KISTLER

measure. analyze. innovate.

Keeping track of the entire process

Vision Inspection

Complete modular solutions to ensure your quality requirements are met

Absolute Attention for tomorrow's world

Kistler develops solutions for challenges in measurement technology with a portfolio that comprises sensors, electronics, systems and services. We push the frontiers of physics in fields such as emission reduction, quality control, mobility and vehicle safety: our products deliver top performance to meet the standards of tomorrow's world, providing the ideal basis for Industry 4.0. This is how we pave the way for innovation and growth – for our customers, and with our customers.

Kistler: the byword for advances in engine monitoring, vehicle safety and vehicle dynamics. Our products deliver data that plays a key part in developing efficient vehicles for tomorrow's world.

Measurement technology from Kistler ensures top performance in sport diagnostics, traffic data acquisition, cutting force analysis and many other applications where absolutely reliable measurements are required despite extreme conditions.

By supporting all the stages in networked, digitalized production, Kistler's systems maximize process efficiency and cost-effectiveness in the smart factories of the next generation.

Contents

The machine hall at pro-sort GmbH, Keltern, Germany

On the safe side – with automated test systems for efficient, end-to-end quality monitoring

Measurement technology for series production and quality laboratories, or parallel quality inspection systems: Kistler delivers complete solutions so you can always access all the data you want, exactly where you want it. Automated testing systems from Kistler help businesses to achieve their goals – with the focus always on added value.

Our Vision Inspection business field pursues a clear goal: to enable efficient, 100-percent testing and sorting of series parts by delivering automated testing systems that are either integrated into the production line or operated as standalone solutions. Our systems deliver multiple benefits: they guarantee quality and avoid bad parts – and what's more, camera-based image processing yields test results that provide information on potential approaches to optimizing production: giving users even more added value.

Kistler's comprehensive portfolio offers unique opportunities to analyze entire process chains. Our Straubenhardt and Shanghai sites specialize in automation and image processing. As well as high-resolution optoelectronic sensors, our solutions utilize digital camera systems, laser triangulation sensors and many other state-of-the-art components. We offer a complete concept comprising technical sales support, image processing expertise, artificial intelligence solutions, Kistler measurement technology, our own proprietary software, and highly integrated solutions: an all-round concept that guarantees high customer satisfaction.

Ready to take off for Industry 4.0
Special-purpose software, high-performance industrial computers and highly efficient controls allow direct access to captured quality data so it can undergo statistical evaluation. By collecting data on all tested parts, users gain an invaluable basis for optimizing their production processes and supplying proof of those processes, backed up by documentation: either locally, in the network, or in the cloud.

Programmed interfaces help to make this data available for downstream processing – by CAQ systems, for example. In all these ways, our automated testing systems play a key part in enabling our customers to implement Industry 4.0.

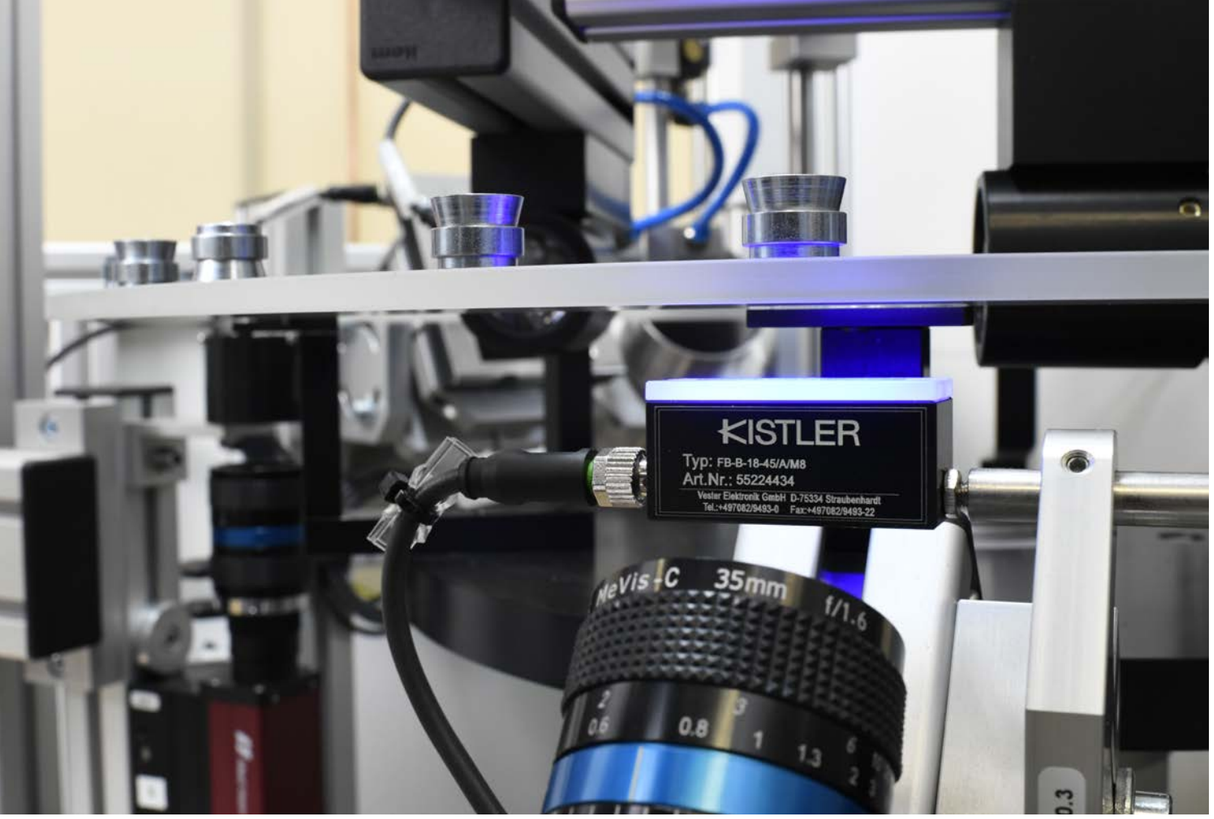
Benefits at a glance:
- Intensive advisory support and feasibility analysis of specified testing tasks
- 100-percent testing of series parts
- Large production volumes and fast cycle times
- Enhanced process reliability and optimized process efficiency
- Comprehensive recording and transmission of quality data
- Reduced quality costs
- Higher plant efficiency and lower total cost of ownership (TCO)
- Rapid amortization (ROI)
- Cyber security option
- Process data evaluation/statistics

To complement our test automation portfolio, Kistler offers a special laser marking system for continuously produced series parts ("marking on the fly"). Its purpose: to meet requirements for product traceability – which will be increasingly enforced as we move towards Industry 4.0.

Boost quality and cut costs
Kistler endeavors to do its very best to meet all our customers' requirements. To achieve this, we make use of a variety of machine systems for our intelligent testing cells: inclined-plane, continuously rotating glass plates, clocked systems (with robot handling as an option) and test cells for continuously produced parts in strip form.

And to meet requirements for unusual applications, we also develop special solutions with integrated robotics or additional components. The focus is always on optimizing customers' processes and resource usage – with the goal of ensuring their business success.

Stricter standardization and specifications for industrial products, more frequent complaints about quality and – in the worst case – recourse claims advanced against companies: faced with these trends of our times, customers can be sure they are on the safe side when they choose tamper-proof test systems from Kistler.



Kistler illumination and sensor modules in a test chamber

All-round solution expertise from one single source

As camera technology becomes more powerful, increasing numbers of test assignments can be accomplished with automated solutions. But at the same time, industrial image processing projects are becoming ever more complex. This is why we see close dialog with our customers as absolutely essential. Exactly what needs to be tested? How precise and how fast must testing be? (Precision and speed are interdependent!) What special requirements must be met by the feed and the testing process? How is sorting to be handled? How can optimum protection for parts be ensured during testing? Our sales specialists provide clear answers to all these questions at the earliest possible stage of the process, because we know that advice for our customers – underpinned by technical expertise – is one of the key success factors.

Detailed feasibility analysis guarantees that customers' requirements can be met

Customers often need clear-cut information about which of their quality problems can be solved, and which technology can be used to solve them. They also require binding quotations. To meet these needs, Kistler's image processing laboratory carries out feasibility studies as required. Our image processing laboratory has all the optical and mechanical equipment needed to issue reliable statements about the feasibility of meeting the specified requirements.

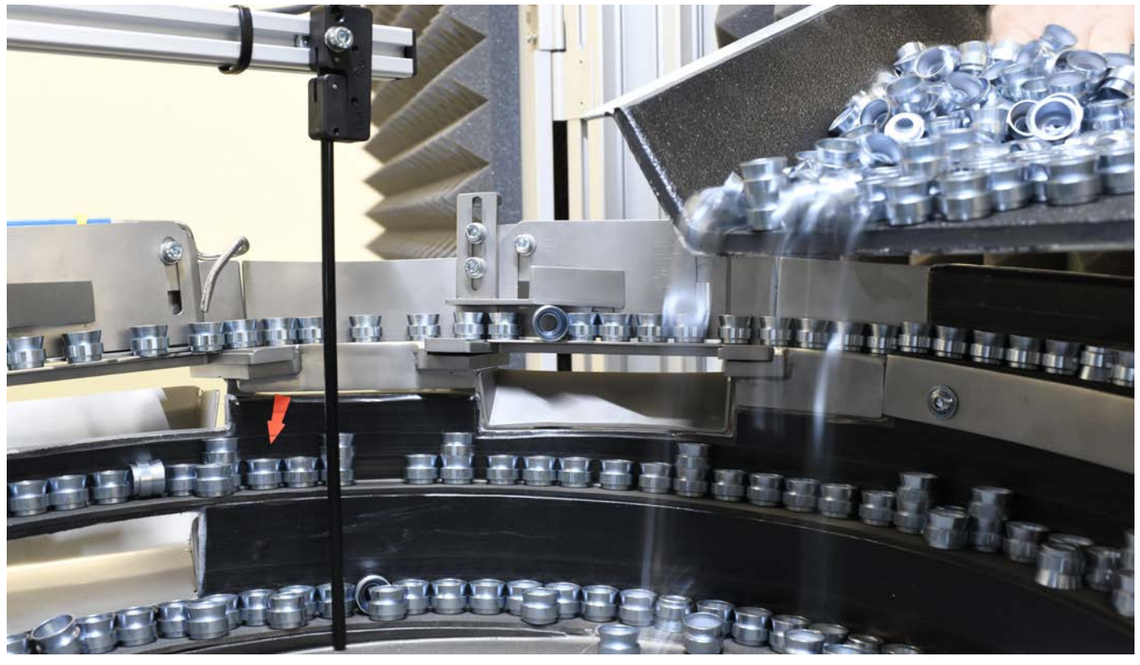
Modular setup with multiple camera inspection stations on a glass plate to inspect upper and lower sides of test objects

In-house proprietary software development

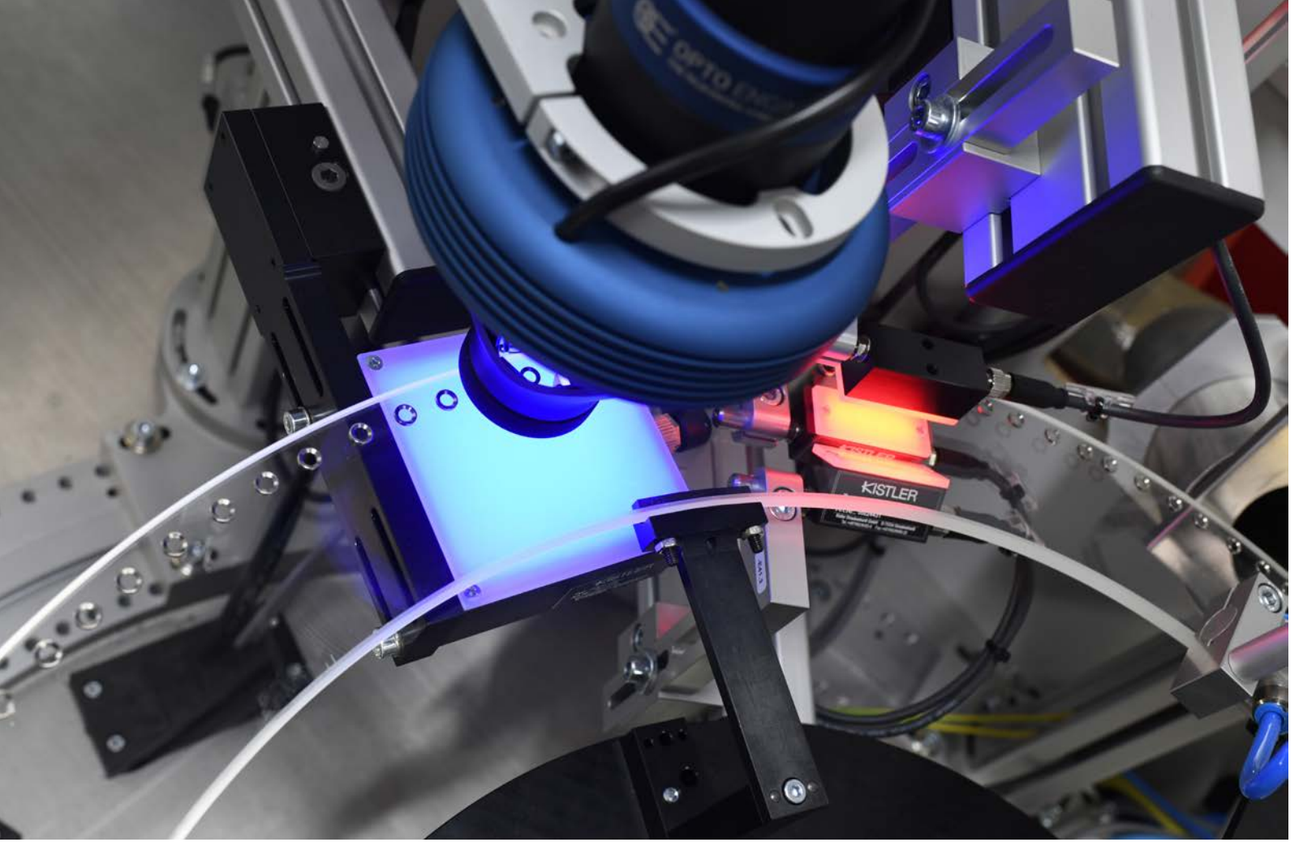
At its Karlsruhe facility, Kistler has inaugurated a competence center to continue developing our KiVision image processing software. The experienced developers in our Vision Center focus their work on enhancing the existing software by adding customer- or application-specific routines as required. This facility ensures that development of Kistler's image processing systems will continue long into the future.

Complete systems from one single source

Kistler solutions based on Kistler technology provide customers with a complete, coordinated package from one single source. We offer expertise in mechanical engineering, image processing and software, backed by precise laboratory analyses – a combination that ensures high vertical integration and paves the way for excellent quality assurance based on high-performance test automation.



Modular conveyor unit for continuous feed of units under test



Complete compatible and modular solution

As regards software, our machinery and plant concept focuses on user-friendliness and intuitive operation. Our systems are equipped with cutting-edge control technology and components compatible with Industry 4.0; they feature a standardized user interface with matching image processing software. It goes without saying that all our test systems are compliant with the latest Machinery Directive and all relevant standards, and each of them undergoes plant-specific risk analysis and evaluation. In response to customers' requests, additional software modules can be integrated to allow remote diagnosis and remote maintenance of our automatic testing and sorting systems.

The easy-to-operate user interface supplies full information on the current test job, processed for graphic visualization. In the era of digitalization, we offer a complete range of options for storing and evaluating data, conditions and proof of capability – from local concepts to secure cloud solutions.

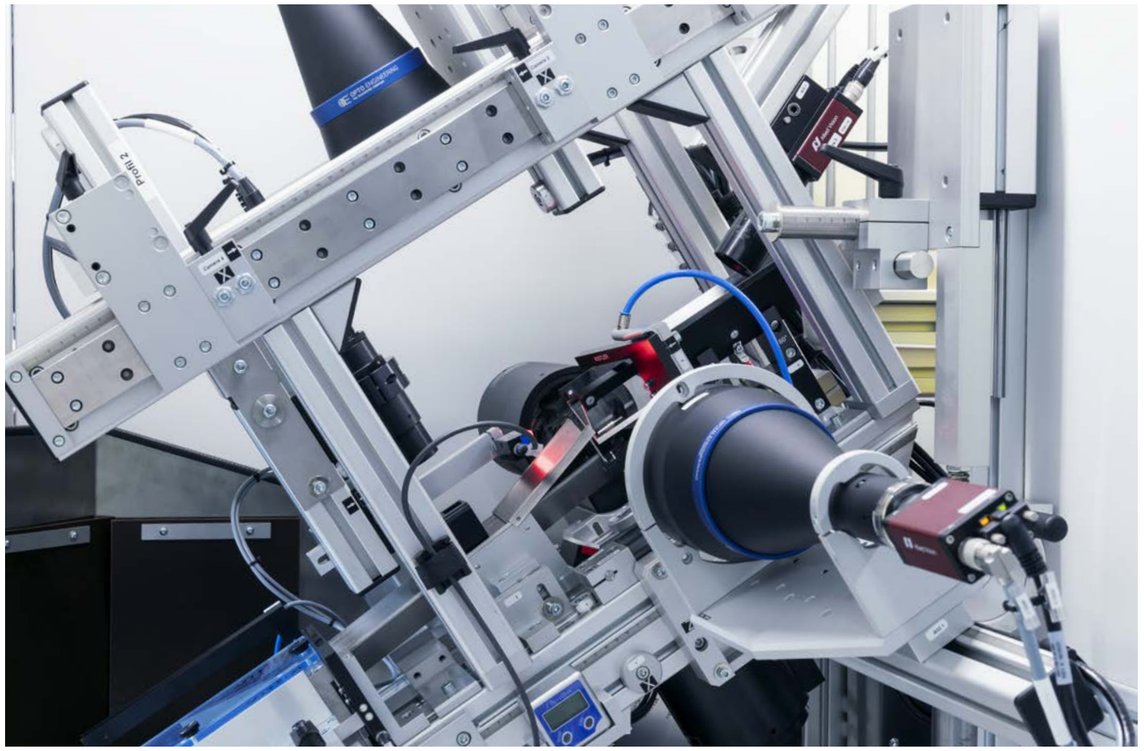
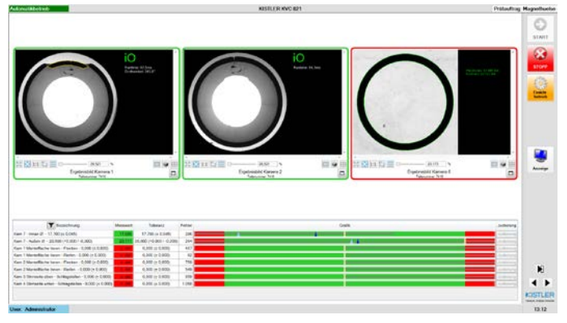


Image processing software KiVision

Setting up the specified testing tasks is fast and simple thanks to integrated image processing software: it has the ability to handle all common industrial testing methods that use image processing technology. An extensive range of tools and ready-made macros supports ultra-precise measurements and highly complex surface inspections. High-performance subpixel algorithms even make it possible to achieve measurement accuracies in the µ-range. The optional "Statistics" add-on package allows evaluation of measurement data as a Gaussian distribution curve or an SPC control card.

As our customers would expect, data transmission to external CAQ systems and integration into their own corporate network are also possible. These features allow external programming of test programs at a PC workstation and central management of program data and measured values.



Test systems: application areas and solutions

Testing principles and machine concepts

As their track record shows, test systems in Kistler's Vision Check (KVC) series ensure fast and precise 100-percent control of series parts – especially when large production quantities are involved. We make a basic distinction here between automated testing systems for continuous materials, and those for single parts fed in as bulk or individually positioned workpieces. Depending on the type of feed and testing involved, there are six different testing principles that provide the basis for standard machine concepts from Kistler.

These solutions include conventional feed components such as vibratory and linear conveyors as well as belt conveyors that transfer the test objects onto an inclined plane or a rotary plate, depending on the type of system. Increasing use is also made of servo axes and robots if test criteria require these part handling technologies.

Modular structure for individual combinations
Test systems from Kistler are based on a modular structure, and they are generally designed as standalone solutions.

The punched-part test cells for strip material with continuous feed are usually positioned in line, directly downstream of the production process concerned. In consultation with the customer, and depending on the requirements and types of parts to be tested, an individual combination of testing principle and feed can be implemented together with the appropriate image processing components.

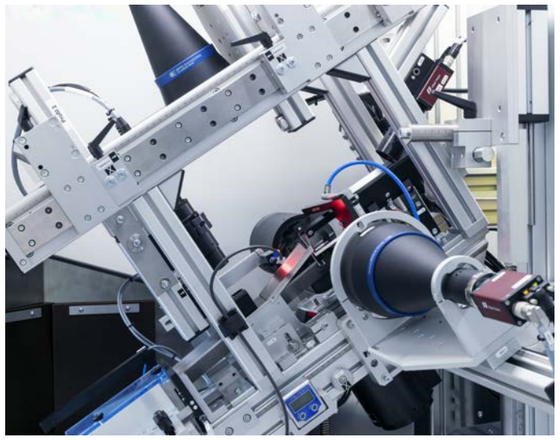
Test cell for punched parts (KVC 621)
100-percent inspection of continuous material with continuous feed, including integrated drive and strip guide

Clocked rotary plate (KVC 820)
Variant of the KVC 821 automatic testing and sorting system with continuous feed, but test objects are clocked to pass through the individual test stations on the rotary plate.

Inclined plane (KVC 121)
100-percent inspection of single parts with continuous feed on an inclined plane, with a sorting separator

Robot handling (KVC 950)
Individual part handing with a SCARA or six-axis robot to feed and position the parts at each testing station

Glass plate (KVC 821)
100-percent inspection of individual parts with continuous feed on a continuously rotating circular plate (usually made of hardened glass)



Integration solutions (KVC 42x)
Precision-tailored solutions for each application case – modular software and hardware components from Kistler combined with each other – for integration in assembly lines and injection molding machines, among other examples

Test systems for continuous materials

Equipped with digital camera technology, the KVC 621 test cell for punched parts is a universal, autonomous video measurement system for 100-percent inspection of continuously produced parts. Applications for this system include punching, lamination, galvanization and injection molding lines as well as rewinding processes. Customers benefit from the modular structure of the standard test cell, with up to six digital cameras in black-and-white or color versions offering different resolutions in each case. In this system, the integrated control and image processing components focus on high processing speeds for complex assignments with transmitted and reflected light.

Individual testing and sorting options
Users of these systems have a variety of options available to test their products. These range from conventional dimension checks on relevant areas and complete contour tracing for sporadic errors all the way through to detection of surface defects. Responses to errors can be set individually on the system: production can be halted, or bad parts can be either marked or separated.

Equipment features and options
- Comfortable operator experience thanks to touchscreen monitor
- Up to six matrix and line-scan cameras (black-and-white or color) with resolution of up to >50 million pixels
- LED flash illumination, transmitted and reflected light (telecentric, coaxial, diffuse)
- Triggering by laser light barrier
- Loop control via sensor, or incremental regulation for each machine cycle
- Adjustable strip guide with programmable servo drive
- Telescopic slide-out with keyboard and touchpad
- Integrated control cabinet including USP
- Remote maintenance is possible

How it works – in detail
The punching strip is protected as it is transported through the test cell thanks to the precision-adjustable strip guide in conjunction with the integrated servo strip drive. Continuous testing is guaranteed by an upstream sensor which, together with the drive, ensures automatic loop control. A laser light barrier (also by Kistler) triggers imaging as the test objects pass through the system. Coupling to the process only requires a clearance signal – clutch on/off – from the press, and a connection to the machine's stop circuit.

Variable designs
As well as the standard version, test cells of different sizes are available to meet customers' specific requirements: these include highly compact cells (for confined spaces) and versions with extended installation space (e.g. to accommodate additional cameras or to integrate a marking laser).

All the automatic testing systems presented here can be equipped with optional extra components such as a strip deflection roller which releases the features to be tested in the running direction.

Product groups
Test cells for continuous materials are suitable for 100-percent inspection of parts such as:
- overmolded stamped contacts
- formed plug contacts
- flat-stamped contacts
- leadframes

Test automation with Kistler – now online!
View our animation to experience convincing, first-class solutions from Kistler – the sure way to 100-percent control of your production:

https://www.kistler.com/vision

Source: pro-sort GmbH, Keltern, Germany

Systems for continuous testing of single parts

Automatic testing and sorting systems in our KVC 121 series ensure high throughput rates for small turned, pressed and molded parts. The inclined-plane principle is applied here, depending on the part geometry and the testing assignment: test objects are fed in and separated via a vibratory conveyor; an inclined prism or flatbed rail then carries them past the test stations at a defined angle, followed by sorting with the help of a separator. Key factors in choosing the test rails are the size, center of gravity and geometry of the parts to be tested.

Contactless dimensional checks, contour tracing and surface testing
These systems also deploy high-grade illumination components using both transmitted and reflected light, as well as telecentric precision lenses. Thanks to these features, dimensional and forming errors can easily be detected from the contour, and surface defects can be identified – with reproducibility ensured in each case.

The basic configuration of the KVC 121 automated testing system can be expanded on a modular basis by adding up to four digital cameras with different resolutions. Depending on the size and weight of the parts to be tested, they are fed in via an integrated feed system. The actual testing procedure is entirely contact-free.

Equipment features of series KVC 121
- Testing rates of up to 250 parts/min
- Comfortable operator experience thanks to touchscreen
- Up to four CCD matrix cameras (black-and-white or color) with resolutions of up to >50 million pixels
- LED flash illumination, transmitted and reflected light (telecentric, coaxial, diffuse)
- Adjustable vibratory conveyor for the part feed
- Separating device with swarf separator
- Triggering by laser light barrier
- Telescopic slide-out with keyboard and trackball
- Control cabinet and 19-inch USP
- CAQ connection
- Remote maintenance is possible

Automatic rotary plate testing systems in our KVC 821 series are the ideal choice to meet the increasing requirements for attributive surface testing, and they are equally suitable for dimensional checks on individual parts. Testing is performed on a continuously rotating plate with a glass ring attachment and a regulated servo drive with a friction clutch.

Depending on their size and weight, the test pieces are fed in via an integrated or separate feeder system. As an option, the basic versions of both designs can be expanded by adding up to eight digital cameras with different resolutions. The optimum target feed rate can be set via the integrated software.

When it comes to complex surface testing in particular, the “shape-from-shading” technology delivers impressive results. Additional options are also available, including a hardness testing module, intelligent feed systems, and 3D triangulation sensors.

Equipment features of series KVC 821
- Testing rates of up to 700 parts/min
- Comfortable operator experience thanks to touchscreen
- Up to eight matrix and line-scan cameras (black-and-white or color) with resolutions of up to >50 million pixels
- LED flash illumination, transmitted and reflected light (telecentric, coaxial, diffuse)
- Illumination unit
- Rotary plate with glass ring attachment
- Adjustable vibratory conveyor for the part feed
- Separating device with swarf separator
- Triggering by laser light barrier
- Telescopic slide-out with keyboard and trackball
- Control cabinet and 19-inch USP
- CAQ connection
- Remote maintenance is possible

Clocked test systems

Clocked test systems are mainly used when the test criteria call for parts to be handled in this way. For example, these systems are chosen if the parts for testing have to be presented to one or more cameras in different positions, or if a test object has to be rotated through 360° to scan for external surface defects.

Also: tactile, pneumatic and endoscopic tests
The central component of the Vision Check KVC 821 automated testing system is a rotary index plate on which the test objects pass through all the required test stations in sequence. This concept also makes it possible to integrate tactile, pneumatic or endoscopic tests into the automatic test lines. As well as conventional feed components, a SCARA robot can be used to place the test objects on the rotary index plate and remove them from it.

Especially when combined with the illumination unit, this makes the KVC 821 automatic testing system ideal for complex testing of sealed or coated surfaces, for example on highly complex punched and deep-drawn parts for the automotive sector.

Equipment features of series KVC 821
- Comfortable operator experience thanks to touchscreen
- Up to 24 matrix and line-scan cameras (black-and-white or color) with resolutions of up to >50 million pixels
- LED flash illumination, transmitted and reflected light (telecentric, coaxial, diffuse)
- Illumination unit
- Rotary index plate with workpiece holders
- Feed via vibratory conveyor, linear conveyor, SCARA robot or handling system
- Triggering by laser light barrier
- Telescopic slide-out with keyboard and trackball
- Control cabinet and 19-inch USP
- CAQ connection
- Remote maintenance is possible

Test systems with robot handling

On the automatic testing systems in our ROBOCheck KVC 950 series, a SCARA or six-axis robot carries out all the part handling. The robot presents the test objects to the various cameras and test stations precisely according to the requirements for the test criteria, positioned as necessary.

Six-axis robots for challenging test assignments
Robots pick the test objects (e.g. from the accumulation section of a linear conveyor) and deposit them correctly in the respective crates or trays. This individual part handling makes the KVC 950 automatic test system especially suitable for complex test assignments and surface checks – for example, complete inspection of the outer surface on turned parts such as banjo bolts.

When six-axis robots are deployed, parts can also be presented to the image processing components in different positions so that multiple characteristics can be captured in one test cycle.

Equipment features of series KVC 950
- Comfortable operator experience thanks to touchscreen
- Up to eight matrix and line-scan cameras (black-and-white or color) with resolutions of up to >50 million pixels
- LED flash illumination, transmitted and reflected light (telecentric, coaxial, diffuse)
- Dome illumination (shape-from-shading technology)
- SCARA or six-axis robots for part handling
- Triggering by laser light barrier
- Telescopic slide-out with keyboard and trackball
- Control cabinet and 19-inch USP
- CAQ connection
- Remote maintenance is possible

KLM 621 laser marking system

Suitable for universal use, the LASERmark KLM 621 laser marking cell is an autonomous system for marking continuously manufactured punched and hybrid products. It is mainly used for complete marking or coding of all manufactured parts in order to ensure traceability. The KLM 621 is usually positioned directly in a production line, and is equally suitable for use in punching, injection molding and assembly lines. Process coupling in a punching line is implemented via the clutch signal from the press and the machine's stop circuit.

Marking on the fly for over 2,500 parts per minute
When the KLM 621 is combined with the KVC 621 test cell for punched parts, the result is an exceptionally efficient solution for 100-percent control and documentation of punched and hybrid parts. Hallmarks of the diode-pumped marking laser used here are excellent beam quality and a very high beam deflection velocity. Thanks to these features, even the smallest parts can be marked with a very high cycle rate of over 2,500 parts per minute. Marking takes place while the parts are moving – a mode known as "marking on the fly".

Equipment features and options
- Accurately positioned high-precision marking:
  - plain text: batch numbers, production data (date, time stamp)
  - bar codes, data matrix codes, logos
- Alternating marking is possible
- Marking speeds of up to 2,000 parts per minute with 6-character marking

Integration solutions

Compact systems for general image processing tasks
Solutions in our KVC 4xx series allow integration of camera stations in plants without the use of a complete automatic testing system. Cutting-edge image processing hardware and software, backed by our many years of expertise in control technology and data evaluation: based on these sound foundations, we can provide the right solution for every application case. Our solutions are designed to match the size of the tested parts, the testing speed and level of testing accuracy required by each customer. This means that our solutions are used in virtually every industrial context – ranging from the food and automotive sectors to the cosmetics industry and the medtech sector. No matter where our technology is used, the key goal is always the same: solutions that guarantee reliable processes for our customers.

This arrangement has multiple benefits for users:
- Unrestricted functionality of current image processing software for varied applications in industrial punched and turned part production, also general automation
- Simple integration into existing production lines thanks to compact dimensions and industry-compliant peripherals
- Uniform user and menu interfaces
- No additional external network components are required
- Image processing components and IPC are interchangeable within the KVC product line

Original Service by Kistler –
service directly from the manufacturer

The Original Service by Kistler

Who knows their products better than the manufacturer? Original Service by Kistler is the comprehensive service solution – direct from the global market leader in dynamic measurement technology. We deliver service that matches the quality of our tried-and-tested products and system solutions. What's more, we offer a range of graduated service packages so we can supply the solution that best matches your needs.

Only the best is good enough
Service solutions from Kistler optimize the performance of industrial processes throughout the entire value chain. This is how we help maximize the value of our systems in the long term – with better results and more transparency in every process.

Creating sustainable value
We offer services that boost the performance and extend the lifetimes of machinery and plant – the basis for creating sustainable value. Better service also means better results:

- Full range of services from one single source – from setup and maintenance through to training
- Advice – Kistler can draw on a vast stock of measurement and application know-how
- Protection for investments – thanks to optimized costs and longer lifetimes

Benefits of Original Service by Kistler

Reliable
- Defined scope of service
- Qualified specialists
- System backup and documentation

Professional
- Advisory support and training by experts
- Inspection and testing of entire systems
- Pragmatic, practice-based solutions

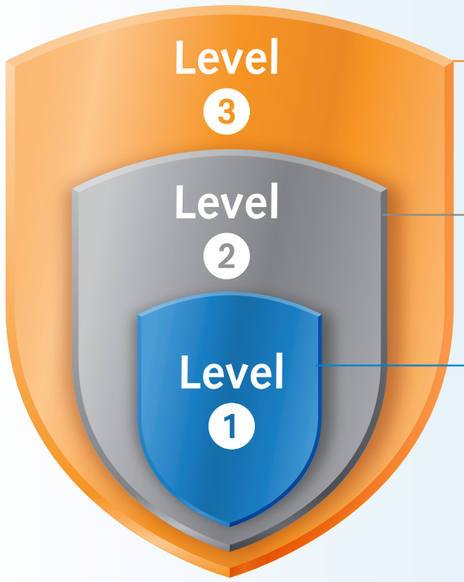
Solution-oriented
- Fast response times
- Customized service packages
- Strong focus on customers and flexible approach

Added value
- In-depth application know-how for advisory support
- Optimized processes and reduced costs
- Higher productivity and overall plant effectiveness

THE ORIGINAL SERVICE

Choose the service agreement that suits you best: for reliable protection and optimized performance

Kistler offers you service solutions with a choice of three levels: select the standards you want for scope of service and response time – and you'll get the solution that matches your needs.



Maximum support and peak efficiency
Your guarantee of maximum possible support from the Kistler service team – backed up with advice, training, regular maintenance and optimization. The key to peak efficiency for your production processes and superlative plant performance.

Longer service lifetimes, higher precision
By undertaking scheduled maintenance, inspections and calibrations, Kistler makes sure that your operation runs smoothly. This service level maximizes your plant's lifespan and precision while minimizing outage risks and downtimes.

Straightforward troubleshooting
Whenever service is needed, Kistler is quickly on the spot to help you resume operation of your plant as soon as possible – so the costs of unscheduled downtime are reduced to the minimum.

What we offer	Level 1	Level 2	Level 3
Scheduling	✓	✓	✓
Contract management	✓	✓	✓
Remote technical support	✓	✓	✓
On-site support	✓	✓	✓
Annual remote training (2 hours)		✓	✓
Download portal		✓	✓
Newsletter on software updates		✓	✓
Support analysis		✓	✓
Response time for on-site support		3 days	1 day
On-site calibration of instruments at customers' premises	O	O	O
Regular scheduled maintenance	O	O	O
On-site training and instruction	O	O	O
Training for specific processes and applications	O	O	O
Process optimization		O	O
Exclusive 24/7 hotline		O	O
Access to emergency stock		O	O

* Machine capability analysis
** Measurement system analysis

✓ = included, O = optional

● Sales Center
▲ Tech Center
■ Production Center

At our customers' service across the globe

Thanks to Kistler's global sales and service network, we are always close to our customers. Some 2,000 employees at more than 60 locations are dedicated to the development of new measurement solutions, and they offer customized on-site support for individual applications.

Find out more about our applications:
www.kistler.com/solutions

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