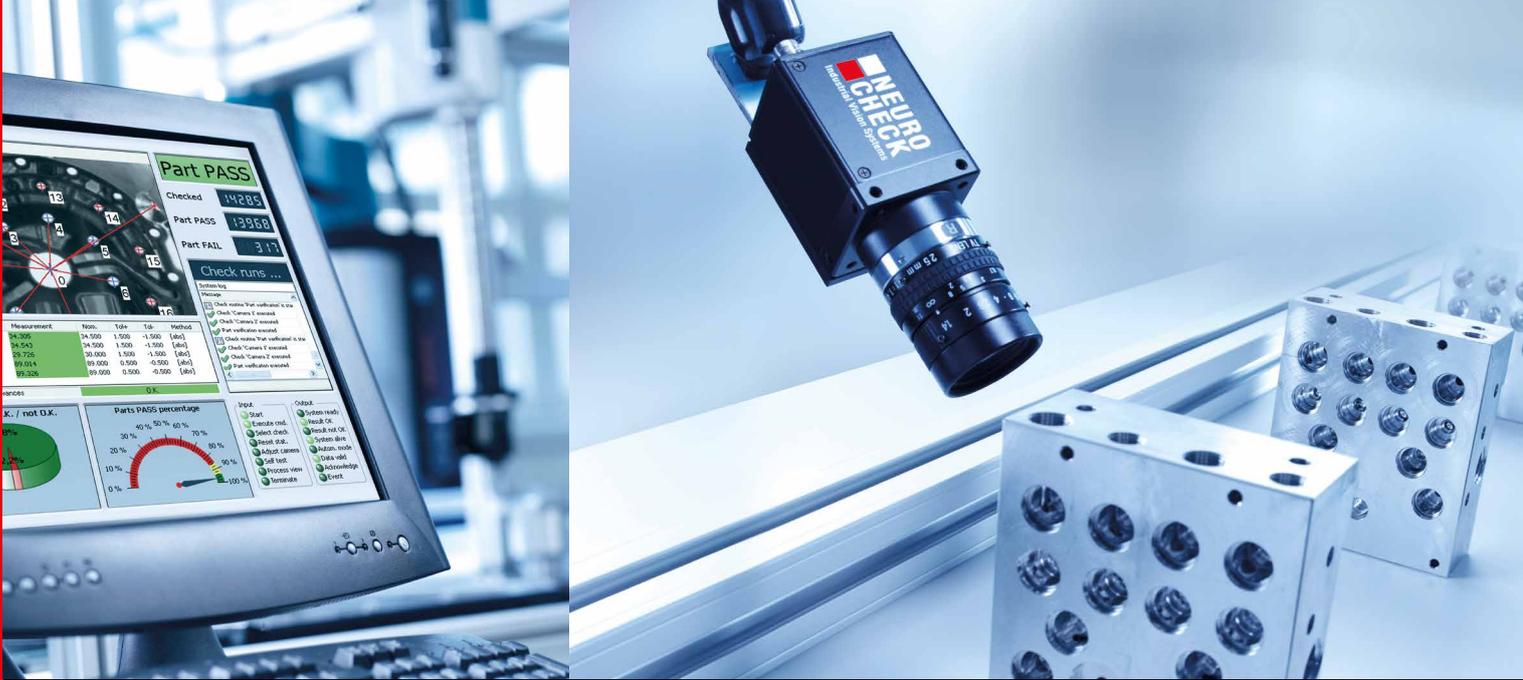


# NeuroCheck

Application Software for Industrial Vision Systems





Experience from more than 20,000 applications continuously contributes to the development of this universal visual inspection software.

For more than 25 years, NeuroCheck has been the synonym for an innovative software product employed throughout all areas of industrial vision.

To develop a powerful and easy-to-use platform for industrial image processing - that was the challenge we set ourselves upon the founding of our company in 1993. The result is NeuroCheck, the software product whose modern architecture makes the development of applications for industrial image processing applications as easy as never before. Because of their reliability and extremely user-friendly handling, our solutions established themselves quickly in the market. By now, more than 20,000 applications of the software are in use worldwide.

NeuroCheck GmbH not only offers a universally applicable software product - our company goes one decisive step further. The business unit Application accompanies our customers in the design and deployment of turnkey system solutions that are implemented with the standard software of the same name.

For you, the customer, the benefits of this unique combination are obvious: With the NeuroCheck software you have at your disposal the know-how we developed in years of practical experience developing optical inspection systems for industrial manufacturing. In close collaboration with our customers and our application department, the software is continuously developed further and improved. Because of this procedure, each new software version has already proven itself in practical use before getting on the market.

NeuroCheck GmbH offers all the advantages and securities of a leading manufacturer and stands for innovation, highest quality and reliability in all areas.

#### NeuroCheck References

ABB, Alfing, Aptar, Audi, Aumann, Automatica, BÄR Automation, Bausch & Lomb, BD Medical, Bippus, BLEICHERT, BMW, Boehringer Ingelheim, boschen & oetting, Braun, BSHG, Carl Zeiss Vision, Cherry, Comau, Continental, Daimler, Danfoss, Delphi, Eaton Automotive, ebm-papst, EKF Automation, EMAG, Emil Schmid, Erkert, Estee Lauder, FELSS, Ford, Fresenius, GE Healthcare, Getrag, GlaxoSmithKline, Grob, HÄRTER, HeMaTech, HKS-Industriemontagen, Hochrainer, HOLZ Automation, Hoyer, Hübers, IfK Automation, Ishida, IWM Automation, Johnson & Johnson, Johnson Matthey, JW Froehlich, Katek, Kemmler+Riehle, KHS, KIA Motors, Kiener, Klumpp, Kodak, Komax, Krauss-Maffei, Kubat, KUKA, Liebherr, MAHLE, Marquardt, MDC Power, Mercedes-AMG, Motorola, Nissan, Nokia, Nypro Healthcare, Opel, Otto Fuchs, PepsiCo, PIA Automation, Powergen, Riwisa, Robert Bosch, Ruag, Ruhlmat, Sampas, Sarstedt, Schaeffler, Schiller Automation, SCHOTT, Sembach, Semikron, Siemens, Söhner, Sortimat, STAR ASSEMBLY, Stihl, Stoba, Teamtechnik, ThyssenKrupp, TRW Automotive, TYCO, VAF, Vernacare Medical, Voland, Volkswagen, Winkelmann, Wrigleys, XENON, Ypsomed, ZF Lemförder, ZF Lenksysteme



## NeuroCheck is the ideal all-round software for demanding inspection tasks in manufacturing processes.

Our highly qualified team uses up-to-date development tools. Software modules are not released before having been tested in our laboratory. Robustness and reliability are checked in a long-time trial.

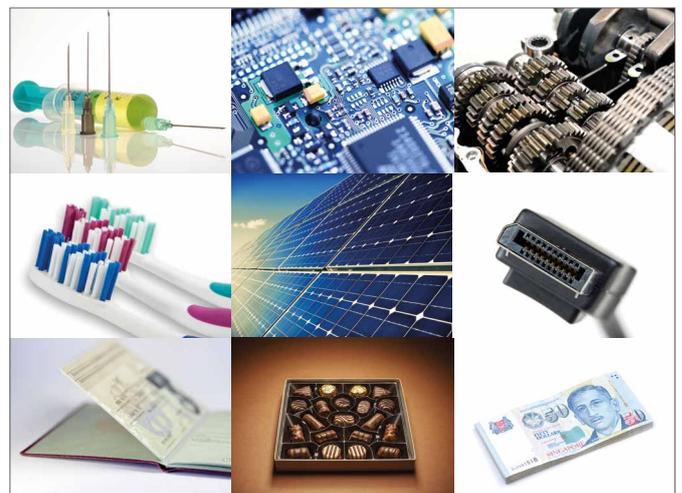
NeuroCheck offers an integrated environment for the interactive configuration of visual inspection applications and their fully automated execution on the manufacturing line. This way, image processing can be integrated quickly and easily without extensive prior knowledge in all application areas in industry, manufacturing and quality control:

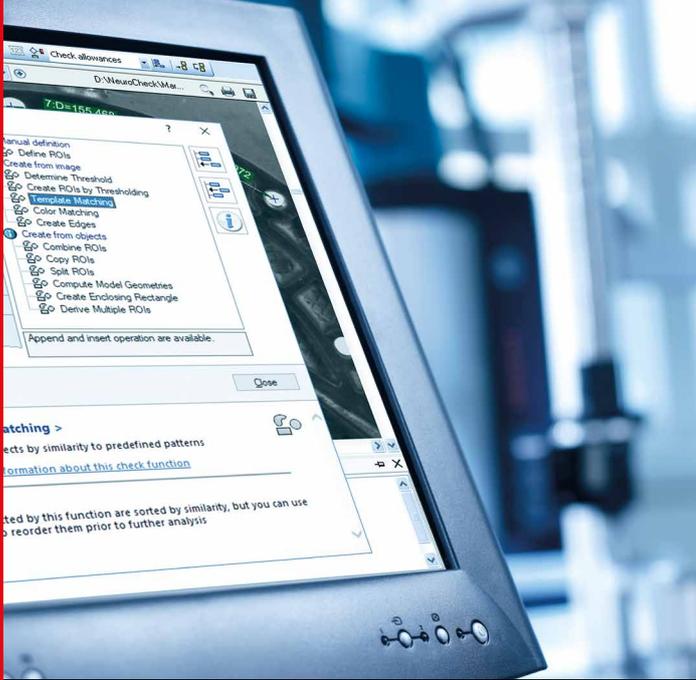
- Assembly checking
- Color recognition
- Gauging
- Identification (1D/2D code, Data-Matrix)
- Pattern recognition
- Presence verification
- Print quality inspection
- Robot guidance
- Surface inspection

Easy configuration and seamless interaction with all established hardware and software standards make the NeuroCheck application software the ideal platform for industrial image processing in companies of any size. Hardware components, software, and comprehensive

services come together to result in a future-proof camera inspection system for various industrial applications from the following areas:

- Automotive and automotive supplier industry
- Electronics and electrical engineering
- Glass production and processing
- Plastics processing
- Machine manufacturing
- Medical technology, pharmaceuticals and cosmetics
- Food industry
- Solar technology and semiconductor manufacturing
- Packaging technology and print technology





The NeuroCheck software functions fit together to fulfill all requirements for a powerful solution.

NeuroCheck software offers two user interfaces. One for the development of inspection solutions, the other for controlling automatic inspection. This makes NeuroCheck the comprehensive software solution for the deployment of a production-ready image processing application.

From camera integration to result output to the control system or master computer - NeuroCheck meets all demands made of an image processing system with a single universal PC standard software. The entire functionality is presented using an ergonomic and intuitive Windows® user interface. To use NeuroCheck, no programming skills are necessary.

### The main functions of NeuroCheck

#### Manual mode

Manual mode offers a development interface for the interactive graphical creation of an inspection solution. Here you define the logical structure of the check procedure and the parameters for executing the algorithms.

#### Automatic mode

In automatic mode, the previously created inspection solution runs automatically. The system monitor visualizes status and results in configurable windows. The process is controlled by a PLC or master computer.

#### Cameras

NeuroCheck supports a multitude of up-to-date digital cameras with established standards and various resolutions. Use the integrated „device manager“ to setup and configure the cameras comfortably.

#### Image processing algorithms

The software encapsulates the NeuroCheck image processing library with thousands of powerful and long-proven evaluation algorithms. The check functions are logically grouped into categories such as image capturing, pre-processing, analysis and gauging.

#### Process integration

For communicating with the supervisory control system, a number of modern standard interfaces are available. Execution of the inspection procedure can be affected dynamically by the process peripherals. Reversely, NeuroCheck also sends the inspection results and measurement values to the peripherals.

With these functions, NeuroCheck makes all capabilities of the latest camera hardware and up-to-date software technologies available to its users.



## All benefits of the Windows®-based NeuroCheck software at a glance

The Windows®-based NeuroCheck software utilizes all features and benefits of the Windows® world.

NeuroCheck uses the modern Microsoft .NET framework and operates under Windows® 7, 8 and 10. Its intelligent architecture combines the advantages of an operating system standard proven in millions of installations with an abundance of functionality to solve your image processing tasks.

### Flexible

After only a short time, complex solutions for the whole area of industrial visual inspections can be created by combining functions.

### Scalability

NeuroCheck can be scaled at will: from pre-configured compact miniature PC systems to networked multi-camera inspection systems. Thus, a uniform software standard can be established throughout production, minimizing adaptation, training and maintenance costs.

### Interactive

The entire development of an inspection solution takes place in an interactive and modern interface. For the user this means shorter development cycles and higher reliability compared with traditional programming.

### Integrated

The integrated development and runtime environment enables configuration and optimization of inspection systems directly on the production line. This allows you to react immediately to any change in the process.

### Expandable

NeuroCheck can be expanded in many directions. Customized user-interfaces, data base connectivity, add-ons to the built-in functionality are only some of the many possibilities within NeuroCheck.

Step by step, we are at the customer's side through all levels of developing a powerful industrial vision solution.





## Feasibility Study

Each and every inspection task is highly individual. Therefore, selecting the optimum hardware requires much experience.

NeuroCheck supports the application engineer with flexible tools for the quick and efficient development of alternative inspection strategies.

The interdisciplinary character of industrial image processing makes high demands on the application engineer. Because of the numerous possible applications in various industrial areas, you are confronted with new tasks on a daily basis. Camera technology, optics and illumination have to be adjusted anew to the specific requirements of every customer. Here, the intuitively operated NeuroCheck software supports you in an optimal fashion as early as in the evaluation phase.

### Camera selection

Solving an inspection task depends significantly on the camera hardware used. Even when looking at sample parts for the first time, the question what camera to use for the inspection task poses itself. What image resolution is necessary? Color or monochrome? Is an area-scan or line-scan camera better? How many cameras are needed?



NCG3XX



NCCG series



NCHG series

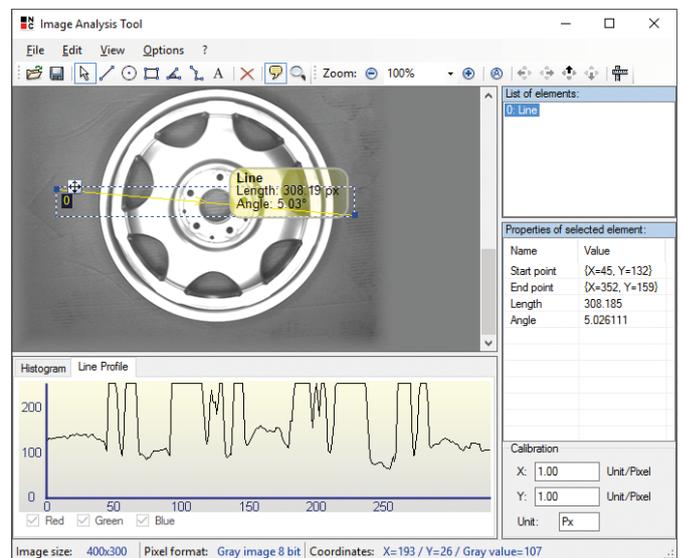
NeuroCheck supports a multitude of powerful digital cameras with established standards and various resolutions. Use the »device manager« to integrate one or more cameras with a few mouse clicks within NeuroCheck.

Setting of all camera parameters such as exposure time takes place in the comfortable parameter dialog which also shows a live image. Even complex multi-camera applications with triggered image capturing can be configured interactively.

### Image analysis tool

The »image analysis tool« enables the application engineer to make a quick evaluation of the currently selected optical components and illumination situation.

Is the camera resolution sufficient for the precision required? Do the illumination and optics work together? Is it possible to render the object features that are necessary for the quality decision »OK« or »not OK«?



The »image analysis tool« offers numerous, interactive functions for histogram analysis and approximate gauging. By setting a gray value profile, you can make an initial evaluation of the reliability of an edge detection.

The clearly visualized results can be enhanced with comments directly in the image. Using the Windows® clipboard, these images can be used immediately, e.g. to prepare a quote or for documentation purposes. Thus, the customer can actually see how precisely his specific task was analyzed.

# Inspection solution

The development of an inspection solution requires the utmost concentration and powerful algorithms with high flexibility with regarding the application.



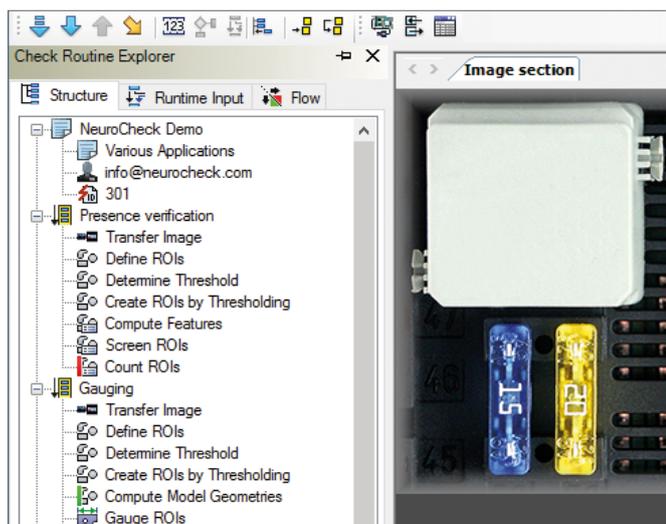
NeuroCheck offers algorithms in a well-arranged, flexible modular system. Parameters are set by Point&Click, giving visual feedback at any time.

The creation of the inspection solution takes place interactively without any programming in »manual mode«. Here the application engineer can build the logical structure of the check routine and set the parameters for executing the algorithms using an intuitive graphical user interface.

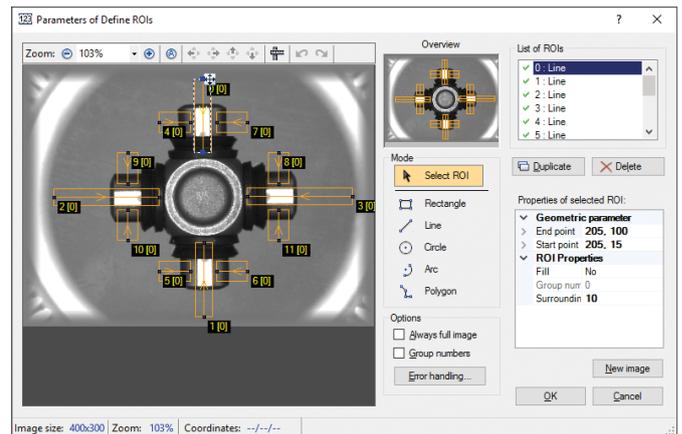
## Structuring with a component system

The »check routine« is the central data object of the NeuroCheck software. A check routine contains any number of »checks« in a clear hierarchical structure. Usually, you define one check per camera position. Checks are executed sequentially. The execution logic can be changed using loops and jumps.

The actual image data evaluation itself takes place within each check by a freely definable sequence of »check functions«. For this the software offers approx. 100 check functions logically grouped into categories such as image capturing, pre-processing and gauging. The check functions encapsulate thousands of powerful and long-proven algorithms of the NeuroCheck image processing library.



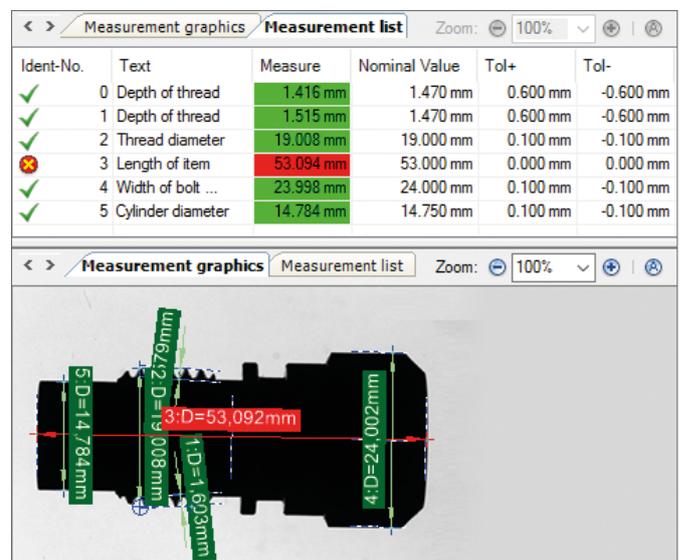
## Simple parameter setting



The parameters for the check functions are set in dialogs carefully designed for their specific tasks. For example, regions of interest can be defined using Drag&Drop or by entering coordinates on the keyboard. Because of the numerous zoom and other display options, you'll always have a good overview even in high-resolution camera images.

## Visual feedback

During check function execution in manual mode, the intermediate results are visualized in detail step by step. This way, the application engineers receive continuous feedback concerning the progress of their work.





## Deployment of inspection station

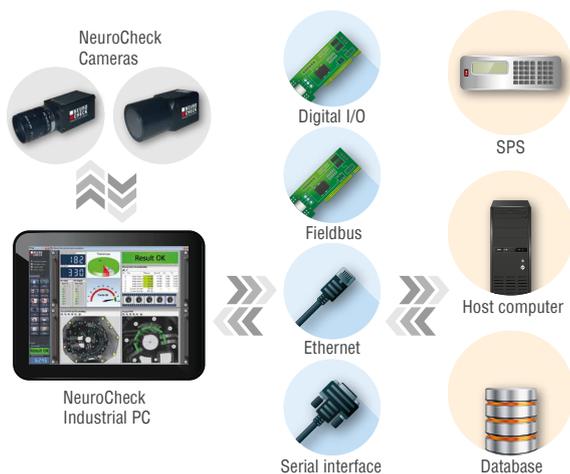
Often, there is little time to transfer the created inspection solution to the customer's facility. Sudden changes in conditions and requirements at the customer's site pose a special challenge.

NeuroCheck is at its most impressive switching directly between manual and automatic mode when fast adaptation of the inspection solution to changed conditions is required.

Deployment at the customer's site is an important step on the way to a completed inspection solution. Within a minimum amount of time, a lab system has to be converted into an online inspection system suitable for manufacturing tasks.

### Integration into the process environment

With just a simple mouse click, NeuroCheck can be connected to a superior control system. For communicating with a programmable logic controller (PLC) and a production master computer, a large number of standard interfaces are at your disposal. To integrate a robot, we at NeuroCheck created the process control RoboDirector as a link between the robot's controller unit and the image processing software. If necessary, more customer-specific drivers can be developed using a programming interface.



The communication paths and file formats are selected interactively within the software. After activating the process integration, the system is ready for automatic operation.

The execution of the currently loaded check routine can be affected dynamically by setting target values and process parameters in the process peripherals. After the evaluation has been completed, NeuroCheck transfers the inspection results and measurement values.

### Optimizing the check routine

The created check routine can be run directly and without compilation on the target system regardless of the computer used for configuring the check routines.



NeuroCheck offers a number of output windows with appealing visualization. The system and process information depicted serves to assess the stability of the inspection process. Apart from the obligatory camera images, measurement results, statistics and process trends can be visualized graphically and in tables.

Because of the immediate switching between manual and automatic mode, the inspection solution can be quickly and easily adjusted to changing conditions in the important deployment phase. Stored error images support the continuous optimization of the process.

### Acceptance

Acceptance takes place together with the customer using previously defined border-line samples. To ensure the functionality of the system and any new calibration at any time, NeuroCheck software makes it possible to save camera images for documentation purposes.

## Automatic inspection mode

System acceptance by the customer is a result of the clearly structured user interface and reliability in continuous operation.



NeuroCheck's design tools offer optimum capabilities for the flexible design of contents and layout of the user interface for automatic mode.

During acceptance, the system has to prove itself for continuous operation. Besides reliable operation, operating personnel receives most of all a clearly structured presentation of the process data. Changes of target values or an adjustment of process parameters can easily take place during operation.

### User interface in automatic mode

The keyboard-oriented »Control Panel« is the central operating element of »Automatic mode«. The design is clearly structured and attractive, reduced to essentials. Commands are entered mostly using function keys.



The modern software architecture allows designing the automatic screen in a task and user-oriented fashion. For this, there are graphically interactive design tools at your disposal during the development stage. Various freely configurable views such as the current system status, inspection results and diagnoses, allow for an individual adjustment to customer needs. In a special dialog, new target values or process parameters can be entered during an inspection run.

### Security profiles

For the security of the system, a carefully designed password management allowing for many user levels and individually tailored access rights is integrated into the software. You can, for example, restrict parameter changes to authorized service technicians. The profiles are selected manually by the operator or using automatic input by a supervisory system.

### Diagnosis and maintenance

Detailed logging of many system events allows fault analysis. In addition to process data, many user driven changes and system interventions can be logged.

The integrated »Event display dialog« presents this data in a clearly structured way for the system operator or service technician. For example, all communication errors of the past hours can be seen and analyzed at a glance.

In a service situation, the software can be monitored and controlled using standard remote maintenance programs. Thus, even complex and powerful multi-camera applications can be serviced for years with little effort.





## Customer service

Excellent customer service is part of preserving the value of our system solutions. Before, during, and after project planning, we support our customers and ensure their satisfaction.

### Satisfied customers world-wide

We emphasize personal support to target our customers' requirements. Long-term experience and global know-how come together in system integration and operator training, maintenance and in situ troubleshooting. Our international network of partners in more than 10 countries guarantees closeness to our global customers. Thus each user all over the world benefits from personal project and technical support in their native language and from local training and service.

### Consulting & Service

NeuroCheck GmbH provides experts with years of experience as competent consultants to our customers in any area.

Our company's service features range from consulting and feasibility studies, engineering and project design to deployment and maintenance/remote maintenance of our turn-key industrial vision solutions.

### Training courses

Our training courses impart hands-on expert knowledge for real-life use to demonstrate the optimal operation of NeuroCheck software and our inspection systems. For our customers, we offer the following training courses:

- Software Training
- Hardware Training
- System Training
- Operator Training

For detailed information regarding our training courses, please refer to our website [www.neurocheck.com](http://www.neurocheck.com).



### Technical Support

Continuous development and optimization of the NeuroCheck software is an integral part of the reliable performance of our industrial vision solutions. Software updates and service packs ensure that our customers have access to the latest software version with new features and expanded functionality.

In our global network of partners, our highly-qualified specialists support our customers in technical and application-specific matters.

- Technical support for NeuroCheck software
- Training courses for software and inspection systems
- Consulting
- Engineering
- Deployment
- On-site service
- Maintenance/remote maintenance

# Technical Data

For optical quality control using the universal industrial vision software NeuroCheck, comprehensive functionality and interfaces are at your disposal.



## NeuroCheck software version 6.2

We create our internationally leading standard software for industrial vision using modern development tools by Microsoft® and powerful, object-oriented programming languages such as C++ and C#. With each current version, our customers have benefit from the comprehensive know-how we have developed in years of practical experience developing optical inspection systems for industrial manufacturing.

To install and run the NeuroCheck software, a computer running Microsoft® Windows® as operating system is required.

System Requirements	
Operating system	Windows® 10 Windows® 8/8.1 Windows® 7 } 32-Bit, 64-Bit recommended
Processor	1,5 GHz (2,5 GHz multi-core CPU recommended)
System memory	4 GB RAM (8 GB or more recommended)
Hard drive space	depending on system environment up to 5 GB on system partition
Screen and graphics adapter	TrueColor, resolution 1024×768 pixel (Full HD recommended)
Interface	USB

## The license levels

- **Premium Edition:** User-defined functions can be added to the system using special editors and software interfaces.
- **Professional Edition:** Standard functionality for the typical image processing user.
- **Runtime Edition:** Cost-efficient duplication of completely configured visual inspection applications.

Functions	Premium	Professional	Runtime
Inspection in automatic mode	✓	✓	✓
Any number of cameras	✓	✓	✓
Integration of system into process environment	✓	✓	✓
Editing of parameters and target values during runtime	✓	✓	✓
Interactive design of check routines	✓	✓	
Use of interactive image analysis tool	✓	✓	
System security with user profiles	✓	✓	
Integration of user-defined functions (plug-in)	✓		

## Cameras

- Digital cameras according to GigE, USB, GenTL standard
- Framegrabber for Camera Link™ and CoaXPress cameras
- Up to 48 megapixel resolution
- Line-scan cameras (mono, color), sensor size 2K to 16K
- Gray value cameras with 8 bit or 16 bit depth
- Color cameras with 24 bit or 36 bit depth
- Sensor types CCD and CMOS
- Triggered image capturing (hardware or software trigger)
- Fast parallel image capture and image sequences
- Large number of cameras in one system
- 3D sensors (laser scanner, stereoscopy, sheet of light, time-of-flight)
- Thermography

## Algorithms

- Image enhancement (contrast, histogram, illumination)
- Geometrical transformations (rotation, mirroring, scaling)
- Image filters (smoothing, contrast, edges, morphology)
- Binary threshold, segmentation, blob analysis and pixel counter
- Automatic position and angle correction
- Template matching
- Color matching and color space transformations
- Model geometries (line, circle) with subpixel precision
- Bar code and Data Matrix code identification
- Pattern and character recognition (OCR, OCV)
- Classification (neural network)
- Measuring and measurement tolerance check
- Calibration functions for images and measurements
- 3D image processing

## Process communication and data

- Digital I/O
- Industrial bus (Profibus DP, PROFINET IO, Ethernet IP, MODBUS TCP, EtherCAT, PowerLink, Sercos)
- Standard Ethernet (TCP/IP, UDP/IP)
- Serial interface (RS-232)
- Data formats (XML, CSV, TXT, custom)
- SQL data bases (MySQL, MS-SQL, SQLite)

## Interfaces for add-ons

- Plug-in interface for customer-specific functions and algorithms
- Communication interface for customer-specific drivers and protocols

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CHECK**  
Industrial Vision Systems

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NeuroCheck GmbH is a member of the VDMA.