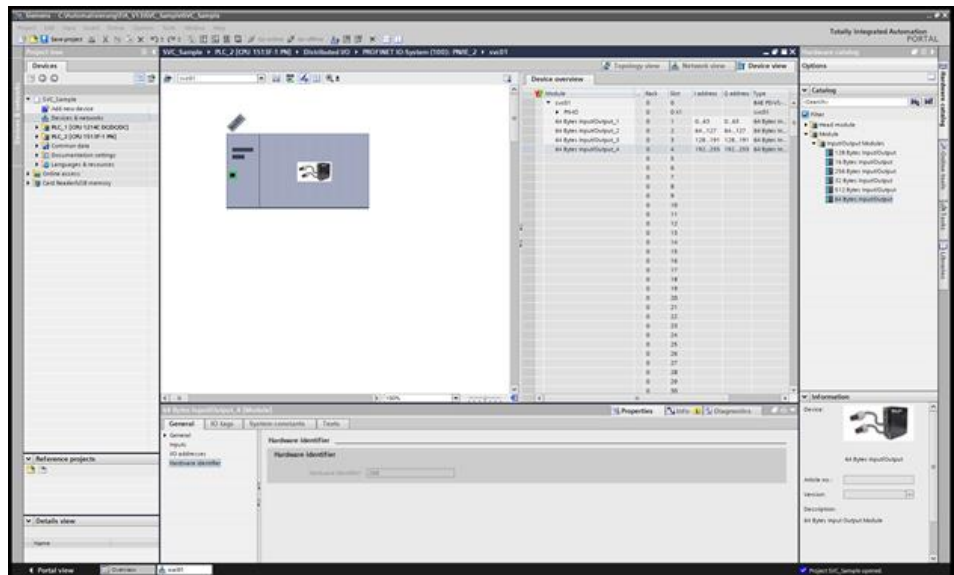
Figure 21 Changing the device's IP address 1



Configuring Balluff SmartVision Controller data

The number of process data (buffer size) of the Balluff SmartVision Controller can be selected by deleting or inserting a corresponding module (min. 16 bytes, max. 512 bytes). For each used camera instance, a IO module has to be projected. When a module is not plugged in, no process data is configured.

Figure 22 Configure input / output modules



PROFINET parameters in BVS Cockpit

The fieldbus parameters are set in the *System settings* on the "Communication" tab. PROFINET is preselected by default. The fieldbus can be changed at any time between PROFINET and EtherNet/IP.

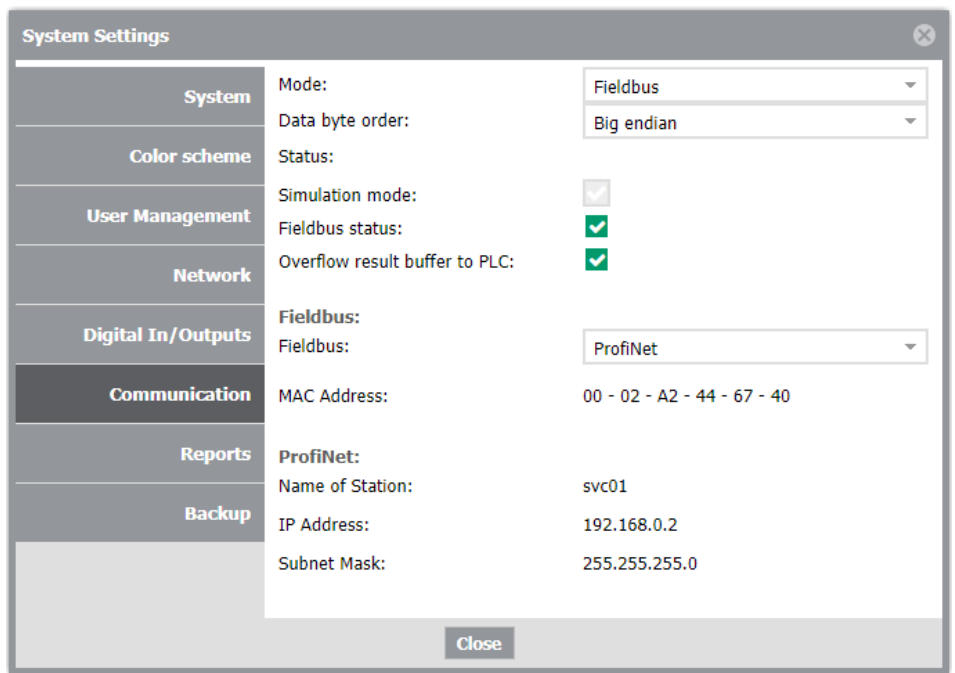
**NOTE**

After switching the fieldbus and after setting a few fieldbus parameters, an internal restart of the fieldbus module is necessary. This

6 STARTUP

process will take some seconds until the dialog is refreshed and the adjusted settings are displayed.

Figure 23 BVS Cockpit - ProfiNet settings



Setting	Description
Name of Station	Name of the fieldbus device
IP Address	Fieldbus IP address, specified by the PLC
Subnet Mask	Fieldbus subnet mask, assigned by the PLC

## 6 STARTUP

## 6.7.3 EtherNet/IP field-bus

## Device master data

To parameterize the correct Balluff SmartVision Controller model in an EtherNet/IP network, device database information in the form of an EDS file is required.

The file is located on the Balluff homepage (see [www.balluff.com](http://www.balluff.com)).

## Process data structure

The following values describe the data sizes of the input, output and configuration data. These must be entered in the host system.

Assembly	Instance ID	Data length in Bytes
INPUT	100	256
OUTPUT	101	256

## Input Assembly (input data, camera to PLC)

Start byte	Length	Description
0	64	Process data of 1st instance at port 9000
64	64	Process data of 2nd instance at port 9001
128	64	Process data of 3rd instance at port 9002
192	64	Process data of 4th instance at port 9003

The process data protocol is described in "Fieldbus interface → Fieldbus protocol of Balluff SmartVision Controller".

## Output Assembly (output data, PLC to camera)

Start byte	Length	Description
0	64	Process data of 1st instance at port 9000
64	64	Process data of 2nd instance at port 9001
128	64	Process data of 3rd instance at port 9002
192	64	Process data of 4th instance at port 9003

The process data protocol is described in "Fieldbus interface → Fieldbus protocol of Balluff SmartVision Controller".

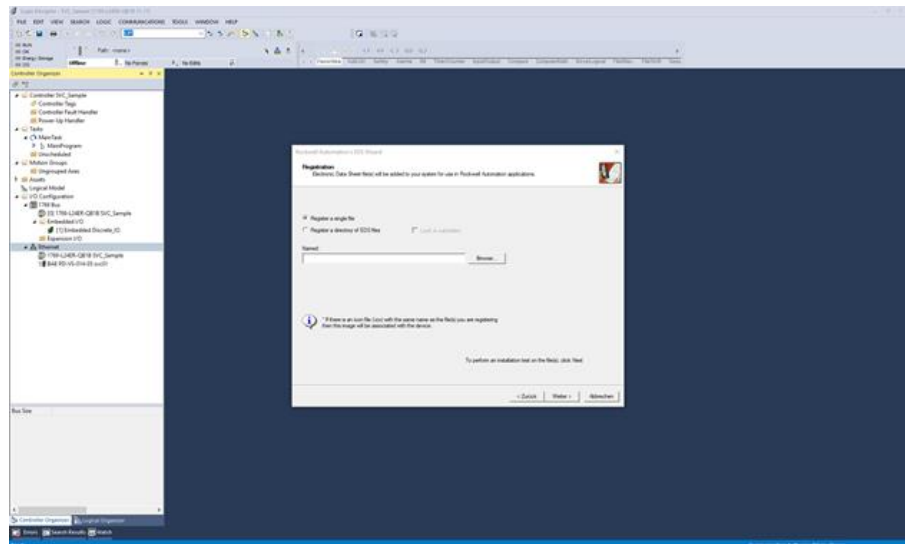
## 6 STARTUP

**Integration in Rockwell Studio 5000**

This example shows how the Balluff Smart Vision Controller connected to a CompactLogix or ControlLogix PLC.

1. Start EDS Hardware Installation Tool in the Logix Designer and register EDS file.

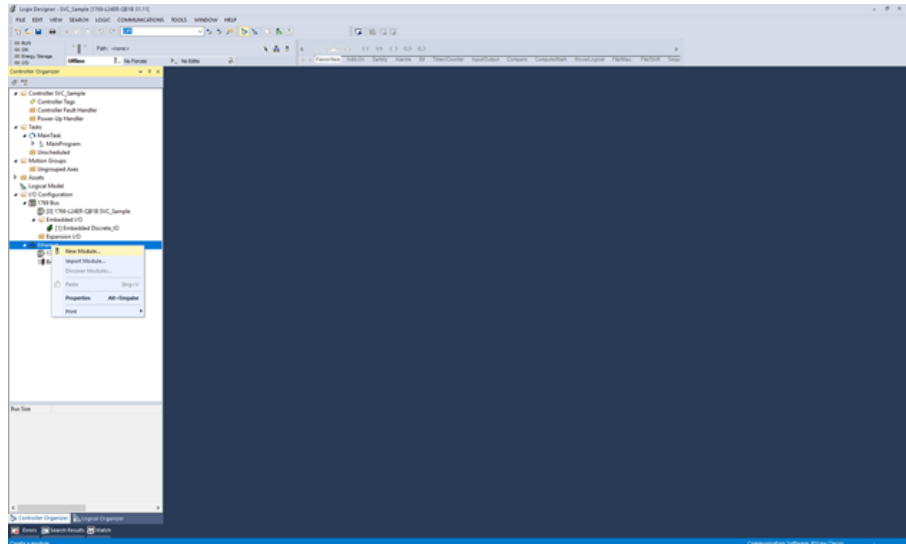
**Figure 24 Register EDS File**



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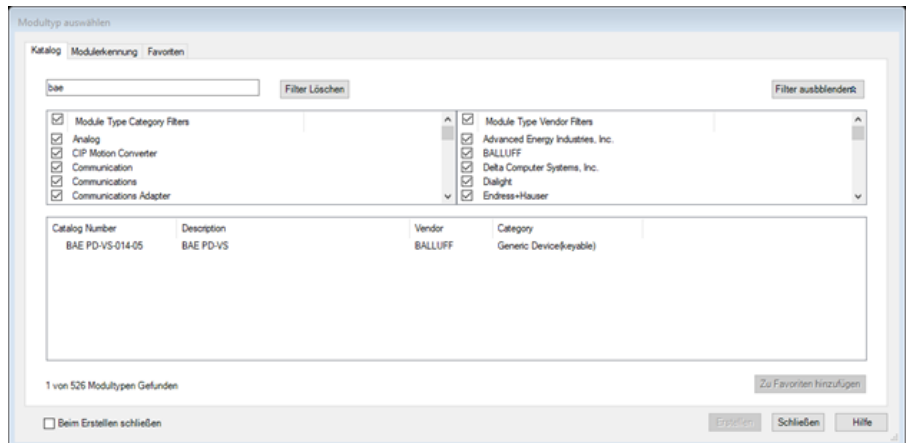
- Right-click Ethernet on the corresponding scanner card. Select a new module. Note: The function is not available in online mode!

**Figure 25 Add module**



- Select Balluff Smart Vision Controller Module BAE PD-VS and apply to the configuration.

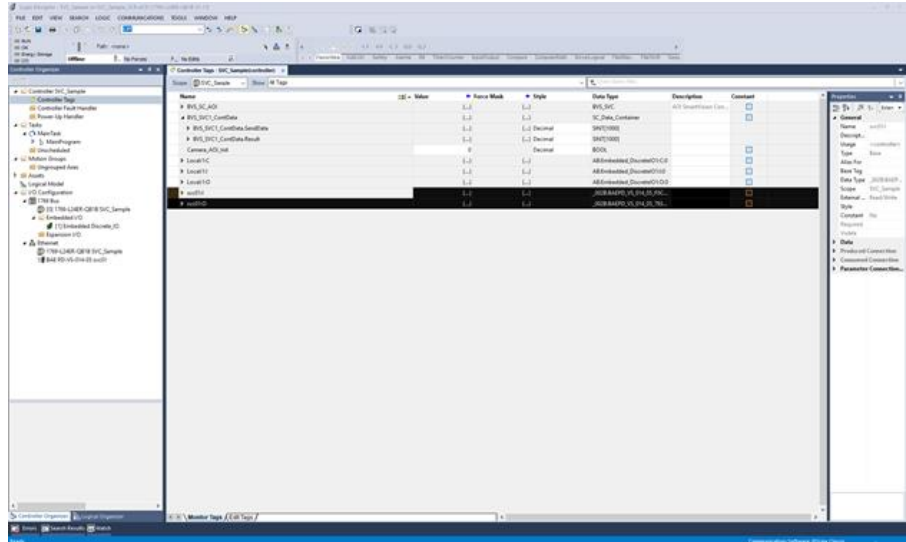
**Figure 26 Select Smart Vision Controller**



- The input, output and configuration tags are automatically created in the controller tags.

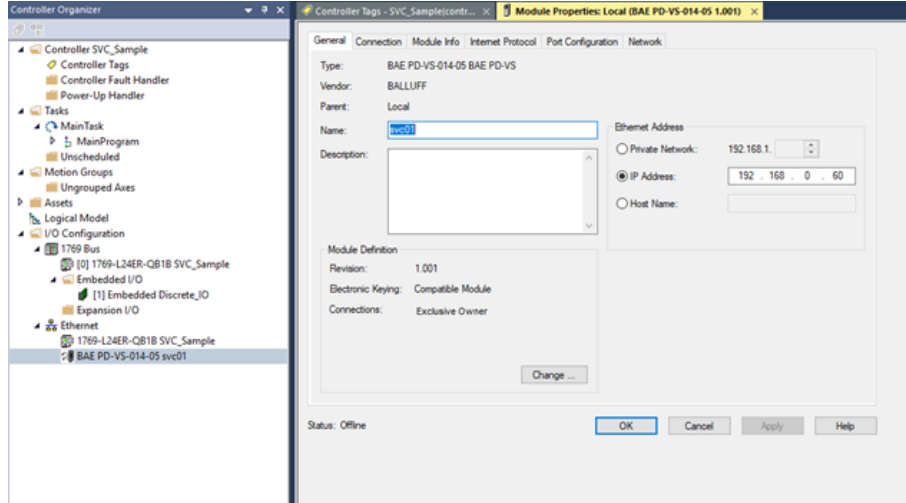
**Figure 27 Camera controller tags**

6 STARTUP



- 5. Set the desired IP address and connection parameters for the Balluff Smart Vision Controllers under Module Properties.

Figure 28 Set connection parameters



**EtherNet/IP parameters in BVS Cockpit**

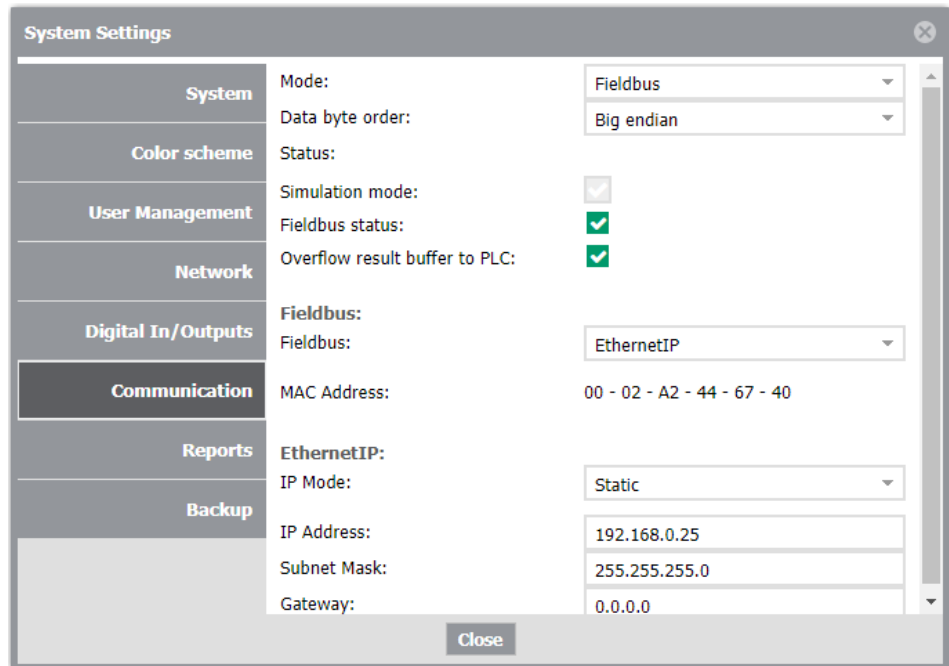
The fieldbus parameters are set in the *System settings* on the "Communication" tab. PROFINET is preselected by default. The fieldbus can be changed at any time between PROFINET and EtherNet/IP.

**NOTE**

After switching the fieldbus and after setting a few fieldbus parameters, an internal restart of the fieldbus module is necessary. This process will take some seconds until the dialog is refreshed and the adjusted settings are displayed.

6 STARTUP

Figure 29 BVS Cockpit - EthernetIP settings



Setting and Displays	Description
IP mode	IP address, subnet mask and gateway can either be manually set (static) or automatically using DHCP protocol or BOOTP.
IP address	Fieldbus IP Address
Subnet mask	Fieldbus subnet mask
Gateway	Fieldbus default gateway

## 7 APPENDIX

### 7.1 Troubleshooting Table

Error	Cause	Action
Accessing the shared folders is not possible.	Your Windows 10 installation does not allow a guest access to the shared folders (BVS Cockpit releases <= 2.3.0); sometimes also with error code <b>0x80070035</b>	<p>Update BVS Cockpit to a version &gt; 2.3.0, which allows accessing the shared folders with following credentials:</p> <ul style="list-style-type: none"> <li>• Login: <i>expert</i></li> <li>• Password: <i>expert</i></li> </ul> <p>If Windows does not prompt for the login and password please use this command in a terminal window, replacing the host name with the correct value:</p> <pre>cmdkey.exe /add:sc-16031893de /U:expert /P:expert</pre>

### 7.2 Type code

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
B	A	E		P	D	-	V	S	-	0	1	4	-	0	5

1-3	BAE	Balluff Accessory Equipment
5-6	PD	Programming Device
8-9	VS	Vision Solution
11-13	014	SmartVision Controller
15-16	05	Operating System Linux

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