Operating Instructions (Compact) Edition 02/2006

SIMATIC VS120
Image Processing Systems

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SIMATIC Sensors

Image processing systems
Vision Sensor SIMATIC VS120

Operating Instructions (Compact)

Edition 02/2006
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Safety Guidelines

This manual contains notices you have to observe in order to ensure your personal safety, as well as to prevent damage to property. The notices referring to your personal safety are highlighted in the manual by a safety alert symbol, notices referring only to property damage have no safety alert symbol. These notices shown below are graded according to the degree of danger.

Danger

indicates that death or severe personal injury **will** result if proper precautions are not taken.

Warning

indicates that death or severe personal injury **may** result if proper precautions are not taken.

Caution

with a safety alert symbol, indicates that minor personal injury can result if proper precautions are not taken.

Caution

without a safety alert symbol, indicates that property damage can result if proper precautions are not taken.

Notice

indicates that an unintended result or situation can occur if the corresponding information is not taken into account.

If more than one degree of danger is present, the warning notice representing the highest degree of danger will be used. A notice warning of injury to persons with a safety alert symbol may also include a warning relating to property damage.

Qualified Personnel

The device/system may only be set up and used in conjunction with this documentation. Commissioning and operation of a device/system may only be performed by **qualified personnel**. Within the context of the safety notes in this documentation qualified persons are defined as persons who are authorized to commission, ground and label devices, systems and circuits in accordance with established safety practices and standards.

Prescribed Usage

Note the following:

Warning

This device may only be used for the applications described in the catalog or the technical description and only in connection with devices or components from other manufacturers which have been approved or recommended by Siemens. Correct, reliable operation of the product requires proper transport, storage, positioning and assembly as well as careful operation and maintenance.

Trademarks

All names identified by ® are registered trademarks of the Siemens AG. The remaining trademarks in this publication may be trademarks whose use by third parties for their own purposes could violate the rights of the owner.

Disclaimer of Liability

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

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Operating instructions (compact)

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1.1 Introduction

This documentation guides you step by step and will help you to commission the SIMATIC VS120 image processing system quickly.

The essential steps for initial commissioning module are as follows:

1. Installation
2. Connecting
3. Adjustment
4. Training
5. Run

1.2 Safety Information

The SIMATIC VS120 products comply with the relevant safety regulations according to:

- IEC
- VDE
- EN

If you have questions about the validity or legality of the installation in the planned environment, please contact your service representative.

Caution

Alterations to the SIMATIC VS120 products are not permitted.

Unauthorized opening of and improper repairs to the device may result in substantial damage to equipment or endanger the user. If you install or exchange system expansions and damage your device, the warranty becomes void.

1.3 Hardware and software requirements

When commissioning the Vision Sensor system SIMATIC VS120 the first time, you require the following hardware and software components:

Hardware

- SIMATIC VS120 processing unit
- Sensor head with CCD sensor chip for detection of the object
- LED ring flash for SIMATIC VS with degree of protection IP65 (not included in every full package), for optimum illumination of the object
- Cables:
  - Power supply cable
  - Lighting cable
  - Sensor cable
  - DI / DO cable
- Documentation package
  - Operating instructions (compact)
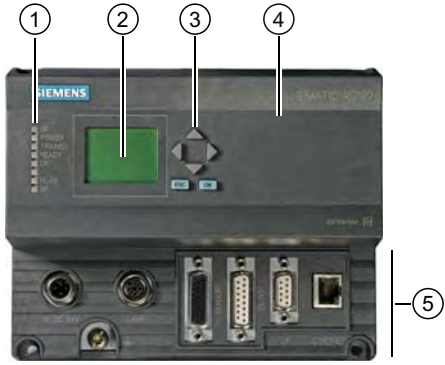 - Documentation CD
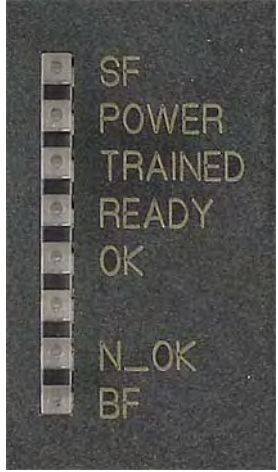
You also require the following:

- 24 V DC, 2 A power supply; (20.4...28.8 V DC, safety extra low voltage, SELV).
- PC / PG with the following configuration:
  - At least 500 MHz clock frequency
  - Graphics card with at least 65536 colors and a resolution of at least 1024 x 768 pixels
  - Ethernet port with up to 100 Mbps (protocol: TCP/IP)
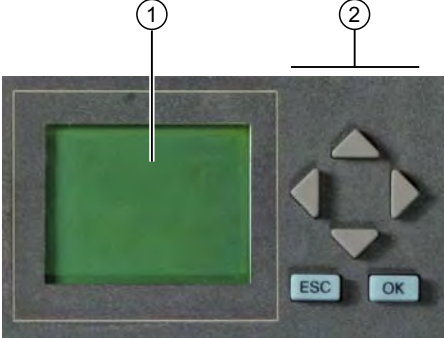- Crossover RJ-45 Ethernet cable for connecting the processing unit and the PC / PG
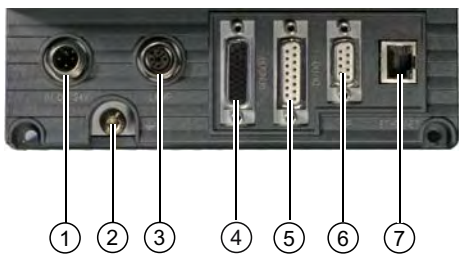
Software

- Microsoft Windows XP Professional SP1 operating system with Internet Explorer 6.0 as of SP1
- Microsoft Java VM or Sun Java VM version J2SE 1.4.2_06 or J2SE 5.0 (you will find more detailed information on the Internet at the following address http://java.sun.com/j2se/)

1.4 Design of the SIMATIC VS120 processing unit
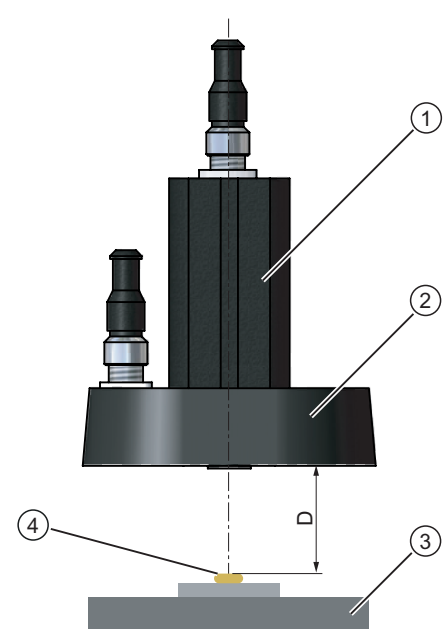
VS120 processing unit (MLFB 6GF1 018-2AA10)	Item no.	Meaning
	(1)	Status LEDs
	(2)	LCD display
	(3)	Keypad
	(4)	Housing consisting of hood and base
	(5)	Ports

Status LEDs	LED	Color	Meaning
	SF	Red	Group error
	POWER	Green	Power supply is turned on
	TRAINED	Green	Selected model has been trained
	READY	Green	• off = device startup or SIMATIC VS120 in Stop • on = SIMATIC VS120 in Run
	OK	Green	Result good: Model was recognized
	-	Green	-
	N_OK	Yellow	Result bad: Model was not recognized
	BF	Red	Bus fault on PROFIBUS DP or PROFINET IO

LCD display and keypad	Item no.	Designation	Meaning
	(1)	LCD display	Displays menu items (lines 1 to 3) and the keys that are currently available (line 4)
	(2)	Keypad	Navigation from menu to menu and within the menus

Ports	Item no.	Meaning
	(1)	Supply voltage 24 V DC, circular M12 connector
	(2)	Functional ground with M5 scew-type connector
	(3)	Lighting unit, circular M12 connector
	(4)	Sensor head, HD D-sub connector, 26-pin
	(5)	I/O, D-sub connector, 15-pin
	(6)	PROFIBUS DP, D-sub connector, 9-pin
	(7)	Ethernet / PROFINET IO; RJ-45 plug

1.5   Design of the sensor head with LED ring light

Sensor head with LED ring flash	Item no.	Meaning
	(1)	Sensor head
	(2)	LED ring flash
	(3)	Conveying unit
	(4)	Test object
	D	Distance between sensor and object with: • 100 mm for 6GF2 002-8DA01 • 90 mm for 6GF2 002-8EA01

1.6   Installing the SIMATIC VS120 processing unit

1. For the location of the holes, refer to the *dimensional drawing of the SIMATIC VS120 processing unit*

2. Install the processing unit so that it is easily accessible for the operator

## 1.7 Installing the sensor head with LED ring light

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Notice

Aligning the optical axis

Align the optical axis of the sensor head vertical to the direction in which the object is conveyed. Otherwise the image of the object will be distorted. The evaluation will be inaccurate.

If the objects always pass the sensor head in the same position, the angle of the mid axis of the objects to the vertical can be up to 45°.

There are two possible ways to install the LED ring flash:

- LED ring flash on the sensor head, parallel to the optical axis of the sensor head

Sensor head

LED ring flash

Object

Conveying unit
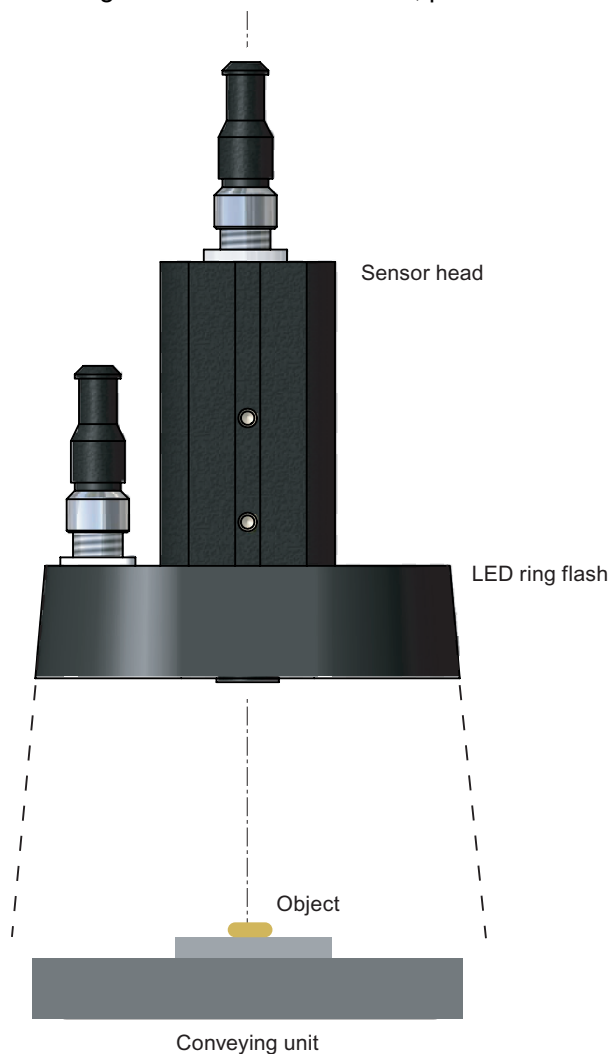
How to mount the LED ring flash on the sensor head

The LED ring flash is supplied with two mounting brackets to allow it to be mounted on the sensor head.

1. Screw the mounting bracket onto the LED ring sensor
2. Push the sensor head through the LED ring sensor
3. Guide the mounting brackets into the grooves of the sensor head
4. Secure the mounting bracket with screws.

How to mount the sensor head

A mounting plate is supplied with the sensor head.

1. Insert the mounting plate in one of the grooves of the sensor head
2. Secure the sensor to your holder with a mounting plate

How to mount the LED ring flash beside the sensor head

No ring light flash is supplied to secure the LED ring flash beside the sensor head For ordering information on a suitable ring flash holder, refer to the section *Accessories* in the operating instructions.

1. Mount the sensor head on your holder

2. Secure the LED ring flash to the ring flash holder

3. Secure the ring light holder to your holder

- LED ring flash beside the sensor head, at an angle to the optical axis of the sensor head

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Notice

LED ring flash beside the sensor head

If the object causes interfering reflections when the LED ring flash is mounted on the sensor head, mount the LED ring flash beside the sensor head.

Sensor head

LED ring flash

Object

Conveying unit
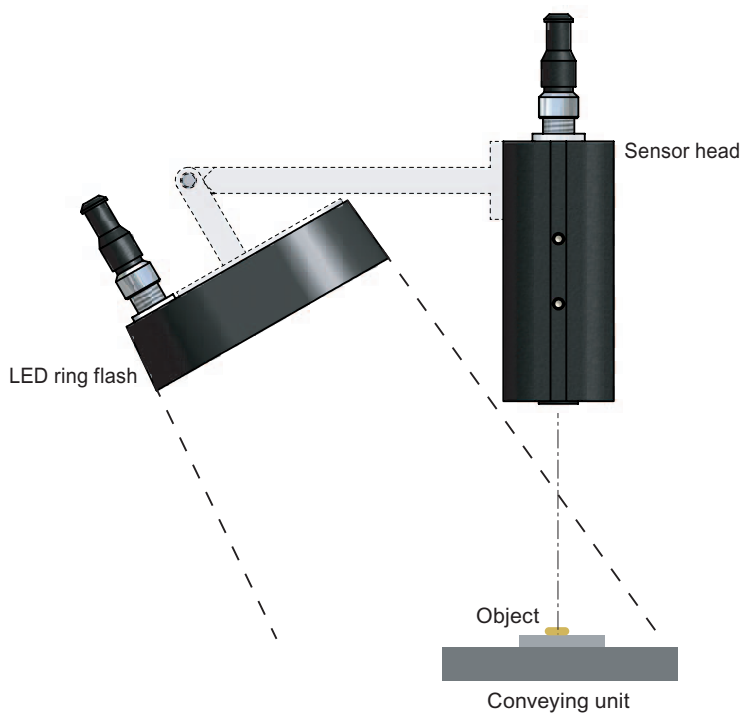
1.8 Connection of hardware components
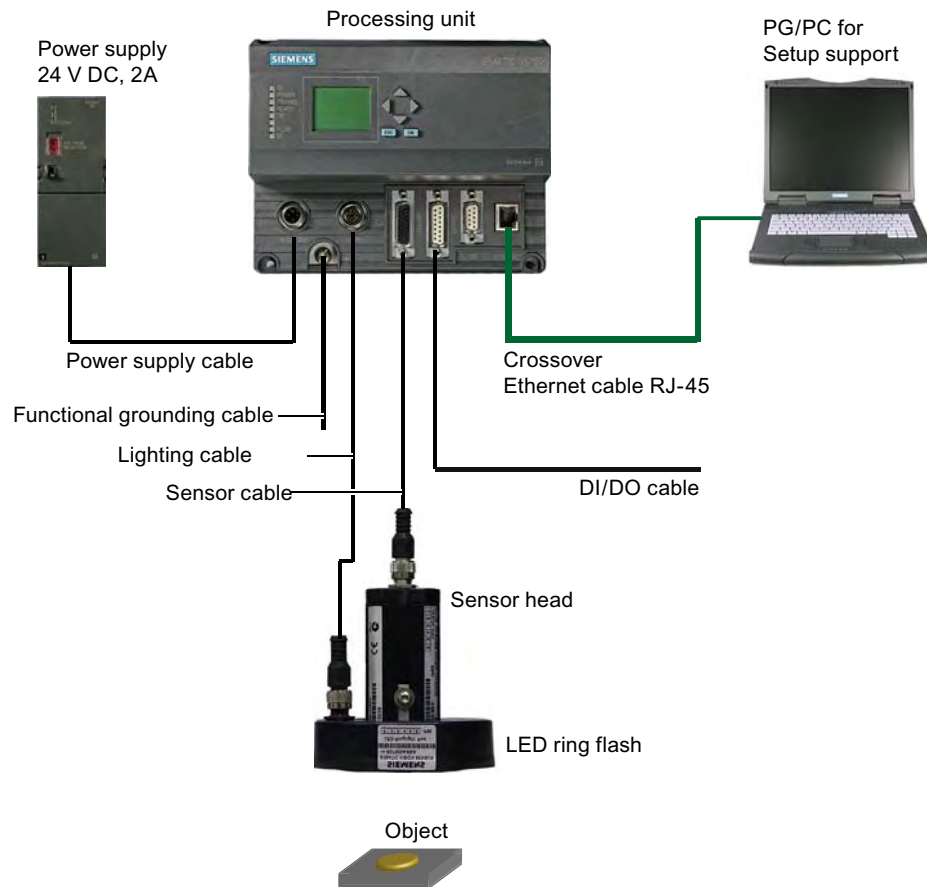

Figure 1-1   Example of a typical system configuration

Caution

If power is supplied to the system configuration, do not remove any connectors!

It is forbidden to remove any connectors while the system configuration power supply is on. Otherwise you could damage hardware components!

Connect the SIMATIC VS120 processing unit with:

1. The PC / PG using the Ethernet crossover cable with the RJ-45 connectors

2. Your I/O "DI / DO" (for example, light barrier, proximity switch) with the DI / DO cable with the 15-pin D-sub connector

3. The sensor head with the sensor cable with the HD 26-pin D-sub connector

4. The LED ring flash with the lighting cable with the circular M12 connector

5. Functional ground PE, cable cross section at least 1.5 mm^2

6. The power supply with the power supply cable with circular M12 connector and connect the power supply cable to the 24 V DC, 2 A power supply

I/O interface pin assignment "DI/DO" (socket)				
Connector	Name	Function	Direction	Wire color
1	DISA	Disable: Disable manual keypad input, model selection via digital I/O	Input	Black
2	SEL0	Select 0: Model selection: Bit 0	Input	Brown
3	SEL1	Select 1: Model selection: Bit 1	Input	Green
4	SEL2	Select 2: Model selection: Bit 2	Input	Orange
5	SEL3	Select 3: Model selection: Bit 3	Input	Yellow
6	--	Not used	--	--
7	TRG	Trigger starts the processing	Input	Blue
8	RES	Reset: Reset error	Input	Violet
9	IN_OP	In operation: • 0 = SIMATIC VS120 starting up or error message is displayed. • 1 = SIMATIC VS120 functional, no errors	Output	White-black
10	TRD	Trained: Selected model has been trained.	Output	White-brown
11	RDY	Ready: • 0 = device startup or SIMATIC VS120 in Stop • 1 = SIMATIC VS120 in processing mode (Run)	Output	White-green
12	OK	Evaluation result: Object was recognized	Output	White-orange
13	--	Not used	--	--
14	N_OK	Evaluation result: Model was not recognized	Output	White-red
15	M	Chassis ground	-	Gray

Interface assignment of power supply "IN 24 V DC" (pin)				
Connector	Name	Function	Direction	Wire color
1	+ 24 V	24 V DC supply voltage	-	Red
2	+ 24 V	24 V DC supply voltage	-	Orange
3	M	Chassis ground	-	Black
4	M	Chassis ground	-	Brown

1.9 Establishing a direct connection between PC / PG and processing unit

To establish a direct connection between the PC / PG and processing unit:

1. Configure the SIMATIC VS120 processing unit as a DHCP server.

2. Configure the PC / PG as a DHCP client

3. Connect the SIMATIC VS120 processing unit and the PC / PG with an Ethernet crossover RJ-45 cable

With this method, the PC / PG automatically obtains its IP address from the processing unit.

Note

IP address of the SIMATIC VS120 processing unit

When shipped, the SIMATIC VS120 processing unit has a default IP address. You can change the IP address. For more information on this topic, read the section *Manual configuration of the SIMATIC VS120 processing unit* in the operating instructions.

Caution

Communication problems in a network

Operating the SIMATIC VS120 processing unit in a network can interfere with the communication in your network if you make certain settings in the Connect > Ports > Ethernet > IP Mode menu. You should therefore only connect the SIMATIC VS120 processing unit to the network after you have completed configuration and checked your settings carefully.

How to configure the SIMATIC VS120 processing unit as a DHCP server.

1. After turning on the SIMATIC VS120 processing unit and after the self-test is completed, go to the "Connect" menu and confirm with "OK".

2. Confirm the selected "Ports" menu with "OK"

3. Change to the "Ethernet" menu and confirm with "OK"

4. Confirm the selected "IP Mode" menu with "OK"

5. Select "DHCPSERV" and confirm with "OK"

How to configure the PC / PG as a DHCP client

1. Click Start > Settings > Network and Dial-up Connections

2. In the "Network and Dial-up Connections" dialog, select your active local area connection to the network

3. Select "Properties" in the context-sensitive menu and select the "Internet Protocol (TCP/IP)" entry.

4. Click the "Properties" button

5. Select the "Obtain an IP address automatically" and "Obtain DNS server address automatically" option buttons

1.10   Starting setup support via the Internet Explorer

1. Start the PC

2. Turn on the power supply of the SIMATIC VS120 processing unit. Once the self-test has completed, go to "Adjust" in the LSD display

3. Press the OK button of the SIMATIC VS120 processing unit. The IP address appears on the LCD display

4. Note down the IP address

5. Start the Internet Explorer

6. In the "IP address" input box, enter the IP address of the processing unit.
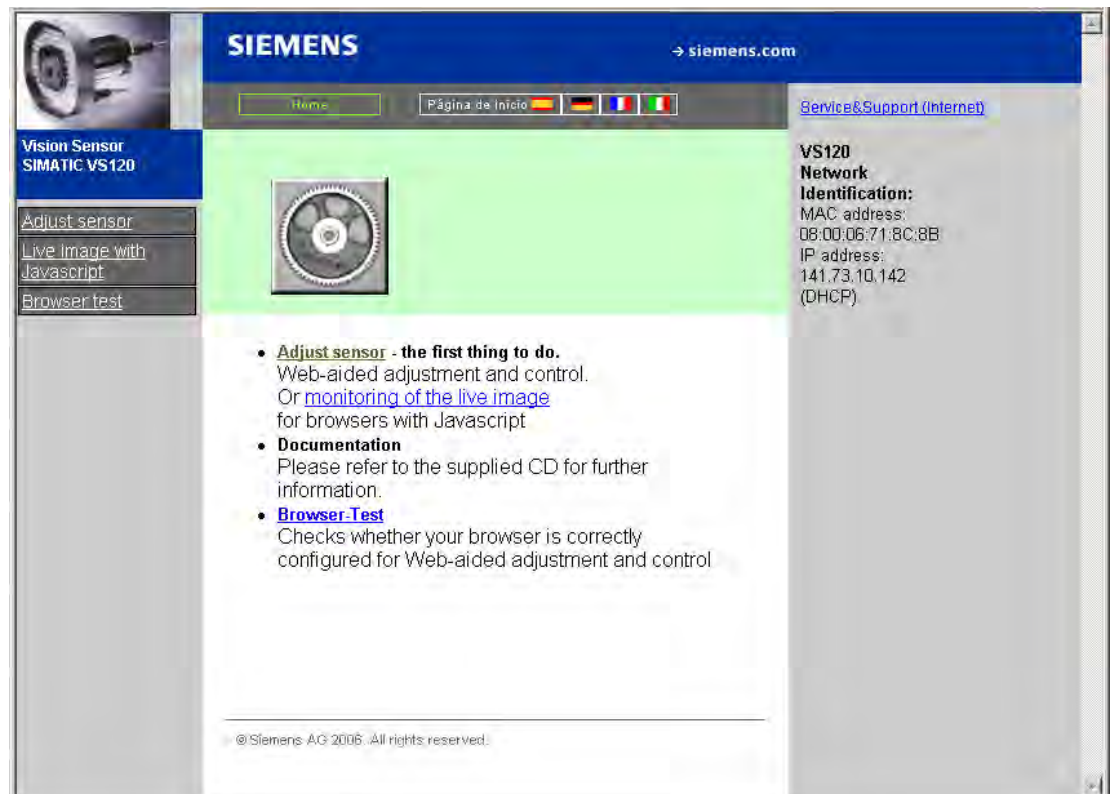
7. Press the enter key on the keypad

Figure 1-2   Home

1.11   Sensor Adjustment

1. On the start page of the setup support, click on "Sensor Adjustment". The "Sensor Adjustment" user interface opens

2. Position an object below the sensor head

3. Click the "Adjustment" button.

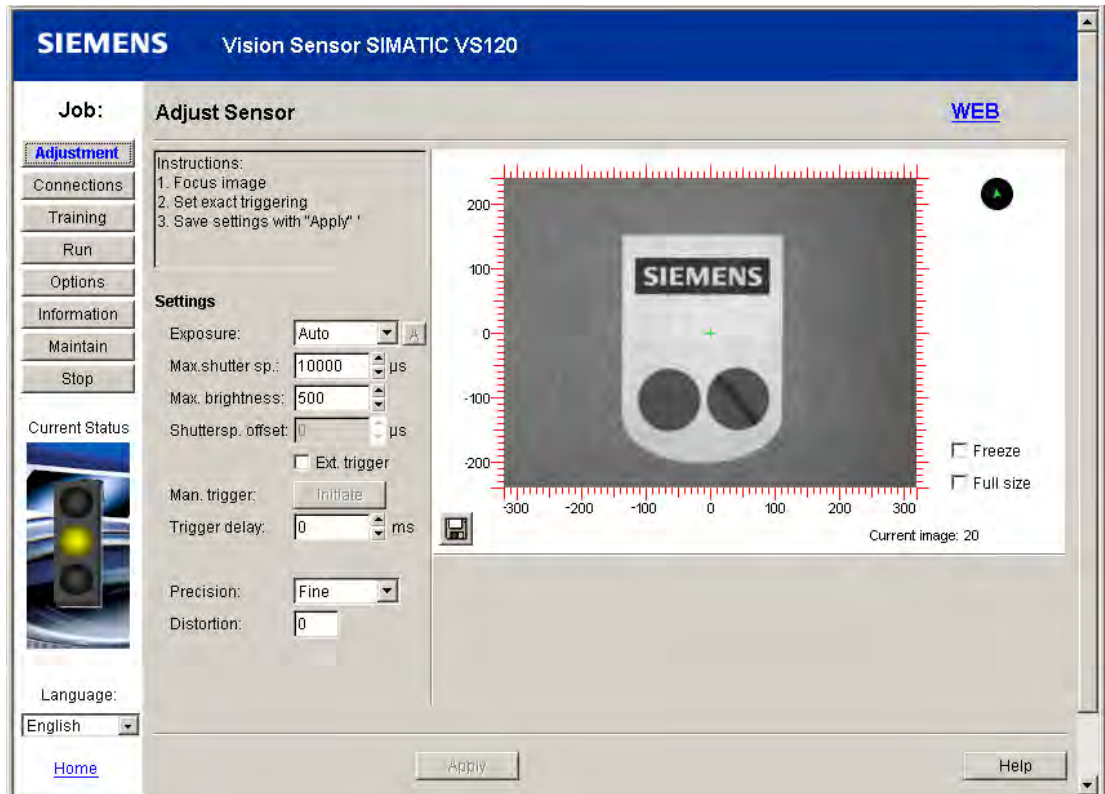4. Follow the instructions displayed as text at the top left.

Figure 1-3   Sensor Adjustment

1.12 Training a model

To form patterns that can be recognized, edges (transitions from light to dark or vice versa) from the image are used. Although the algorithm of the SIMATIC VS120 extracts the edges automatically, the user must make sure that the lighting is ideal for an image with good contrast; in other words, to create models for recognition, it is essential to use the lighting correctly to achieve an image with high contrast.

1. Click the "Train" button. The "Training - Selection" tab of the user interface opens
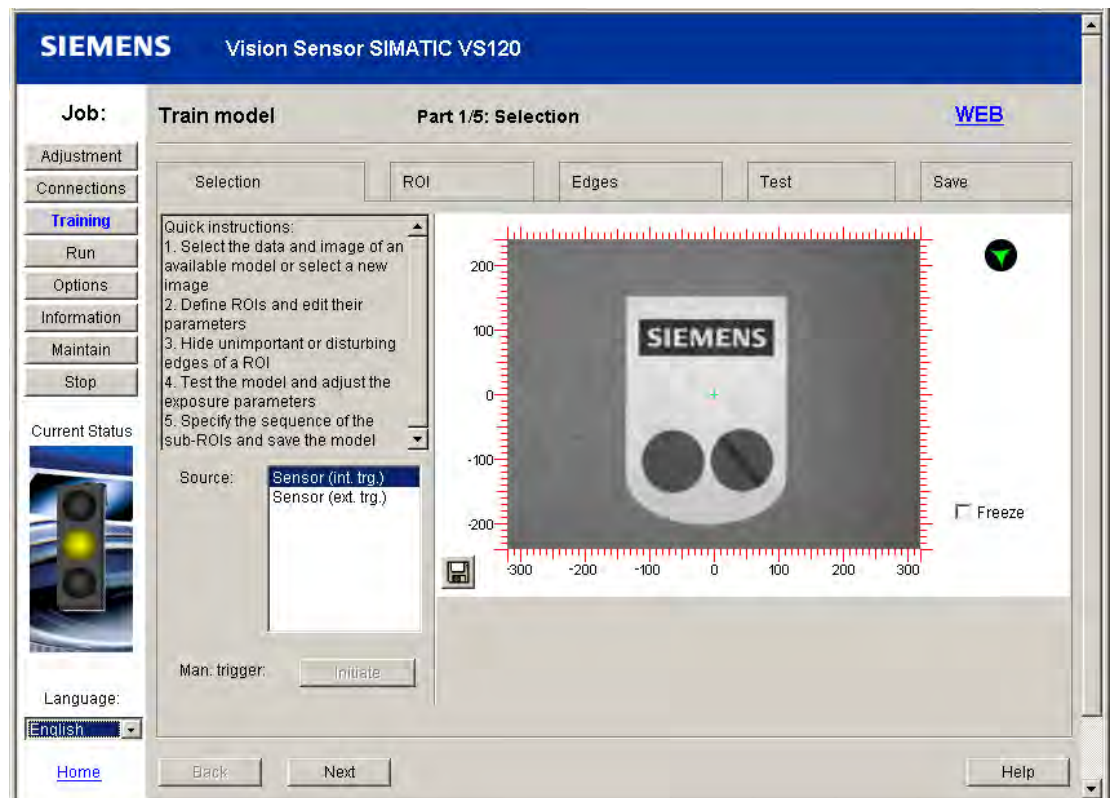
Figure 1-4   Training - Selection tab

2. For the triggering, select "Sensor (int. Trigger)": The displayed image is constantly refreshed

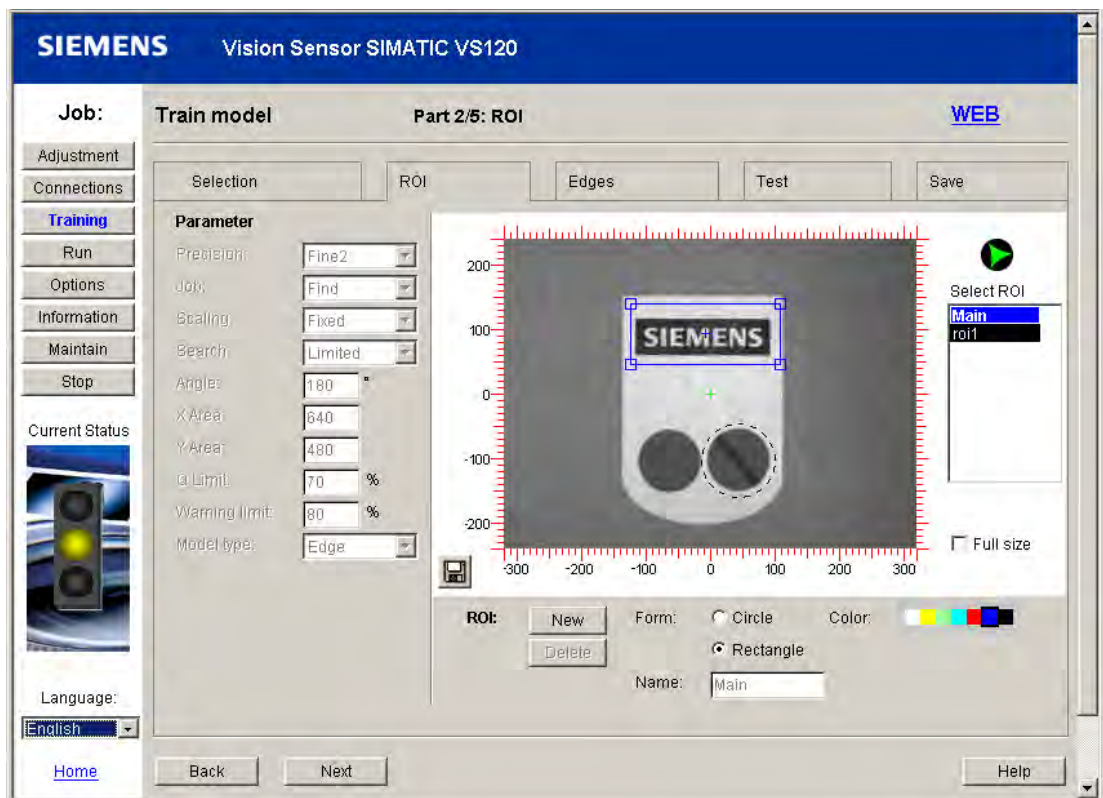3. Click the "Next" button. The "Training - ROI" tab of the user interface opens

Figure 1-5   Training - ROI tab

4. Using the cursor, select the image section (image source) that will later be used for the comparison.

5. Open the "Save" tab. The "Training - Save" tab of the user interface opens

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Note

Further operator options

- In the "Edges" tab, you will find further options with which you can optimize the object (image).

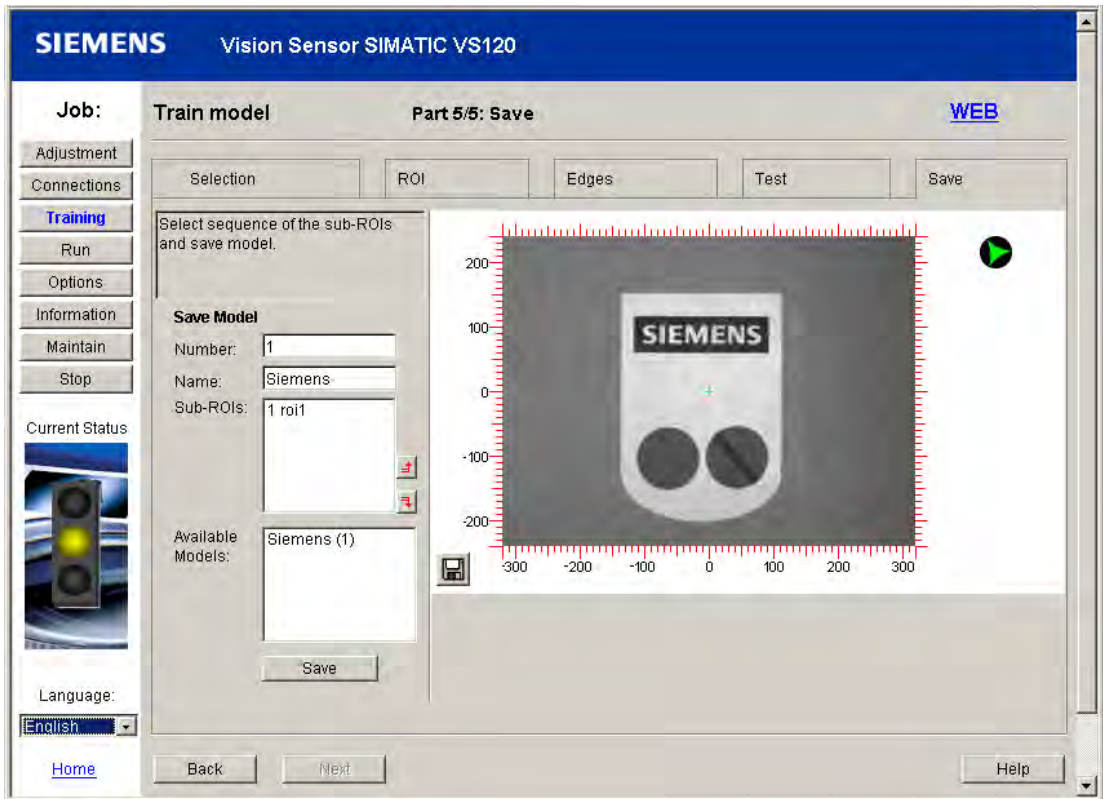- In the "Test" tab, you can try out processing the object.

Figure 1-6   Training - Save tab

6. Enter the model number (for example 1)

7. Enter the model name (for example SIEMENS)

8. Click on the "Save" button

1.13   Evaluating the object

1. Click the "Run" button. The "Run" user interface opens

2. Select the trained model

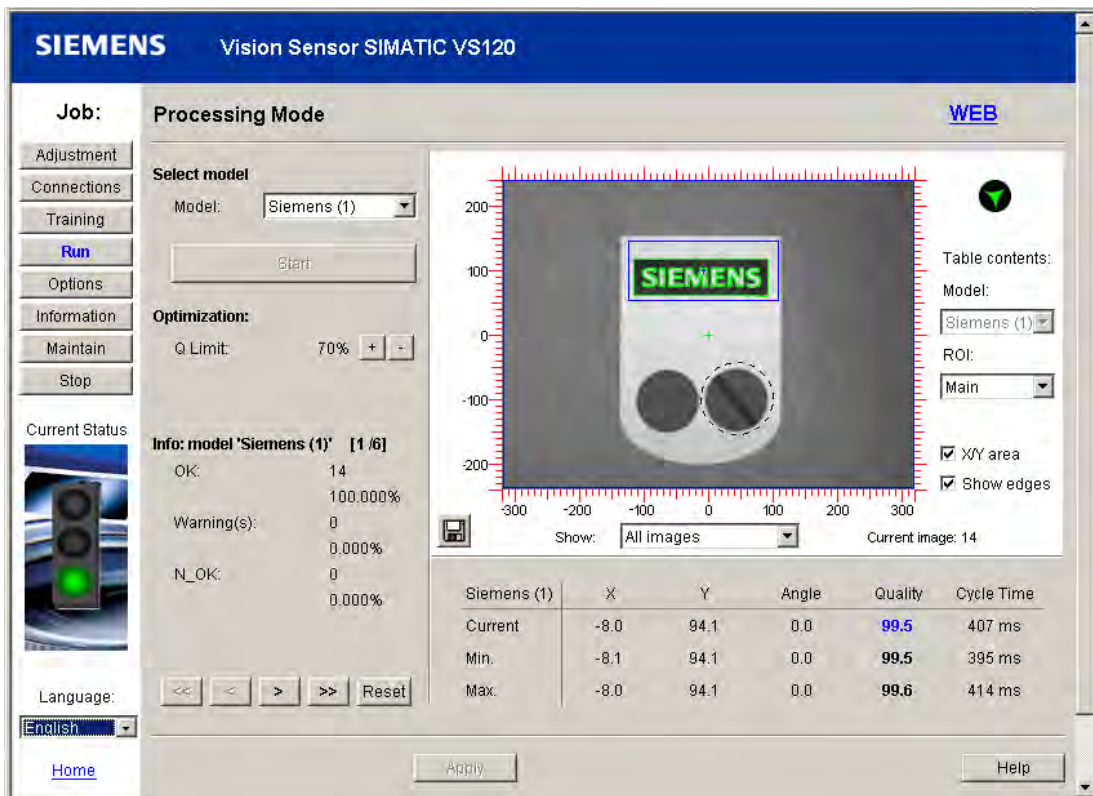3. Click the "Start" button. You then see the current results of the evaluation

Figure 1-7   Run

Note

LCD display of the SIMATIC VS120 processing unit

The LCD display of the SIMATIC VS120 processing unit also displays the current evaluation results.

Note

Remaining tasks / functions

You will find information on the other functions "Connections", "Options", "Information", "Maintenance", and "Stop" in the operating instructions. The functions are called using the buttons of the same name.

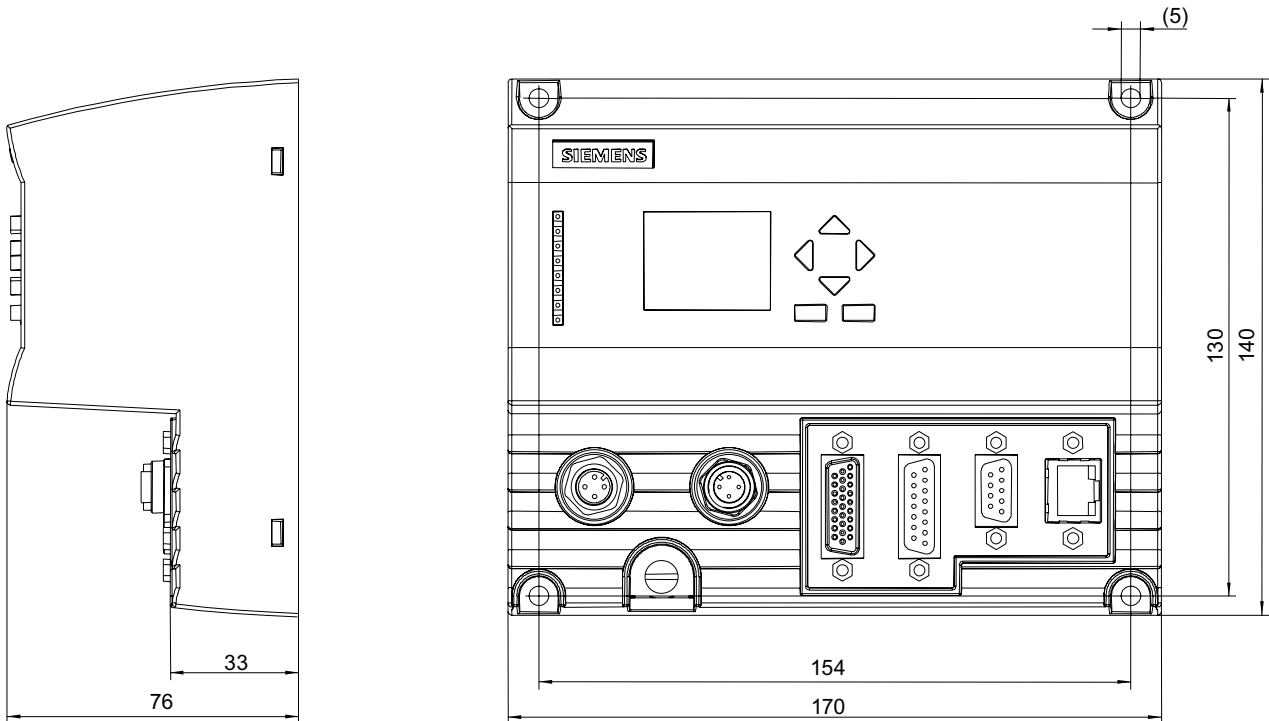# 1.14 Dimension drawing of the SIMATIC VS120 processing unit

Figure 1-8   Dimension drawing of the processing unit

- Securing screws M4×12 or longer
- Permitted, static bending radii with:
  - Power supply cable with a minimum radius of 40 mm
  - Illumination cable with a minimum radius of 25 mm
  - Sensor cable with a minimum radius of 40 mm
  - DI / DO cable with a minimum radius of 50 mm

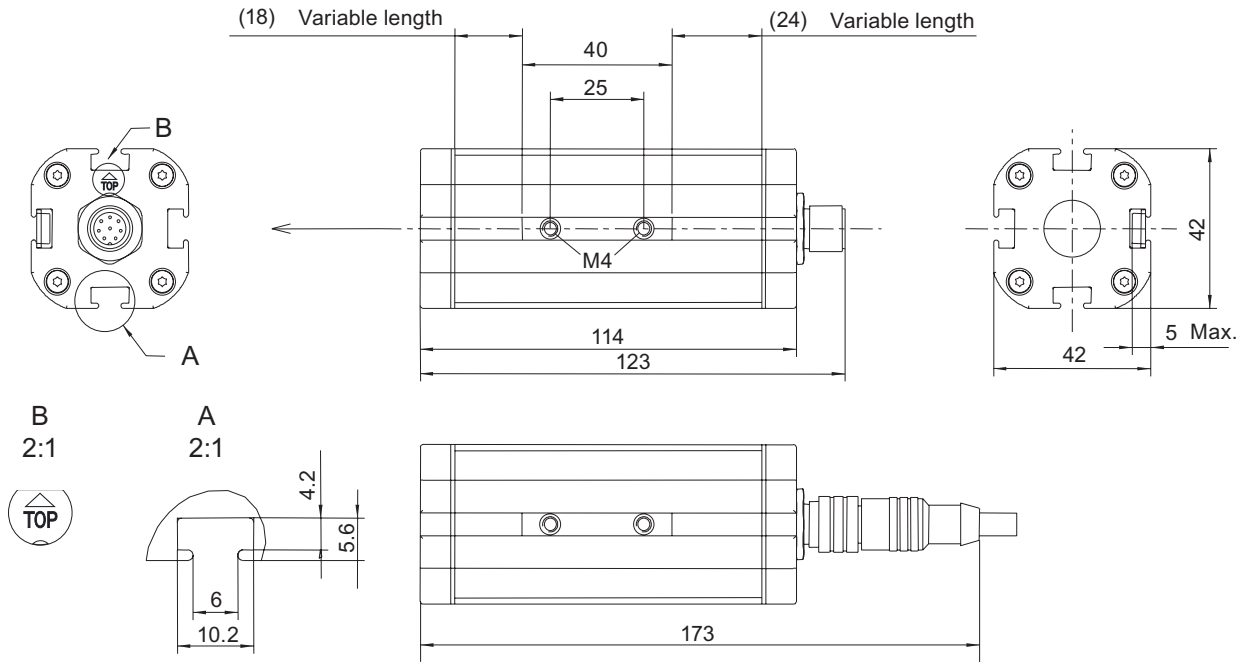## 1.15 Dimension drawing of the sensor head

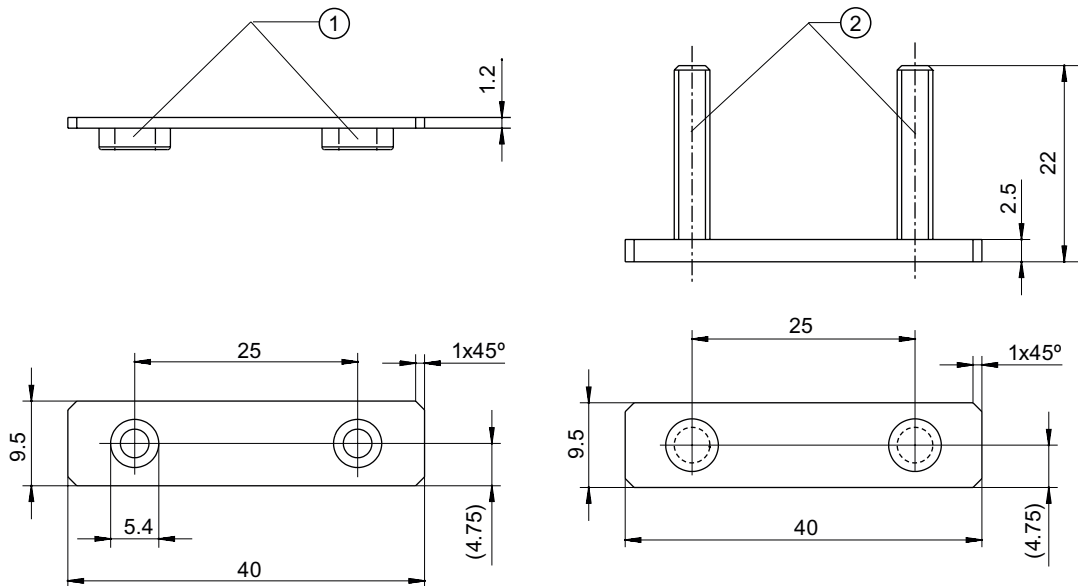Figure 1-9   Dimension drawing of the sensor head

Figure 1-10   Mounting plate for sensor head

1) press-in nut M4

2) press-in bolt M4 x 22

1.16 Dimension drawing of the LED ring flash

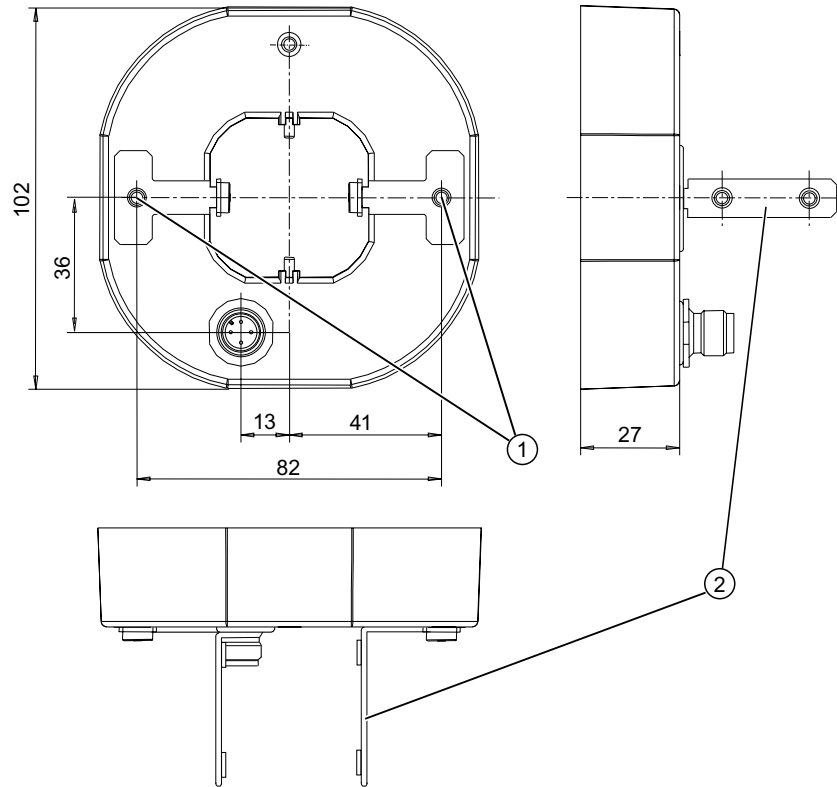Figure 1-11   Dimension drawing of the LED ring flash

1) M4 screw
2) mounting bracket for mounting the sensor head

1.17 Documentation on the SIMATIC VS120

Documentation package	Content
Operating Instructions (compact) SIMATIC VS120	Step-by-step instructions for fast initial commissioning
Documentation CD SIMATIC VS120	• SIMATIC VS120 Operating Instructions • Operating Instructions (compact) SIMATIC VS120 • Online help • Function block FB1 and data block DB10 for PROFIBUS DP and PROFINET IO data exchange • Sample programs for FB1 • Sample program for archiving • SIMATIC S7-300 Automation System, Installation Manual • Device master data file SI0180ED.GSD and the corresponding bitmap file VS1X0__N.DIB for PROFIBUS DP and device master data file GSDML-V2.0-Siemens-002A-VS100-20060208.XML for PROFINET IO

Sources:

• Can be downloaded free of charge on the Internet at:
   http://www.siemens.de/automation/service&support

• SIMATIC Manual Collection on DVD; 5-languages; all manuals on S7-200/300/400, C7, LOGO!, SIMATIC DP, PC, PG, STEP 7, ENGINEERING Software, RUNTIME Software, PCS7, SIMATIC HMI, SIMATIC NET, SIMATIC MACHINE VISION, SIMATIC SENSORS; MLFB: 6ES7998-8XC01-8YE0

1.18 A&D Mall / Interactive Catalog (CA01)

In the online catalog CA01 of the Automation & Drives group, you will find details on the following and can place orders:

• Products

• Systems

• Solutions

Internet address:
http://mall.ad.siemens.com

1.19　Service and support

Technical support

You can reach the technical support team for all A&D projects at:

- Telephone: ++49 (0) 180 5050 222
- Fax:　　++49 (0) 180 5050 223

Internet

- Visit our site on the Internet at:

  http://www.siemens.com/automation/service&support
- You can send a support query to:

  http://www.siemens.de/automation/support-request
- The online catalog and the online ordering system is available at:

  http://www.siemens.de/automation/mall
- For further information on factory automation sensors, visit

  http://www.siemens.de/simatic-sensors