



HEIDENHAIN



Product Information

VT 121

VT 122

Cameras for Tool Inspection
within Machine Tools

Visual Tool Check

Software for Tool Inspection

VT 121, VT 122

Cameras for tool inspection

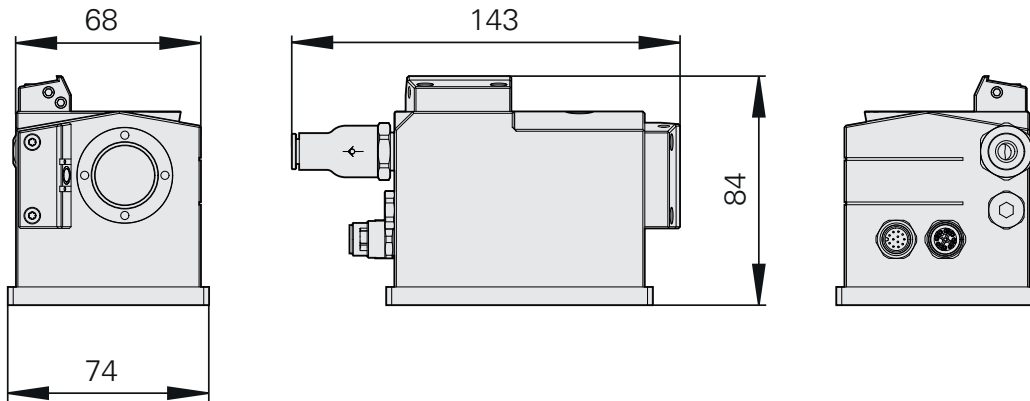
[VT 121, VT 122](#)



VT 121



Overall dimensions indicated without tolerances



Technical drawings at www.heidenhain.com/documentation



VT 121 mating dimensions
[ID 1294069](#)

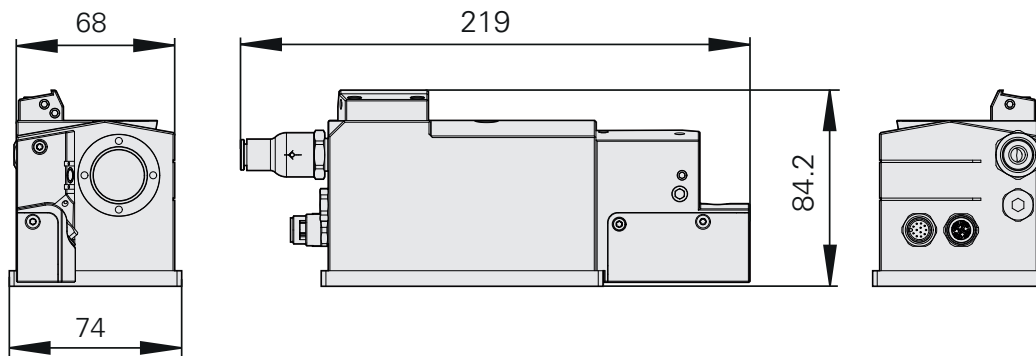


VT 122

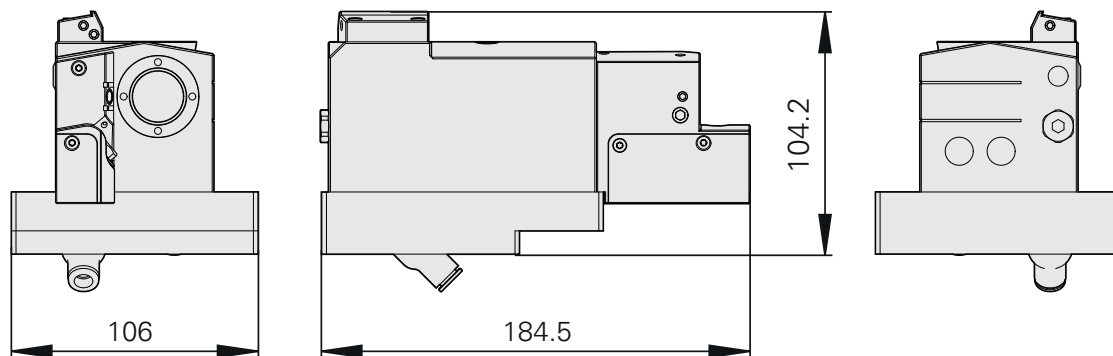


Overall dimensions indicated without tolerances

Connections on the rear



Through the base plate



Technical drawings at www.heidenhain.com/documentation



VT 122 mating dimensions
[ID 1411179](#)



Specifications	VT 121	VT 122
Camera	Two 1.3-megapixel cameras • Monochrome • Each with a ring light and lateral LED (adjustable via software) • 8 mm compressed air inlet for pulse cleaning of tool and cover lenses (optional: two 6 mm inlets available)	
	–	Measuring LED on Camera 1 for tool measurement
Image size	8 mm x 10 mm	
Supply voltage	19.2 V to 30 V (EN 61131-2)	
Electrical connection (supply voltage)	12-pin A-coded M12 flange socket (male)	
Camera interface	Gigabit Ethernet (CAT 6 or later)	
Electrical connection (camera interface)	8-pin X-coded M12 flange socket (female)	
Cable length	Max. 25 m (with HEIDENHAIN cable)	
Placement of connections*	On the rear	• On the rear • Through the base plate
Operating distance	20.5 mm	52 mm (Camera 1) 20.5 mm (Camera 2)
IP rating (when connected)	IP66/68	
Mass	≈ 1.00 kg	
Operating temperature	0 °C to 45 °C	
Type of mounting*	Attached with fixing clamps	• Attached with fixing clamps • Fastened with four M6 screws: 92 mm x 50 mm
ID number	1249466-01	1373589-xx

* Please select when ordering

Visual Tool Check

Software for tool inspection

Visual Tool Check software	Functions
Standard	• Images of the tool from the side and from below • Close-up image of each flute • Manual wear measurement • Breakage control
Option	• Panoramic images of the entire tool circumference • Automated flank-wear measurement (VB) for end mills (available starting from version 1.6)

Tool	Diameter	Breakage control Starting from a length difference of DL ≥ 0.1 mm	Images	Wear measurement (VB) Resolution 5 µm	Tool measurement With VT 122 ¹⁾
End mill	1 mm to 100 mm	✓	✓	✓	✓
Drill	1 mm to 32 mm	✓	✓	✓	✓
Ball-nose cutter	1 mm to 32 mm	✓	✓	–	✓
Toroid cutter	1 mm to 100 mm (R ₂ ≤ 16 mm)	✓	✓	–	✓
Others	Upon request				

¹⁾ Example reproducibility. $2\sigma < 2 \mu\text{m}$ for an end mill with $\varnothing$ of 10 mm and spindle speed of 1000 rpm

Control	TNC 640 HSCI, TNC7	Other controls (also non-TNC)
NC software version	Installation possible starting with NC software 340590-10 (with the <i>Python OEM Process</i> and <i>Remote Desktop Manager</i> software options)	Upon request
Cycles	• Setup • Calibration • Manual inspection • Panoramic image of side teeth • Plan view or profile view • Individual or mosaic image of face teeth • Breakage detection (length) • Tool measurement (length, radius, corner radius) • Measuring with zero length • Point angle measurement • Temperature compensation	• Individual images • Panoramic image • Breakage detection (length) • Other cycles available on request
Installation	• Machine manufacturers • HEIDENHAIN subsidiaries²⁾ • HEIDENHAIN dealers²⁾ • HEIDENHAIN agencies²⁾	

²⁾ In coordination with the machine manufacturer



More information:

The VTC User's Manual (1322445) has details on the scope of function

VTC software download:
www.heidenhain.com ► service ►
 downloads ► software

Visual tool inspection directly in the machine

Microscopic inspection and precise measurement

Vision systems from HEIDENHAIN

The VT 121 and VT 122 vision systems enable tool imaging within a machine tool's work envelope. The systems consist of two components:

- A camera with two objectives (VT 121, VT 122)
- The Visual Tool Check software (VTC)

As part of the tool inspection, the non-contacting cameras take close-up images of each flute as well as detailed panoramic images of the entire tool circumference. The tools can be imaged from the side and also from below. The VT 122 camera also enables tool measurement.

Comparison of VT 121 and VT 122

The VT 121 camera scores with its particularly compact design and is ideal for visual tool inspection. If tool measurement is also required, then the VT 122 is recommended. It features an integrated LED for measuring both the length and diameter of tools. The VT 122 is available in two variants:

- Standard version with connections for cable routing through the housing end
- Space-saving version with connections through the base plate

Both camera models have defined probing surfaces for simple and automated setup using a touch probe. This way, its position in the work envelope can be ascertained precisely for optimum use in the VTC software.

Together with the VTC software and the corresponding cycles in the control software, tool images can be generated quickly and easily. The TNC7 from HEIDENHAIN offers cycles for automatic tool inspection:

- Positioning of the tool
- Activation of the compressed air supply
- Capturing the images

The images are transferred via Gigabit Ethernet to a PC or IPC, and can also be viewed on the control's screen (Remote Desktop).

Actual tool inspection and subsequent evaluations can then easily be performed on the control's touchscreen. The VTC software provides an inspection overview feature that makes it easy to inspect tools with a large number of flutes, allowing you to navigate through the image series with a zoom window for greater detail.

Advantages of the vision systems

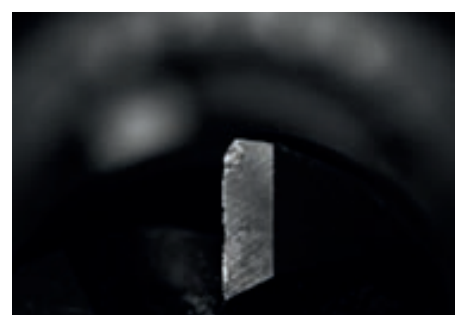
- Compact dimensions and durable camera design
- Brief and spot-on use of compressed air is sufficient
- Tool remains clamped in the spindle
- Images generated automatically within the machine tool
- High-resolution images
- Software with simple touch operation

The compact and highly durable cameras are designed to be installed inside the machine's work envelope. They can be employed regardless of whether cooling lubricant is used or dry machining is performed.

The tools and cover glasses are cleaned using compressed air from the integrated nozzles. The compressed air is needed only shortly before the image is taken. This suffices for reliable removal of chips and liquids in the area being imaged, permitting useful and meaningful tool inspection.



Illustrative video with the system in action



Inspection within the machine tool

The HEIDENHAIN vision systems inspect tools quickly and effortlessly. Generating these tool images before critical machining steps has nearly no influence on a machine's productive time. Based on these images, solid decisions can be reached regarding further use of the tools.

Thanks to these high-resolution images and the possibility of the tool remaining in the spindle, analyses can now be performed that previously required a large amount of effort:

- Optimization of cutting parameters
- Improvement of NC programs

After a tool exceeds its theoretical service life or total distance traveled, visual inspection can provide sound reasons for whether to continue using the tool—thereby effectively contributing to a reduction in tool costs. Furthermore, the vision system is also used for breakage detection, even for small flute damage.

Tool wear

Tools are subject to heavy loads while machining, meaning that wear is unavoidable. This leads to dimensional deviations, poor surface quality, increased cutting forces, more power being required, and, in extreme cases, to tool breakage.

A tool's condition is usually assessed through the volume of chips it has cut, its service life, or its distance traveled. Factors like the workpiece material, machining parameters, and lubricant are often largely ignored. Whether the standard assessments are appropriate in any specific instance can practically be determined only with great effort.

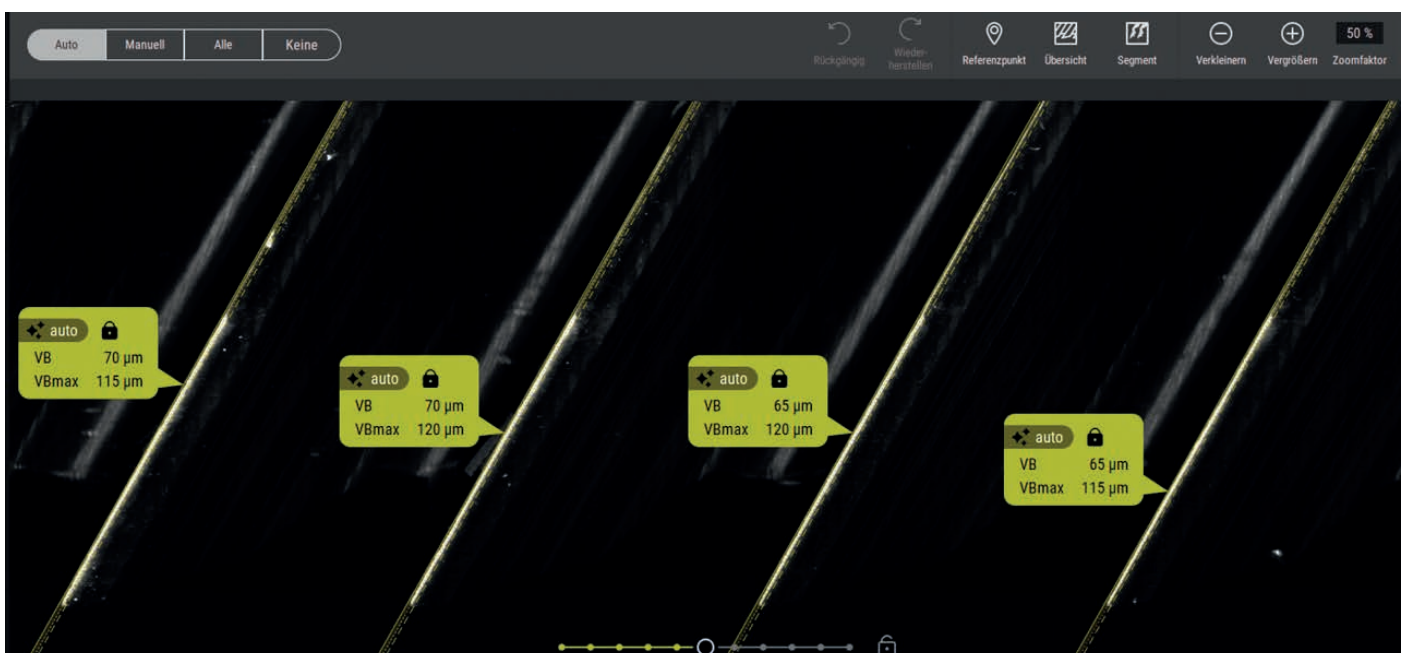
By being able to mount the VT 121 and VT 122 cameras within the work envelope, and by using the control's comprehensive package of cycles, checking the tool condition is now fast and easy: The cameras feature a resolution of 1.3 megapixels with large zoom factors, so that even very small indications of wear are visible. The VTC software doesn't just present the wear visually; it also makes it directly measurable on the control's screen.

AI-supported wear measurement

The new "Automated flank-wear measurement" option of the VTC software is particularly useful for automatically detecting the flank wear that is typical of end mills. The software was trained at HEIDENHAIN using a very comprehensive image gallery, so that it can evaluate cutting edges and automatically ascertain the average and maximum values of the flank-wear width. Even irritants like chips and droplets on the flutes are recognized and factored out during the evaluation.

The system provides precise data on the wear already just a couple seconds after generating the images—completely without manual intervention. The measuring accuracy is typically $\pm 20 \mu\text{m}$. If adaptable limit values are exceeded, a warning notice or disabling notice can be generated. This could lead, for example, to an end mill in the TNC7 being blocked from further use. This ensures safe tool use even in highly automated operations, such as during night shifts.

The simple and rapid generation of images also enables documentation of the wear over time and clearly estimating any future possible use of the tool. All recorded data are available in CSV files for subsequent analysis and reporting.



Electrical connection

Adapter cables and connecting cables

PUR 4 x (2 x 0.16 mm ²)			
PUR 6 x (2 x 0.19 mm ²); A _P = 0.19 mm ²		Ø 6 mm ¹⁾	Ø 6.9 mm ²⁾
Adapter cable for camera interface, partially in metal armor, 8-pin M12 X-coded coupling (male) and 8-pin RJ45 connector (IP20)		–	1313965-xx ³⁾
Adapter cable for camera interface, with 8-pin M12 X-coded coupling (male) and 8-pin RJ45 IP20 connector		–	1436254-xx ⁵⁾
Connecting cable for power supply, partially in metal armor, 12-pin M12 connector (female) and stripped cable end		1325985-xx ³⁾	–
Connecting cable with 12-pin M12 connector (female) and stripped cable end		801285-xx ⁴⁾	–
Connecting cable with 12-pin M12 connector (female) and 12-pin M12 coupling (male)		1109993-xx ⁴⁾	–

1) Metal armor Ø: 10 mm
2) Metal armor Ø: 11.1 mm
3) Cable length: 5 m to 30 m
4) Cable length: 1 m to 20 m
5) Cable length: 1 m to 30 m
A_P: Cross section of power supply lines



Accessories

Mounting

Two fixing clamps already included with VT 121 and VT 122 (variant with connections at the housing's end) ID 329454-02

Installation

- Compressed air tubing ID 207881-41 or ID 207881-42

Maintenance

- Replacement kit with cover glass for the VT 121 and VT 122 (ID 1321963-02)

HEIDENHAIN

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This Product Information document supersedes all previous editions, which thereby become invalid. The basis for ordering from HEIDENHAIN is always the Product Information document edition valid when the order is placed.

More information:

Comply with the requirements described in the following documents to ensure correct and intended operation:

- Installation Instructions: VT 121 1459062-xx
- Installation Instructions: VT 122 1422124-xx