SIEMENS

SIMATIC

Vision Sensor VS 130

Manual

Edition 03/2003
A5E00199459-01

Safety Guidelines

This manual contains notices intended to ensure personal safety, as well as to protect the products and connected equipment against damage. These notices are highlighted by the symbols shown below and graded according to severity by the following texts:

Danger
indicates that death, severe personal injury or substantial property damage will result if proper precautions are not taken.

Warning
indicates that death, severe personal injury or substantial property damage can result if proper precautions are not taken.

Caution
indicates that minor personal injury can result if proper precautions are not taken.

Caution
indicates that property damage can result if proper precautions are not taken.

Notice
draws your attention to particularly important information on the product, handling the product, or to a particular part of the documentation.

Qualified Personnel

Only **qualified personnel** should be allowed to install and work on this equipment. Qualified persons are defined as persons who are authorized to commission, to ground and to tag circuits, equipment, and systems in accordance with established safety practices and standards.

Correct Usage

Note the following:

Warning
This device and its components 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.

This product can only function correctly and safely if it is transported, stored, set up, and installed correctly, and operated and maintained as recommended.

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Disclaimer of Liability

We have checked the contents of this manual for agreement with the hardware and software described. Since deviations cannot be precluded entirely, we cannot guarantee full agreement. However, the data in this manual are reviewed regularly and any necessary corrections included in subsequent editions. Suggestions for improvement are welcomed.

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A5E00199459-01

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Preface

Purpose of the Manual

This manual describes Vision Sensors SIMATIC VS 130. It supports you during theinstallation, commissioning and operation of the Sensors.

The manual is intended for persons working in the fields of programming, configuration, commissioning, servicing programmable logic controllers and image processing devices.

Guide

For easy and fast access of special information, the manual contains the following access aids:

- At the beginning of the manual you will find a complete table of contents.
- At the end of the manual you will find a comprehensive index which gives you rapid access to the information you need.
- In the chapters, you will find information that gives you an overview of the contents of the section on the left column of every chapter.

Additional Information

An installation instruction manual in paper form is supplied for the installation and wiring of the product.

You will find a "Getting Started" on the CD supplied for the first commissioning of SIMATIC VS 130.

Additional Support

If you have questions on how to use the products described in this manual that are not answered here, please contact your local Siemens dealer or office.

http://www.siemens.com/automation/partner

A&D Technical Support

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Worldwide (Nuernberg) **Technical Support** 24 hours a day, 365 days a year Phone: +49 (0) 180 5050-222 Fax: +49 (0) 180 5050-223 E-Mail: adsupport@ siemens.com GMT: +1:00		
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The languages of the SIMATIC Hotlines and the authorization hotline are generally German and English.		

Service & Support on the Internet

In addition to our documentation, we offer our Know-how online on the internet at:

http://www.ad.siemens.de/support

where you will find the following:

- Current Product Information leaflets, FAQs (Frequently Asked Questions), Downloads, Tips and Tricks.
- A newsletter giving you the most up-to-date information on our products.
- The Knowledge Manager helps you find the documents you need.
- Users and specialists from all over the world share information in the forum.
- Your local customer service representative for Automation & Drives in our customer service representative data bank.
- Information on field service, repairs, spare parts and more under "Services".

Contents

1 Product Overview

1.1 Product Description

The Vision Sensor SIMATIC VS 130 is a data matrix code reader. You can use it to read the coded labeling of products and then pass the read code to a PLC or a computer.

Use of the two-dimensional data matrix code is becoming more widespread due to the following characteristics:

- High information density
- Readability even when damaged or poor "print" quality
- Readability not dependent on orientation

SIMATIC VS 130 reads data matrix codes and works with overhead lighting. The object is lit from above with the supplied ring flash.

Three models of the Vision Sensor SIMATIC VS 130 are available:

- SIMATIC VS 130 for large code areas (order number of the full package: 6GF1 130-1AA)
- SIMATIC VS 130 for small code areas (order number of the full package: 6GF1 130-2AA)
- SIMATIC VS 130 for variable code areas (Order number of the basic package: 6GF1 130-3AA), if you are using C- or CS-mount lenses.

Reading or Verifying Data Matrix Code

The SIMATIC VS 130 can read and, when necessary, verify data matrix codes (compare the entire code or part of it with a saved code).

The entire read character string or only part of it (in other words, filtered) can be output. When it is output, further characters can de appended at the start or end as a prefix or suffix.

The SIMATIC VS 130 can operate both in standalone mode to make good/bad decisions or as part of a control system to pass on the read codes for further processing.

Features

- Recognition and decoding data matrix codes according to ECC 200 (with the exception of base256)
- Ring flash
- Installation support by setup software on the PC
- Up to 5 code readings per second
- Option of code comparison with up to 15 saved codes
- Option of filtering and formatting the result
- To sort the objects, there are 3 digital outputs:
  READ, MATCH, N_OK
- Control via digital I/O and PROFIBUS DP
- Transfer of results via RS-232 interface and PROFIBUS DP

You will find the technical specifications SIMATIC VS 130 in Appendix A.2

Code Characteristics

Characteristics	**SIMATIC VS 130 for "large code areas" (6GF1 130-1AA with 6GF2 002-8DA sensor head)**	**SIMATIC VS 130 for "small code areas" (6GF1 130-2AA with 6GF2 002-8EA sensor head)**	**C-/CS-mount**
CCD resolution	0.11 mm	0.6 mm	Image width / 640
Minimum dot size (edge length)	0.6 mm	0.35 mm	Image width / 120
Maximum dot size (edge length)	3.5 mm	2 mm	Image width / 22
Minimum code dimension (rows * columns)	10 *10		
Maximum code dimension (rows * columns)	48 *48		72 *72 [1)]

[1)] With large code dimensions such as 72*72, make sure that the lens used does not cause any distortion at the edges.

Note

The NUL control character (00_H) shows the end of a read result contained in a data matrix code. Characters located after a NUL character in data matrix code are not output.

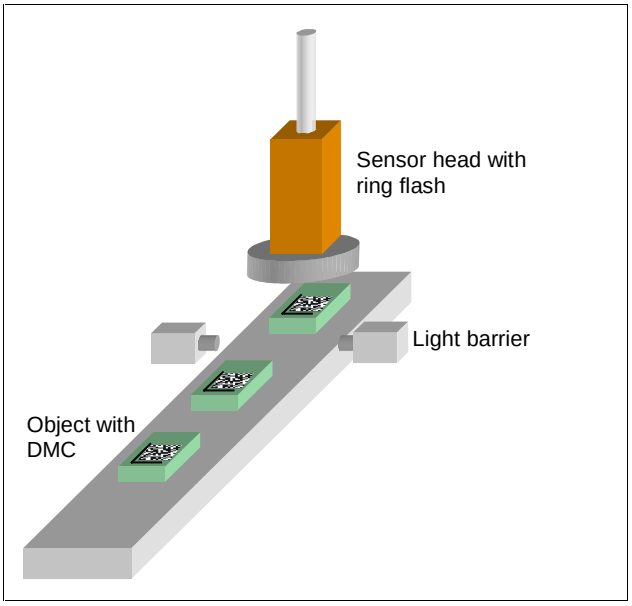
1.2 Components

The full Vision Sensor Sensor SIMATIC VS 130 consists of

- Sensor head with CCD sensor chip (CCD = Charge Coupled Device) for sensing the code
- LED overhead lighting, red, degree of protection IP65 as ring flash (order number 6GF9 004-8BA)
- Processing unit for code evaluation, output of results, PROFIBUS DP interface and parameter assignment
- Cables to connect the individual components
- Installation instructions for installing and wiring the SIMATIC VS 130
- CD with:
  - The setup software that runs under Windows (98, ME, NT 4.0, 2000 or XP) allowing the image captured by the SIMATIC VS 130 to be displayed on a PG/PC
  - This manual SIMATIC VS 130 (German and English)
  - Getting Started
  - Installation Instructions
  - The installation manual *SIMATIC S7-300, Programmable Controller, Hardware and Installation*
  - The device master data file SIEM8100.GSD and the corresponding bitmap file VS1X0__N.DIB

You will find an overview of the complete range of components in Appendix A.1

1.3 Processing Setup



The objects with the data matrix code are fed past the sensor head with a suitable conveyor.

They must be located fully within the sensor field of view when being read.

In the training mode, the character content of the code is saved.

In the evaluation mode, the current code is read and, if required, compared with the saved content of the trained code. Depending on the results of the read operation, the digital output signals are set: READ (code was localized and decoded), MATCH (code matches the learned code), N_OK (code was not legible).

The result of the read operation is output via the RS-232 interface or via PROFIBUS. It is also possible to filter the read character string and to append additional characters at the start or end.

Triggering

To read the data matrix code, you must make sure that the code is completely within in the sensor field of view and clearly visible.

The data matrix code is captured at the trigger time. In this case, you generate an exact trigger signal at the trigger time, for example with a laser light barrier.

You can check your settings with the setup software of the VS 130.

1.4 Important Requirements for Installation

The following requirements must be met:

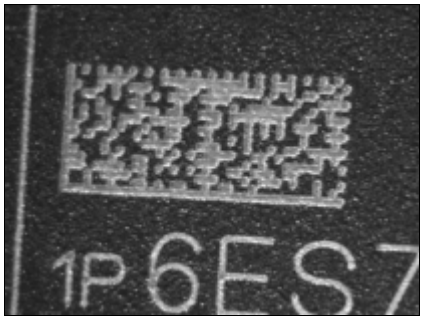
- The code must be clearly visible:
  - There should be as few reflections is possible in the code field.
  - The code field should be uniformly illuminated without shadows.
  - All parts of the code should be sharply printed.
- The sensor can be up to 45° from the vertical.
- The distance between the code and the image edge should be at least two dot widths.

1.5 Applications

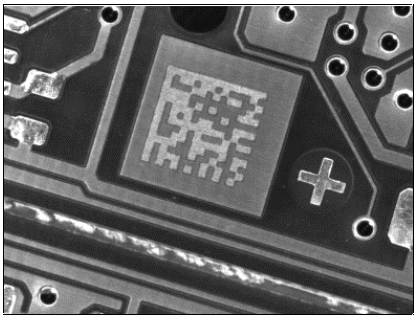
Below, you will see several examples of data matrix codes:

- Printed code

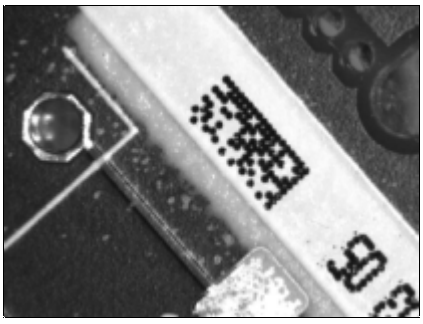
- Lasered code (plastic surface)



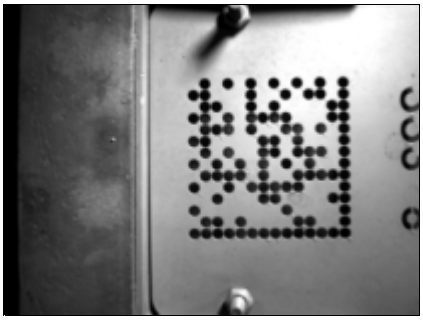
- Lasered code (PCB)



- Code created with inkjet printer

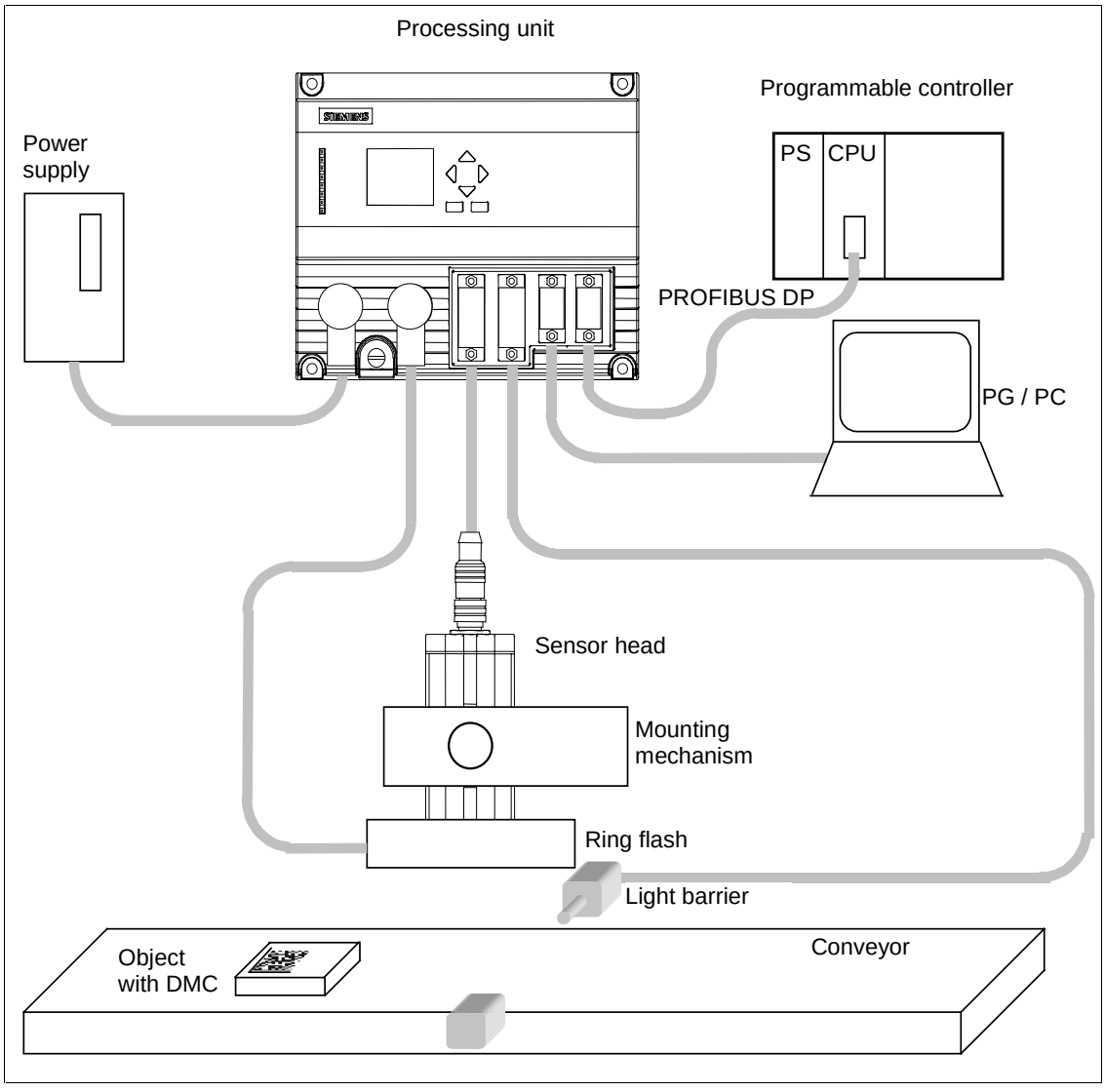


- Punched code



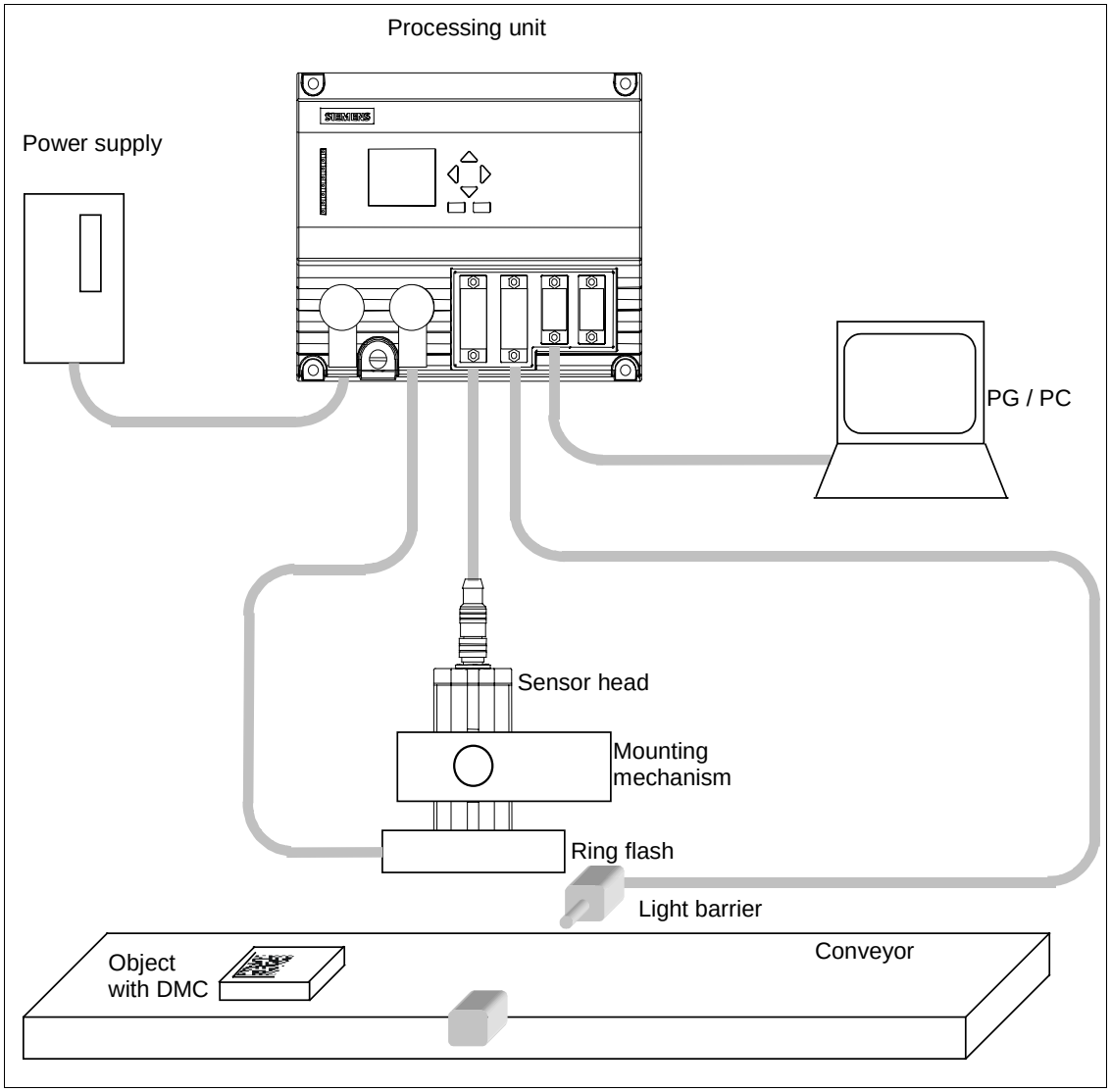
2 System Integration

2.1 Configuration



2.2 Application Examples

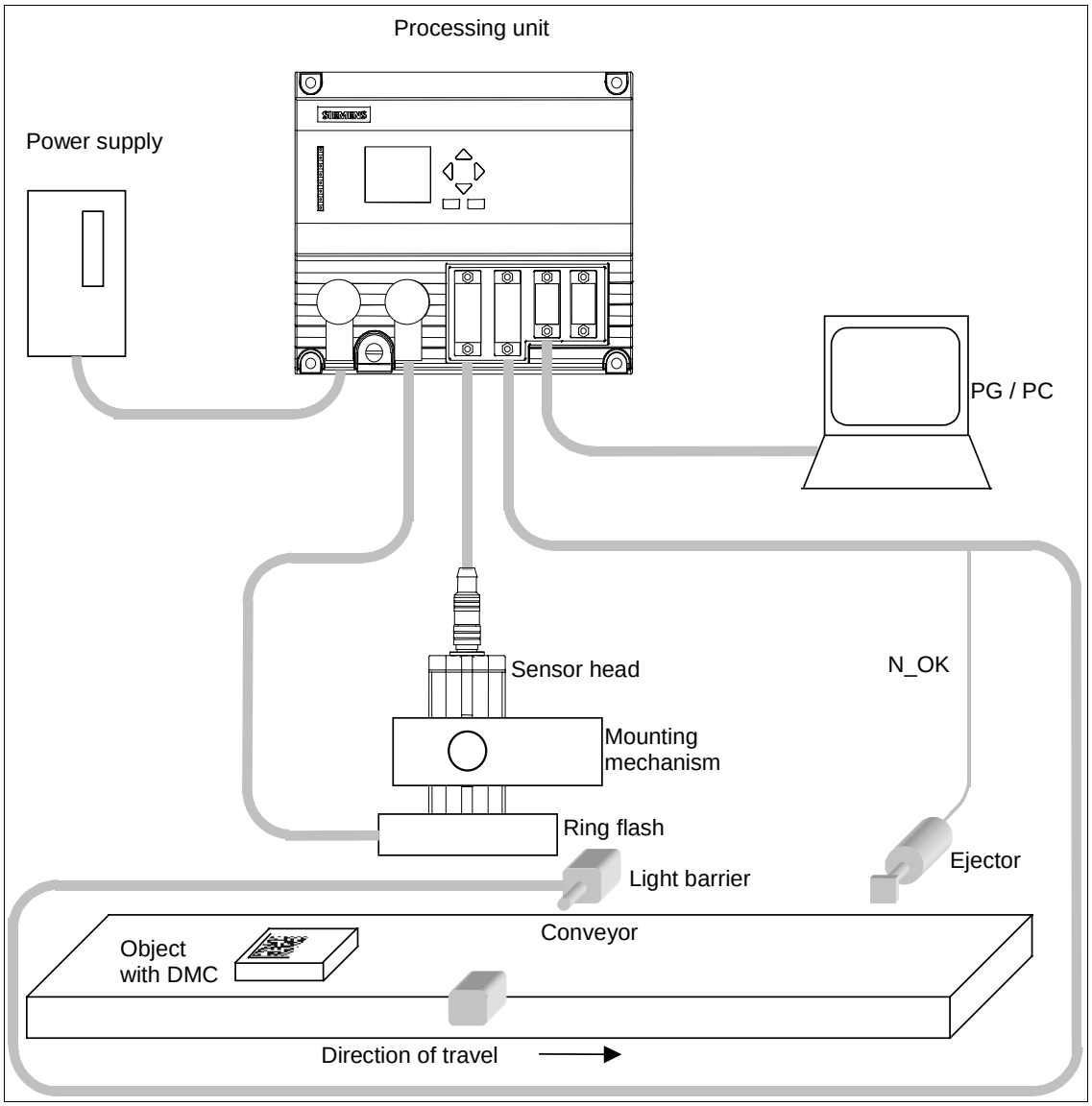
2.2.1 Reading Codes in Stand-alone Mode



There is no connection to PROFIBUS.

VS 130 reads the codes and outputs them on a PG/PC connected via the RS-232 interface. It is also possible to filter the read character string and to append additional characters at the start or end (see section 5.3.4).

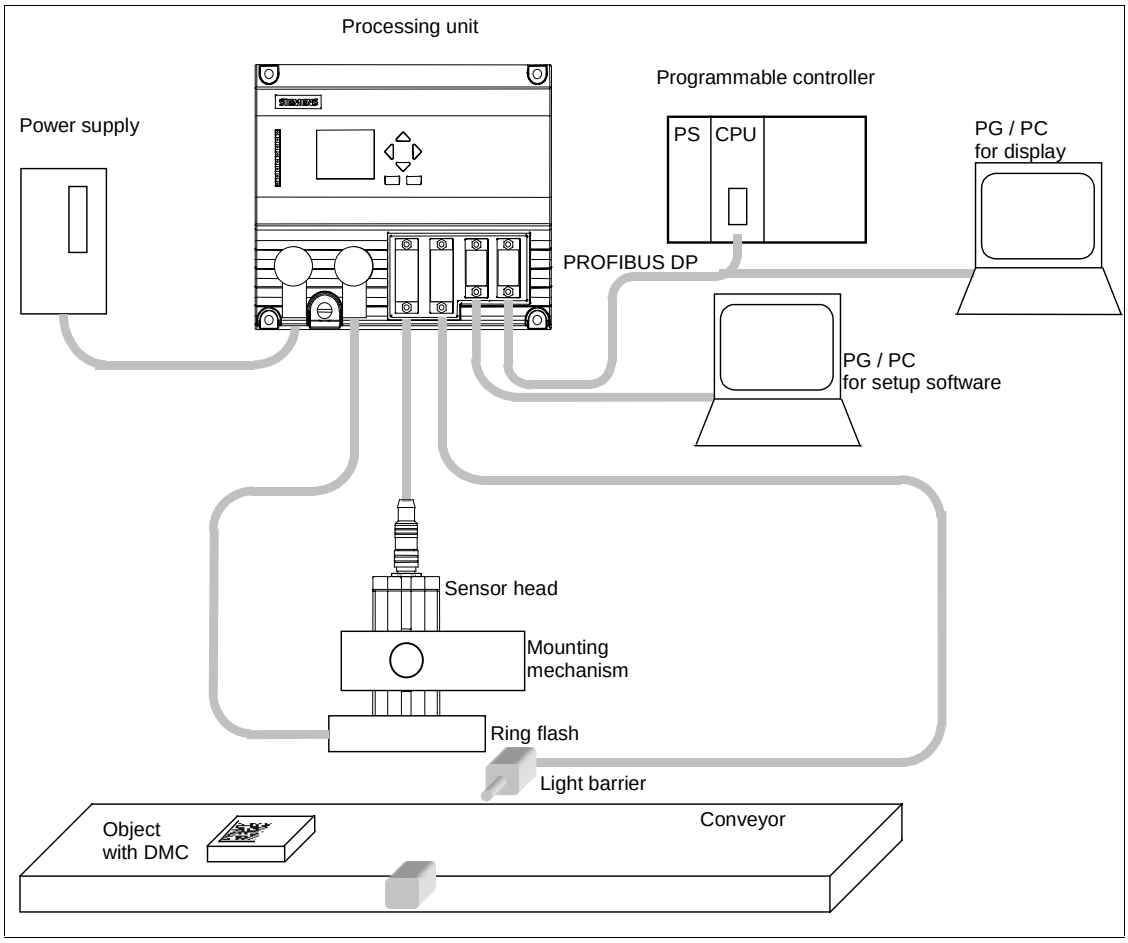
2.2.2 Reading and Comparing Codes in Standalone Mode



There is no connection to PROFIBUS.

VS 130 reads the codes and compares either the entire code or part of the code with a user-defined string. If it was not possible to read code (the output signal N_OK is set), an ejector removes the object from the conveyor.

2.2.3 Reading Codes in a PROFIBUS Environment



A PG/PC intended solely for setup is connected via the RS-232 interface. Via PROFIBUS, there is a connection to a PLC and to another PG/PC.

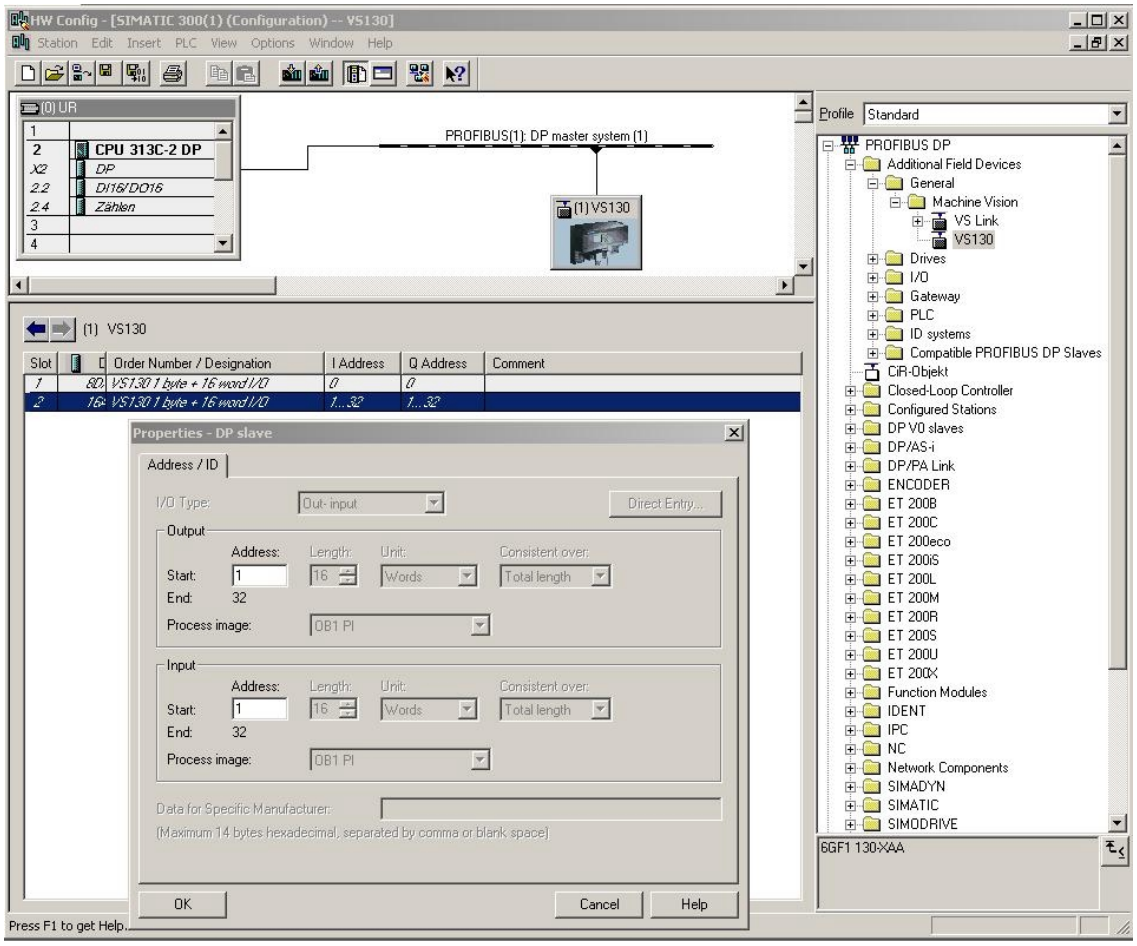
The VS 130 is controlled via PROFIBUS by the PLC and the codes output on this PG/PC once again via PROFIBUS. In this situation, it is, of course, also possible to filter the read character string and to append additional characters at the start or end (see Section 5.3.4).

2.3 Including the Vision Sensor VS 130 in HW Config

The supplied device master data file SIEM8100.GSD contains the PROFIBUS properties of the VS 130 DP standard slave. If you are using a STEP 7 version earlier than V5.2 SP1, the Vision Sensor VS 130 is not yet in the modules catalog in HW Config. In this case, you must add it to the catalog with Options > Install New GSD... . Remember that the corresponding bitmap file VS1X0__N.DIB must be in the same folder as the GSD file.

You can also download both files from the Internet at http://www.ad.siemens.de/csi_e/gsd.

The Vision Sensor VS 130 then appears in the modules catalog under PROFIBUS DP \ Additional Field Devices \ General \ Machine Vision (see screenshot below).



In the configuration example above, the control byte of the VS 130 was set to output address 0 and the status byte of the VS 130 was set to input address 0 of the CPU (DP master, slot 1). If these addresses are in the process image of OB1 (process image partition "OB1 PI"), you can work here in OB1 with process image access (for example "A I0.6" or "S Q0.1"). If this is not the case, you must work with direct I/O access (for example "L PIB 0").

In the configuration example above, the start of the 16 word long consistent communication area of the Vision Sensor VS 130 was set to input address 1 and output address 1 (slot 2). If these addresses are in the process image of OB1 (process image partition "OB1 PI"), you can work in OB1 with process image access (for example "L IW 2", "T QB 1") without violating the consistency. If, on the other hand, these addresses are not in the process image of OB1, you must access the communication area of the VS 130 using SFCs 14 "DPRD_DAT" and 15 "DPWR_DAT" to ensure consistency.

The Vision Sensor VS 130 detects the transmission rate on PROFIBUS automatically. Even if the transmission rate has changed, this is detected automatically. The following values possible:

- 9.6 kbps
- 19.2 kbps
- 45.45 kbps
- 93.75 kbps
- 187.5 kbps
- 500 kbps
- 1.5 Mbps
- 3 Mbps
- 6 Mbps
- 12 Mbps

The PROFIBUS address of the VS 130 is set in the Settings > Ports > DP Addr. menu of the processing unit. Possible values are 1, ... 125.

Changing the PROFIBUS address via PROFIBUS is not supported.

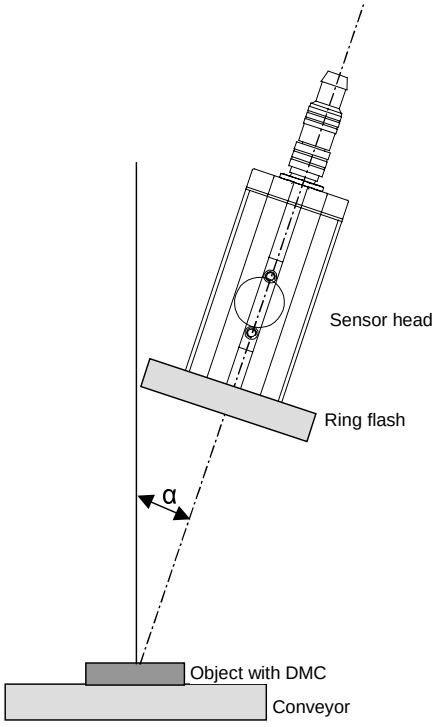
If you assign parameter values to the Vision Sensor VS 130 via PROFIBUS, you can only set its default values (all zero). If you enter values other than zero here, a slave diagnostic message is generated ("Invalid DP parameters"). If you are using an S7-CPU as the DP master, a diagnostic interrupt is triggered (No OB82 start, because CPU is in STOP): "Faulty module" is entered in the diagnostic buffer and the "SF" LED is lit.

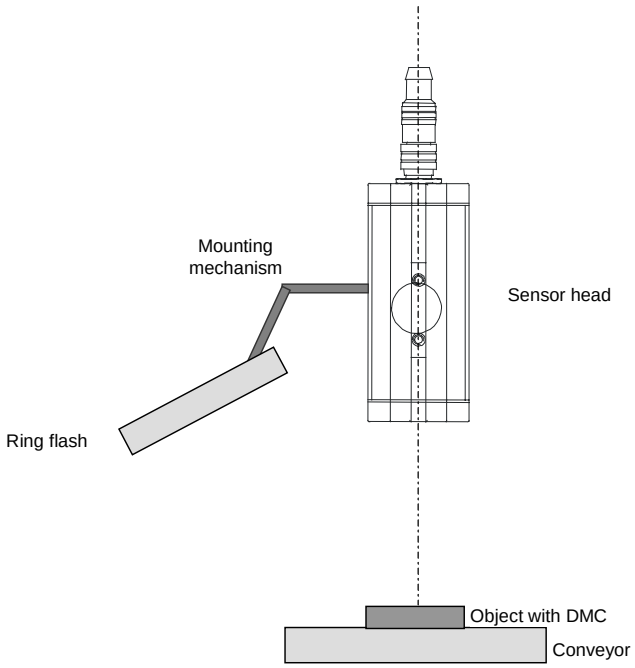
If problems occur entering the device in HW Config, refer to Chapter 7.

3 Installation

3.1 Installing Components

Steps in Installation

Step	Activity
1a	Arrange the sensor head so that reflections are kept to a minimum. The angle of its central axis is typically 15° from vertical (angle α) (permitted angles: $0 \leq \alpha \leq 45°$). 

Step	Activity
1b	If there is still too much reflection at an angle of 15 °, select an arrangement in which the sensor head and the ring flash are not concentric. Note: The mechanism for mounting the ring flash is not supplied with the product. If the ring flash does not need your requirements, please contact your sales partner who will be able to recommend other suppliers of lighting for the VS 130. 
1c	Regardless of the arrangement you select, make sure that you maintain the following clearances (these clearances depend on the type of sensor head) between the end of the sensor head and the data matrix code you are reading: • 6GF2 002 8DA: 110 mm clearance • 6GF2 002 8EA: 85 mm clearance **Caution**: If the code area is relatively large and the sensor is placed close to the code area at a large angle, the image may be distorted and thus the clarity will be reduced.
2	Install the processing unit so that it is easily accessible for the operator.
3	Install the external triggering unit, for example a light barrier.
4	Start the setup software on the PG/PC, and switch the processing unit to the Adjust mode. You then see an image as seen by the sensor head. • Check the trigger signal. Activate the "Triggered only" check box in the "Options" group. Check whether VS 130 can read the codes with the sensor head in its current position with the ring flash by activating the "Read" check box in the "Options" group (see Manual, Section A.7). If necessary, correct the trigger point and/or position of the sensor head. • Select suitable values for the shutter speed and brightness. The image should not be too bright.

3.2 Wiring Components

Connect the processing unit with the other components using the connectors on the front panel. The pinning of the connectors is described in Appendix A.5.

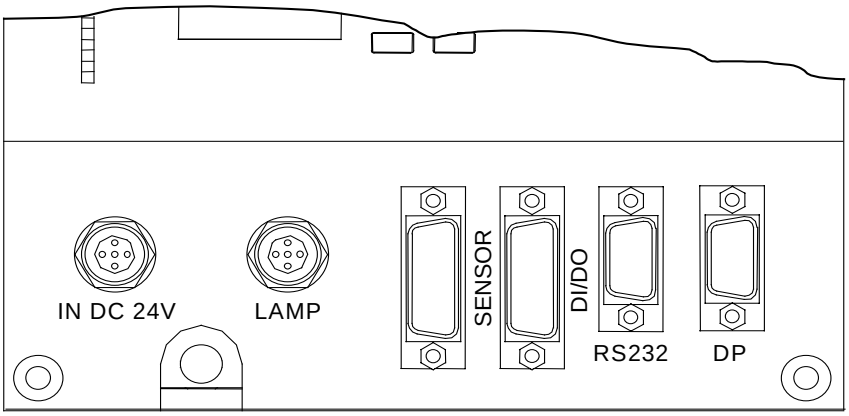
Caution!

Do not connect or disconnect cables when the power supply is on.

Apart from the RS-232 cable (6ES7 901-1BF00-0XA0) all the cables are supplied (see Appendix A.1).

Warning

Grounding the VS 130 cancels the ungrounded installation of the power unit used to operate the VS 130.



Connector	Connector Label	Type	Number of pins	Cable Cross Section	Type
Functional earth	-	Screw terminal	-	-	-
Power supply	IN DC 24 V	Circular connector M12	4	0.56 mm^2	Pin
Lighting unit	LAMP	Circular connector M12	4	0.23 mm^2	Socket
Sensor head (shielded cable)	SENSOR	HD Sub D *	26	0.09 mm^2	Socket
I/O	DI/DO	Sub D	15	0.14 mm^2	Socket
RS-232	RS-232	Sub D	9	-	Pin
PROFIBUS DP	PROFIBUS DP	Sub D	9	-	Socket

* The supplied ferrite ring must be fixed to the sensor cable (approx. 50 mm from connector to processing unit).

Step	Activity
1	Read the guidelines on preventing electrical interference (see Section 3.3).
2	Connect the processing unit to the sensor head and the lighting unit with the cables.
3	If you do not want to process the result bits READ, MATCH, N_OK via PROFIBUS DP: Connect the READ, MATCH, N_OK digital outputs as described in Section 6.1.1.
4	Connect the trigger signal via the TRG digital input.
5	If you intend to control the SIMATIC VS 130 with a PLC, connect the other digital inputs and outputs as described in Section 6.1.1
6	Connect functional ground of the processing unit to chassis ground (diameter of the ring: M5, cable cross section 1.5 mm^2).
7	Connect the processing unit to the 24 V power supply (2 A).
8	Connect the PC / PG via the RS-232 interface. The PC / PG is required only for setting up the sensor. Optional (not supplied with the package): RS-232 cable 5 m long, connectors prefitted at SIMATIC VS 130 end and PLC/PC end (pinning, see Appendix A.5).

Note

The **DC load power supply** must meet the following requirements:

Only low voltage less than or equal to 24 V DC safely isolated from the power supply network must be used for the load current supply. Safe isolation can be implemented, for example, by adhering to the specifications in

VDE 0100-410 / HD 384-4-41 S2 / IEC 60364-4-41
(functional low voltage with safe isolation) or

VDE 0805 / EN 60950 / IEC 60950
(as safety extra-low voltage SELV) or VDE 0106 Part 101.

Note

The supply chassis of the I/O and CPU must be connected to the supply chassis of the processing unit.

3.3 Guidelines on Preventing Electrical Interference

To avoid interference, you must shield your system. Low-frequency (LF) and high-frequency (HF) interference signals can result in an incorrect response if the system is badly grounded or not shielded.

Interference signals can be caused, for example, by switching relays or contactors (high rates of change in current or voltage, HF interference signals) or by different ground potentials between two parts of a system (LF interference signals).

Using/Laying Interference-Proof Cable

- The cable to the sensor head and the RS-232 cable must be shielded.

The standard cables supplied by Siemens meet these requirements.

- All plug-in connections must be secured by screws or a locking mechanism.
- Signal lines must not run parallel to power cables. A separate cable channel must be used with a minimum clearance of 50 cm from power cables.

Note

For more detailed information, refer to the installation manual *SIMATIC S7-300 Programmable Controller, Hardware and Installation in the section on "Wiring"*.

3.4 Guidelines for Use of PROFIBUS DP

If you are using PROFIBUS DP (to control the device and/or to transfer the results) the installation and configuration guidelines must be kept to. You will find this information in the installation manual *SIMATIC S7-300 Programmable Controller, Hardware and Installation.*

4 Putting into Operation

You can operate the Vision Sensor SIMATIC VS 130 interactively or controlled by signals:

- In this chapter, you will learn about interactive operation using the operator control and display field of the processing unit.
- Chapter 6 explains the options open to you with signal-controlled operation.

4.1 Turning on the Device

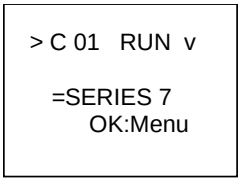
Turn on the power on the processing unit. The text "SIMATIC VS 130 V ..." and the current firmware version appear on the display.

The VS 130 then runs through the following tests:

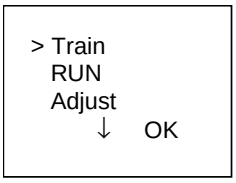
- Test of the sensor head
- Check of the saved settings and code data
- If applicable, test of whether data can be exchanged on PROFIBUS (This test is performed if you have selected "DP" in one or more of the following menus on the processing unit: Settings > Ports > Result, Settings > Ports > Trigger, Settings > Ports > Control).

If there are no errors in the self test, either the RUN menu or the STOP menu is displayed depending on the status when you last shut down.

"RUN" menu:



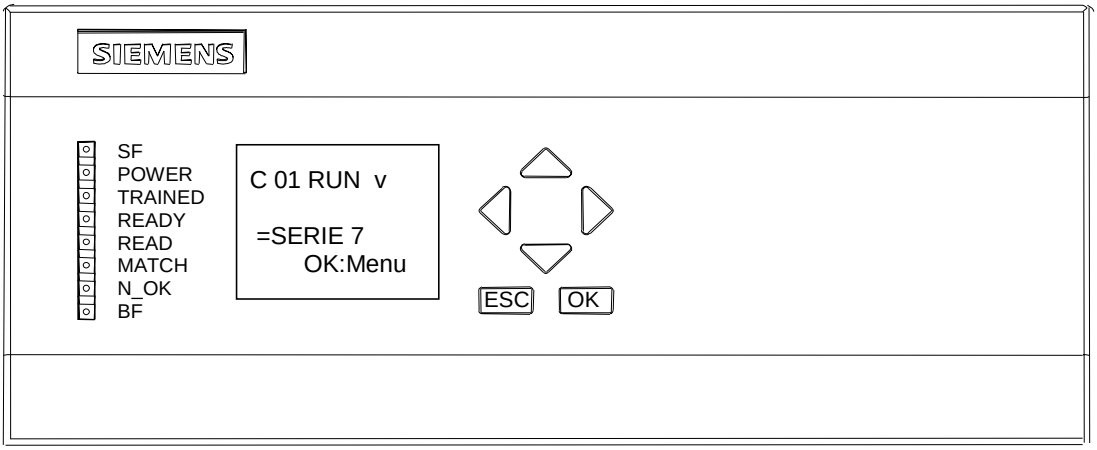
"STOP" menu level:



4.1.1 Control and Display Panel

The operator is guided by menus in the display panel.

- The menu items appear in the first three lines of the display panel. The cursor "**>**" points to the selected menu item.



- In the fourth line of the display panel, you can see which buttons of the control panel are currently available (**OK**, **ESC**, ▲, ▼, ◀, ▶). Using the buttons of the control panel, you can navigate within menus and from one menu to another:
  - With the arrow buttons "▲" and "▼" , you can move the cursor up and down and select the menu command you require.
  - With the "**OK**" button, you confirm your selection and move on to the next step.
  - With the "**ESC**" button, you open the previous menu.

Description of the LEDs

LED	Function
SF	Group error
POWER	Power supply turned on
TRAINED	Trained: • In Run: - 0 = selected code has not been trained - 1 = selected code has been trained • In Training (TRN=1): - 0 = training active - 1 = acknowledgment signal (RDY=0)
READY	Ready: • 0 = device startup or SIMATIC VS 130 in Stop • 1 = SIMATIC VS 130 in Run
READ	Result of evaluation: Code was localized and decoded. The LED is lit when the corresponding output signal changes.
MATCH	Result of evaluation: Code matches learned code. The LED is lit when the corresponding output signal changes.
N_OK	Code was not legible.
BF	Bus error on PROFIBUS

Setting Numeric Values

You select the places of a value with the arrow buttons "◀" and "▶".

You change the value of a place in the number with the arrow buttons "▲" and "▼".

The speed at which the numeric value changes depends on how long you press the arrow buttons. As soon as you release the arrow buttons, the rate of change returns to the slowest level again.

4.2 Adjusting the Sensor with the Setup Software

Before you start to work with the SIMATIC VS 130, you must first align the sensor head correctly using the setup software on a PG / PC. The setup software shows you an image as seen by the sensor head. For more detailed information on the setup software, refer to Appendix A.7.

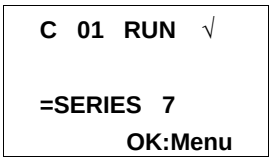
Step	Activity
1	**Starting the setup software on the PC / PG** 1. Turn on the PG /PC and wait until the computer has booted. 2. Turn on the processing unit. 3. Connect the two devices over a serial cable. 4. Insert the CD with the setup software "ADJUST-SW". The program starts automatically. 5. If the program does not start automatically, you can start it manually by selecting the CD drive and double-clicking on ADJUST-SW. 6. Turn the processing unit to "Adjust". **Result:** Once the setup software has started, the sensor field of view is displayed on the PC/PG monitor. The displayed image is updated several times per second.
2	**Adjusting the Sensor** 1. Bring the data matrix code into the image. 2. Set a sharp image by adjusting the distance between the end of the sensor head and the data matrix code correctly. 3. Correct the shutter speed and the brightness if necessary. 4. Minimize reflection. 5. Activate the "Triggered only" check box to test the trigger signal. 6. Activate the "Read" check box to check whether the code can be read, and make any necessary fine adjustments. **Note:** If you have too many errors, clean the lens and diffuser with a lint-free cloth.
3	Secure the sensor and then check the correct sensor position.

5 Operator Functions

5.1 Overview

The display of the processing unit is used to display the currently read code and to navigate through the menus and make entries.

Example of the display of a code:



There are two menu levels:

- RUN
- STOP

The following table contains the menus of the RUN menu level.

Menu	Meaning
Code	Select the code number
STOP	Stop evaluation
Info	Information on the selected parameters of the "Match" menu, on the absolute and relative number of successful read operations, the unsuccessful read operations and the read operations with a positive comparison result, on the evaluation time required for the code currently being read and the relative number of read operations for which the time available for evaluating the code was not adequate.

The menus of the STOP menu level are listed in the following table.

Menu	Submenu	Meaning
Train	(specify code number)	Train a code
RUN	(specify code number)	Start evaluation of a code
Adjust	-	Setup on PC
Settings	Ports	Set global device parameters
	Read	
	Match	
	Result	
	Reset All	
Delete	(specify code number)	Delete a trained code

5.2 Menus of the "RUN" Menu Level

5.2.1 "Code" Menu

With the "Code", you select one of a maximum of 15 codes. You must already have trained these codes.

Step	Display	Activity
1	**> Code** **STOP** **Info** **ESC OK**	At the "RUN" menu level on the processing unit, select "Code" with the arrow buttons ▼ and ▲ and press "OK".
2	**Run** **Code: 01** **(trained)** **ESC ←↕→ OK**	Select the code number (range of values 01 to 15) with the ▼ and ▲ buttons and press "OK". "(trained)" indicates that you have already trained a code with this number. "(empty)" indicates that there is no trained code with this number.
3	**C 01 RUN** √ **=SERIES 7** **OK:Menu**	

5.2.2 "STOP" Menu

With "STOP", you stop the evaluation (RUN) and change to the "STOP" menu level.

5.2.3 "Info" Menu

With the "Info" menu, you obtain information on the following:

- the part of the learned code with which the read code will be compared
- the absolute and relative number of successful read operations
- the absolute and relative number of unsuccessful read operations
- the absolute and relative number of read operations with a positive comparison result
- the evaluation time required for the code currently being read
- the relative number of read operations, for which the time available for evaluation was not adequate

Step	Display	Activity
1	**Code** **STOP** **> Info** **ESC OK**	At the "RUN" menu level on the processing unit, select "Info" with the arrow buttons ▼ and ▲ and press "OK". This opens the first information screen form.
2	**C 02 MATCH** **Off** **1/6 ↓ OK**	You can display further information with the arrow buttons ▲ and ▼ By pressing "OK", you returned to the highest hierarchy level of the "RUN" menu level.

Information Form No.	Display	Description
1	**C 02 MATCH** **Off** **1/6 ↓ OK**	The value "Off" was set for the Match-Opt parameter of code 2, in other words, there is no comparison of the codes read.
1	**C 02 MATCH** **All** **=This can..** **1/6 ←↓→ OK**	The value "All" was set for the Match-Opt parameter of code 2, in other words, the read codes will be compared with the entire learned code.
1	**C 02 MATCH** **Pos=6..8** **=can←** **1/6 ←↓→ OK**	The value "Position" was set for the Match-Opt parameter of code 2, in other words, The read codes are checked to see whether they contain the string "can" at position 6 to 8.
1	**C 02 MATCH** **ID=T** **=his can ..** **1/6 ←↓→ OK**	The value "ID" was set for the Match-Opt parameter of code 2, in other words, MATCH-ID has the value "T" and the substring begins with "his can " (the other characters are no longer visible in the display field).

Information Form No.	Display	Description
2	**C 02 READS** **=3226** **=99.907%** **2/6 ↕ OK**	Since the last start, the code 02 was decoded successfully 3226 times. This corresponds to 99.907 % of all read operations since the last evaluation startup.
3	**C 02 N_OK** **=3** **=0.093%** **3/6 ↕ OK**	Since the last start, the code 02 could not be decoded 3 times. This corresponds to 0.093 % of all read operations since the last evaluation startup.
4	**C 02 MATCH** **=3226** **=99.907%** **4/6 ↕ OK**	Since the start of evaluation, the substring of the learned code 02 specified in the "Match" submenu was found 3226 times in the read codes. This corresponds to 99.907 % of all read operations since the last evaluation startup.
5	**C 02 Curr. Cycletime** **=300ms** **5/6 ↕ OK**	The evaluation time required for the read code (code 02) (current cycletime)
6	**C 02 Cycle Too Short** **=0.072%** **6/6 ↑ OK**	Since the start of the evaluation, the time available for evaluating the read code (cycletime) was not adequate in 0.072 % of all read operations. **Note:** This information form is used in particular for monitoring when the evaluation time of the read code is of a similar length to the time available (cycletime). If you have set the cycle time too low, the percentage shown here will be reflected in the percentage shown in information form no. 3. In this case, increasing the cycle time will improve the detection rate.

5.3 Menus of the STOP Menu Level

5.3.1 "Train" Menu

When training a code, the VS 130 learns the following code characteristics:

- Dot size (physical extent)
- Code dimension
- Gray value of the dots (dark dots on light background or vice versa)
- Environment of the data matrix code

These characteristics are stored in the data of the selected code. They are used for the optimum setting when reading the code in the evaluation mode.

You can train up to 15 different codes.

In the following situations, you must retrain:

- The polarity of the code changes, in other words, dark dots on a light background become light dots on a dark background and vice versa.
- You are in the Match mode and want to compare the read codes with a new pattern.
- The number of "objects" in the image is increased by more than 3. This would be the case with a PCB, if, for example, three new solder points or surfaces are now within the image that were previously not there.
- The dot size changes.
- The code dimension changes.

Step	Display	Activity
1	**C 01 RUN** √ **=SERIES 7** **OK:Menu**	If you are already evaluating codes, you are in evaluation mode. The currently read code is displayed on the screen. To change to the "RUN" menu level, press the OK button
2	**Code** **> STOP** **Info** **OK**	You are now at the RUN menu level. Select "STOP" with the arrow buttons ▼ and ▲ and press "OK".
3	**> Train** **RUN** **Adjust** ↓ **OK**	You are now at the STOP menu level. Select "Train" with the arrow buttons ▼ and ▲ and press "OK".

Step	Display	Activity
4	**Train** **Code: 01** **(new)** **ESC ←↕→ OK**	Select the code number with the arrow buttons ▼ and ▲ and press "OK". "(new)" shows that no code has been trained under this number yet. "(overwrite)" means that the code trained under this number will be overwritten when you train again.
5	**Code 01** **Train?** **ESC OK**	To start training, press the "OK" button.
6	**Code 01** **Training . .** **ESC**	Transport an object with the code to be read and activate the trigger signal. Note: The digital output N_OK is set to 1 for the selected time at each trigger signal (Settings > Ports > Pulsetime menu).
7	**Code 01** **Train done.** **RUN?** **ESC OK**	When you press "OK", you switch to RUN mode. If you press "ESC", the code 01 continues to be trained. You can train this again or select a different code.

5.3.2 "RUN" Menu

The transition to "RUN" means start of the evaluation for the VS 130. The codes are read and, if required, checked for specified strings.

Step	Display	Activity
1	**> Train** **RUN** **Adjust** **↓ OK**	You are at the "STOP" menu level. Select "RUN" with the arrow buttons ▼ and ▲ and press "OK".
2	**Run** **Code: 01** **(trained)** **ESC ←↕→ OK**	Select the code number with the arrow buttons ▼ and ▲ and then press "OK". • "(empty)" indicates that there is not yet any trained code with this number. • "(trained)" indicates that you have already trained a code with this number.
3	**C 01 RUN √** **ID=1P** **=ABCDEFG..** **OK:Menu**	Transport objects with codes and activate the trigger signal.

5.3.3 "Adjust" Menu

Step	Display	Activity
1	**Train** **RUN** **> Adjust** **↓ OK**	You are at the "STOP" menu level. Select "Adjust" with the arrow buttons ▼ and ▲ and press "OK".

The following displays are possible:

Display	Description
Adjust All **Read√** **X:+6 Y:-1** **OK:Finish**	• First line: The mode "Evaluate all images" is set (Note: this is the default.). • Second line: The code could be read. • Third line: A general statement about localization of the code is made here: - X:+9 Object at right edge - X:-9 Object at left edge - Y:+9 Object at top edge - Y: -9 Object at lower edge • Fourth line: By pressing "OK", you exit the adjust mode.

Display	Description
Adjust All **N_OK** **OK:Finish**	• 1st line: The mode "Evaluate all images" is set (Note: this is the default.). • 2nd line: The code could not be localized (and therefore not read). • 4th line: By pressing "OK", you exit the adjust mode.

Note

If the processing unit has a connection to a PC with setup software, and you have deactivated the "Read" check box in the "Options" group, the second and third lines of the display field in the last two displays remain empty, since in this case, there is no code localization.

No Connection to PC with Setup Software

After evaluating approximately 20 images or when you press the arrow buttons ◄ or ►, the following display appears for approximately two seconds (this is called the toggle display):

Display	Description
Use ↑ and **↓ to** **toggle TRG** **and ALL**	With the arrow buttons ▲ and ▼, you switch between the modes "Evaluate all images" and "Image capture only on trigger signal".

In the "Image capture only on trigger signal" mode, the display appears, for example as shown below:

Display	Description
Adjust TRG **Read√** **X:+6 Y:-1** **OK:Finish**	The "Image capture only on trigger signal" is indicated by "TRG".

After capturing approximately 20 (triggered) images or when you press the arrow buttons ◄ or ► the toggle display appears again.

Connection to PC with Setup Software

If you want to change over between the modes "Evaluate all images" and "Image capture only on trigger signal", you do this with the "Triggered only" check box in the "Options" group of the setup software (see Section A.7.3).

Note

If the connection between the processing unit and PC with the setup software is interrupted, the same applies as explained in "No connection to PC with setup software".

5.3.4 "Settings" Menu

With the "Settings" menu, you set the parameters required for operation. It contains the following submenus:

- Ports: To specify or assign parameters to the ports
- Read: to set the parameters for image evaluation
- Match: To compare the read codes with a string
- Result: To output the read codes
- Reset All: To set all the parameters of the "Settings" menu to the default

Step	Display	Activity
1	**RUN** **Adjust** **> Settings** ↕ **OK**	You are at the "STOP" menu level. Select "Settings" with the arrow buttons ▼ and ▲ and press "OK".

Note

The current setting for all parameters that can only be activated or deactivated is indicated by "√".

"Ports" Submenu

In the "Ports" submenu, you specify the ports and assign parameters for them.

Menu Entry or Parameter		Possible Values	Default	Meaning
DP	Address	001 to 125	007	Address on PROFIBUS DP
	Timeout	100 to 2000	500	Handshake monitoring time in ms
RS-232	Bit rate	9600, 14400, 19200, 28800, 38400, 57600, 115200	115200	Bit rate in bits / s
	Stop bits	1, 2	2	Number of stop bits
	Parity	Even, Odd, None	Even	Parity
	Bits	7, 8	8	Number of data bits
Result	String	DP, RS-232	RS-232	Port via which the processing unit provides the read code

Menu Entry or Parameter		Possible Values	Default	Meaning
Trigger	Trigger	DP, DI/DO	DI/DO	Port via which the trigger signal is supplied to the processing unit
Control	Control	DP, DI/DO	DI/DO	Port for the signals DISA, SEL0, SEL1, SEL2, SEL3, TRN, RES, IN_OP, TRD, RDY, READ, MATCH, N_OK
Pulsetime	Pulsetime	5 ms to 999 ms	30 ms	Pulse time of the digital outputs READ, MATCH, N_OK

"Read" Submenu

You set the parameters for image evaluation in the "Read" submenu.

Menu Entry	Parameter	Possible Values	Default	Meaning
Cycletime	Cycle time	100 ms to 9999 ms	2000 ms	Time between two trigger signals This time is available for image evaluation.
Dot Shape	Dot shape	Normal, Bold, Separate	Normal	Shape of the dots in the codes being read: normal, overlapping, not touching
Shutter	Shutter	1 µs to 20000 µs	200 µs	Shutter time
Brightness	Brightness	10 to 500	250	Brightness

"Match" Submenu

in the "Match" submenu, you decide whether or not the read codes will be compared with a pattern you have selected.

Menu Entry	Parameter	Possible Values	Meaning
Option	Match-Opt	Off (=default)	No comparison
		All	Compare all characters of the read code with all characters of the learned code
		Position	Compare the string starting at character number "StartPos" over the length specified in "Length" of the read code with the corresponding string of the learned code Example: Learned code = 1PABCDEF, StartPos = 3, Length = 2 The read codes are then checked to find out whether the letter at the 3rd position is "A" and at the 4th position is "B".
		ID	• A substring is formed according to the following rules: The start of the substring is identified by the MATCH-ID. MATCH-ID can be at the beginning of the read code or immediately following a separator. The substring extends as far as the next separator or to the end of the code if there are no separators. • Compare the substring of the read code with the substring of the learned code. • If they do not match, there is a MatchErr. Example: learned code = A-1P01234+B, separators = +-, MATCH-ID = 1P, read code = A-1P01235-B substring of the read code: 01235, substring of the learned code: 01234 => Match Err If you change the separators and/or the "MATCH-ID", the processing unit checks all learned codes to find out whether they contain a substring that results from the rules formulated with the parameters. If this is not the case for one or more learned codes, you have the following alternatives: • You can delete all the learned codes. • You can cancel the changes to the separators and/or "MATCH-ID".

Note

If you want to change the "Match-Opt" parameter from "Position" to "ID", the processing unit checks all the learned codes to find out whether there is a sequence that results from the current parameters "MATCH-ID" and separators from the rules. If this is not the case for one or more learned codes, you have the following alternatives:

- You can delete all the learned codes.
- You can cancel the change in the "Match-Opt" parameter from "Position" to "ID".

The same applies if you want to change the "Match-Opt" parameter from "ID" to "Position".

"Result" Submenu

In the "Result" submenu, you specify how the read codes are output and which text is displayed on the display of the processing unit if an error occurs.

Menu Entry or Parameter		**Possible Values**	**Meaning**
Filter	Filter-Opt	Off (=default)	No character in the read codes is suppressed.
		Position	In the string of the read code only the substring starting at "StartPos" for the number of characters specified by "Length" is output. Example: read code = 1PABCDEF, StartPos = 3, Length = 2 "AB" is output.
		ID	"Filter-ID" consists of one or more IDs separated by a "separator". For each ID contained in "Filter-ID", an attempt is made to form a substring from the read code according to the following rules: • The substring start is identified by the ID. If several sequences are identified by the ID, only the first one is used. • The ID can be at the beginning of the read code or immediately following a separator. • The substring extends as far as the next separator or to the end of the code if there are no separators. The sequences found are then put together in the order in which the IDs occur in "Filter-ID". They are separated by the same separator as the corresponding IDs in "Filter-ID". If one or more sequences cannot be formed, the string set with "Result" > "Messages">"Filter-Msg" is displayed. Example: read code = A+1P01234+1R01235-1Q01236, separators = +-/_, FILTER-ID = 1P_1Q/1R output: 01234_01236/01235.

Menu Entry or Parameter		Possible Values	Meaning
Messages	ReadErr	(user-defined string) Default: *Read ERR*|-0D|-0A [1)]	Text for display on the processing unit and for output over RS-232 or DP if a read error occurs
	FilterMsg	(user-defined string) Default: *WrongDMC*|-0D|-0A [1)]	Text for display on the processing unit and for output over RS-232 or DP if the value selected for "Position" or "ID" in the "Result" submenu parameter "Filter" does not occur
	MatchErr	(user-defined string) Default: *MatchERR*|-0D|-0A [1)]	Text for display on the processing unit and for output over RS-232 or DP if a comparison error occurs
Prefix	Prefix-OK	(user-defined string) maximum length: 101 characters	String (ASCII) that precedes the characters of the read code
Suffix	Suffix-OK	(user-defined string) Default:|-0D|-0A [1)] maximum length: 101 characters	String (ASCII) that follows the characters of the read code

[1)] (|-0D|-0A corresponds to $0D_H0A_H$, $0D_H$ = ASCII code for CR, $0A_H$ = ASCII code for LF)

"Reset All" Submenu

In the "Reset All" submenu, you can change the value of every parameter back to the default in one action.

5.3.5 "Delete" Menu

With the "Delete" menu, you can delete all the characteristics of the selected code that were saved during training.

Step	Display	Activity
1	**Adjust** **Settings** **> Delete** **↑ OK**	You are at the "STOP" menu level. Select "Delete" with the arrow buttons ▼ and ▲ and press "OK".
2	**Delete** **Code: 01?** **(trained)** **ESC ←↕→ OK**	Select the code number with the arrow buttons ▼ and ▲ and then press "OK". • "(empty)" indicates that there is not yet any trained code with this number. • "(trained)" indicates that you have already trained a code with this number.
3	**Code C 01** **Delete?** **ESC OK**	If you press "OK", you delete the saved characteristics of the selected code.

6 Controlling with a PLC

As an alternative to operator control from the control panel, you can also control the SIMATIC VS 130 with a PLC. This makes it possible to train and work almost automatically.

6.1 Control via the I/O Interface "DI/DO"

6.1.1 Control Signals

You will find the pinning of the I/O interface "DI/DO" in Appendix A.5.

Input Signals

Name	Function
DISA	Disable: Disable manual control panel input, model selection and train via digital I/O
SEL0	Select 0: Code selection: bit 0
SEL1	Select 1: Code selection bit 1 (if TRN=0) / train code (if TRN=1)
SEL2	Select 2: Code selection bit 2
SEL3	Select 3: Code selection bit 3
TRN	Train: Train new code
TRG	Trigger: An evaluation is started on the positive-going edge
RES	Reset: Reset error

Output Signals

Name	Function	LED
IN_OP	In Operation: • 0 = error message is displayed. • 1 = SIMATIC VS 130 functional, no errors	Group error SF on SF off
TRD	Trained: • In Run: - 0 = selected code has not been trained - 1 = selected code has been trained • In Training (TRN=1): - 0 = training active - 1 = acknowledgment signal (RDY=0)	TRAINED
RDY	Ready: • 0 = device startup or SIMATIC VS 130 in Stop • 1 = SIMATIC VS 130 in Run	READY
READ	Result of evaluation: Code was localized and decoded.	READ
MATCH	Result of evaluation: Code matches learned code.	MATCH
N_OK	Code was not legible.	N_OK

6.1.2 Selecting the Mode

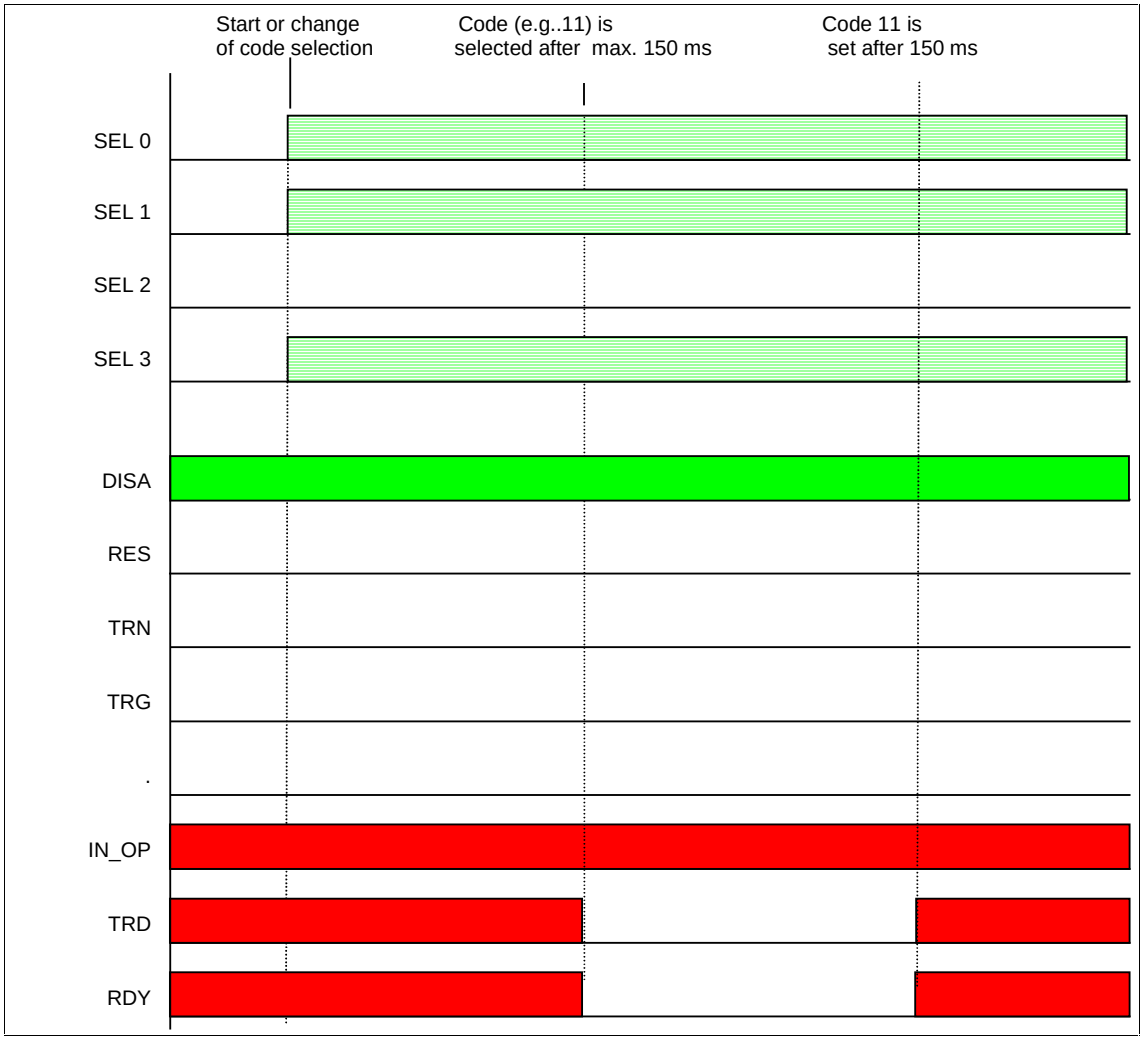
You can use the following modes:

- Select code
- Train code
- Start evaluation

The modes are described in Section 5.3.

Select Code

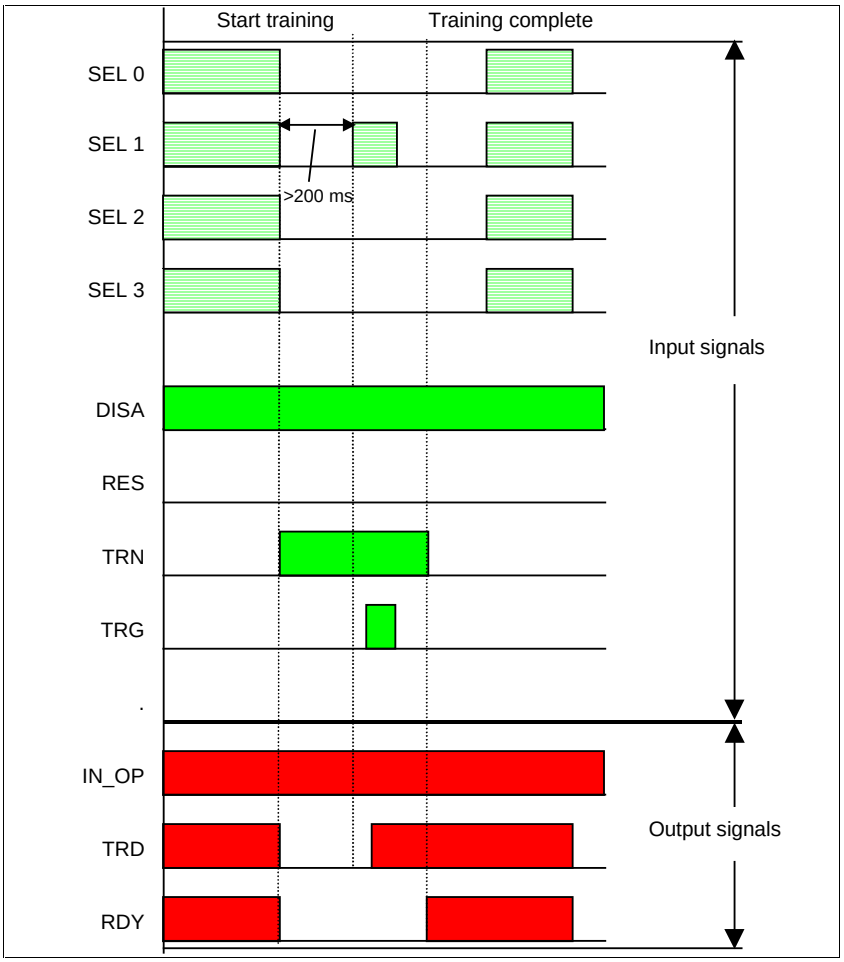
To select a code, apply the appropriate bit pattern to the inputs SEL0 to SEL3. You can select codes 1 to 15. If you select code 0, the last selected code is retained.



Step	Input	Output	Description
1	DISA=1 TRN=0 TRG=0 RES=0		Prepare code selection
2	SEL0=1 SEL1=1 SEL2=0 SEL3=1		Select code (based on example of code 11)
3		TRD=0 RDY=0	The code changeover is started
4		TRD=1 RDY=1	Code changeover is completed after approximately 150 ms. Code 11 is selected

Train Code

The diagram below illustrates an example of the training sequence for code 15. Note that the trigger signal must be applied for at least 5 ms.



Note

After an error has occurred, you must set the signals SEL0 to SEL3 and the signal TRN to 0 and then reset the error with the RES signal.

The training sequence is described below.

Step	Input	Output	Description
1	DISA=1 TRN=1 SEL0, SEL1, SEL2, SEL3=0		Disable keyboard operation (training will be via "DI/DO") Start training
		TRD=0	Training active (previously active code is trained)
		RDY=0	RDY signal changes to FALSE
2	Wait at least 200 ms SEL1=1 TRG=1		Feed object with data matrix code Train Trigger signal
		TRD=1	Selected code has been trained
3	SEL1=0 TRG=0		Reset signals
4	TRN=0		End training
		RDY=1	Training is ended

Start Evaluation

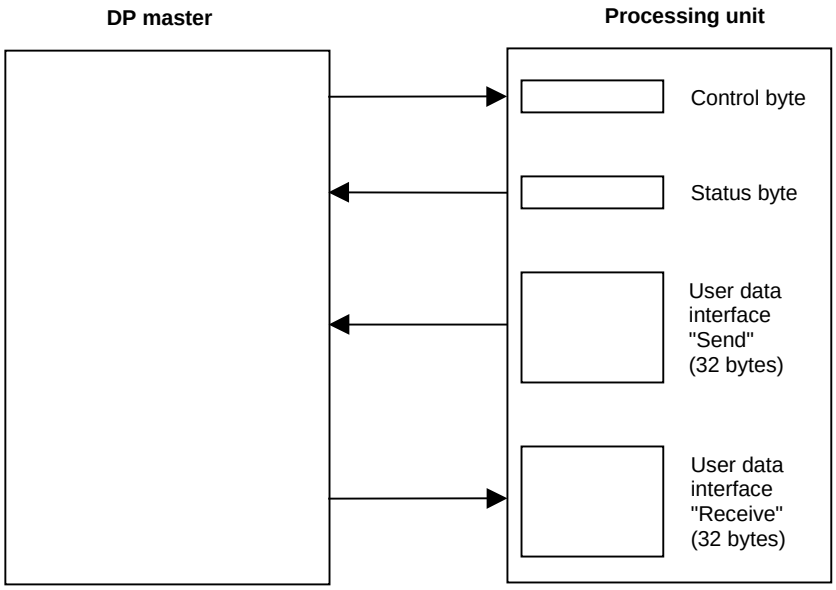
Immediately after completion of training, the evaluation is started.

Step	Input	Output	Description
1			If required, you select a code (see above.).
2			The outputs are set as follows depending on the evaluation result:
		READ	Code was localized and decoded.
		MATCH	Code matches learned code.
		N_OK	Code was not legible.

6.2 Control via the "PROFIBUS DP" Interface

6.2.1 Principle of Data Transmission via PROFIBUS DP

The following block diagram shows the relevant interfaces of the processing unit for data transmission over PROFIBUS DP.



Note

Of the "Send" user data interface, bytes 1 to 31 are relevant, of the "Receive" user data interface, only byte 1 is relevant.

If these two user data interfaces are not located in the process image of OB1, you must use SFC 14 "DPRD_DAT" during the data transfer from the "Send" user data interface of the processing unit to the DP master to ensure data consistency. In the opposite direction, SFC 15 "DPWR_DAT" must be used for data transmission from the DP master to the "Receive" user data interface.

6.2.2 Assignment of the Interface of the Processing Unit with Relevance for PROFIBUS DP

Control Byte

Bit No.	Corresponds to Signal	Function
0	DISA	Disable: Disable manual control panel input, model selection and train over PROFIBUS DP
1	SEL0	Select 0: Code selection: bit 0
2	SEL1	Select 1: Code selection bit 1 (if TRN=0) / train code (if TRN=1)
3	SEL2	Select 2: Code selection: bit 2
4	SEL3	Select 3: Code selection bit 3
5	TRN	Train: Train new code
6	TRG	Trigger: An evaluation is started on the positive-going edge
7	RES	Reset: Reset error

Status byte

Bit No.	Corresponds to Signal	Function
0	IN_OP	In Operation: • 0 = error message is displayed. • 1 = SIMATIC VS 130 functional, no errors
1	TRD	Trained: • In Run: - 0 = selected code has not been trained - 1 = selected code has been trained • In Training (TRN=1) - 0 = training active - 1 = acknowledgment signal (RDY=0)
2	RDY	Ready: • 0 = device startup or SIMATIC VS 130 in Stop • 1 = SIMATIC VS 130 in Run
3	READ	Result of evaluation: Code was localized and decoded.
4	MATCH	Result of evaluation: Code matches learned code.
5	N_OK	Code was not legible.
6	-	reserved
7	-	reserved

Note

Writing the control byte and reading and evaluating the status byte must be analogous to the time diagrams in Section 6.1.2.

"Send" User Data Interface

Byte No.	Meaning
0	reserved
1	Consecutive number of the data packet to be sent to the DP master
2	Net total length of the data to be transmitted in bytes (in STEP 7 format)
3	
4	1st user data byte
5	2nd user data byte
...	...
31	28th user data byte

"Receive" User Data Interface

Byte No.	Meaning
0	reserved
1	Consecutive number of the latest data packet correctly received from the DP master
2	reserved
...	...
31	reserved

6.2.3 Sample Program for Data Exchange, if Code Length ≤ 28 Bytes

Below, you will see a sample program for data exchange when the code length is a maximum of 28 bytes.

Explanation of the Program

The DP master does not check how many bytes the processing unit has supplied, but always reads 28 bytes without any monitoring.

The start of the "Send" user data interface is at address 4 of the process image input table. The start of the "Receive" user data interface is at address 4 of the process image output table.

To ensure consistency over the entire range (32 bytes) there must be no process image update during the program shown below.

The user data are stored in data block DB17 starting at byte 4.

STL Program

```
                // check no. of data packet for 1
                L     IB 5              // no. of data package from processing unit
                L     1
                <>    I                 // If no. not 1
                JC    m001              // ... there is no user data

                // read user data from processing unit
                L     ID 8              // read the first 4 bytes of user data
                T     DB17.DBD 4        // enter in DB

                L     ID 12             // read the next 4 bytes of user data
                T     DB17.DBD 8        // enter in DB

                L     ID 16             // read the next 4 bytes of user data
                T     DB17.DBD 12       // enter in DB

                L     ID 20             // read the next 4 bytes of user data
                T     DB17.DBD 16       // enter in DB

                L     ID 24             // read the next 4 bytes of user data
                T     DB17.DBD 20       // enter in DB

                L     ID 28             // read the next 4 bytes of user data
                T     DB17.DBD 24       // enter in DB

                L     ID 32             // read the last 4 bytes of user data
                T     DB17.DBD 28       // enter in DB

                // acknowledge with no. of data packet
m001:           L     IB 5              // no. of data packet
                T     QB 5              // send as acknowledgment to the processing unit
                      BEU
```

6.2.4 Consistent Data Transmission

Handshaking

The following section introduces a handshake mechanism that ensures the consistency of all the data sent from the processing unit to the DP master regardless of any configured PROFIBUS consistency mechanisms.

Step	Activity in the User Program of the DP Master
1	Query byte 1 of the "Send" user data interface cyclically. As long as this byte has the value 0, there is no new data. If it has the value 1, go to step 2.
2	The value 1 in byte 1 of the "Send" user data interface means: The VS 130 has started data transmission. Read the net total length of the data to be transferred from bytes 2 and 3 of the "Send" user data interface and the user data of the first data packet from bytes 4 to 31.
3	Acknowledge correct receipt of the first data packet by writing the value 1 in byte 1 of the "Receive" user data interface. The processing unit queries byte 1 of the "Receive" user data interface. As soon as it reads the value 1, it fills bytes 4 to 31 of the "Send" user data interface with the user data of the second data packet and enters the number of this data package (in this case 2) in byte 1.
4	Query byte 1 of the "Send" user data interface cyclically. As long as this still contains the number of the previously transferred data packet (1), there is no new data. As soon as byte 1 has the value 2 (number of the next data packet), go to step 5.
5	Read the user data of the second data packet from bytes 4 to 31.
6	Acknowledge correct receipt of the second data packet by writing the value 2 in byte 1 of the "Receive" user data interface.
...	...
Last - 4	Query byte 1 of the "Send" user data interface cyclically. As long as this contains the number of the last but one data packet, the data of the last data packet is not yet available. As soon as byte 1 has the number of the last data packet, go to next step.
Last - 3	Read the user data of the last data packet from bytes 4 to 31.
Last - 2	Acknowledge receipt of the last data packet by writing the number of the last data packet in byte 1 of the "Receive" user data interface. The processing unit queries byte 1 of the "Receive" user data interface. As soon as it reads the number of the last data packet, it writes the value 0 to bytes 2 and 3 of the user data interface and also to byte 1. The value 0 in byte 1 signals the end of the current data transfer to the DP master.
Last - 1	Query byte 1 of the "Send" user data interface cyclically. As soon as the value 0 is read, go to last step.
Last	Acknowledge correct receipt of all data by writing the value 0 in byte 1 of the "Receive" user data interface.

Response to Problems, Timeouts, and Errors

The processing unit monitors the following:

- The time between the arrival of two acknowledgments from the DP master is monitored for the timeout set in the Settings > Ports > DP > Timeout menu.
- The correct order of the data packets acknowledged by the DP master is monitored.

If an error occurs, the processing unit enters B#16#FF in byte 1 of the "Send" user data interface and so aborts the current data transmission.

It is advisable to implement the following monitoring functions in the user program of the DP master:

- Monitoring of the time between arrival of two consecutive data packets.
- Monitor the correct order of the data packets sent by the processing unit.
- Check whether the total length of the user data actually transferred matches the net total length of data to be transferred as specified by the processing unit at the start of the data transfer.

If an error occurs, writing B#16#FF to byte 1 of the "Receive" user data interface causes the current data transmission to be aborted.

7 Diagnostics

7.1 Introduction

With certain operator input and if an error occurs in the evaluation mode, the VS 130 provides you with adequate diagnostic information. This can take the following form:

- Message on the display of the processing unit
- Activation of the "BF" LED
- Slave diagnostics

These possibilities are explained in detail below.

7.2 Diagnostics with Messages

A distinction is made between the following message types:

- Error messages
- Warnings/notes
- Read results

All three types of message are displayed on the display of the processing unit.

Most messages of the error message type also trigger a diagnostic interrupt on the DP master via PROFIBUS (details below).

Sections 7.2.1 through 7.2.3 describe all the messages, their meaning and possible remedies.

7.2.1 Error Messages

When error messages are generated, the "IN_OP" signal (in operation) is reset and the SF LED (group error) is lit.

If the VS 130 is attached to PROFIBUS DP, all error messages with a number in the "Bit No. Starting at Diagnostic Byte 0 (DP)" column in the following table trigger a diagnostic interrupt on the DP master. How to read out the diagnostic information made available on the VS 130 and how to evaluate it is explained in Section 7.4.

Cons. No.	Message	Bit No. Starting at Diagnostic Byte 0 (DP)	Description	Possible Remedies
1	PROFIBUS Error	-	An error occurred during transfer of data over PROFIBUS or the processing unit is not (yet) in the data exchange phase. Note: After downloading the system data from HW Config to a DP master again, the master is not capable of data exchange for a brief time.	Check the connection from the processing unit to the DP master. Make sure that the set PROFIBUS address is correct. If you do not want to operate the device over PROFIBUS, deactivate DP in the Result>Trigger>Control menu. If this does not help, the hardware may be defective.
2	Settings not found	-	The system parameters were not found or could not be restored.	Set the system parameters again.
3	Invalid Sensor	0	The connected sensor head is not supported by the firmware of this processing unit.	Check that the sensor head connected actually belongs to the processing unit based on the order numbers. Check whether the firmware version of the processing unit supports the connected sensor head and, if necessary, update the firmware.
4	Sensor not found	1	The sensor head is defective or not connected	Check the connection to the sensor head. The connector is possibly not correctly inserted. It is also possible that the cable to the sensor head is damaged or the sensor head or the processing unit is defective.
5	Frame Error	2	An error has occurred transferring the image from the sensor head to the processing unit causing loss of a single image	Check the cable between the sensor head and the processing unit for damage. In a noise polluted environment: Shield cables and remove any possible sources of interference.
6	Error Disable-Sig. Change	3	The disable signal changes during training	You must not change over from operation using the buttons on the processing unit to operation by the digital inputs/outputs or vice versa during training. End the training run

Cons. No.	Message	Bit No. Starting at Diagnostic Byte 0 (DP)	Description	Possible Remedies
7	Error in Signal Sequence	4	Error signaled during training via the PLC or digital I/O	A timing error occurred when training via the digital inputs/outputs. Make sure that you keep to the correct timing.
8	Code corrupt	5	The stored code could not be read from the EPROM or has not been trained.	Retrain the code.
9	Trigger too fast	6	In the evaluation mode: The trigger sequence is faster than the permitted evaluation time set for Cycletime.	The Cycletime setting must be adapted to the actual trigger frequency. In some cases, it may be necessary to reduce the parts rate. Make sure that the trigger is not bouncing.
10	Transmit Error	7	In the evaluation mode: An error occurred transferring the decoded string.	When outputting over RS-232: Increase the set bit rate of the RS-232 interface. It may be necessary to reduce the parts rate. When outputting over PROFIBUS: • Check the connection to the PROFIBUS master. • Increase the transmission rate of the DP master. It may be necessary to reduce the parts rate. • Check your handshake programming. • Check that the cycle time on the DP master is not too high. • Increase the handshake monitoring time (Settings>Ports>DP>Timeout menu of the processing unit)
11	Invalid DP Parameters	8	Invalid parameter assignment over PROFIBUS	Default parameter settings (all zero)
12	Cycletime too short	9	In the evaluation mode: The evaluation time of the last code that was read is higher than the time set in the Settings>Read>Cycletime menu.	Increase the time in the Settings>Read>Cycletime menu in keeping with the maximum time allowed for reading in your application. This must be higher than the minimum time required for reading a code.

Cons. No.	Message	Bit No. Starting at Diagnostic Byte 0 (DP)	Description	Possible Remedies
13	Error Training Code	10	The code was not legible and could not be saved.	Check the following potential source of error and make corrections as necessary: • There was no code in the sensor field of view. • The code was not completely in the sensor field of view. • The code was too close to the edge of the field of view (2 dots minimum clearance are necessary). • The dot size is too small. • The dot size is too large. • The image is too bright or too dark, the code visible to the sensor is damaged. • The code is damaged or defective. • It is a die-punched code. • The viewing angle to the code is too steep. The permitted angle is between 0 and 45 degrees to the vertical. • The dot type is not correctly configured
14	Error Match Mismatch	11	You are attempting to train a code that does not match the settings made in Settings>Match.	Check the values in Settings>Match and make sure that these are valid for the code you want to read. Example: There must be a specified ID in the data matrix code.
15	Error No ECC200 Code	12	You are attempting to train a code that does not comply with the ECC200 standard or is base256 coded. Other possible error: The code you are reading has print errors so that the code cannot be identified as ECC200 code (without base256).	Use a data matrix coding conforming with ECC200. (Base256 of the ECC200 standard is also not supported).

7.2.2 Warnings/Notes

Cons. No.	Message	Description	Possible Remedies
1	This will delete all codes	This warning is displayed when the change you are planning will result in all saved codes being deleted.	Check whether you really want to change this parameter. If you do, all the saved codes will be deleted and must be retrained.
2	Can only select trained code	You have attempted to select a code that has not been trained.	Train the code. Afterwards, you can start the evaluation.
3	This will stop processing	This message is displayed when you change from the "RUN" menu to the "STOP" menu.	Check whether or not you really want to cancel the evaluation.

7.2.3 Read Results

Cons. No.	Message	Description	Possible Remedies
1	***Read ERR***	The code could not be read in the evaluation mode. Note: You can modify this text in Settings>Result>Messages >ReadErr	For possible causes, refer to "Error Training Code" in the error messages.
2	***WrongDMC***	1. The data matrix code currently being read does not correspond to the expected data matrix code. 2. The parameter settings in Settings>Result>Filter are incorrect. Note: You can modify this text in Settings>Result>Messages >FilterErr	1. Check whether the DMC currently being read is correct. 2. Correct the settings in Settings>Result>Filter.
3	***Match ERR***	The parameter selected in Settings>Match was not found in the data matrix code being compared or the string defined during training does not match the current string of the data matrix code. Note: You can modify this text in Settings>Result>Messages >MatchErr	1. The data matrix code currently being read is different from the trained code (and is therefore bad) or the wrong data matrix code was trained. 2. Check the selected parameter settings in Settings>Match.

7.3 Diagnostics Based on the "BF" LED

LED "BF"	Meaning if an Error Occurs	Possible Remedies
off	PROFIBUS driver of the VS 130 not started	Select "DP" in the Settings > Result menu or/and in the Settings > Trigger menu or/and in the Settings > Control menu and set a valid PROFIBUS address in the Settings > DP Addr. menu.
on	VS 130 is not in the data exchange phase but is searching for the transmission rate	• Check that the bus connector is correctly inserted. • Check that there is no break on the bus cable to the DP master. • If you are using an S7-DP master: Check the diagnostic buffer of the DP master or the DP slave diagnostic information in HW Config.
flashing	VS 130 is neither in the data exchange phase nor searching for the transmission rate	• Check the cable lengths relative to the transmission rate. • Check the settings of the terminating resistors. • Check the configuration of the DP master (PROFIBUS address, transmission rate, configuration, bus profile). • If you are using an S7-DP master: Check the diagnostic buffer of the DP master or the DP slave diagnostic information in HW Config.

7.4 Slave Diagnostics

7.4.1 Introduction

Errors such as "Sensor not found" trigger a slave diagnostic message. This is according to the PROFIBUS standards EN 50170 and IEC 61158 / IEC 61784. Depending on the DP master, it can be read out with STEP 7.

How to read out the slave diagnostic information and how it is structured is described briefly below. You will find a detailed description in the *Distributed I/O Station ET 200M* manual.

7.4.2 Reading Out the Diagnostic Information with S 7

If an error message such as "Sensor not found" occurs on the processing unit and you are using an S7-CPU as the DP master, the diagnostic interrupt OB (OB82) is started.

Its local variables OB_82_EV_CLASS, OB_82_MDL_DEFECT, and OB82_EXT_FAULT can have the following values:

Variable	Value	Meaning
OB_82_EV_CLASS	B#16#39	Event entering state
OB_82_MDL_DEFECT	TRUE	Module fault
OB_82_EXT_FAULT	TRUE	External error

Unfortunately it is not possible to obtain the actual cause of the problem from the local variables of OB82. You can, however, call SFC13 "DPNRM_DG" in OB82 to obtain the cause.

Bytes 7 through 10 of the slave diagnostic information (diagnostic bytes 0 through 3) read with SFC13 correspond to the 32-bit long field "Unit_Diag_Bit" of the GSD file SIEM8100.GSD.

The entry "Module fault" appears in the diagnostic buffer and the relevant text from the GSD file is shown as the module status of the VS 130, for example "Sensor not found".

Once you have eliminated the problem (in the example here, you have inserted the sensor again) and acknowledged on the processing unit, the diagnostic interrupt OB (OB82) is started again.

Its local variables OB_82_EV_CLASS, OB_82_MDL_DEFECT, and OB82_EXT_FAULT can have the following values:

Variable	Value	Meaning
OB_82_EV_CLASS	B#16#38	Event exiting state
OB_82_MDL_DEFECT	FALSE	No module fault
OB_82_EXT_FAULT	FALSE	No external error

The entry "Module OK" now appears in the diagnostic buffer and the error text from the GSD file is no longer shown as the module status of the VS 130.

7.4.3 Structure of the Slave Diagnostic Data

PROFIBUS Frame	Meaning	Range of Validity
Byte 0	Station status1 (bit 3 = 1: external diagnostic data exists)	According to standard
Byte 1	Station status 2	According to standard
Byte 2	Station status 3	According to standard
Byte 3	Master PROFIBUS address	According to standard
Byte 4	Vendor ID (high byte): B#16#81	According to standard
Byte 5	Vendor ID (low byte): B#16#00	According to standard
Byte 6	Length of the VS 130-specific diagnostic data incl. byte 6: B#16#05	According to standard
Byte 7	Diagnostic byte 0 (bit 1 "Sensor not found")	VS 130-specific
Byte 8	Diagnostic byte 1	VS 130-specific
Byte 9	Diagnostic byte 2	VS 130-specific
Byte 10	Diagnostic byte 3	VS 130-specific

A Appendix

A.1 Components of the Product

Full Packages

Order Number	Description
6GF1 130-1AA	**SIMATIC VS 130 for "large code areas"**: Full package for recognition of data matrix codes, comprising: • **Sensor head** (6GF2 002-8DA) in IP65 for **picture field size or 70 mm x 50 mm**, white • **Sensor cable**(6GF9 002-8CD) for sensor heads SIMATIC VS 100, 2.5 m long, connectors at both ends, capable of trailing + ferrite ring (A5E00159706) • **Lighting unit**, overhead lighting, red (6GF9 004-8BA) in IP65, with diffuser • **Lighting cable** (6GF9 002-8CE) for SIMATIC VS 100, 2.5 m long, connectors at both ends, capable of trailing • **Processing unit** (6GF1 018-3AA) SIMATIC VS 130 in IP40 • **Power supply cable** (6GF9 002-8CA) SIMATIC VS 100, 10 m long • **Digital communication cable** (6GF9 002-8CB) SIMATIC VS 100, 10 m long • **Documentation package** (6GF7 031-1AA) SIMATIC VS 130 containing manuals/commissioning CD and installation instructions
6GF1 130-2AA	**SIMATIC VS 130 for "small code areas"**: Full package for recognition of data matrix codes, comprising: • **Sensor head** (6GF2 002-8EA) in IP65 for **picture field size or 40 mm x 30 mm**, white • **Sensor cable**(6GF9 002-8CD) for sensor heads SIMATIC VS 100, 2.5 m long, can be plugged in at both ends, capable of trailing + ferrite ring (A5E00159706) • **Lighting unit**, overhead lighting, red (6GF9 004-8BA) in IP65, with diffuser • **Lighting cable** (6GF9 002-8CE) for SIMATIC VS 100, 2.5 m long, connectors at both ends, capable of trailing • **Processing unit** (6GF1 018-3AA) SIMATIC VS 130 in IP40 • **Power supply cable** (6GF9 002-8CA) SIMATIC VS 100, 10 m long • **Digital communication cable** (6GF9 002-8CB) SIMATIC VS 100, 10 m long • **Documentation package** (6GF7 031-1AA) SIMATIC VS 130, containing manuals/commissioning CD and installation instructions

Order Number	Description
6GF1 130-3AA	**SIMATIC VS 130**: Basic package for recognition of data matrix codes, comprising: • **Sensor head** (6GF2 002-8CA) in IP40 for **variable image field size** for C-/CS-mount lenses • **Sensor cable**(6GF9 002-8CD) for sensor heads SIMATIC VS 100, 2.5 m long, connectors at both ends, capable of trailing + ferrite ring (A5E00159706) • **Processing unit** (6GF1 018-3AA) SIMATIC VS 130 in IP40 • **Power supply cable** (6GF9 002-8CA) SIMATIC VS 100, 10 m long • **Digital communication cable** (6GF9 002-8CB) SIMATIC VS 100, 10 m long • **Documentation package** (6GF7 031-1AA) SIMATIC VS 130 containing manuals/commissioning CD and installation instructions **You also require suitable lighting and a lens.**

Components, Accessories

Order Number	Description
6GF7 031-1AA	**Documentation package** SIMATIC VS 130, containing manuals/commissioning CD and installation instructions (included in full and basic package)
6ES7 901-1BF00-0XA0	**RS-232 connecting cable to PG/PC**: SIMATIC S7, connecting cable for HMI adapter and PC/TS adapter 5 m long

A.2 Technical Specifications

A.2.1 Vision Sensor SIMATIC® VS 130

Lighting Unit	
LED ring flash	• LEDs, wavelength 630 nm (red) • Ring flash with flash duration of 20 µs ... 10 ms, diffuse • DIN EN 60825-1:1994+A11:1996+A2:2001
Casing	Plastic
Dimensions (W x H x D) in mm	102 * 102 * 26,5
Weight	approx. 0.13 kg
Rated voltage	16.5 V
Degree of protection	IP 65

Sensor Head			
Image capture	CCD chip ¼", 640 x 480 square pixels; full-frame shutter		
Image data transfer	triggered image capture		
Casing	Aluminum profile casing, anodized black		
Dimensions (W x H x D) in mm	42 x 42 x 100		
Weight	approx. 0.24 kg		
Rated voltage	16.5 V		
	SIMATIC VS 130 for "large code areas" (6GF1 130-1AA with sensor head 6GF2 002-8DA)	**SIMATIC VS 130 for "small code areas" (6GF1 130-2AA with sensor head 6GF2 002-8EA)**	**C-/CS-mount**
Distance from sensor front edge to test object	110 mm	85 mm	Depending on lens
Degree of protection	IP 65 to IEC 60529		IP 40 to IEC 60529

Processing Unit	
Operator controls	4-row text display and 6 control buttons
Training new codes	Codes are trained automatically at the push of a button
Number of stored codes	15 different codes, selectable using control buttons or digital inputs, stored in non-volatile memory
Triggering tests	External (via digital input) or over PROFIBUS
Setup Software	PC software for displaying the sensor image during installation and adjustment of the sensor head and illumination on supplied CD
Casing	Plastic, all cables can be plugged in, suitable for installation without cubicle

Processing Unit			
Dimensions (W x H x D) in mm	170 x 140 x 76		
Weight	approx. 0.5 kg		
Degree of protection	IP 40 to IEC 60529		
Interfaces on the processing unit			
Interface for load current supply	• 4-pin circular connector (male) for load current supply • Cable length: 10 m (4 x 0.56 mm^2)		
Illumination control	• 4-pin circular connector (female) for power supply and triggering the flasher lamp • Current consumption at 16.5 V: max. 0.3 A • Cable length: 2.5 m (4 x 0.23 mm^2)		
Sensor head interface	• Digital interface (26-pin sub-D female connector) for connecting the SIMATIC VS 130 sensor head • Current consumption at 16.5 V: max. 0.16 A • Cable length: 2.5 m (26 x 0.09 mm^2)		
Digital inputs for 24 V d.c.	• 8; one being a trigger input with interrupt capability for standard binary sensors, • 7 further PLC-compliant control inputs		
Digital outputs for 24 V d.c.	• 6; max. load 0.5 A each, however in total a maximum of 1.5 A (15-pin sub-D female for inputs/outputs) • Cable length: 10 m (15 x 0.14 mm^2)		
Serial interface	• RS-232 (9-pin. sub-D, male) for commissioning support and display of results • Cable length: 5 m		
DP interface	9-pin. sub-D, socket; can be programmed with software; • floating: data lines A,B; control lines RTS; 5V power supply (max. 90 mA) • grounded: shield of the DP12 connecting cable; RS 485; floating		
Resolution of processing unit	**SIMATIC VS 130 for "large code areas" (6GF1 130-1AA with sensor head 6GF2 002-8DA)**	**SIMATIC VS 130 for "small code areas" (6GF1 130-2AA with sensor head 6GF2 002-8EA)**	**C-/CS-mount**
CCD resolution	0.11 mm	0.06 mm	Image width / 640
Minimum dot size (edge length)	0.6 mm	0.35 mm	Image width / 120
Maximum dot size (edge length)	3.5 mm	2 mm	Image width / 22
Minimum code dimension (rows * columns)	10 *10		
Maximum code dimension (rows * columns)	48 *48		72 *72 [1)]

[1)] With large code dimensions such as 72*72, make sure that the lens used does not cause any distortion at the edges.

Limit Data for Evaluation of Parts with Data Matrix Code	
Permitted Part Rates	Depends on the dot size and code dimensions, however at least 5/s

A.2.2 General Data

Power Supply	
Supply voltage (U_N)	DC24 V; (DC20.4...DC28.8 V, safety extra-low voltage SELV). SIMATIC VS 130 does not have integrated protection against surge in the µs range. For external measures, see EMC.
• Input voltage protected against polarity reversal	Yes
• Voltage loss (can be bridged)	≥ 20 ms
Current consumption (I_N)	typically: I = 2 A (maximum load of 1.5 A over the digital inputs/outputs)
Fuse	max. 10 A
Making current	$_1$ max. 10 A; < 1 ms
Safety requirements complying with	IEC 61131-2 corresponds to DIN EN 61131-2

Electromagnetic Compatibility (EMC)		
Pulse-shaped interference		
Interference	**Test voltage**	**Corr. to severity**
Electrostatic discharge according to IEC 61000-4-2	• Discharge in air: ±8 kV • Contact discharge: ±6 kV	3
Burst pulse (fast transients) complying with IEC 61000-4-4	• 2 kV (power supply cable) • 2 kV (signal line)	3
Surge complying with IEC 61000-4-5		
Coupling	**Test voltage**	**Corr. to severity**
Asymmetrical	2 kV (power supply cable) direct voltage with protective elements	3
Symmetrical	1 kV (power supply cable) direct voltage with protective elements	3
Sine-shaped disturbance		
Radio frequency electromagnetic fields	**Test values**	**Corr. to severity**
complying with IEC 61000-4-3	10 V/m at 80 % amplitude modulation of 1 kHz in the range from 80 MHz to 1000 MHz	3
complying with IEC 61000-4-3	10 V/m at 50 % pulse modulation at 900 MHz	3
RF interference on cable/cable shields	**Test values**	**Corr. to severity**
complying with IEC 61000-4-6	Test voltage 10 V at 80 % amplitude modulation of 1 kHz in the range from 9 kHz to 80 MHz	3

Electromagnetic Compatibility (EMC)	
Emitted interference	
Limit class	• Radiation of electromagnetic fields complying with EN 55011: Limit class A, group 1 • Emission of interference over line a.c. supply complying with EN 55011: Limit class A, group 1 • Sensor head and illumination are within the limit value to comply with EN 55022 class B

Transport and Storage of Modules	
With regard to transport and storage conditions, the SIMATIC VS 130 is better than required by IEC 61131-2. The following information applies to modules transported or stored in their original packaging. The climatic conditions correspond to IEC 60721-3-3, Class 3K7 for storage and IEC 60721-3-2, Class 2K4 for transport. The mechanical conditions correspond to IEC 60721-3-2, Class 2M2.	
Conditions	**Permitted Range**
Free fall	≤ 1 m (up to 10 kg)
Temperature	-30 °C to +70 ° C
Air pressure	1080 to 660 hPa (corresponds to a height of -1000 to 3500 m)
Relative humidity (at +25 °C)	5 to 95 %, no condensation
Sine-shaped oscillations complying with IEC 60068-2-6	5 - 9 Hz: 3.5 mm 9 - 500 Hz: 9.8 m/s^2
Shock complying with IEC 60068-2-29	250 m/s^2, 6 ms, 1000 shocks

Mechanical Environmental Conditions for Operation	
SIMATIC VS 130 is designed for fixed installation in an environment protected from the weather. SIMATIC VS 130 meets the conditions for use complying with DIN IEC 60721-3-3: • Class 3M3 (mechanical requirements) • Class 3K3 (climatic environmental conditions)	
Mechanical environmental conditions, sine-shaped oscillations	
Frequency range in Hz	**Test values**
10 ≤ f < 58	0.075 mm amplitude
58 ≤ f < 500	1 g constant acceleration
Test for mechanical environmental conditions	
Test for / Test standard	**Remarks**
Oscillations Oscillation test complying with IEC 60068-2-6 (sine)	• Type of oscillation: Frequency sweeps with a rate of change of 1 octave/minute. - 10 Hz ≤ f < 58 Hz, constant amplitude 0.075 mm - 58 Hz ≤ f < 500 Hz, constant acceleration 1 g - 10 Hz ≤ f ≤ 55 Hz, amplitude 1 mm (only sensor head and illumination) • Period of oscillation: 10 frequency sweeps per axis in each of the 3 perpendicular axes

Mechanical Environmental Conditions for Operation		
Test for / Test standard		**Remarks**
Shock	Shock test complying with IEC 60068-2-29	• Type of shock: half sine • Strength of the shock: - Processing unit: 10 g peak value / 16 ms duration - Sensor head, illumination: 10 g peak value / 16 ms duration • Direction of shock: 100 shocks in each of the 3 perpendicular axes
	Shock test complying with IEC 60068-2-27	Sensor head, illumination: • 70 g peak value / 6 ms duration 3 times in each direction • 30 g peak value / 11 ms duration 3 times in each direction

Climatic Environmental Conditions for Operation		
Environmental Conditions	**Permitted Range**	**Note**
Temperature	0 to +50 °C	
Temperature change	Max. 10 °C/h	
Relative humidity	Max. 95 % at +25 °C	No condensation, corresponds to relative humidity degree 2 to IEC 61131-2
Air pressure	1080 to 795 hPa (corresponds to a height of -1000 to 2000 m)	
Contaminant concentration	• SO_2: < 0.5 ppm; RH < 60 %, no condensation • H_2S: < 0.1 ppm; RH < 60 %, no condensation	• Test: 10 ppm; 4 days • Test: 1 ppm; 4 days

Note

The mechanic and climatic ambient conditions specified above for operation are valid for only sensor heads with order numbers 6GF2 002-8DA and 6GF2 002-8EA.
The mechanic and climatic ambient conditions for the sensor head with order number 6GF2 002-8CA depend on the lens used.

Test voltages to IEC 61131-2	
Circuits with rated voltage U_e to other circuits or ground	**Test voltage**
0 V < U_e ≤ 50 V	350 V
50 V < U_e ≤ 100 V	700 V
100 V < U_e ≤ 150 V	1300 V
150 V < U_e ≤ 300 V	2200 V

A.2.3 Interface Digital Inputs/Outputs

Module-Specific Data	
Number of inputs	8
Number of outputs	6
Cable length, unshielded	10 m
Voltage, Currents, Potentials	
Rated voltage Load current supply L+	24 V d.c.
Permitted rated voltage Load current supply L+	20.4 V to 28.8 V
Current consumption L+	Dependent on configuration
Number of simultaneously controllable inputs	8
Number of simultaneously controllable outputs	6
Total current of the outputs	max. 1.5 A with max. 0.5 A/output
Electrical isolation	No
Data for Selecting a Sensor	
Input voltage • Rated value • For signal "1" • For signal "0"	 24 V d.c. from 13 to 30 V -30 V to +5 V
Input current • For signal "1"	 Typical. 7 mA
Input signal characteristics	"Trigger" input to IEC61131-2 type 2 Other inputs: IEC61131-2 type 1
Connection of two-wire BERO	Max. 1.5 mA
Data for Selecting an Actuator	
Output voltage • For signal "1"	 Min. L+ (-1.3 V)
Output current • For signal "1" • For signal "0"	 Rated value: 0.5 A Permitted range: 5 mA to 0.5 A Residual current: max. 0.5 mA
Off delay (with resistive load) • from "0" to "1"	 max. 100 µs
Load resistor	Max. 48 Ω to 4 KΩ
Lamp load	max. 5 W
Parallel wiring of 2 outputs	No
Operating frequency: • With resistive load • With inductive load to IEC 947-5-1, DC 13 • With lamp load	 Max. 100 Hz Max. 0.5 Hz at 0.5 A Max. 10 Hz
Limit on inductive cutoff voltage	Typical. L+ (-53 V)
Short-circuit protection of the output • Operating threshold	Electronic Typical. 1 A

A.3 Certifications, Standards, and Approvals

IEC 61131-2

SIMATIC VS 130 meets the requirements and criteria of the standard IEC 61131-2.

CE Mark

SIMATIC VS 130 meets the requirements and protective aims of the following EU directive.

89/336/EEC "Electromagnetic Compatibility" (EMC Directive)

CE The EU conformity certificates are available for the relevant authorities and are kept at the following address:

Siemens Aktiengesellschaft

Bereich Automatisierungstechnik

A&D AS RD 42

Postfach 1963

D-92209 Amberg,
Germany

EMC Directive

SIMATIC VS 130 is designed for use in an industrial environment.

Area of Application	Requirements	
	Emitted interference	Immunity
Industry	EN 50081-2 : 1993	EN 61000-6-2 : 1999

Marks for Australia and New Zealand

SIMATIC VS 130 meets the requirements of the standard AS/NZS 2064 (Class A).

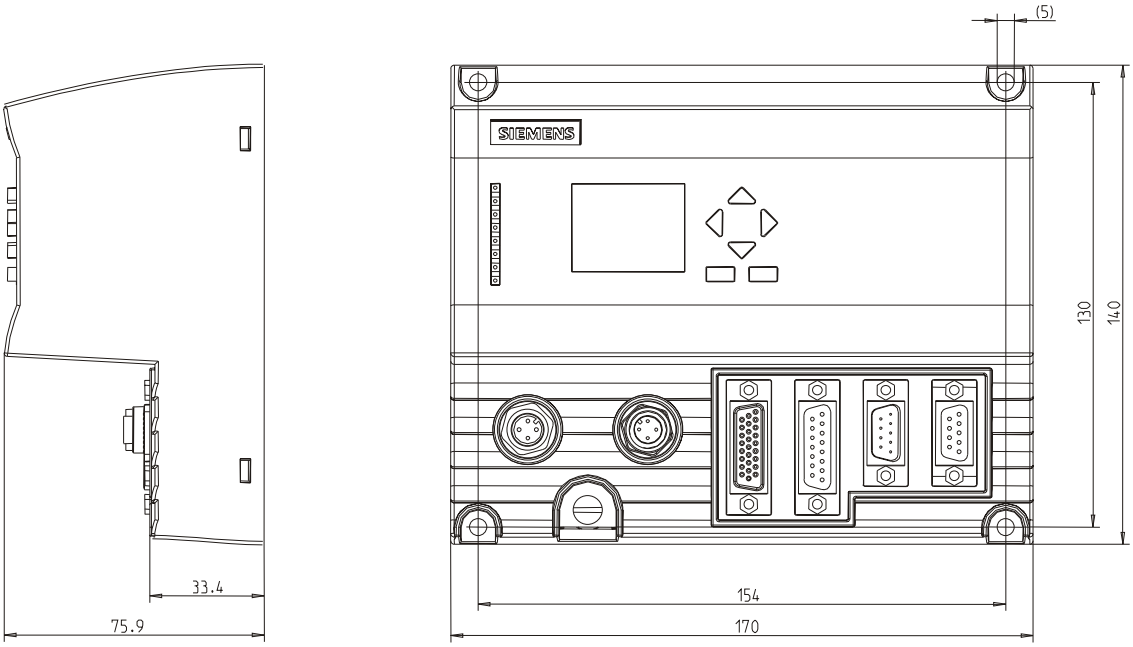
Installation Guidelines

SIMATIC VS 130 is "enclosed equipment" complying with IEC 61131-2".

The installation guidelines and safety notices specified in the documentation must be adhered to during commissioning and operation.

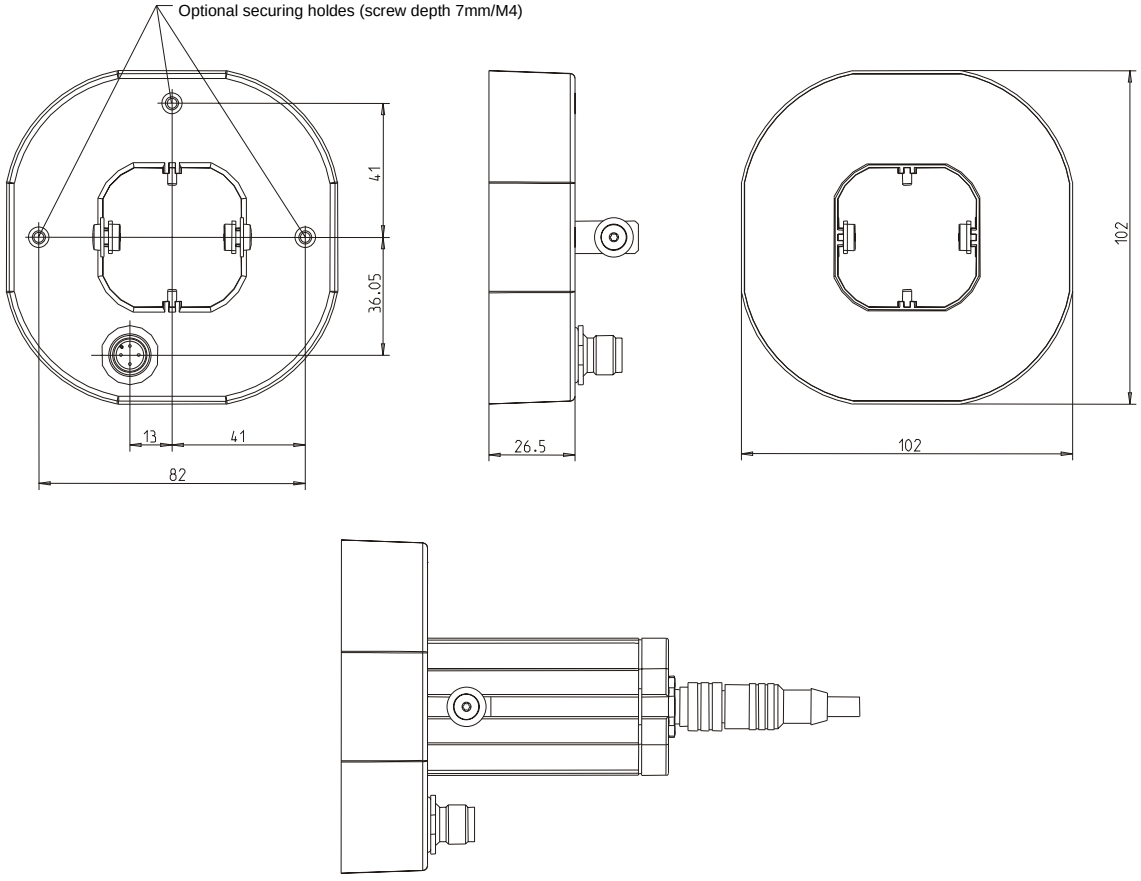
A.4 Installation Dimensions

Processing Unit



Securing screws: M4x12 or longer
Permitted static bending radius: PS cable approx. R40
Permitted static bending radius: Lighting cable approx. R25
Permitted static bending radius: Sensor cable approx. R40
Permitted static bending radius: I/O cable approx. R50

Sensor Head and Lighting Unit



A.5 Interface Assignment of the Processing Unit

Power supply of "IN DC 24V" (pin)

Connector	Name	Function	Direction	Wire Color
1	+24V	24 V power supply	-	red
2	+24V	24 V power supply	-	orange
3	M	Ground	-	black
4	M	Ground	-	brown

Interface to Lighting Unit "LAMP" (socket)

Connector	Name	Function	Direction
1	+16V	16.5 V power supply	-
2	LIGHT	Pulse to start a light flash (24 V)	Output
3	M	Ground	-
4	M	Ground	-

Interface to Sensor Head "SENSOR" (socket)

Connector	Name	Function	Direction
Casing		Shield	-
9	M		-
10	M		-
14		+16V	-
20	TxDP	Image data +	Input
21	TxDN	Image data -	Input
22	CLK_P	Image synchronization +	Output
23	CLK_N	Image synchronization -	Output
24	RxD_P	Sensor parameter +	Output
25	RxD_N	Sensor parameter -	Output
26	M		-

I/O Interface "DI/DO" (socket)

Connector	Name	Function	Direction	Wire Color
1	DISA	Disable: Disable manual control panel input, model selection and train via digital I/O	Input	black
2	SEL0	Select 0: Code selection: bit 0	Input	brown
3	SEL1	Select 1: Code selection bit 1 / train code	Input	green
4	SEL2	Select 2: Code selection bit 2	Input	orange
5	SEL3	Select 3: Code selection bit 3	Input	yellow
6	TRN	Train: Train new code	Input	red
7	TRG	Trigger: An evaluation is started on the positive-going edge	Input	blue
8	RES	Reset: Reset error	Input	violet
9	IN_OP	In Operation: • 0 = error message is displayed. • 1 = SIMATIC VS 130 functional, no errors	Output	white-black
10	TRD	Trained: • In Run: - 0 = selected code has not been trained - 1 = selected code has been trained • In Training (TRN=1) - 0 = training active - 1 = acknowledgment signal (RDY=0)	Output	white-brown
11	RDY	Ready: • 0 = device startup or SIMATIC VS 130 in Stop • 1 = SIMATIC VS 130 in Run	Output	white-green
12	READ	Result of evaluation: Code was localized and decoded.	Output	white-orange
13	MATCH	Result of evaluation: Code matches learned code.	Output	white-yellow
14	N_OK	In the "RUN" mode (evaluation): Code was not legible. In the "STOP" mode: set to 0 If there is a group error and during training, the digital output N_OK is set to "1" at each trigger signal for the duration of the set pulse time "1".	Output	white-red
15	-	-	-	-

RS-232 Interface, Floating "RS-232" (pin)

Connector	Name	Function	Direction
Casing	Shield	Shield	-
2	RxD	Receive:	Input
3	TxD	Transmit:	Output
5	M	Ground	-

PROFIBUS DP Interface (socket)

Connector	Name	Function
1	-	Not used
2	M	Chassis, non-floating
3	LTG_B	Data line (I/O)
4	RTSAS	Turn on PLC transmitter (O)
5	GND	Chassis, floating
6	P5V	+ 5V (fused) floating
7	24V	non-floating
8	LTG_A	Data line (I/O)
9	-	Not used

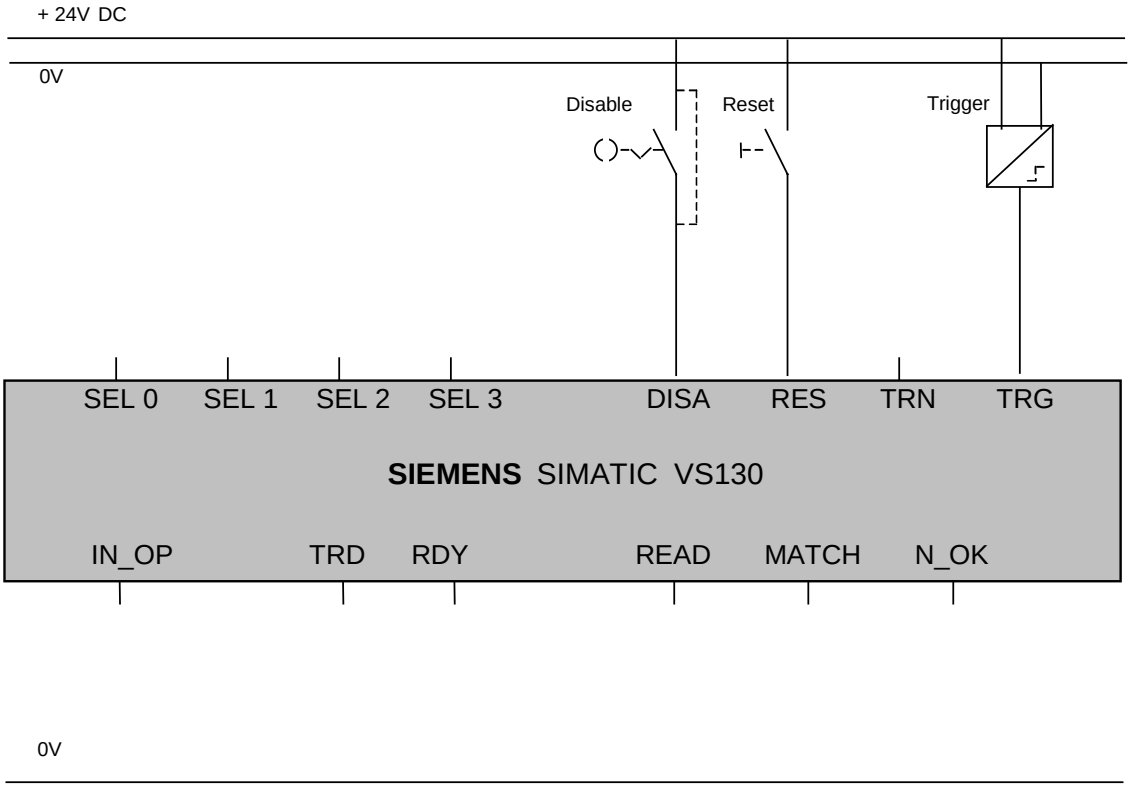
A.6 Wiring Suggestions

Controlling with Control Panel Buttons

The equipment is controlled from the control panel .

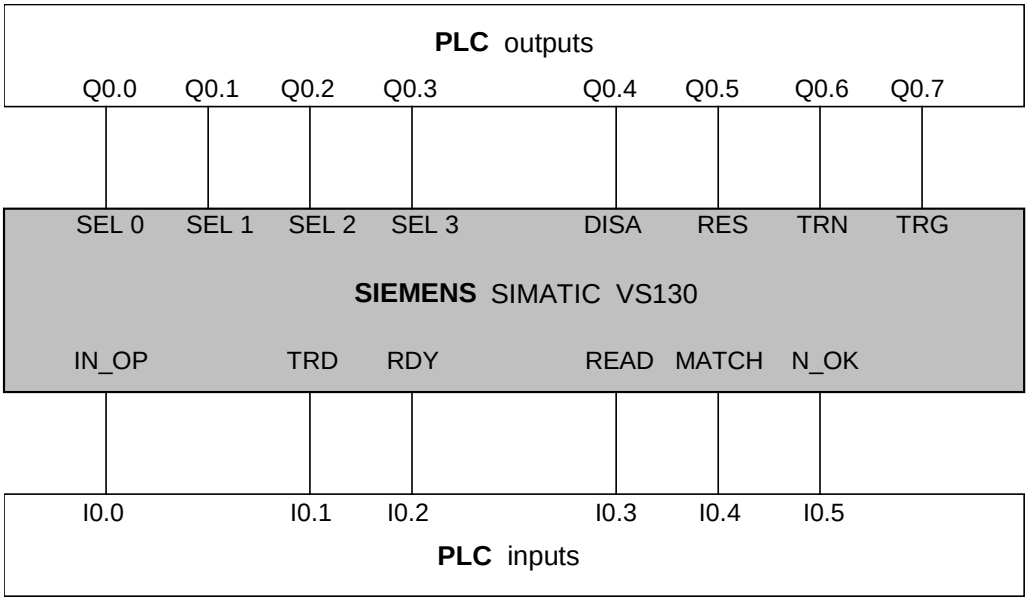
Using a keyswitch, you can disable the buttons by applying +24 V at the DISA input (disable).

Error messages are acknowledged via the RES input (reset).



Controlling with a Programmable Controller

The inputs and outputs of the programmable controller are connected directly to the SIMATIC VS 130.



A.7 Setup Software for SIMATIC VS 130

The setup software is used to adjust the sensor head.

A.7.1 Requirements

- Microsoft Windows PC (98, Me, NT 4.0, 2000 or XP)
- Intel or compatible processor Pentium 200 MHz or faster
- Graphics card /monitor with at least 65536 colors and a resolution of at least 640x480
- Serial interface with 115200 Kbps supported by Windows as COM1...9. This must be a different interface than that used by the mouse

A.7.2 Preparations

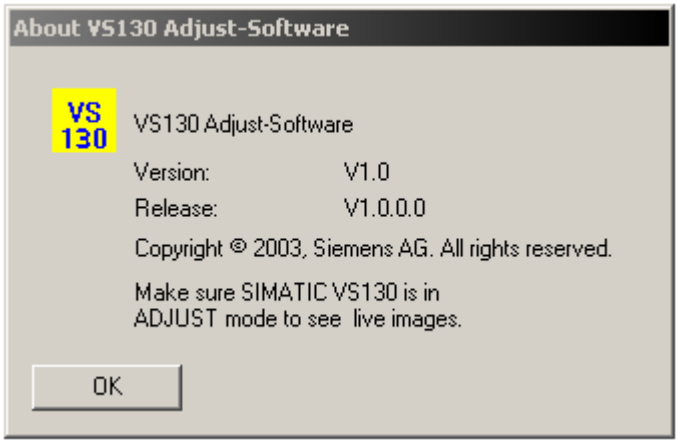
Connect the PC and the processing unit using an RS-232 null modem cable (6ES7901-1BF00-0XA0).

Note

Establish the serial connection only when Windows has completed startup and close the connection before restarting the PC.

If a PC is started while the processing unit is connected over the serial cable, you may encounter problems with the mouse.

After starting the program, a message is displayed telling you that the SIMATIC VS 130 must be in the "Setup" mode to display live pictures.

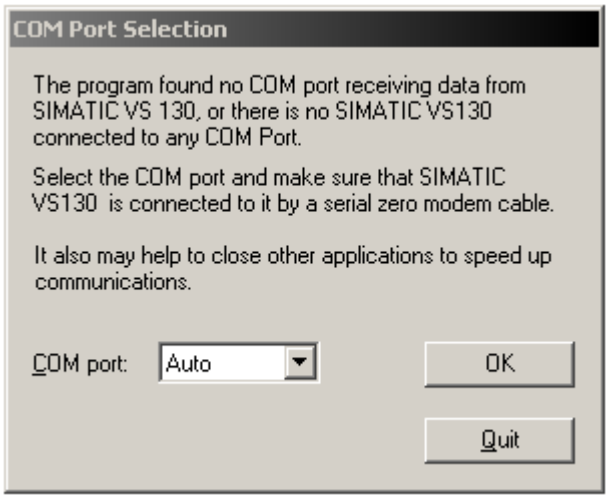


You must acknowledge this message with "OK".

After starting the program, it automatically searches for the interface to which the processing unit is connected. This is only possible after the processing unit has completed its self test.

During the automatic interface selection, all the available serial interfaces are investigated to find out whether or not data can be received from the processing unit over them. The first interface to meet this requirement is selected.

Very occasionally, automatic detection fails to find a connected processing unit. If the program does not find an interface, the following dialog box appears:



In this case, you have the option of either

- running another automatic search or
- selecting the interface to which the processing unit is connected manually.

To cancel the search, simply click the "Quit" button to exit the program.

You can see that a connection was established successfully because "Online" is displayed in the status bar. You can also see which interface is being used for the connection.

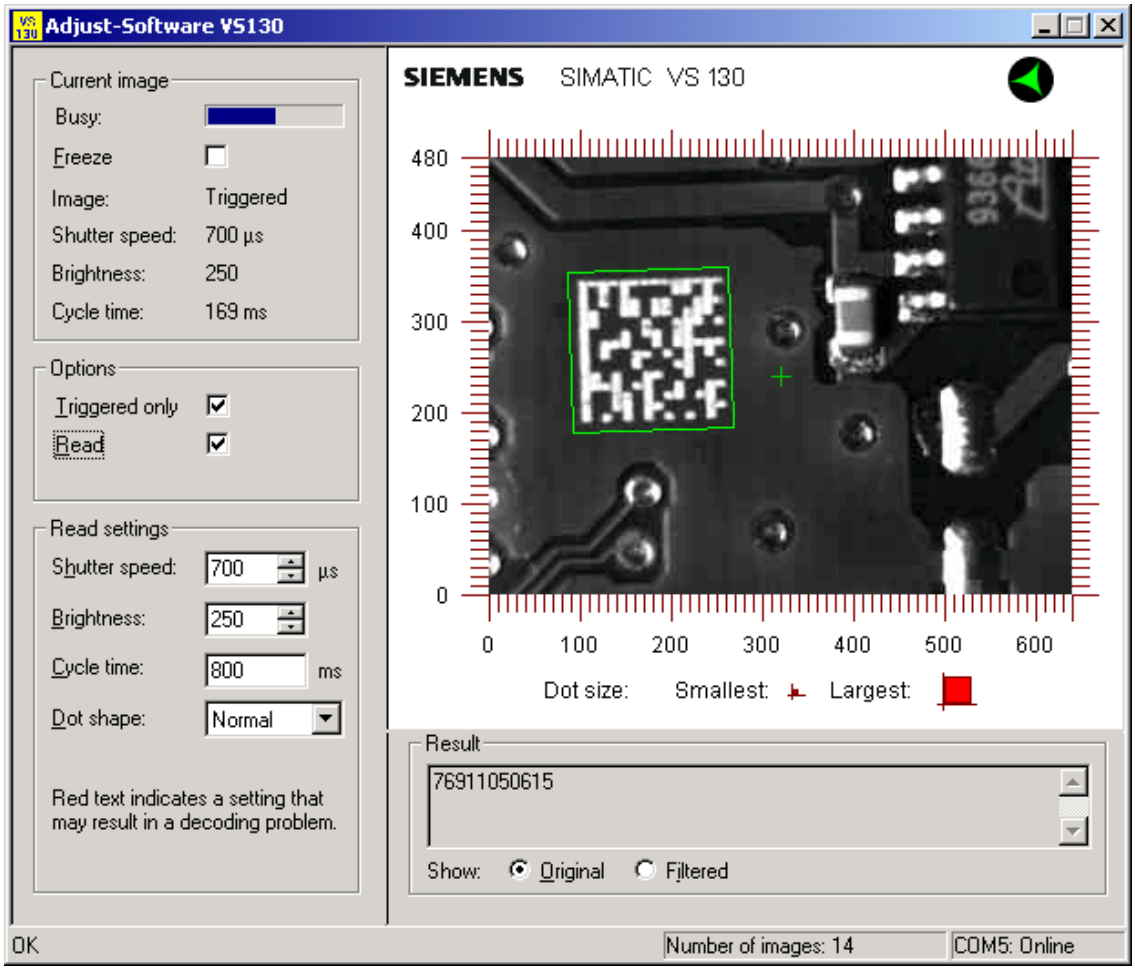
A.7.3 Displaying Images to Adjust the Sensor Head

To display images, the processing unit must be in the Settings > Adjust menu.

The "Adjust-SW VS 130" window consists of the following parts:

- 4 groups in which you can set parameters for image capture and display information on the last transferred image
- Display of the last transferred image
  This also includes a sign of life for the connection between the setup software and the sensor (green symbol on a black background) and the display of the smallest and largest possible dot that can be decoded with the existing arrangement.

  If you selected the "Freeze" check box in the "Current image" group, you can save the currently displayed image as a bitmap using the right mouse button.



"Current image" Group

The first element of this group is the "Load" progress bar. From the length of the progress bar, you can see how long the currently recorded image will take to load. If you have activated the "Freeze" check box, the current image remains displayed in the right pane. In this case the progress bar has zero length and is not visible.

Note

If you have activated the "Read" check box in the "Options" group, the text for the progress bar changes cyclically: "Busy" as long as a data matrix code is being decoded, and "Load" when the image just recorded is being loaded.

"Image:" shows how the image is captured (refer to the description of the "Triggered only" check box in the "Options" group):

- "Live", if the image is captured while idling
- "Triggered", if the image is captured only on the trigger signal

"Shutter speed" indicates the exposure time of the currently displayed image, "Brightness" indicates the brightness of the currently displayed image, and "Cycle time" indicates the time required to evaluate the code currently being read.

Note

If you have activated the "Read" check box in the "Options" group, the color of the "Shutter speed", "Brightness", and "Cycle time" texts depends on the entries in the "Read settings" group (see below). The texts are either black or red.

"Options" Group

This group contains the following check boxes:

- "Triggered only": If this check box is activated, the image is captured only on the trigger signal. If the check box is deactivated the image is captured while idling.
- "Read": If this check box is activated, evaluation of the read code is attempted following each image capture. If the check box is deactivated, there is no evaluation.

"Read settings" Group

You enter the parameters for image evaluation in the "Read settings" group.

Note

The parameters in the "Read settings" group are exactly the same as in the Settings > Read menu on the processing unit.

You select the shutter speed in the "Shutter speed" box (range of values: 1 through 20000 µs) and the brightness in the "Brightness" box (range of values: 10 through 500).

In the "Cycle time" input box, you enter the time between two trigger signals. This time is the maximum time available to VS 130 for image evaluation.

Before explaining the cycle time setting in greater detail, two definitions of processing parts with data matrix codes are required:

- Asynchronous parts processing: Parts arrive at the VS 130 and are further processed depending on the time require for evaluating their data matrix code. The process "waits" for the result of the VS 130 evaluation and other parts arriving are temporarily buffered.
- Synchronous parts processing: Parts arrive at the VS 130 at intervals decided by the process and must be further processed "just in time" (example: conveyor belt).

Type of Parts Processing	Cycle Time Setting
Asynchronous	Set the cycle time to several seconds to obtain as high a code recognition rate as possible. Note: The evaluation time is generally well below this value, so that the average part throughput will be higher than when the evaluation time is set to the same time as cycle time.
Synchronous	Set the cycle time to a value less than the time available per part. The result will be available at the latest when cycle time expires. Note: In some situations, the reliability of detection may not be as high as with asynchronous part processing. This does not apply if the time available per part is in the range of several seconds. In this case, the cycle time can also be set generously.

In the "Dot shape" drop-down list box, you set the shape of the dots in the code to be read:

- Normal
- Bold: overlapping
- Separated: no touching

Immediately after a change in the "Read settings" group, all the current settings of this group are sent to the processing unit and are therefore active.

Note

The settings sent to the processing unit are saved only after confirming with "OK" in the Settings > Adjust menu of the processing unit.

If you have activated the "Read" check box in the "Options" group, the color of the "Shutter speed", "Brightness", and "Cycle time" texts depends on the values in the input fields. Red text for a parameter means that this setting can lead to an evaluation problem, as follows:

- "Shutter speed" is red when the image is too dark or too light.
- "Brightness" is red if you set a value of 300 or higher.
- "Cycle time" is red when the time actually required for the codes currently being read (see "Current image" group) is higher than or equal to 50 % of the maximum evaluation time set in the "Read settings" group.

"Result" Group

What you see here depends on whether the "Read" check box is selected in the "Options" group:

- If the "Read" check box is not selected, the display is empty.
- If the "Read" check box is activated, the last code to be read is displayed.

If the "Original" check box is selected, this is the actual text, if the "Filtered" check box is selected, it is the text modified according to the parameters of the Settings>Result menu.

If the data matrix code could not be decoded, the appropriate error message is displayed here. In contrast to the read code, the error message is red.

Note

Double-clicking on the "Number of images" field in the status bar resets the image counter to zero.

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