Software manual
Version 2.3.28

Photoelectric distance sensor
Profile detector

OPD101

Contents

1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at www.ifm.com.

1.1 Symbols used

✓	Requirement
▶	Instructions
▷	Reaction, result
[...]	Designation of keys, buttons or indications
→	Cross-reference
⚠	Important note Non-compliance may result in malfunction or interference.
ⓘ	Information Supplementary note

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2 Safety instructions

Please read the operating instructions prior to set-up of the device. The device must be suitable for the application without any restrictions.

If the operating instructions or the technical data are not adhered to, personal injury and damage to property can occur.

3   Intended use

The ifmVisionAssistant software is used for the following functions:

• recognising the device in the local subnet,

• configuring the device,

• collecting, storing and evaluating data,

• installing and monitoring the profile on the device,

• displaying high-resolution profile pictures,

• displaying detailed status information.

> As soon as the reference profile is installed, the device can be operated without the ifmVisionAssistant.

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5   Installation

5.1   System requirements

Software

The following software is required for operation:

- Operating system: Windows 10 (32/64 bits)

- ifmVisionAssistant software: 2.3.28 or higher

> [i]   Other versions
>
> ▷ Other versions of the software or firmware may contain changed or new functions which are not described in this software manual.

Hardware

The following hardware is required for operation:

- Hard disk: min. 1 GB free memory space

- Monitor: Resolution of min. 1024x768 pixels, 32-bit colour depth

Accessories

> [i]   ▷ Information about the accessories: www.ifm.com

5.2   Hardware

> [i]   ▷ Detailed information about installation and electrical connection of the hardware can be found in the operating instructions of the device.

5.3   Software

Installing the ifmVisionAssistant:

▶ Download the ifmVisionAssistant from the website: www.ifm.com

▶ Copy the zip file to a directory on the PC and unzip.

▷ The ifmVisionAssistant is installed an can be started via the file "ifmVisionAssistant.exe".

> [i]   ifmVisionAssistant does not start
>
> ▷ If the ifmVisionAssistant does not appear within 5-10 seconds after starting:
>
> ▶ Check the system requirements.

5.3.1   Uninstall

Uninstalling the ifmVisionAssistant:

▶ Delete the installation folder of the ifmVisionAssistant.

▷ The ifmVisionAssistant is uninstalled.

ⓘ   ▷   Existing settings and log files are not deleted.

Deleting the settings and log files:

▶   Delete the following directory: „`%AppData%\ifm electronic\ifmVisionAssistant`"

6   Getting started

The chapter "First steps" explains the first steps with the device and the ifmVisionAssistant software.

Connecting the device

Installation and electrical connection are described in the operating instructions of the device.

Using the ifmVisionAssistant

▶ Install and start the ifmVisionAssistant software.

▶ Click the button [Find sensor] on the start page.

▶ Connect the device with a click.

ifmVisionAssistant: "Monitor" area

The "Monitor" area displays the active reference profile. The received data from the device is displayed in a live image. (→ Monitor ☐ 16)

ifmVisionAssistant: "Reference profiles" area

A reference profile sets the device for a specific application. (→ Reference profiles ☐ 19) Depending on the device, up to 10 reference profiles can be created.

A reference profile contains the following settings:

•   Import and export a reference profile

•   ROI marking

•   MultiROI (ROI1 / ROI2)

•   Saving the reference profile

•   Region of interest (ROI) position

•   Threshold value

•   Integration time

•   Data filters

•   Tolerance range

Detecting an object with the device

▶ Click on the button [Reference profiles]: ⬚ .

  ▷ The "Reference profiles" area indicates the reference profiles stored on the device.

▶ Click on the [Create new profile] button: ⊹ .

  ▷ The profile image of the object is displayed in the live image.

▶ Set the search zone (ROI) in the live image with the vertical lines.

The device is ready for operation and executes the active reference profile.

7   Start page

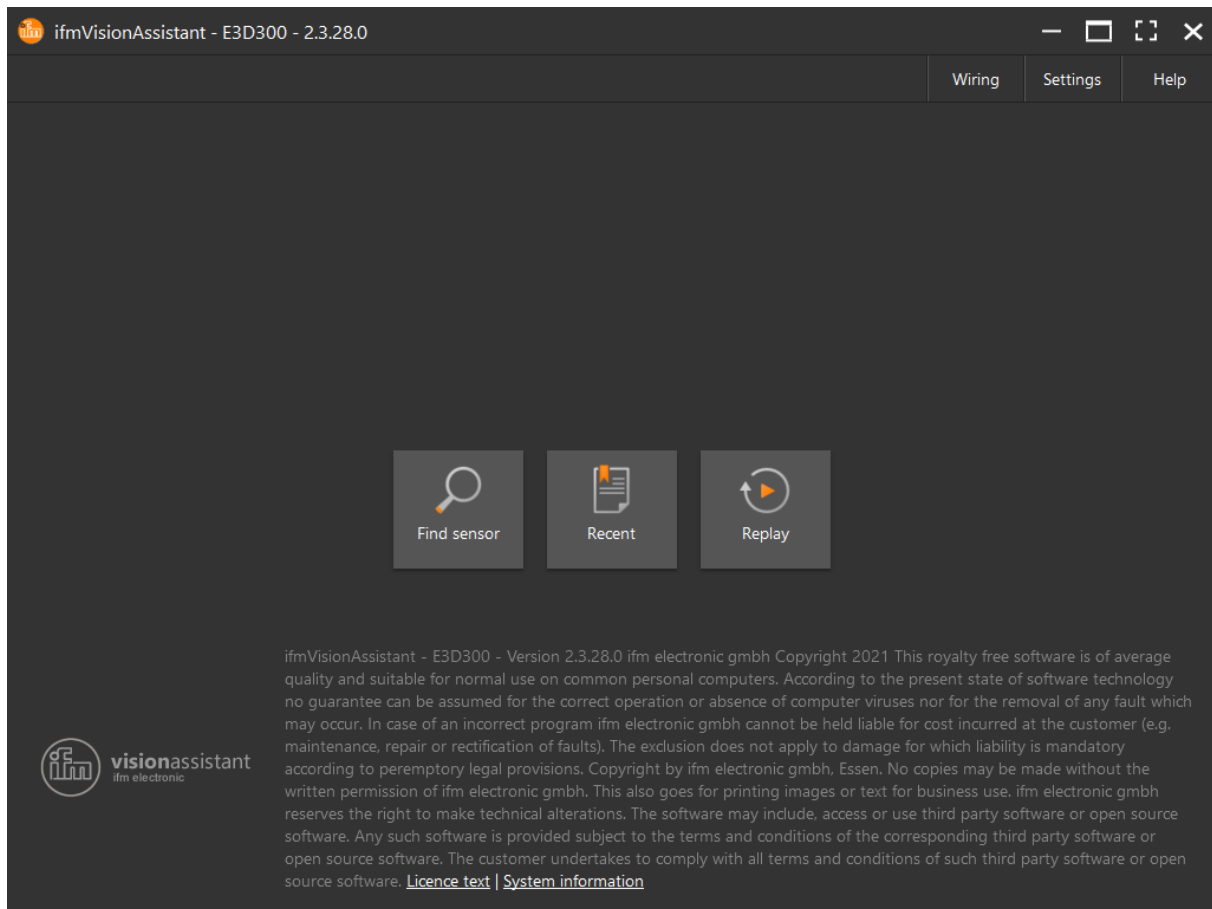The start page contains the basic functions of the ifmVisionAssistant.

Fig. 1: Start page

Indicator	Name	Description
—	Zoom out	Reduces the size of the window.
▢	Zoom in	Enlarges the window.
⤢	Full screen	Displays the window in full screen.
✕	Exit	Closes the software.

Tab. 1: Title bar

ⓘ ▷ With the F11 key, you can switch between full screen and window view.

Name	Description
Device status	Displays information about the hardware and firmware of the connected device. For the function [Device status], the device must be connected.
	The information can be saved in a text file for diagnostics by the support staff:
	▶ Click on the [Device status] tab.
	▶ Click on the [Show device details] button.
	▶ Click on the [Save] button.

Name	Description
Wiring	Displays information on wiring and connection aids.
Settings	Sets the language and colour of the user interface.
Help	Displays the documentation and contact information of the support.

Tab. 2: Menu bar

Button	Name	Description
🔍	Find sensor	Searches for connected devices and displays them in a list. For this function, the device must be connected.
📑	Recent	Displays devices that have already been used before in a list. For this function, the device must be connected.
▶	Replay	Plays back a saved image capture.

Tab. 3: Buttons

7.1   Connecting a new device

This function searches for a new device and displays it in a list. The device can then be connected.

ℹ️ The search for devices currently only works in combination with

▶ E30390 USB IO-Link master and

▶ AL1060 USB IO-Link master.

▷ Use the manual connection in combination with IO-Link Master AL13xx.

Preparations

▶ Connect the device to the voltage supply.

▶ Connect the device with an IO-Link master.

▶ Connect the IO-Link master to a PC via USB or Ethernet.

Connecting a new device

▶ Click the button [Find sensor]: 🔍

▷ The ifmVisionAssistant searches for connected devices. A list shows the devices found and their settings.

▶ Select a found device.

▷ The connection to the device will be established.

ℹ️ Connection problems

▷ If the device is not found:

▶ Check the connections and the operating status of the device.

▶ Connect the device manually.

ℹ️ Messages in the ifmVisionAssistant

▷ With the key combination Ctrl+C, the text of a message is copied to the clipboard.

7.1.1   Connecting the device manually

A device can be connected manually by entering the IP address.

▶ Click the button [Find sensor]: 🔍

▶ Click on the message [Click to connect manually].

  ▷ The "Manual connection" window is displayed.

▶ In the list "Select the type of sensor", select the device type [OPD1xx(IO-Link)].

▶ In the "Master Type" list, set the connection between the PC and the IO-Link master: [USB] or [Ethernet].

▶ Select the master address in the "Master address" list.

▶ Select the port in the "Port" list.

▶ Click on the [Connection] button.

7.2   Connecting a device that has already been used

This function displays devices that have already been used before in a list.

▶ Click the button [Recent]: 📄

▷ The window "Recent" is displayed.

▶ Select a device from the list.

▷ The device is connected and can now be used.

7.3   Playing back image captures

The function [Replay] plays back a saved image capture. Recordings are saved in the "Monitor" area.

The function contains the following operating elements:

Operating element	Name	Description
◀◀	Previous image	Jumps to the previous image.
▶	Replay	Starts the replay.
▶▶	Next image	Jumps to the next image.
❚❚	Pause	Pauses the replay.
▬▬▬█▬▬	Progress bar	Indicates the current position of the replay.
[Open other file]	Open other file	Opens another image capture.

Tab. 4: Operating elements

Playing back image captures

▶ Click the button [Replay]: ▶

  ▷ A window for opening an image capture is displayed. The image captures are saved in the following folder by default: `%appdata%\ifm electronic\ifmVisionAssistant\capture`

▶ Select an image capture.

▶ Click the button [Open].

▷ The image capture is displayed.

7.3.1   Converting an image capture

This function converts an image capture into another output format. The image capture is converted via the following operating elements.

Operating element	Type	Description
[Output format]	List	Sets the output format (see table below).
[Output file path]	Output field	Displays the set output file.
[...]	Button	Sets the output directory or the output file.
[Output range]	List	Sets the output range (see table below).
[Convert]	Button	Starts converting the image capture.

Tab. 5: Operating elements

ⓘ   ▷ Depending on the output format set, some operating elements are not displayed.

Output format

Output format	Description
[HDF5 ifm streams (*.h5)]	Flexible data container
[Data capture files (*.dat)]	Proprietary format

Tab. 6: Output format

Data format

Data format	Description
[ASCII]	Sets the data format to "ASCII".
[Binary little endian]	Sets the data format to "Binary little endian".
[Binary big endian]	Sets the data format to "Binary big endian".

Tab. 7: Data format

Output range

Output range	Description
Whole file	Converts the whole image capture.
From the current position to the end of the file	Converts from the current position of the progress bar to the end of the image capture.
From start to current position	Converts from the start of the image capture to the current position of the progress bar.
Only the next image	Converts the next image of the image capture, viewed from the current position of the progress bar.

Tab. 8: Output range

8   Structure of the user interface

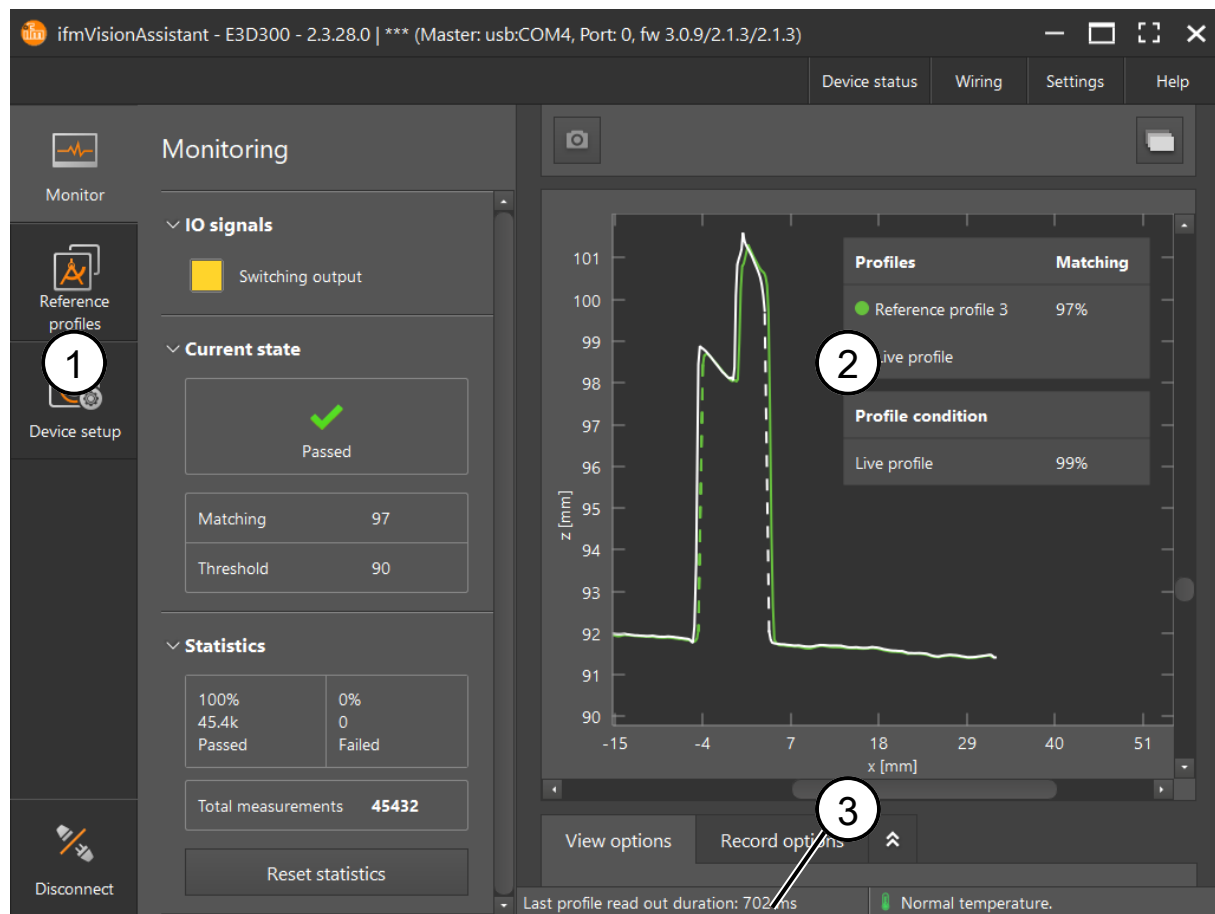The user interface is divided into the following areas:

Fig. 2: User interface

1 Navigation bar   2 Main area
3 Status bar

Navigation bar

The buttons in the navigation bar are used to switch between the areas of the ifmVisionAssistant.

Button	Name	Description
	Monitor	Displays the received data of the device. (→ Monitor □ 16)
	Reference profiles	Displays the reference profiles. (→ Reference profiles □ 19)
	Device set-up	Displays the device configuration. The device is set in the device configuration.
	Disconnect	Disconnects the connection to the device.

Main area

The function selected with the navigation bar is displayed in the main area.

Status bar

The status bar shows current information about the device:

• readout duration of the reference profile [ms]

• the temperature of the device

9 Monitor

The "Monitor" area displays the active reference profile. The device is in the operating mode.

In trigger mode "Continuous mode", the received data of the device is continuously updated in the live image.
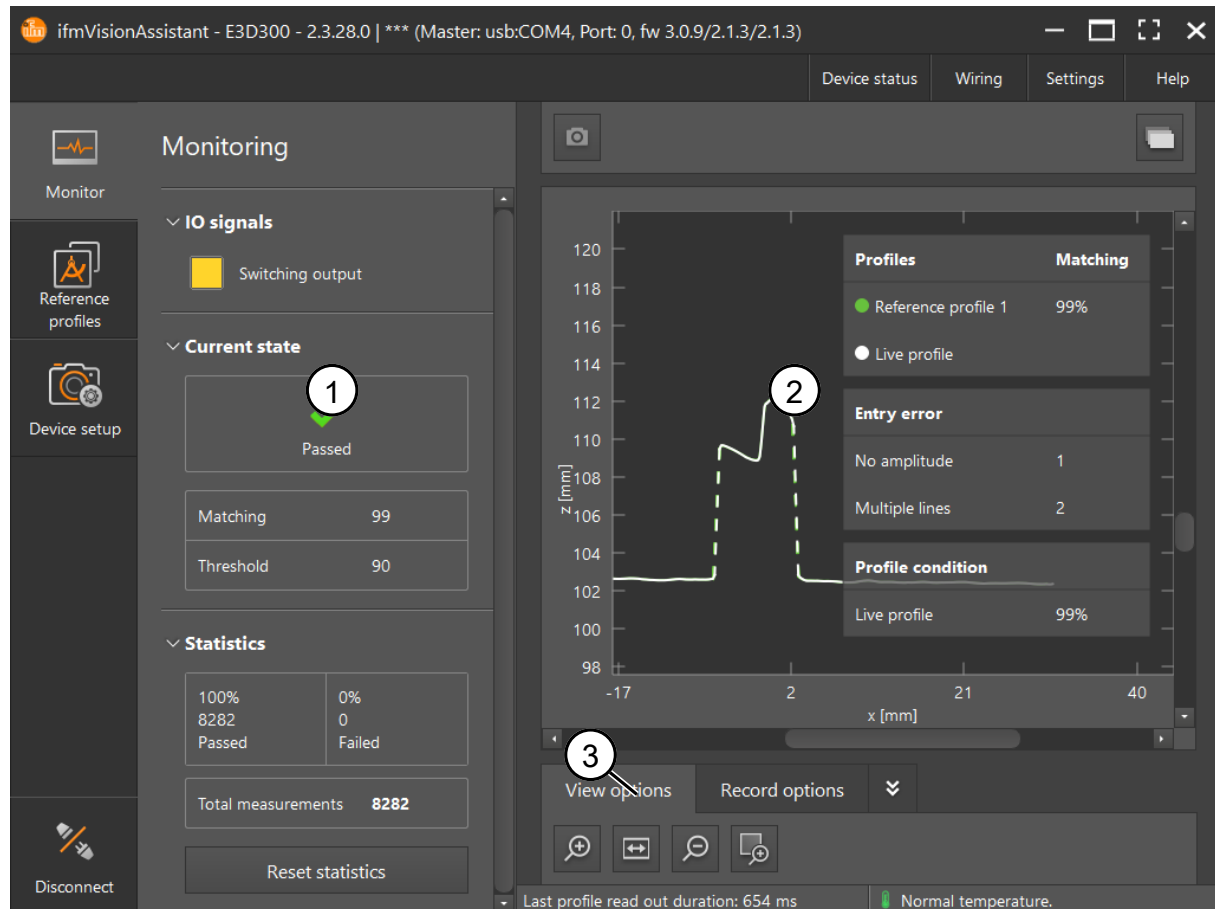

Fig. 3: "Monitor" area

1 Status indicators   2 Live image
3 Tabs

Status indicators

The "status indicators" show the status of the digital outputs and the statistics on the active reference profile.

- "IO signals": Shows the status of the digital output. If a signal is present, the yellow LED is on.

- "Current state": Shows the current state of the reference profile.

- "Statistics": Shows the recorded values of the reference profile and the number of total measurements. The values "Passed" and "Failed" are incremented via a counter. The ratio of the two values is indicated in per cent.

- [Reset statistics]: This button resets the overall statistics.

Live image

The "live image" visually displays the recognised and saved profile images. A profile image consists of 352 data points. The profile images are displayed differently:

- The recognised profile image is displayed as a white line.

- A saved reference profile is shown as a green line.

- Faulty data points are displayed as a dashed line, for example, if the nature of the object or position of the unit does not allow proper recognition.

⟨i⟩ Faulty data points are not used for the match check of the detected profile image and stored reference profile.

⟨i⟩ The operating instructions contain information on the installation of the device.

In trigger mode "Continuous mode", the received data of the device is continuously updated in the live image. To update the live image, a trigger must be released with the [📷] button in the other trigger modes.

The "live image "contains the following operating elements:

Operating element	Name	Description
[📷]	Trigger	Releases a trigger. This updates the live image. The operating element [Trigger] is only available when the trigger mode [Triggered mode] is active.
[▭]	Show and hide chart legends	Displays a menu that shows additional data in the live image. [Profiles]: Displays the active reference profile and its match to the recognised profile image in [%]. [Measurements]: Displays in [mm] the height of the object and the X and Z offset. [Entry error]: Displays detected data errors. [Profile condition] Shows the quality of the recognised profile picture.

Tabs

The area "Monitor" contains the following tabs:

Tab	Description
[View options]	Adjusts the displayed image area of the live image.
[Record options]	Records the data of the device and the results of the reference profile as a video.

The tab [View options] contains the following operating elements:

Operating element	Name	Description
[🔍+]	Zoom in	Enlarges the image area of the live image. The zoom level can also be changed using the mouse wheel.
[↔]	Fit to page size	Adjusts the image area of the live image optimally to the displayed data.
[🔍−]	Zoom out	Reduces the image area of the live image. The zoom level can also be changed using the mouse wheel.
[🔍]	Zoom defined area	Zooms in on an area selected with the mouse. After clicking the button, a rectangular area in the live image is selected with the mouse. The area is then displayed enlarged..

The tab [Record options] contains the following operating elements:

Operating element	Name	Description
[Duration]	Duration	Sets the duration of the image capture. Approx. 4 MB/minute are required. If the duration is set to [Continuous], the image capture is limited by the free memory capacity of the data carrier.
⊚	Start/Stop	Starts or stops the image capture. The image capture is saved in a file with the extension "*.h5" or "*.dat".
- / 02:00	Image capture time	Shows the duration of the current image capture and the maximum capture time.

9.1   Data error

The data errors indicate difficulties in recognising a profile image, for example, if the nature of the object or position of the device does not allow proper recognition.

The number next to the data error indicates the number of data points affected. Faulty data points are shown as a dashed line.

> ⓘ Faulty data points are not used for the match check of the detected profile image and stored reference profile.

The following data errors are displayed:

Data error	Root issue	Solution
Low amplitude	The data points of the detected laser line have a very low intensity.	All data points (352) are concerned: ► Check the distance to the object. ▷ Object is outside the operating range or is extremely dark. If only a few data points are concerned: ► Change the position of the device or the object. ▷ Object features large differences in luminosity. ▷ Due to the characteristics of the object, some of the reflected laser beams do not reach the receiver.
High amplitude	The data points of the detected laser line have a very high intensity.	In case of a fixed integration time: ► Reduce the time or set to [Auto]. In case of large differences in luminosity: ► Change the position of the device or the object.
Multiple lines	Laser line is too thick due to: • translucent surfaces, such as skin, rubber • multipath propagation on shiny surfaces	► Enlarge the distance to the object. ► Change the position of the device or the object.
	Device receives multiple reflections because of: • semi-transparent objects, laser line is reflected at two planes • shiny surfaces on sharp profiles	► Change the angle of incidence; if possible with a darkened background. ► Change the position of the device or the object.
Too near / far	Data points outside the operating range in Z direction (< 150 mm, > 300 mm)	► Place the object within the operating range (150...300 mm).
Overhang direction 1 or 2	The profile is concealed by an overhang.	► Change the angle of incidence. ► Change the position of the device or the object.

> ⓘ The operating instructions contain information on the installation of the device.

10 Reference profiles

The "Reference profiles" area manages and sets the reference profiles. The reference profile is used to set the device for an application. Up to 10 reference profiles can be set.

A reference profile contains the following settings:

- Import and export a reference profile

- ROI marking

- MultiROI (ROI1 / ROI2)

- Saving the reference profile

- Region of interest (ROI) position

- Threshold value

- Integration time
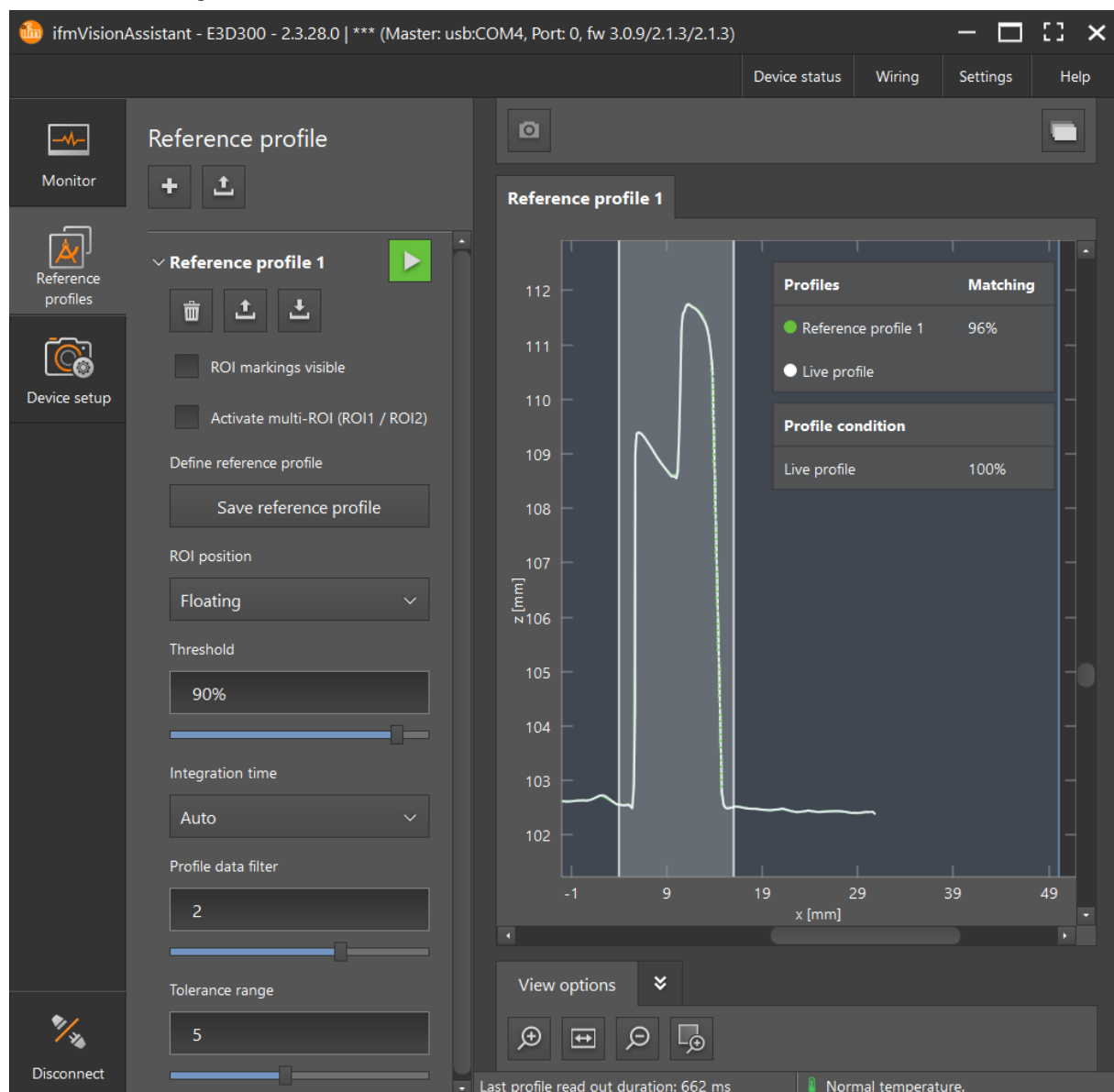
- Data filters

- Tolerance range

Fig. 4: "Reference profiles" area

The "Reference profile" area contains the following operating elements:

Operating element	Type	Description
	Button	Creates a new reference profile Depending on the device, up to 10 reference profiles can be created.
	Button	Exports one or all reference profiles to a file with the extension "opd1xxprf".
	Button	Displays the active reference profile.
	Button	Activates the selected reference profile.
	Button	Deletes the selected reference profile irrevocably after confirmation.
	Button	Imports the settings from a file with the extension "opd1xxprf" into the selected reference profile.
[ROI markings visible]	Checkbox	Projects 2 green laser lines onto the working area. With the setting "Region of interest (ROI) position"=[Fixed], the laser lines show the boundaries of the region of interest (ROI). With the setting "Region of interest (ROI) position"=[Variable], the laser lines show the search range.
[Activate MultiROI (ROI1 / ROI2)]	Checkbox	Activates a 2nd region of interest. The regions of interest are set in the live image.
[Save reference profile]	Button	Saves the captured profile image of an object as a reference profile. The device then continuously captures profile images and compares them to the stored reference profile. If there is a match, the reference profile is considered to have been found.
[Region of interest (ROI) position]	List	Sets the position of the region of interest (ROI).
[Threshold]	Input box	Sets the threshold in [%] above which recognised profile images are considered found. The device compares recognised profile images with the stored reference profile and saves the result as a match value. If the match value is above the threshold, the profile picture is considered found.
[Integration time]	List	Sets the exposure time. [0-9]: graduated fixed exposure times. [Auto]: automatic exposure time. Long exposure times are favourable for dark objects. Short exposure times are favourable for bright objects. Under-exposure leads to increased noise (unstable values). Over-exposure leads to systematic errors. Extreme exposures are detected and marked as data errors. (→ Data error ⌑ 18)

Operating element	Type	Description
[Profile data filter]	Input box	Smoothes the straight parts of the profile.
		[Lower values]: low smoothing to show fine object structures (ex: thread of a screw).
		[Higher values]: strong smoothing to minimise noise and distortion.
Tolerance range	Input box	Adjusts the sensitivity of the matching value to deviations.
		[<5]: detects small profile changes.
		[>5]: detects major profile changes.

10.1   Setting the region of interest (ROI)

One region of interest (ROI: Region of Interest) is displayed in the live image as a white transparent area.
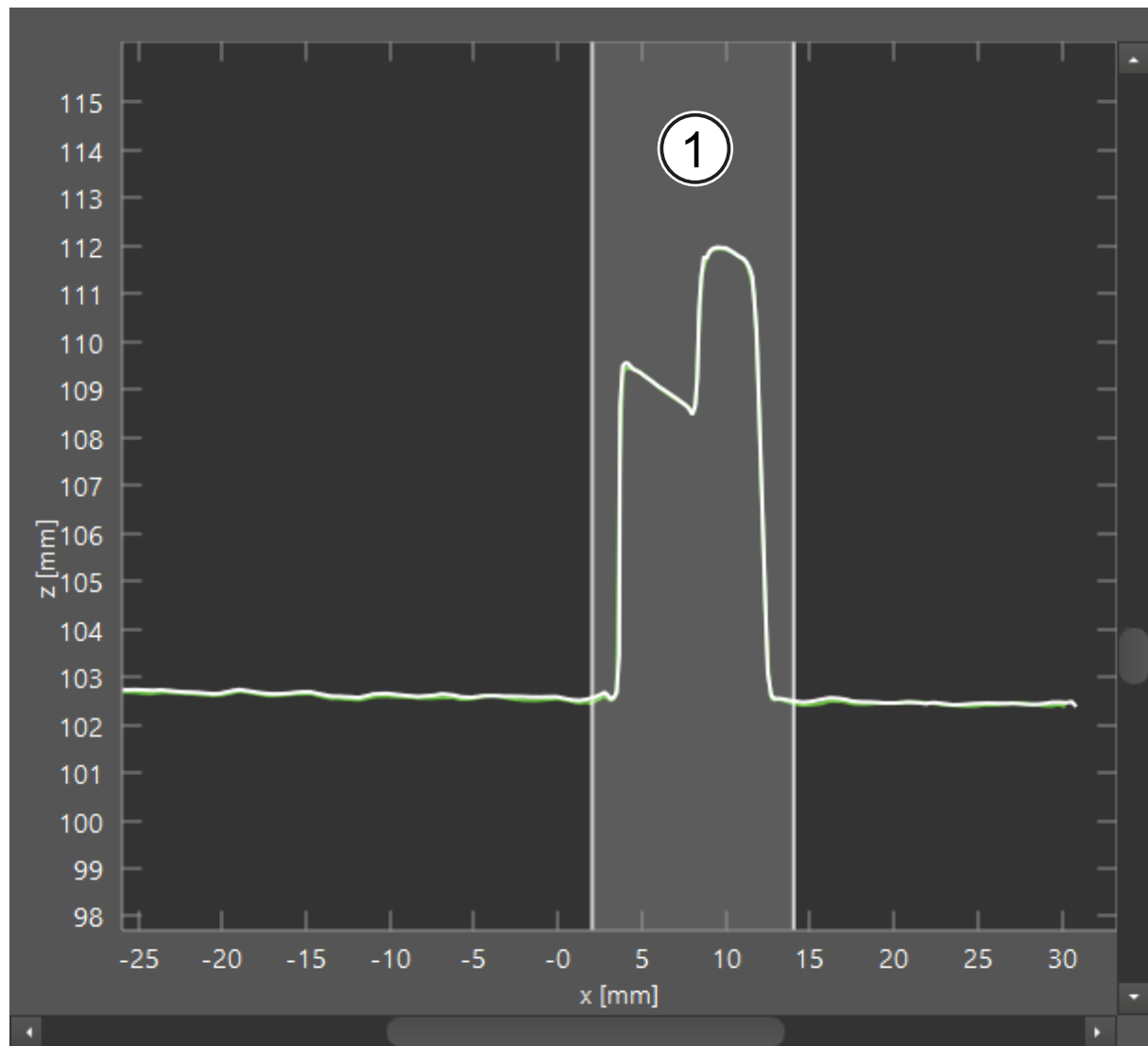

Fig. 5: The live image shows the search zone with the setting "Region of interest (ROI) position" = [Fixed]. (→ Region of interest (ROI) position ▯ 22)

    1 Region of interest (ROI)

Within the region of interest, the device searches for conditions that can be fulfilled, for example, the profile picture of an object.

Moving a region of interest:

▶ Drag the region of interest to the new position by clicking and holding with the mouse.

Set the boundaries of a region of interest:

▶ Drag the boundaries of the region of interest to the new position by clicking and holding with the mouse.

> A 2nd region of interest can be activated with the check box [Activate multi-ROI (ROI1 / ROI2)] in the "Reference profiles" area.

10.2   Region of interest (ROI) position

The list [Region of interest (ROI) position] sets the fixed or variable position of the region of interest (ROI).

[Fixed]: The region of interest (ROI) has a fixed position within the workspace. Profile pictures are found within the region of interest (ROI) at the fixed position.

[Variable]: Within the search range (1), the region of interest (ROI) (2) adjusts to an area of interest. Profile pictures are found in the area.
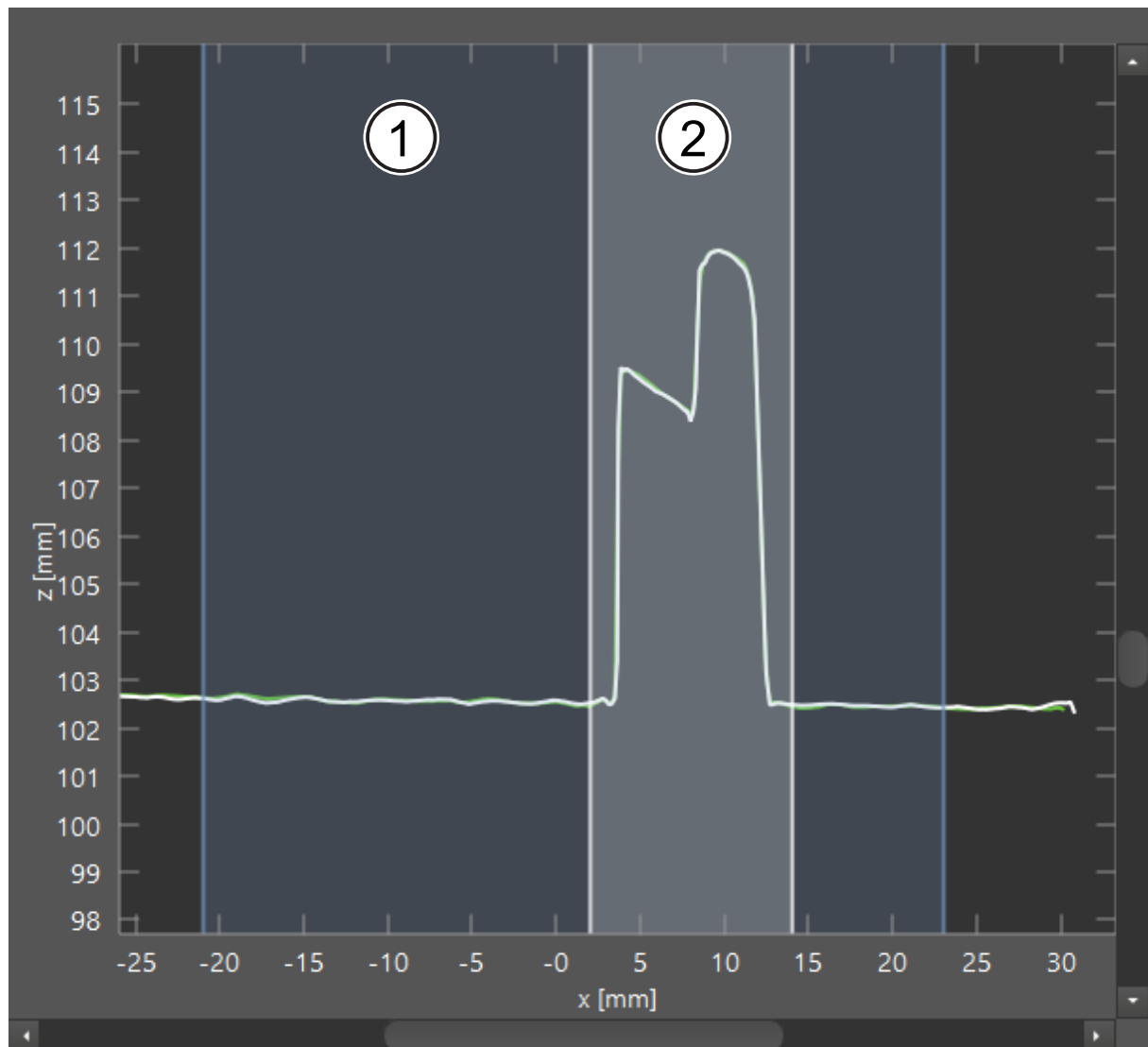

Fig. 6: The live image shows the search zone with the setting "Region of interest (ROI) position" = [Variable].

1 Seach range   2 Region of interest (ROI)

The search range (1) is only displayed with the [Variable] setting. The search range can be set.

Moving the search range:

▶ Drag the search range to the new position by clicking and holding with the mouse.

Set the limits of the search range:

▶ Drag the boundaries of the search range to the new position by clicking and holding with the mouse.

11   Device set-up

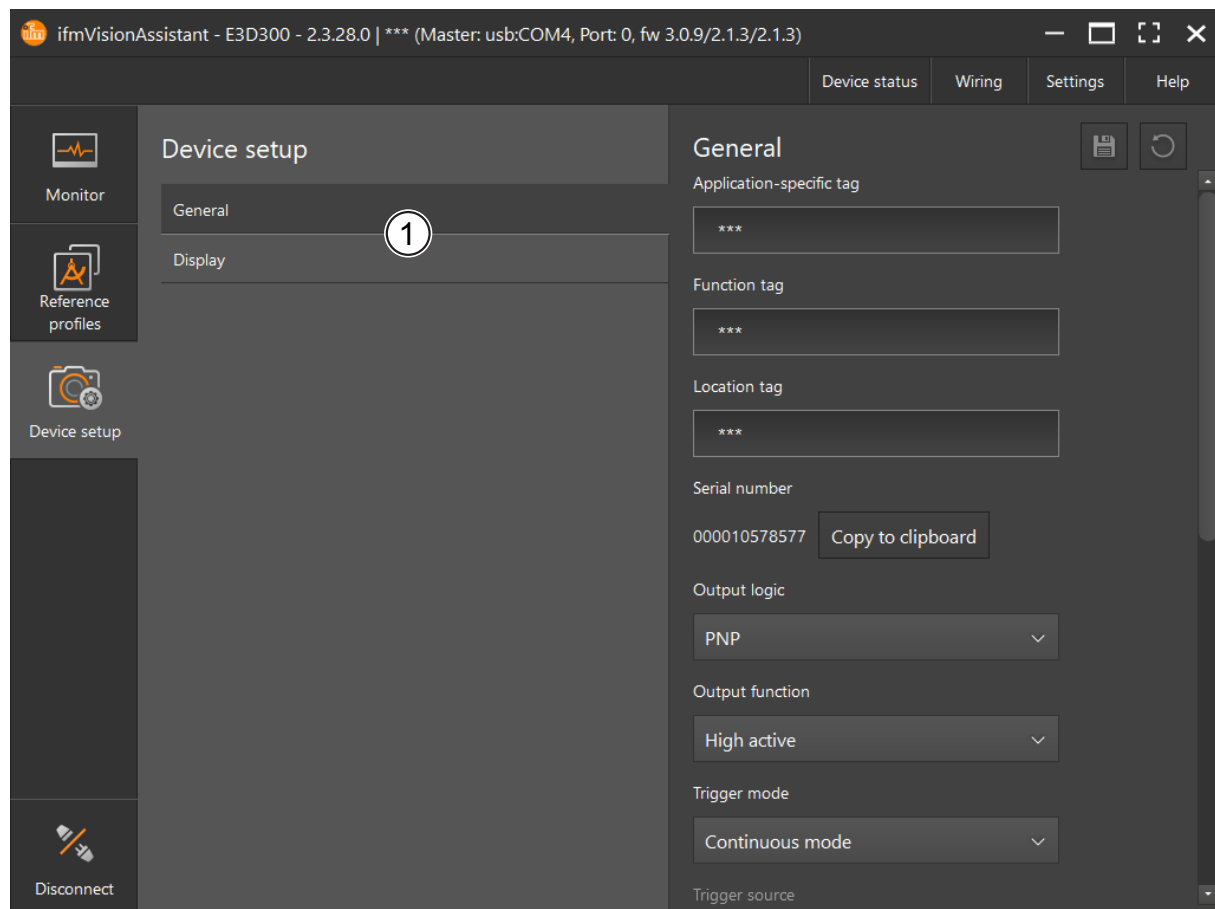The device and the graphic display are set in the area "Device setup".

Fig. 7: "Device setup" area.

    1 List

The "Device setup" area contains the following operating elements in the list:

Operating element	Description
General	Sets the device, the trigger and the output. (→ General ▯ 24)
Display	Sets the graphic display of the device.

11.1   General

The [General] item sets the device, trigger and output.

The [General] item contains the following operating elements:

Operating element	Type	Description
💾	Button	Saves the settings on the device.
↻	Button	Resets the changed settings.
[Application-specific tag]	Input box	Sets a description for the application.
[Function tag]	Input box	Sets a description for the function.
[Location tag]	Input box	Sets a description for the location.

Operating element	Type	Description
[Copy to clipboard]	Button	Copies the serial number to the clipboard.
[Output logic]	List	Sets the logic of the OUT1 and OUT2 outputs: [PNP]: switches positive potential to the outputs. [NPN]: switches the ground to the outputs.
[Output function]	List	Sets the function of the output OUT1: [High active]: The output OUT1 switches if **matching value > switching threshold**. [Low active]: The output OUT1 switches if **matching value < switching threshold**.
[Trigger mode]	List	Sets the trigger mode: [Triggered mode]: The device is triggered externally. [Continuous mode]: The device continuously captures profile images. This mode is usually used for tests. The output OUT2 is automatically set as an anti-valent output to OUT1. For more information on the trigger mode, see the operating instructions.
[Trigger source]	List	Sets the source for a trigger: [HW(pin5)]: The device is triggered via pin 5 (input). [PDOut]: The device is triggered via IO-Link.
[Trigger delay]	Input box	Sets a time delay in [ms] between the received trigger signal and the release of a trigger.
[Profile selection source]	List	Sets the source for selecting the reference profile: [Local]: The reference profile is set via the display of the device. [PDOut]: The reference profile is set via IO-Link.
[Output delay]	List	Sets a delay of the output signal that makes the output signal last longer: [No delay]: A static output signal is provided. [ON impulse]: A pulsed output signal is provided. The output signal lasts longer.
[Laser disable source]	List	Sets the source for disabling the laser: [PDOut]: The laser is disabled via IO-Link. [HW(pin5)]: The laser is disabled via pin 5 (input).
[Reset]	Button	Resets the device irrevocably to the factory settings.
[Reset DeviceID]	Button	Resets the DeviceID (IO-Link) of the device. The device is unambiguously identified via the DeviceID.

11.2   Display

The [Display] item sets the graphic display of the device.

The [Display] item contains the following operating elements:

Operating element	Type	Description
	Button	Saves the settings on the device.
	Button	Resets the changed settings.
[Language]	List	Sets the language of the graphic display.
[Display brightness]	Switch	Sets the brightness of the graphic displays. When the brightness is deactivated, the graphic display is deactivated.
[Display colour]	List	Sets the colours of the graphic display: [G1OU]: Displays matching values above the threshold in green. Values below the threshold are displayed in red. [R1OU]: Displays matching values above the threshold in red. Values below the threshold are displayed in green. [BK/WH]: Always displays matching values in white. [Red]: Always displays matching values in red. [Green]: Always displays matching values in green.
[Display rotation]	List	Sets the rotation of the graphic display: [0°]: Deactivates the rotation of the graphic display. [180°]: Rotates the graphic display image by 180°.

12   Appendix

12.1   Command line parameters

The command line parameters influence the start of the ifmVisionAssistant by attaching parameters to the exe file. Several parameters can be appended one after the other, separated by a space.

Command line parameters via command prompt

Starting the ifmVisionAssistant via the prompt:

▶ In the prompt, add the command line parameters after "ifmVisionAssistant.exe" separated by a space.

▷ Example: `"ifmVisionAssistant.exe -log"`

Command line parameters via Windows

Start the ifmVisionAssistant with command line parameters via Windows:

▶ Click on the [ifmVisionAssistant] link on the right.

▶ Click [Properties] in the submenu.

▶ Click tab [Shortcut]

▶ Click the field [Target] and move the cursor to the end of the line.

▶ Enter space followed by the command line parameter.

▶ Click on [OK].

Available command line parameters

The following command line parameters are available:

Command line parameters	Description
`-disableclosebtn`	Deactivates the button to exit the ifmVisionAssistant.
`-log`	Creates a log file for a detailed fault analysis. The log file is saved in the following folder: `"%APPDATA%\ifm electronic\ifmVisionAssistant\logs"`

Command line parameters	Description

`-autoconnect filename.xml`	Automatically establishes the connection to a device. The file "filename.xml" must have the following contents
	
	`<?xml version="1.0" encoding="UTF-8"?>`
	`<sensor>`
	`<sensorType>OPD1XX</sensorType>`
	`<addressType>IO_LINK</addressType>`
	`<name>OPD1XX</name>`
	`<address>`
	`<iol_master>eth:192.168.0.123</iol_master>`
	`<iol_port>1</iol_port>`
	`</address>`
	`</sensor>`
	
	When connected to an IO-Link master via Ethernet (e.g. AL1320):
	▶ Set the Ethernet address in `<iol_master>`, e.g. `eth:192.168.0.123`
	▶ In `<iol_port>`, set the IO-Link port of the master, e.g. `1`
	When connected to an older IO-Link master via USB (e.g. E30390):
	▶ In `<iol_master>` set the virtual serial port of the master, e.g. `usb:COM8`
	▷ When connected via USB, `<iol_port>` has no effect.
	When connecting to a new IO-Link master via USB (e.g. AL1060):
	▶ In `<iol_master>`, set the virtual serial port of the master, e.g. `ifmusb:COM5`
	▷ When connected via USB, `<iol_port>` has no effect.

`-geometry [screen]:[width]x[height]+[x]+[y]`	Sets the window size and position of the ifmVisionAssistant (incl. window frame). The minimum window size is 1024x768 pixels. Example: `-geometry 1:1380x768+0+0"` The window is placed on screen 1 (screen=1). The window size incl. Windows window frame is set to 1380x768 (width = 1380 and height = 768). The window is positioned at the top left (x=0 and y=0). When negative values are entered for the window position x and y, the opposite corner is used as zero point. Example: "+0+0" window at the top left "-0+0" window at the top right "+0-0" window at the bottom left "-0-0" window at the bottom right
`-frameless`	Starts the ifmVisionAssistant without the native Windows window frame.

Kiosk mode

In Kiosk mode, the Windows window frame is hidden and the ifmVisionAssistant cannot be closed just like that. The mode is particularly suitable for fairs and demonstrations.

Using Kiosk mode:

▶ Use the following command line parameters in succession:

```
ifmVisionAssistant.exe -disableclosebtn -frameless
```

> ⓘ With the key combination "Ctrl+F4", the ifmVisionAssistant can be closed.

List of figures

List of tables