



Q.VITEC

Discover the possibilities.

Vision Q.400 | Q.400 *[plus]*

Universal inspection software for
industrial machine vision



Discover the possibilities

The more complex one's daily challenges, the higher one's own expectations, and the greater the demands on the work performed – and the more experience and the right know-how become indispensable. Not only do we understand the complexity of industrial machine vision; we also recognise the nearly limitless potential of this technology.

Today, machine vision systems are an indispensable component in the automation of countless processes. From reliable inspection and identification of individual components to code scanning and controlling entire manufacturing plants – none of this would be possible without high-performance machine vision. Other practical advantages are obvious as well. Intelligent machine vision will secure the quality of your production process, and helps to avoid errors. This reduces the consumption of materials. The result is increased energy efficiency and lower costs for raw materials.

Advanced machine vision is the starting point for optimising the results of your production processes. This simple principle has become a guiding idea for us at Q.VITEC, and we are firmly dedicated to it. This is why we strive to put our wealth of experience and passion for machine vision into practice in our solutions – so that we can pass them on directly to our customers. We are aware of the significant degree of support required by our products. For this reason, we have committed to the mission of supporting users of our technology by employing an exceptionally customer-oriented and holistic process from start to fin-



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TION RESULTS?”*

ish. In practice, we begin by analysing your procedures and the precise requirements imposed by your needs. We then create solutions to optimise your workflows, integrating our components directly into your systems – working in precise, customised fashion.

The most important objective is to achieve maximum economy and performance in your production process. Our products are simply the means to this end – the optimal means, we dare say.

Adhering to this approach, we not only prize sustainability in our products, but user-friendliness as well. Ease-of-use is the focus, and it paves the way for performance gains. It is important to remain constantly focused on developments such as ever increasing standardisation, or the enduring trend toward miniaturisation. This is precisely the common thread running through our solutions; supported by years of expertise and a distinct awareness of the value of service, and of employing a practical approach. Our ambition is to forge ahead where others run up against

their limitations. When we identify and develop a solution together with you, it will also be realisable in practice. This is the focus of all our efforts; we always see ourselves as the interface between intelligent technology and the immediate needs of our customers. In the end, our products need to offer only one thing: the simple answer to the question “How can we achieve optimal production results?”

In other words, the more complex the daily challenges, the higher your own expectations, and the greater the demands on the work performed – the clearer it becomes that Q.VITEC is the right partner to have at your side.



Q.VITEC

- One tool for many tasks
- By the industry for the industry
- Ready for any requirement
- Saving time – even when connecting
- Quick development of inspection
- Reliable production output

Vision Q.400

Unique in many respects

Vision Q.400, the flexible and intuitive machine vision software from Q.VITEC, enables you to generate high-quality, high-performance inspection procedures in a very short time. You do not need any programming knowledge – our slogan is “don’t program, configure”. As a standalone version, Vision Q.400 is the ideal basis for powerful OEM systems and inspection solutions. Its particular strengths shine through when pre-installed on our Imagechecker Q.400 camera system. All components are perfectly harmonised with one another. Whether alone or coupled with our high-performance hardware, Vision Q.400 offers numerous advantages in both configurations:

1

Multifunctional

Vision Q.400 provides first-class inspection algorithms for (almost) any optical inspection or measurement task. Should the built-in features not offer the right tool, new functions may be added.

2

Quick and robust algorithms

From one of the world’s largest electronics groups, we know what matters when it comes to production: speed, stability and reproducibility. The Vision Q.400 algorithms have also been trimmed to this end.

3

Variable

Vision Q.400 is available as a stand-alone product or ready to use, pre-installed on different hardware platforms. From the space-saving touch panel to the high-end 19” industrial PC.

4

Established and proven

Vision Q.400 is the product of a constant development and improvement process that has lasted over 15 years. It is based on one of the world’s largest image processing libraries.

5

Results display

When developing the Vision Q.400 we placed special importance on the ease of handling results. This applies both to the parameterisation of the OK/NG decisions as well as to the connection and handling of conventional hardware interfaces.

6

Don’t program, configure!

With Vision Q.400 you don’t have to reinvent the wheel. At the click of a mouse you can combine decades of accumulated expert knowledge into a professional inspection routine. It can be changed at any time as Vision Q.400 is both setup and inspection software in one.

7

Customisable in many ways

As customised as machine vision applications can be, that is how extensive the customisation options are in Vision Q.400. Indicators, ActiveX® Clients right down to the inclusion of own inspection algorithms. HALCON compatibility is of particular interest.

The user interface

1 Menu bar

This is where basic settings are made such as opening and saving applications, selecting the camera, setting the password and so on.

2 Selecting the checker

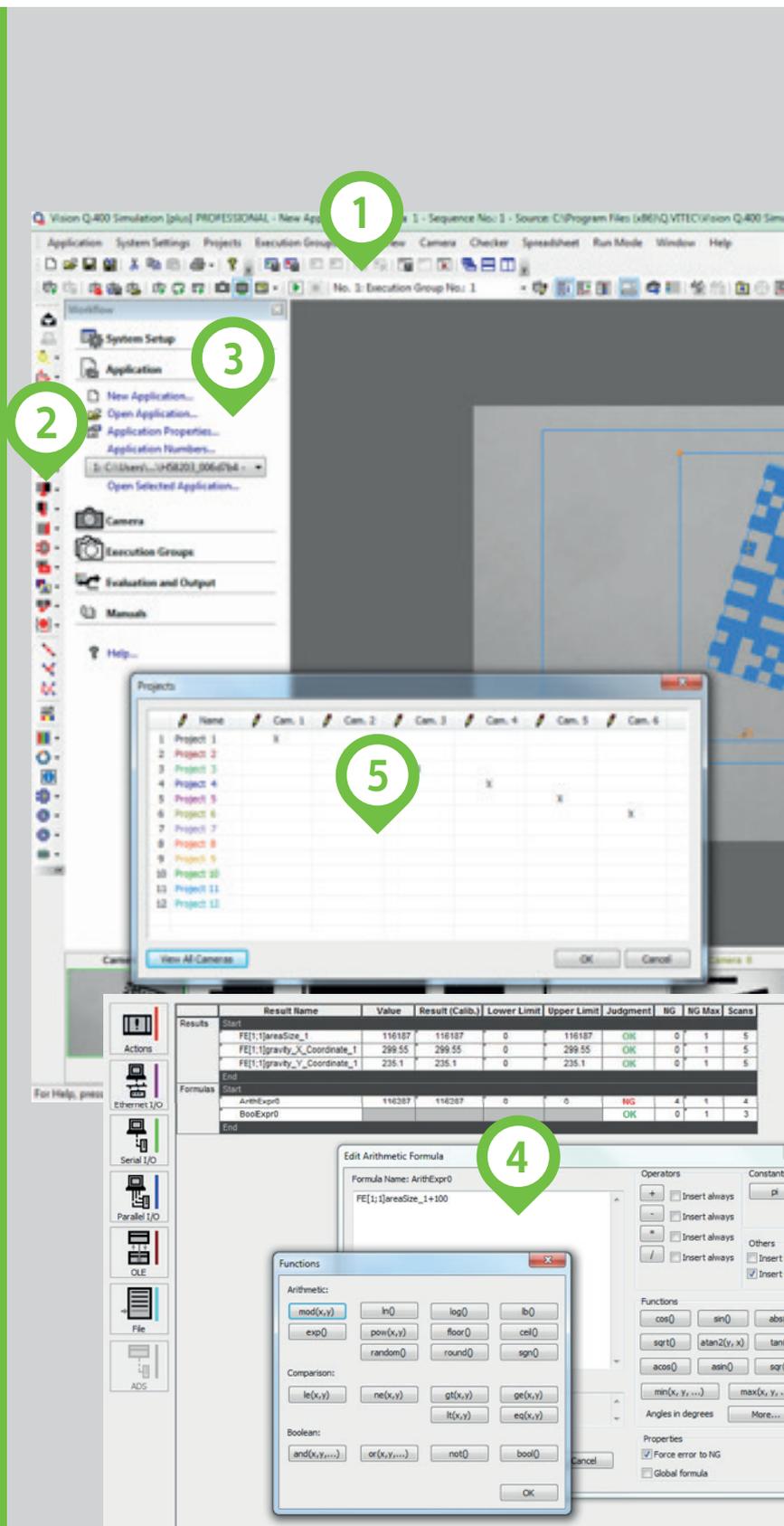
This menu bar is where the inspection procedures and the positions and forms of the inspection regions are selected. It is enough to simply draw one inspection element in the image. Many parameters are optimised automatically.

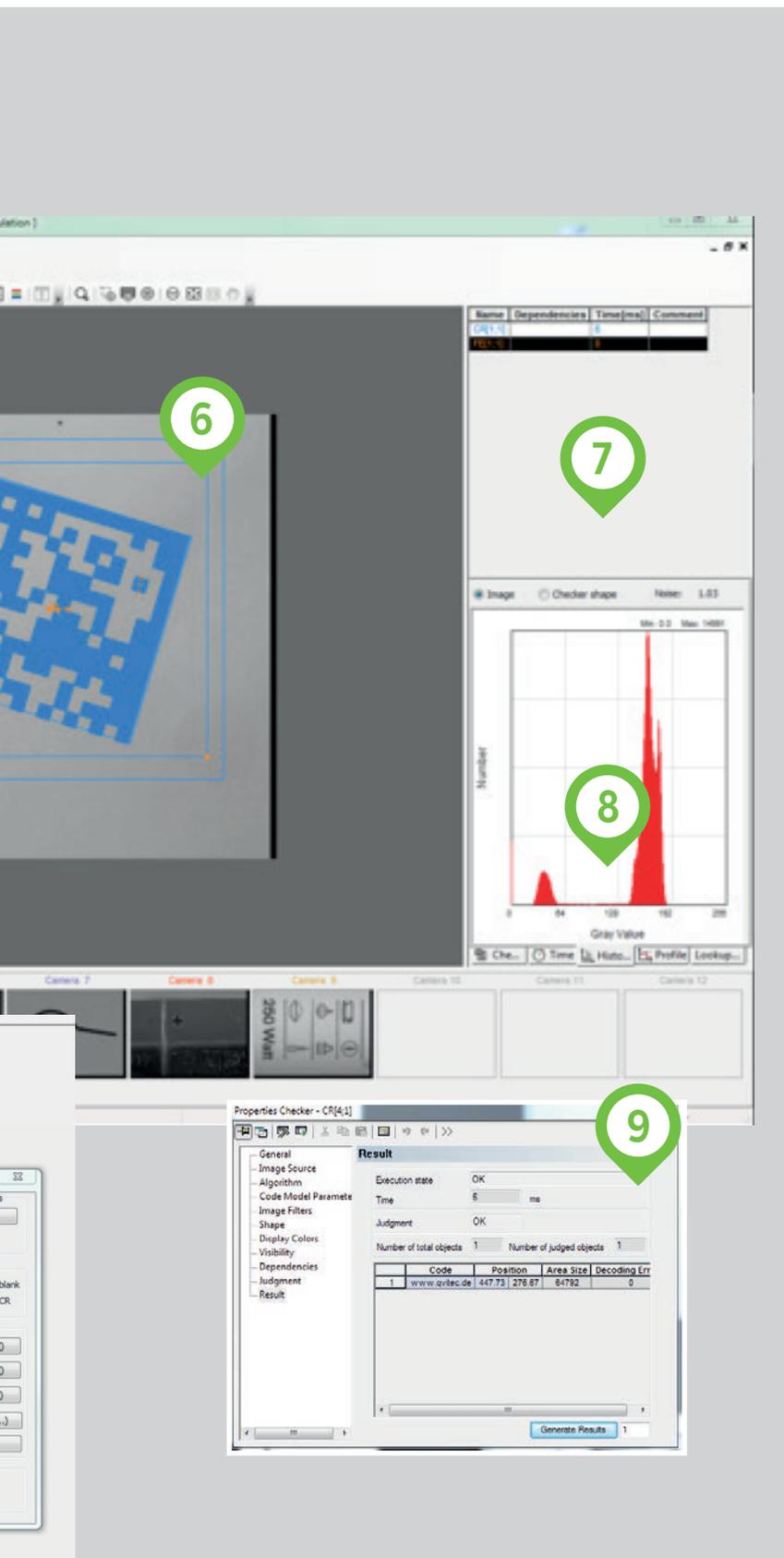
3 Workflow window

The workflow window takes you step by step through all of the important settings.

4 Spreadsheet

The spreadsheet summarises all of the results of the checkers. This is where limit values are set, calibration takes place, statistical values are collected the various interfaces are controlled. Settings are usually carried out using drag & drop.





5 Process configuration

This is where you assign the available cameras to the individual projects in Vision Q.400[plus].

6 Camera window

Each camera has its own window including progress bar. This is where the current camera image and the inspection elements are displayed.

7 Checker sequence bar

Provides an overview of the inspection elements used and their sequence of execution.

8 Help tools

Provide a quick overview of important values (e. g. greyscale values).

9 Checker property window

Each inspection element has its own dialogue box and can be individually adjusted. Graphic indicators and automatic functions frequently supported the setup.

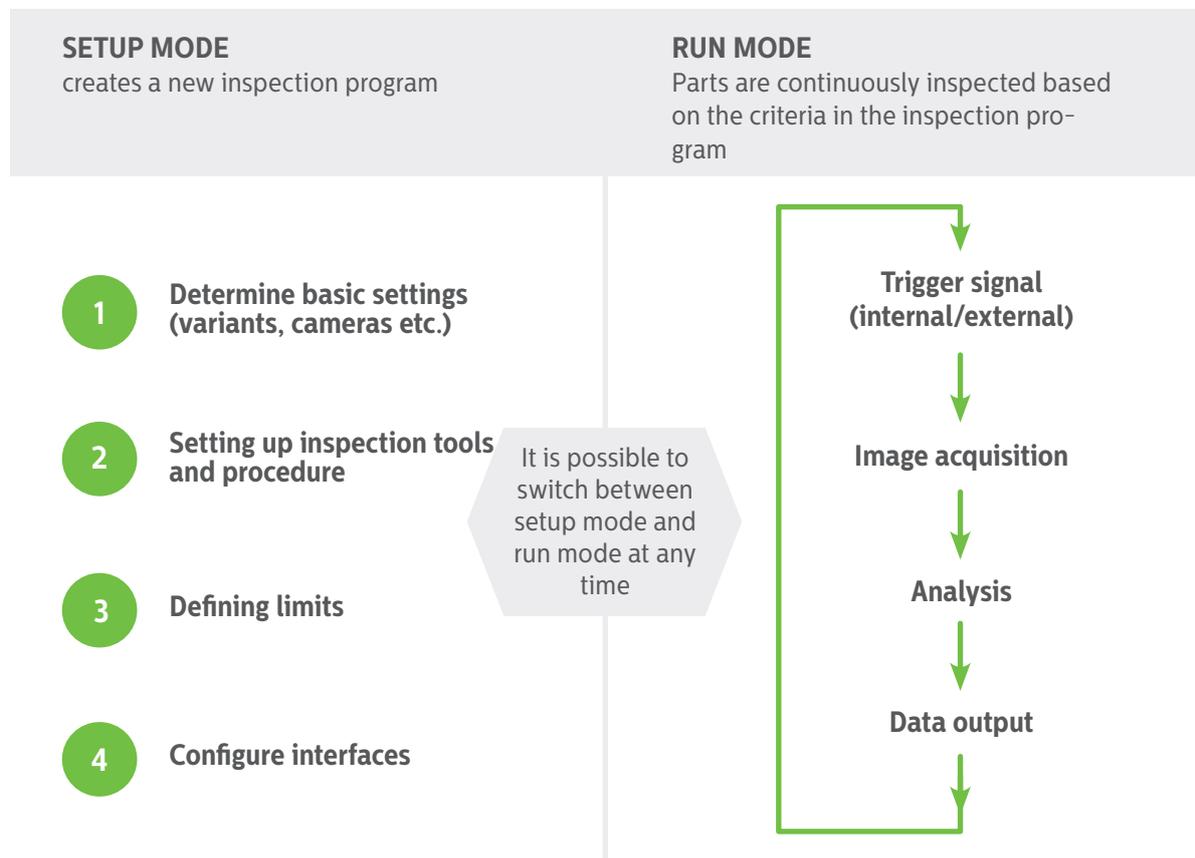
Quick and flexible for the perfect inspection

The functionality of Vision Q.400

Vision Q.400 is both parameterisation and inspection software in one. In SETUP mode you use predefined basic functions and practice-oriented inspection modules – the so-called “Checkers” – to create your own personalised inspection routine with just a few mouse clicks. You can also define the decision limits for “good” and “bad” and carry out the settings for the cameras and interfaces used. After switching to RUN mode the system waits for a triggering signal (internal or external) to start the inspection procedures.

You can switch between these two modes at any time. This gives you the flexibility to quickly and easily adapt to new process conditions and product variants, even directly at the production line.

Vision Q.400 is also available as a simulation version, allowing you to create and test your application from the office – even without special computers or cameras.



The “Checkers”

Inspection tools at the click of a mouse

In Vision Q.400, “Checker” is the synonym for an adjustable inspection tool that can take care of various tasks depending on use. Vision Q.400 contains the following checkers as a standard feature:



Exposure Adjustment Checker



Window Checker



Difference Checker



OCR Checker



Position and Rotation Adjustment Checkers



Feature Extraction Checker



Contour Matching Checker



Code Reader Checker



Object Shape Checker



Edge Detection Checker



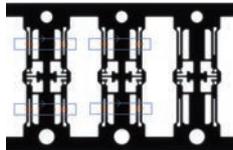
Cross-Correlation Matching Checker



Geometry Checker

The checkers work with both greyscale and colour cameras. They will help you solve a wide variety of inspection tasks. Here are a few typical examples:

Dimensional inspection



High precision measurement, e.g. of distances, angles, radii, diameters and surfaces. Depending on the boundary conditions (object lens, camera, lighting), a repeatability of 1/20 pixels or a few micrometers is feasible.

Presence/completeness check



By identifying missing or unwanted details in the camera image, it is easy to perform a component presence check, and to classify or sort objects.

Object/pattern recognition



A variety of procedures enable the recognition of patterns or structures. A particularly elegant approach is contour comparison, which can even identify overlapping characteristics, or characteristics that vary in size and shape.

Position and orientation identification



A secondary action of object recognition is also the position information (x, y, angle) of the identified objects. This data can be used e.g. for Pick & Place tasks sent to a handling robot or in order to perform assembly inspections.

Character recognition (OCR/OCV)



The algorithm employed here recognises characters based on fonts it has been trained to identify. It is possible to achieve extremely high recognition rates, even in hard to read characters like those of dot matrix printing or “direct part marking” on metal.

Surface/print inspection



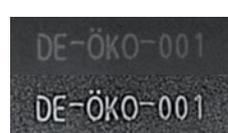
Identifying extremely small defects or imperfections over relatively large surface areas is one of the most demanding inspection tasks. Vision Q.400 offers several efficient and rapid solutions to this end.

Determining code content & quality



Vision Q.400 can read numerous barcodes and 2D codes, even under critical conditions. Codes marked directly on the component (DPM) are also reliably recognised. Optionally, code quality is determined and output in accordance with ISO/IEC 15415 or AIM DPM-1-2006.

Image enhancement/filtering

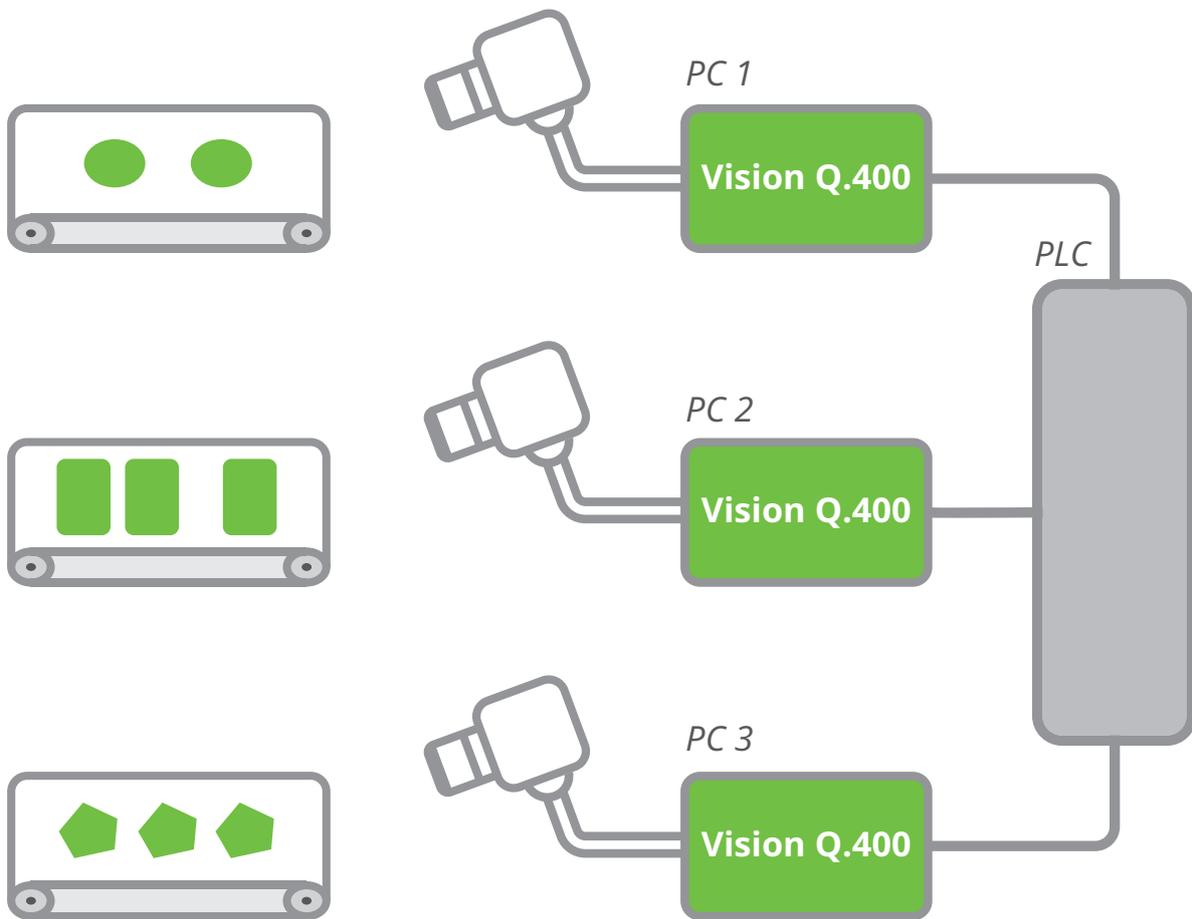


It is not always possible to perform optical imaging on an inspection object, and in some cases disruptive boundary conditions lead to unsuitable image quality. Various algorithms in Vision Q.400 permit the enhancement and pre-processing of such images before they are subjected to the actual inspection process.

The biggest benefit for unsynchronised feeding system

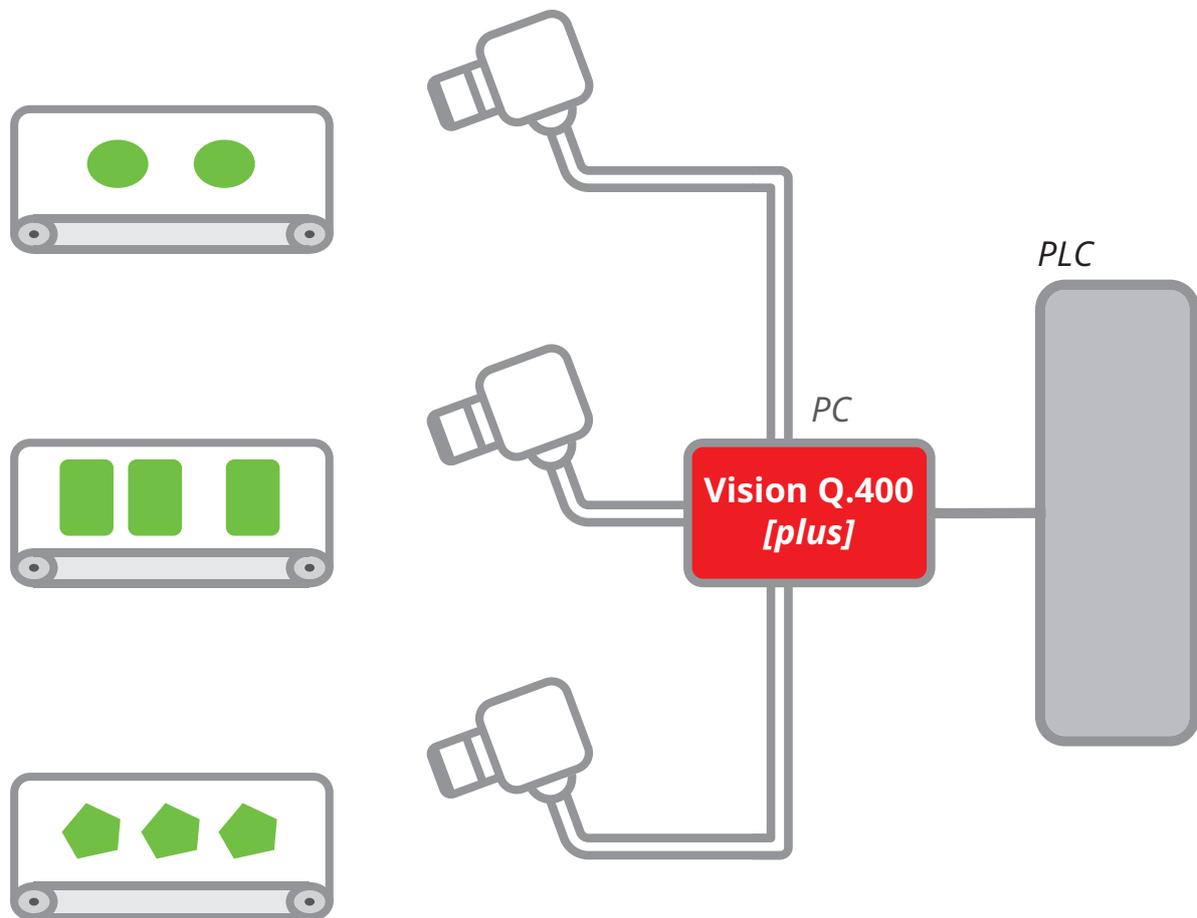
Independent inspections with just one vision system

With Vision Q.400 *[plus]* you can perform up to 12 independent inspection processes with just one machine vision system. The connected cameras are divided up and used in secondary inspection projects within the overall application and they can be started at independent points in time. In practice, the processing PC behaves as if there were several independent systems in use. This way the fast computers available today with several processor cores can be used efficiently and no longer spend the majority of their computing time waiting for the next inspection run. This cuts down on both hardware



ns: Vision Q.400 [plus]

and operating costs as well as enabling the use of smaller cabinets requiring less effort when it comes to installation. Vision Q.400 [plus] also comes in Basic, Advanced and Professional versions and can be expanded by adding modules. In addition, Vision Q.400 [plus] can be scaled to accommodate the required number of concurrently running inspections.



Vision Q.400 licensing model

| | Vision Q.400 | | | Vision Q.400 [plus] | | |
|--|---------------|---------------|---------------|---------------------|---------------|---------------|
| | Basic | Advanced | Professional | Basic | Advanced | Professional |
| Camera functions: | | | | | | |
| Colour | Yes | Yes | Yes | Yes | Yes | Yes |
| Size | All sizes | All sizes | All sizes | All sizes | All sizes | All sizes |
| Line scan | Yes | Yes | Yes | Yes | Yes | Yes |
| Checker (inspection tools): | | | | | | |
| Geometry | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Indicators | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Camera threshold values | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| White balance | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Position & rotation adjustment | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Object shape | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Inspection window | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Feature extraction | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Binary edge detection | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Grey-value edge detection 1 and 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Image subtraction | – | ✓ | ✓ | – | ✓ | ✓ |
| Contour matching | – | ✓ | ✓ | – | ✓ | ✓ |
| Cross-correlation matching | – | ✓ | ✓ | – | ✓ | ✓ |
| Code reader | 1 2 | 1 2 | ✓ | 1 2 | 1 2 | ✓ |
| OCR | 2 | 2 | ✓ | 2 | 2 | ✓ |
| Identification | 3 | 3 | ✓ | 3 | 3 | ✓ |
| Asynchronous image evaluation | – | – | – | ✓ | ✓ | ✓ |
| System properties: | | | | | | |
| Limit of checkers (inspection tools) per application | no limitation | no limitation | no limitation | no limitation | no limitation | no limitation |
| Q.CX interface (ActiveX) | Yes | Yes | Yes | Yes | Yes | Yes |
| Max. number of cameras | 2 4 | 2 4 | 12 | 2 4 | 2 4 | 12 |
| Quick switching execution groups | No 4 | No 4 | Yes | No 4 | No 4 | Yes |
| Conditional branching (If-case) | No 4 | No 4 | Yes | No 4 | No 4 | Yes |
| PIO support | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of actions (spreadsheet) | 1 4 | 1 4 | no limitation | 1 4 | 1 4 | no limitation |
| Q.HI activation | No 5 | No 5 | Yes | No 5 | No 5 | Yes |

1 CODE READER Module

2 OCR Module

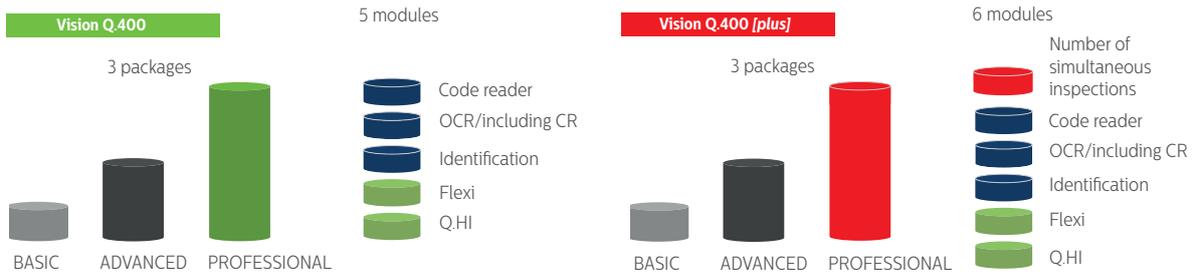
3 IDENTIFICATION Module

4 FLEXI Module

5 Q.HI Module

Basic package and expansion modules

Take advantage of the freedom to configure Vision Q.400 to suit your requirements perfectly. Even the Vision Q.400 Basic masters simple inspection tasks with great precision. Vision Q.400 Advanced expands the possibilities when it comes to quick object identification. Using expansion modules you can gradually expand the “Basic” and “Advanced” versions to incorporate all of the features of Vision Q.400 Professional. Vision Q.400 Professional offers complete flexibility, even for the most demanding of tasks with up to 12 cameras, for prototypes or when you appreciate the security of being able to respond quickly and at any time to subsequently occurring requirements. In addition, the possible number of simultaneously running inspections can be determined for Vision Q.400 [plus].



1 CODE READER Module

This module activates Vision Q.400’s Code Reader Checker. This enables your system to scan a wide variety of barcodes and 2D codes, which are recognised reliably even under critical conditions. As an option, it is possible to determine and output code quality as well.

2 OCR Module (Optical Character Recognition)

In addition to the OCR Checker, this module activates the Vision Q.400 Code Reader Checker. The OCR Checker enables automated reading of text. This applies equally to simple predefined fonts, and to special fonts which the system has been previously “trained” to recognise.

3 IDENTIFICATION Module

This module activates the Identification Checker. It can be used to identify objects on which the system has been trained based on characteristic features like text or colour. The system can recognise regardless of rotation, scaling, perspective, lighting changes and – within certain limits – even regardless of deformation and masking. The algorithm merely requires textured objects.

4 FLEXI Module

With this module, there is no longer any limitation with respect to the number of actions to be executed in a result-dependent manner. Use up to 12 cameras! Take advantage of the clear structure of execution groups just as conveniently as the option of branch execution using if-case formulas.

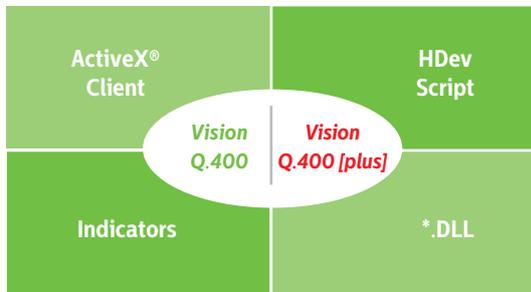
5 Q.HI-Module (Q.400–HALCON–Interface)

Once equipped with this module, your system will be able to do practically anything when it comes to algorithms. It enables seamless integration of HDevelop script code. This means that you will have full access to MVTec’s established image processing library HALCON. You can either do the programming yourself, or leave it to us.

6 Number of simultaneous inspections

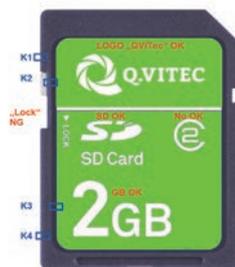
Vision Q.400 [plus] permits inspections in up to 12 independent, asynchronous processes. Reduce costs for hardware and installation.

Expansion options



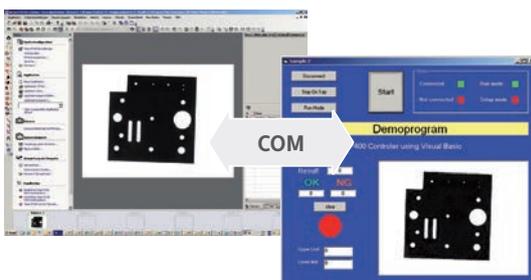
Open to the future

Vision Q.400 offers a variety of options to customise and expand functionality. The possibilities are wide-ranging, from customer-specific results display right down to completely new inspection algorithms. Of particular note in this context is the Q.HI interface (Q.400-Halcon interface) which enables Halcon scripts to be easily integrated.



Indicators

Indicators can be used to visually highlight measurements, results and evaluations on the screen with the help of geometric shapes, images and definable texts. Display elements such as lines, arrows and bitmaps can be made dependent on the actual inspection results. A “good” evaluation could, for example, provide a different appearance than a “bad part”.



Q.CX (ActiveX®) interface

Using the Q.CX (ActiveX®) interface, you can expand Vision Q.400 to include a customised user interface or special statistical evaluations. It is also possible to connect to other MS Windows applications such as databases or MES systems. You have access to all important parameters, measurement results and images. ActiveX® is supported by practically all programming languages including Visual C, Visual Basic, Delphi, C# and many more. Our detailed description and numerous examples facilitate your start in programming.

HDevEngine Integration



HDevelop:
Create a new image
processing routine
in just a few steps.

Customised image processing algorithms with HALCON

Thanks to its interface with HALCON, Vision Q.400 gives you the freedom to expand the range of functions practically any way you like. HALCON is one of the world's most extensive and powerful image processing libraries.

More than 1600 operators provide you with an unbelievably versatile toolbox at your disposal. Use the interactive programming environment HDevelop to develop your own customised inspection sequences and embed them as new "Checkers" into Vision Q.400 with just a few clicks of a mouse.

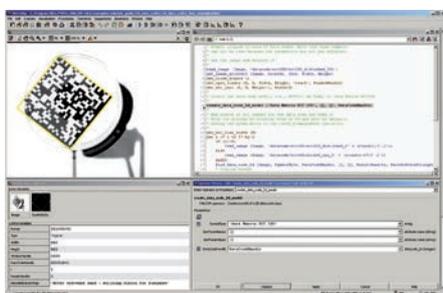
You will benefit from the following advantages:

Save time when developing inspection sequences. Vision Q.400 is the basis for new developments. The stable and powerful framework is already the complete, tried and tested structure for a powerful inspection routine with the following basic functions:

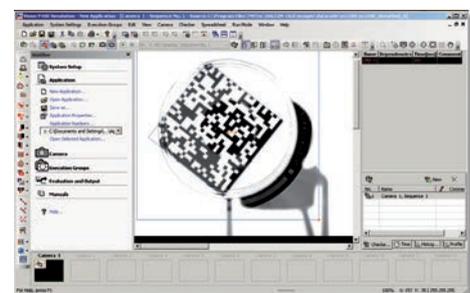
- Image acquisition
- Position correction
- Numerous image processing algorithms
- Results and interface handling
- Storage of parameters, images and measurements
- Results evaluation and output

You can use HDevelop for your own developments. This allows you to develop new functionalities conveniently and surprisingly quickly without having to grapple with programming in a high-level language.

The entire HALCON functionality is at your disposal. Vision Q.400 includes a HALCON runtime license.



HALCON HDevelop



Vision Q.400



Script file

Product variants



Vision Q.400 software

The stand-alone software package Vision Q.400 is the right solution for you if you wish to use existing industrial PCs. We provide high-quality greyscale and colour cameras with various resolutions and speeds, all of which are optimally matched to the software in question. In addition, Vision Q.400 generally supports cameras that comply with the GigE-Vision standard. Representative models from various providers have been successfully tested. Please contact us if you wish to use a special camera.



Imagechecker Q.400PD/PS

Turnkey touchscreen system with preinstalled Vision Q.400. GigE cameras can be directly connected via two Ethernet ports. The compact and efficient panel PC with touch sensitive monitor enables machine-oriented installation and convenient, contemporary operation. The price-performance ratio is also extremely attractive. The Q.400 PD/PS is available in display sizes 10"–19".



Imagechecker Q.400SD

The Q.400SD provides industrial image processing with great performance in a small size for the top hat rail. A 1.9 GHz Atom Quad Core CPU runs inside the housing of the Q.400SD. Both GigE ports support PoE (48 V). For the price of one Vision sensor, you can operate up to two 5-megapixel cameras with the power of a quad core processor. In addition, the Q.400SD has a massive, extremely high-quality industrial housing that can easily be installed in suitable switching cabinets or standard electrical cabinets thanks to its standardised installation options.



Imagechecker Q.400MD

The "embedded" Q.400MD platform delivers high performance in a compact unit. This system is especially well suited to time-critical applications as a CameraLink® variant. Up to four high-resolution cameras can be operated in parallel in this configuration. An optional switch can be used to increase the number of cameras in the GigE version. Both system variants are available with preinstalled Vision Q.400 and a parallel interface card with 32 digital inputs/outputs.



Imagechecker Q.400XD

In addition to the best computer performance, the Q.400XD also offers the most expansion options in our range. The system is particularly well suited to processing-intensive inspection tasks, with the option of up to six CameraLink® cameras operating in parallel. Free slots make it possible to expand the system - to include additional interface cards, for example. It also provides the best conditions for operating with high-resolution line scan cameras - for the inspection of paper webs and material panels, for example.



Panasonic Imagecheckers

The PV series by Panasonic boasts high flexibility and ultimate performance. The digital Camera Link® interface guarantees interference-free image transfer. Numerous inspection tools make this system a reliable universal measurement instrument.

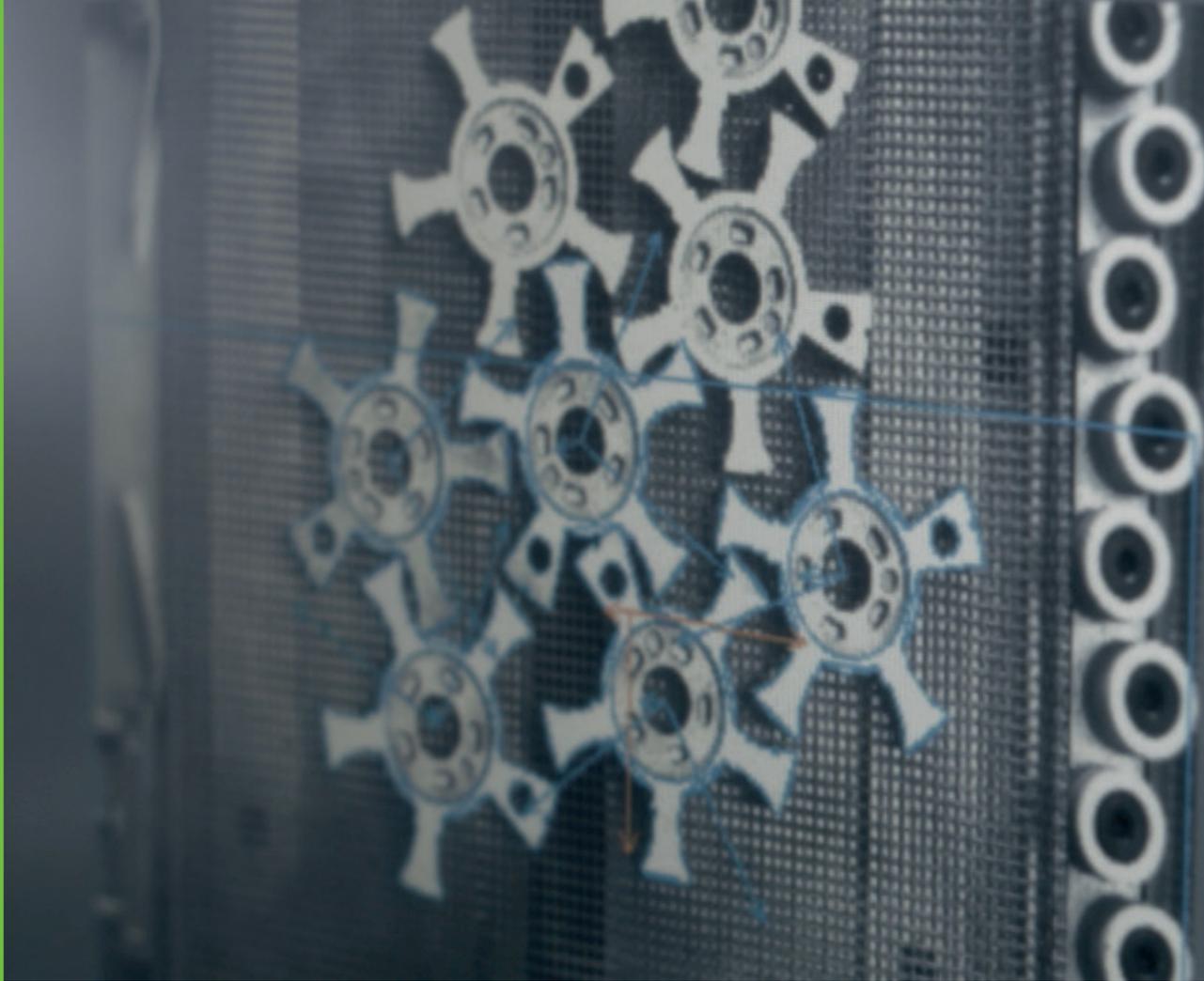
| Model | CPU/RAM/HD | Camera Interface | Digital IO | OS |
|---------|---|---|----------------|------------------------|
| Q.400SD | Intel Atom E3845, 1.91 GHz quad-core CPU, 4 GB RAM, 32 GB SSD | GigE (PoE) | 4IN/4OUT (NPN) | Win7 Embedded (64-bit) |
| Q.400MD | Intel Core i7-3610QE 2.2/3.3 GHz, 6 MB Cache, 4 GB RAM, 60 GB SSD | CameraLink / GigE (with or without PoE) | 16IN/16OUT | Win7 Embedded (64-bit) |
| Q.400PD | Core™ Duo P8400, 2.26 GHz 2 to 8 GB RAM, CF 4 GB, CF 8 GB, HDD 250 GB, SSD 32 GB | GigE | - | Win7 Embedded (32-bit) |
| Q.400PS | Intel® Atom™ E6x0 1.3 GHz (Single core/Dual thread) 2 GB RAM, CFast card with 16 GB | GigE | - | Win7 Embedded (32-bit) |
| Q.400XD | Core™ i7/i5/i3 LGA1150 processors with Q87 | CameraLink / GigE (with or without PoE) | 16IN/16OUT | Win7 Embedded (64-bit) |
| PV200 | 4 CPUs: DSP, RISC CPU, Custom Graphic Processor | CameraLink | 16IN/16OUT | Panasonic OS |
| PV500 | 4 CPUs: DSP, RISC CPU, Custom Graphic Processor | CameraLink | 16IN/16OUT | Panasonic OS |
| Q.AGE-X | 2.70 GHz, i5-3610ME, 4 GB RAM, 32 GB SSD | GigE (PoE) | 8IN/8OUT | Win7 Embedded (64-bit) |

DEMO version

See for yourself! Test Vision Q.400 with the DEMO version. The Vision Q.400 DEMO version is a completely functional simulation of Vision Q.400 and can be used for an unlimited period of time. It is not possible to operate cameras with the DEMO version.

http://www.qvitec.de/QR_Download





Customer solutions

Solutions adapted to individual process requirements

We offer adapted solutions, even with customised process requirements. Q.VITEC accompanies you throughout this holistic process, helping you develop the solution that is perfect for you. That means it is a solution customised to your needs and one that guarantees an optimal result.

How may we further assist you? Vision Q.400 is a powerful, scalable tool that you as a user can harness to carry out nearly all tasks within the field of industrial machine vision. But sometimes needs arise that are far removed from any standard. Do you need a special camera, be it for thermal imaging or x-ray imaging? There is a good chance that this too can be integrated into your system.

Do you need special algorithms for your inspection procedure? These can be integrated as add-on inspecting elements using our Q.HI interface. It goes without saying that they will completely retain all standard properties of Vision

Q.400. Does your robot need an unusual interface protocol, or do you need to feed inspection results directly into your spreadsheet? This is a doddle with Q.CX, our universal ActiveX interface.

We will be happy to support you in the development of the product that you subsequently wish to inspect. The fact is that many inspections simply become easier to perform when your product has been designed with its eventual manufacturing check in mind. We also offer you turnkey solutions in conjunction with our system integrators.

All from the one source

TEC-GROUP



The TEC-GROUP consists of the owner-managed companies PRAUTEC, Q.VITEC and UNITTEC. We are specialists in numerous fields of industrial automation. Our services range from the generation of concepts to the development and integration of various product solutions.

Q.VITEC distribution network



Together with our strong partners, Q.VITEC now has a broad, effective distribution network throughout Europe and Canada. Thanks to short transport distances, we are able to react rapidly to your wishes at any time, and are capable, with you as our partner, of flexibly developing an individualised solution to whatever challenges you are facing.



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