KTvision Inspection Systems

EEP Maschinenbau & Elastomerrecycling GmbH

TÜVRheinland ZERTIFIZIERT

KT Vision Systems

www.eep-maschinenbau.de

KONZEPT

Mit der Kooperation der führenden Experten am Markt hinsichtlich Mechanik, Sensortechnik, Software, Anwendung und Prozesskette haben wir eine einzigartige Kombination geschaffen;
KT Prüfsysteme sind dadurch die einzigen Systeme am Markt die für jeden Anwender entwickelt worden sind.

CONCEPT

With the cooperation of the leading experts on the market in terms of mechanics, sensor technology, software, application and process chain, we have created a unique combination;
KT Vision Systems are thus the only systems on the market that have been developed for each user.

KT PRÜFSYSTEME

sind einzigartig in der Bildauswertung durch die konsequente Weiterentwicklung von Kamera- und Sensortechnik. In Verbindung mit der entsprechenden Software und der einfachen Bedienung ergibt dies höchste Qualität und Effizienz in der Prüfung.
Die modulare Bauweise erlaubt eine einfache Konfiguration und Nachrüstung. Die Anlagen sind als Plug and Play Anlagen konzipiert und ohne besondere Kenntnisse sofort einsatzbereit.

KT VISION SYSTEMS

are unique in the picture analysis through consequent use of innovative sensor technologies. This in combination with the very special software and the simple operation delivers highest quality and efficiency in the vision inspection.
The systems aim to be as simple as possible needed with a modular design; designed as plug-and-play systems and without any special knowledge for immediate use.

KT SENSOREN

Innovationen im Detail und höchste optische Präzision ermöglichen detaillierte Bilder von den Teilen. Mehrstufige Beleuchtungssysteme bieten höchstmöglichen Kontrast und somit eine sichere und reproduzierbare Oberflächenanalyse.
Alle Sensoren sind mit eigener Rechnerleistung ausgestattet und arbeiten autonom. Nur die Ergebnisse und die Prüfanweisungen werden über ein Netzwerk mit dem Bedienrechner ausgetauscht.

KT SOFTWARE

ist intelligent und einfach zu bedienen! Beim KT auto-setup stellt sich die Prüfmaschine selbständig auf die Anlern-/Musterteile ein. Der Bediener beeinflusst im Normalfall nur noch die Prüfschärfe und die minimale Fehlergrenze. Beleuchtung, Blitzzeiten, die Prüfzonen und die restlichen Parameter für die Oberflächenanalyse werden automatisch ermittelt und optimal eingestellt. Das KT auto-setup funktioniert bei standardisierten Bauteilen wie O-Ringe oder V-Seals. Für nicht standardisierte Bauteile/Dichtungen steht ein Expertenmodus zur Verfügung, um eigene Prüfrezepte zu erstellen.
Eine weitere Besonderheit ist die Mustererkennung zusammen mit einem Expertensystem, welches die finale Entscheidung fällt ob eine Fehlstelle noch akzeptabel ist oder ob das Teil als fehlerhaft ausgeblasen wird. Dieses intelligente Entscheidungsverfahren reduziert signifikant den sogenannten Pseudoausschuss und macht das Prüfsystem wirtschaftlicher als die meisten anderen Systeme am Markt.

KT SENSORS

Innovations in detail and highest optical precision are generating detailed pictures of the parts. Multi-level lighting systems offer the highest possible contrast and thus a safe and reproducible surface analysis.
All sensors are equipped with their own computing power and work autonomously. Only the results and the test instructions are exchanged via a network to the control computer.

KT SOFTWARE

is intelligent and easy to use! With KT auto-setup, the vision system applies a self-test on the master samples or even the first teach in parts. Generally, the operator sets only the severity and the minimum error limit. Lighting, flash, the test zones and the remaining parameters for the surface analysis are automatically determined and set optimally. The KT auto-setup works for standardized components such as O-rings or V-Seals. For non-standard parts/seals, the expert mode is suitable to create your own receipts.
Another highlight is the defect recognition together with an expert system, which drops the final decision as to whether a defect is acceptable or the part is blown out as faulty. This intelligent decision procedure reduces significantly the so-called pseudo scrap and makes the test system more efficient than most other systems on the market.

KTsoftware

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KT Software - KTvision

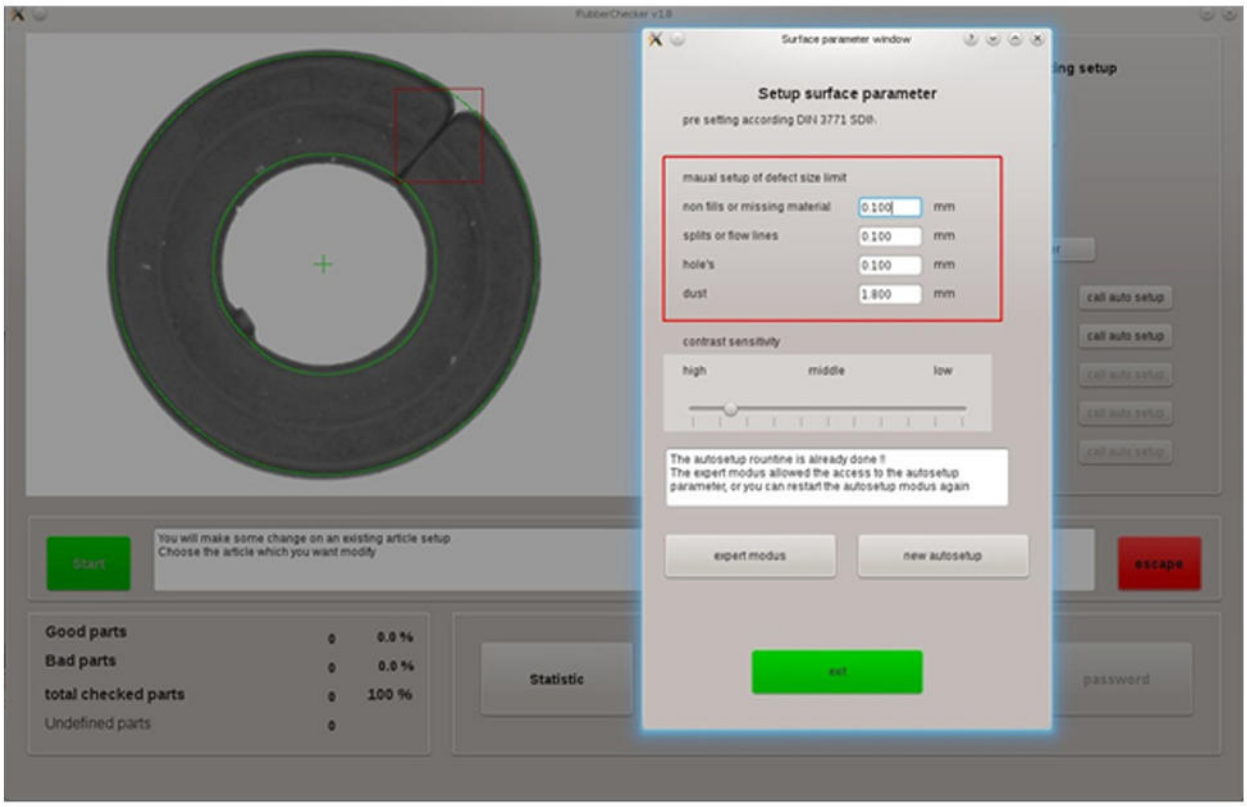
The KT Software is especially designed for rubber seals, but also useable for other materials. Rubber is called a living material and the surface condition of rubber seals has a wide varity of different looking. Therefore the rubber surface examination needs a special algorithm.

The KT software consists of all necessary tools for a vision inspection machine. Features are:

- modern designed GUI
- a special feature is the active user guidedance
- facilitation for the user: auto-setup modus for usual seals like o, v, or q-ring, break seals, frame seals and so on
- expert setup modus for complex seals and for general optimization after auto-setup
- pattern recognition: the software recognizes the general type of defect
- all size limits displayed and prompt in mm or inch
- informative statistic
- machine operation (PLC)

KTvision - auto-setup:

The KT auto-setup is a useful tool for a fast machine setup. The operator can choose between the general type of seal in a list. Afterwards the operator can move a good sample under each camera and initialize the auto-setup.



The auto-setup adjusts the right light combination and the right camera parameter, as well as setting the area of interest. After a successful auto-setup, the machine can be used without any more adjustments. Only defect tolerance and basic sensitive settings are necessary to set.

This feature is even more useful for customers changing the parts in a high frequency.

KTvision - pattern recognition

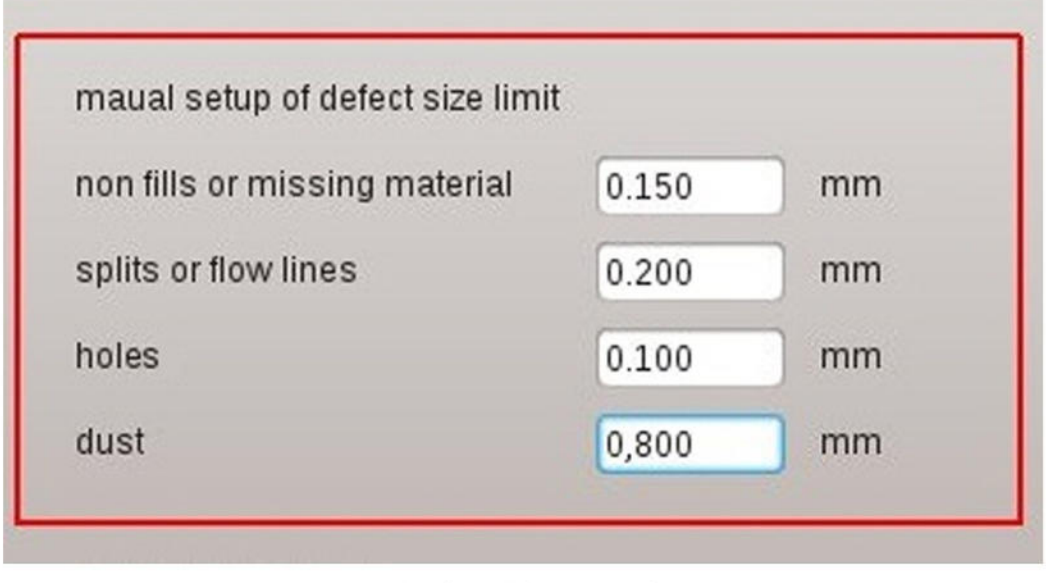
One of the most advanced feature is the pattern recognition. The software is not only checking the amount of white or dark pixel, it's able to recognize the major pattern of a defect. The customer can name the different pattern like: non fill, split, flow line, dust or whatever.

<u>The huge advantage of a pattern recognition is:</u>

- a strong reducing of called false scrap, while the software can recognize dust and contamination. Usually this leads to a decision as a bad part, but the KTvision can understand that dust, within a maximum size, can be accepted.

- The second advantage is a better statistic information, while bad parts are separated and counted in different kind of defects.

- The next useful advantage is the feasibility of setting different defect limits for different types of defects.



Example for different defect limits

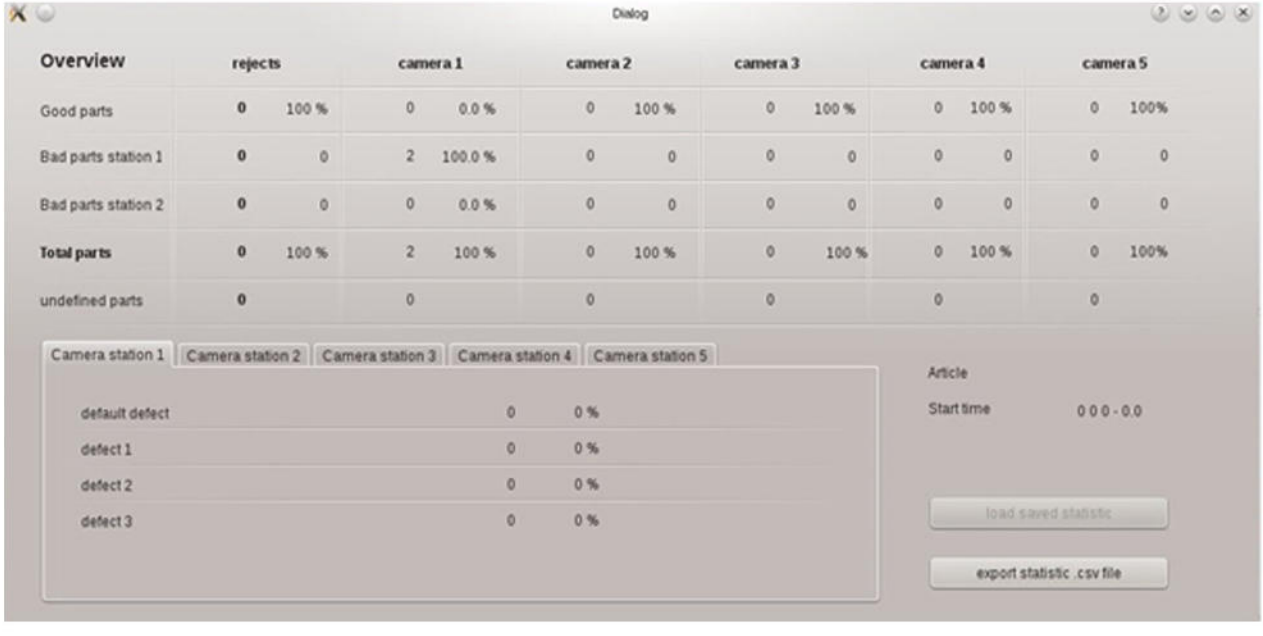
- a further advantage with an intigrated pattern recognition is: different limit values could be set for different defect types, in real measure, in mm or inch. Is the extension of a defect type higher than the set defect threshold the part is detected as faulty and sort out.

Using the maximum limit dimension for a type of a defect in mm or inch is more convenience for the operator as any setup in pixel amount.

KTvision - Statistic

The statistic provides several useful information from the last inspection run. It's counting the good, bad and undefined parts as well as the different defect pattern.

The statistic can be export as an csv file (excel form), by an external network connection or downloaded to a memory stick.



KTvision – active operator guidance

KT understands under "active operator guidance" a useful tool to support the operator. There are two main graphic and text features: The software will flash in a red frame, covering the next likely operation. This will guide the eyes from the operator, together with a help text output in a separate text field, to the next right, or necessary operation.

A red frame flashing to show the next probable operator input

A short discription for necessary operator input or status report as quick help for operator is shown in the text field

Sorting

The parts are sorted depending on check result. Therby the items are blown off from the glass turntable and are collected in transparent and easy to handle boxes. The filling capacity is visible any time without need to remove the boxes.

To select the good parts in the right box all active sensors have to confirm with status „good“. This security measure avoids that a part is marked good although possibly a sensor has not inspected completely.

Bad parts could be seperated in two different boxes. If required, different defect types could be sorted out seperately or one box only includes bad parts to be reworked (e.g. flash) and the second box the really bad parts.

Parts with a wrong/not provable position, parts not marked with status „good“ by all sensors or parts with a fault unclear are fed back again to the inspection cycle.

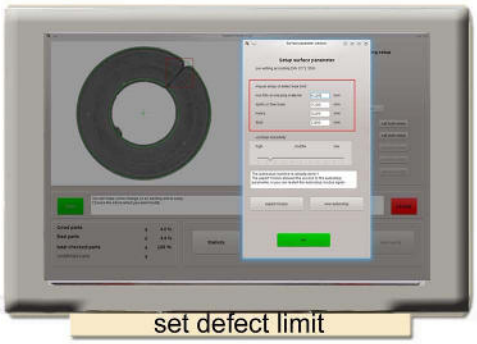
Highlights at a glance:

- Newest innovative algorithms for stable inspection results
- Minimization of pseudo false output rate by pattern identification
- Informative statistics of various defect types (MS-Excel compatible file)
- Comfortable touchscreen operation with clearly arranged and self-explanatory user interface (GUI)
- USB Port and network-compatible
- Active operator support with visual guidance
  >> next-step-help, where the software expects the next input/setting (red frame > next step) and additional short-help-text during the operator usage
- Innovative auto-setup function for fast read-in of articles during frequent product changes (>article library)
  >> Preset selection of the basic shape of the parts, then scanning good part once with each sensor - ready

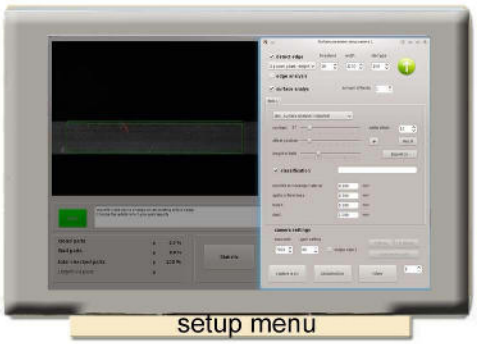
picture gallary Ktsoftware

main operating page

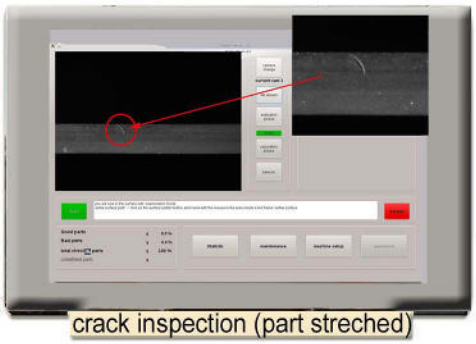
surface defect marked



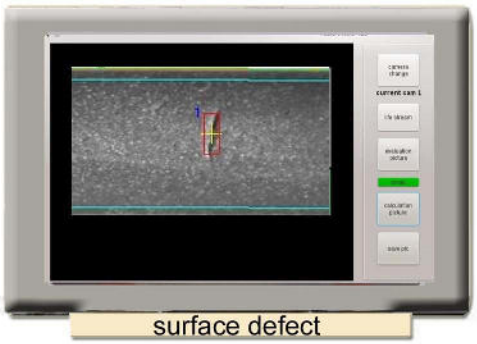
set defect limit



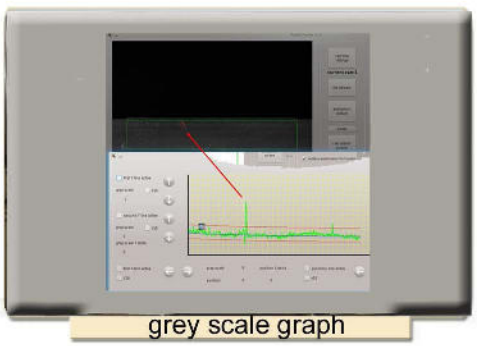
setup menu



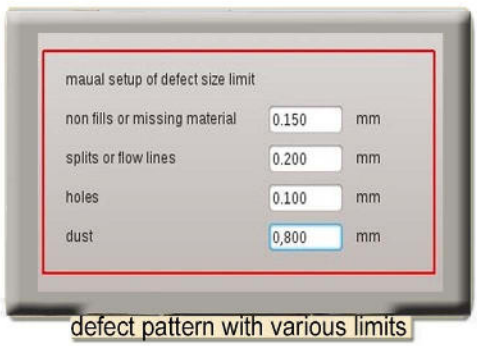
crack inspection (part streched)



surface defect



grey scale graph



defect pattern with various limits

statistics

software tools

setup image processing

main page indexer inspection system

Maschinenbau & Elastomerrecycling GmbH

KTprime

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KTprime

Product Information

Modular single or double glass plate inspection system

Typically used for:

all kind of o-rings and similar round symmetrical sealing parts, especially for rubber, plastic, ceramics or light metal materials

Details and Advantages

This system comes up with the best in class inspection software and unique precision sensors for secure quality assurance system with best price/ performance ratio. Based on modular construction the system allows optimal adjustments/updrades according to customer needs anytime.

All high quality optical camera sensors are equipped with a lighting system created for special surface requirements. This ensures a high contrast and a stable long-term inspection result.

The analysis software, especially the one for the surface analysis, is equipped with the latest innovative algorithms designed for stable results and a minimal amount of pseudo-rejects. The easy to use operator interface (HMI) with touchscreen control has a very special and comfortable feature in addition:
- **The active userguidance for easy setup -**

The entire inspection system is constructed on a solid frame and requires a minimum of space. Good accessibility and cleaning capability is assured.

Product features

- max. part size from 2 until 40 mm (50 mm KTprime²) OD (outside diameter) and max. 30 mm height
- throughput until 10 pieces per second (depends on part material and inspection volume)
- surface and geometric inspection
- modular construction, simple adaptable to the customers need
- single glass table (extendable to double glass table) inspection machine
- auto-setup function for easy approach to new products/seals
- HMI (**H**uman **M**achine **I**nterface) comfortable and easy adjustments by active user control and touchscreen
- surface analysis with pattern recognition to reduce the false scrap, and more statistic informations (Excel-compatible) with details about the imperfections

The basic machine can be extended with a second glass table including a turn over station

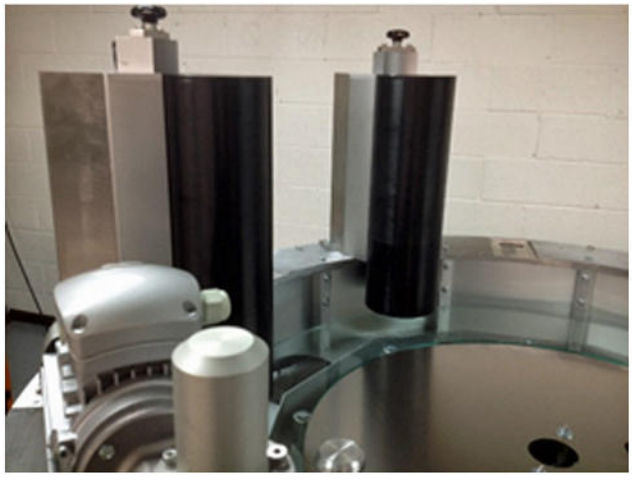
- KTprime-B1 Basic inspection machine with one glass table
- KTprime-B2 additional glass table including turn over station for the **KTprime²**

The feeding and separation unit will be available for two part sizes

- KTfeeder_1 Standard feeder for part size from 10 until 40 (50) mm
- KTfeeder_2 Microfeeder for small parts from 2 until 15 mm

The KTprime can be configured with several intelligent sensor units according to customer needs

- KTsensor_M Sensor unit for geometrical inspection (i.g. OD,ID and CS)
- KTsensor_O Sensor for surface inspection, view from the top or bottom
- KTsensor_A Sensor for outside and inside surface inspection
- KTsensor_H Height sensor for profile or height measurement



All sensor units are working as independent vision sensor including camera, lens, optic, flash controller, part tracing and triggering, as well as an own small PC (embedded board) with independent vision software. Each sensor is only connected with the operator PC via GigE network. Each sensor can be assembled on each position. This makes the KTprime full flexible for any customers requirement.

Geometric Sensor Type M

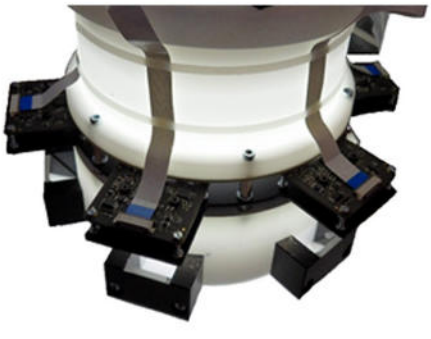
Sensor for geometric measurement i.g. for o-rings, outside, inside and radial cross section, as well as geometric values from frame seals or other.

Camera type:	3 MPixel	5 MPixel
Resolution:	0,02 (0,025) mm	0,016 (0,02) mm
Field of view:	40 (50) mm	40 (50) mm
Measurable tolerance cpk 1,6:	+/- 0,15 (0,2) mm	+/- 0,12 (0,1) mm
Frames per second:	10 fps	7 fps
Illumination:	back light	back light
Objective:	telezentric	telezentric

Surface Sensor – top side Type O

Surface inspection sensor with top view. Surface defects reference by DIN 3771 N (S)

Camera:	3 MPixel
Pixelresolution:	0,02 mm
Limit of visible defect size:	0,15 x 0,15 mm
Min. gray scale (contrast):	20 gray steps
Min. defect depth (contrast):	0,08 mm
Illumination:	LED dom and dark light



Outside (inside) Sensor Type A

Outside and inside sensor for surface inspection with a view from the outside or inside.

Outside – inside with one sensor is possible up to an outside diameter of 25 mm. For bigger parts a separate outside and inside sensor is necessary.

Camera:	6 x 1,2 MPixel
Pixelresolution per sensor:	0,025 mm
Limit of visible defect size:	0,2 x 0,15 mm
Min. gray scale (contrast):	20 gray steps
Min. defect depth:	0,1 mm

General technical data sheet:

Power supply:	220 V 50 Hz
Power consumption:	1,2 KW
Compressed air:	min. 5 at
HMI	
Operating system:	Linux
Display:	14“ Touchscreen
Max. amount sensors	
Single glass table machine:	up to 6
Double glass table machine:	up to 9
Max. partsize (filmgate)	
Single glass table machine:	max. 40 (45) mm
Double glass table machine:	max. 50 (55) mm
Dimensions (w/l /h:)	2,00 x 3,30 x 2,20 m
with opened cabinet	height 3,10 m
Externernal LAN network:	GigE Interface DHCP oder statisch

KT Software - KTvision

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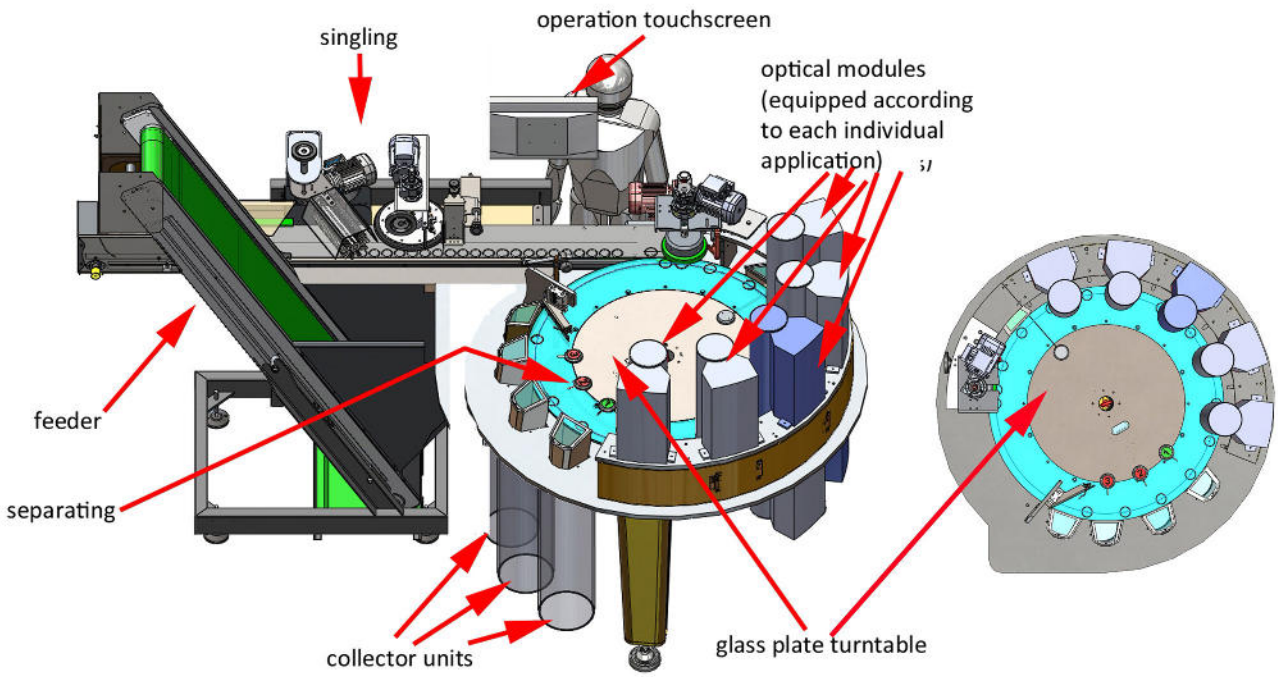
- pattern recognition: the software recognizes the general type of defect
- all size limits displayed and prompt in mm or inch
- informative statistic
- machine operation (PLC)

For more informative details, please see our brochure „Ktsoftware“

KTprime one-plate turntable system



Thanks to the modular concept, the KTprime is upgradeable anytime and thus offers a high grade of flexibility and adaptation according to any user specific needs.

module overview

- measurem. sensor
- surface sensor
- outside sensor
- height sensor

camera module

- feeder for parts
  - up to 15 mm
  - up to 40 mm

feeder module

KTprime one-plate system

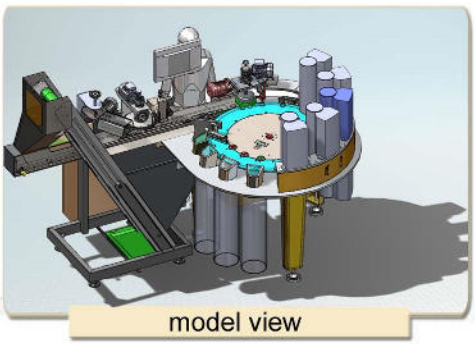
software module

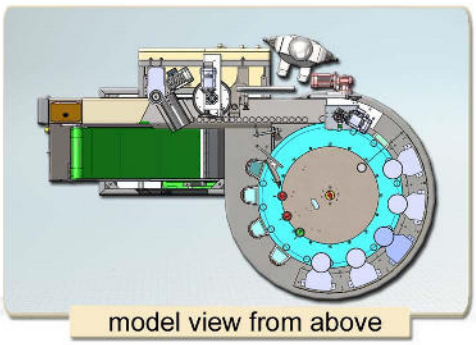
- x-ray module
- deformation module for cracks inspection
- Double-plate module

module for various applications

picture gallery KTprime

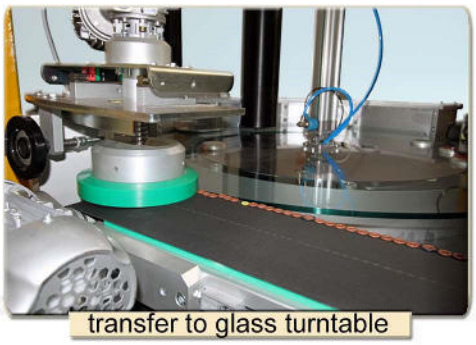

front view


model view


model view from above


feeder


singling

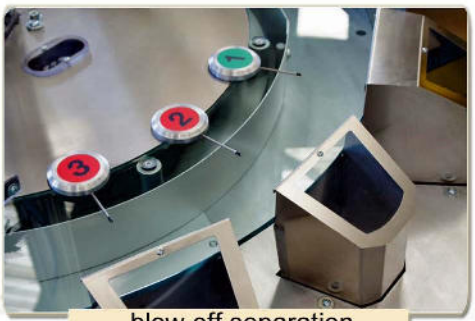

transfer to glass turntable


glass turntable


operating unit


inspection software


camera sensors


blow off separation


collector-box units

Maschinenbau & Elastomerrecycling GmbH

Highlights at a glance:

- Upgradeable plug & play system
- Modular construction with high grade of flexibility and adaptation according to any user specific needs
- Intelligent high precision scanning-technology for safe surface analysis
- Newest innovative algorithms for stable inspection results
- Minimization of pseudo false output rate by identification of contamination
- Informative statistics of various defect types (MS-Excel compatible file)
- Comfortable touchscreen operation with clearly arranged and self-explanatory user interface (GUI)
- USB Port and network-compatible
- Active operator support with visual guidance
  >> next-step-help, where the software expects the next input/setting (red frame > next step) and additional short-help-text during the operator usage
- Innovative auto-setup function for fast read-in of articles during frequent product changes (>article library)
  >> Preset selection of the basic shape of the parts, then scanning good part once with each sensor - ready

KTline

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KTline

Product Information

The KTline is especially designed for unstable or soft sealing parts.

In particular, the KTline is suitable for cutted hose rings with a diameter up to 120 mm OD.

The hose rings are checked double-sided, as well as the inner and outer side, for typical surface defects.

They are e.g.:

- Cutting errors on the edges
- Cracks created by sliced bubbles
- Non fills, flow lines, burned material, visible on the whole surface

A half transparent feeder belt with forced-turnaround serves here as carrier.

The big advantage against a double glass-plate inspection system is that this type of machine has only one transition point. After transferring the unstable part from the feeding and separation unit to the first belt, the part still remains in the same convoyer until blown off in accordance with the inspection result.

With high-resolution cameras both sides of the part and in addition the inner and outer surface are inspected by special sensor units. A set of sensors checks on the first belt one side of the parts, and a second set checks after the forced turn-around the other side.

In addition to the surface sensors a measuring station is optional available, able to measure ID, CS and height on one point.

Technical data KTline:

■ Dimension (l/w/h)	approx. 4 m x 1,8 m x 2 m
■ Connection values:	220V 2 KW min. 4,5 at compressed air
■ HMI operating system:	Linux
■ HMI visualisation:	Flat panel 14“ touchscreen
■ External LAN network:	GigE Interface DHCP or static

Defect size:

■ Camera resolution	0,025 mm
■ Surfacde defects	min 0,25 mm x 0,25 mm and min depth 0,2 mm
■ Split on the top or bottom side	min. 0,1 mm x 0,5 mm min. visible > 25 gray scale contrast

Measurement station:

■ Pixel resolution	0,01 mm
■ Measurement capability for	+/- 0,1 mm tolerance

all technical values are tentative up until a final technical alignment

KTstep

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KTstep

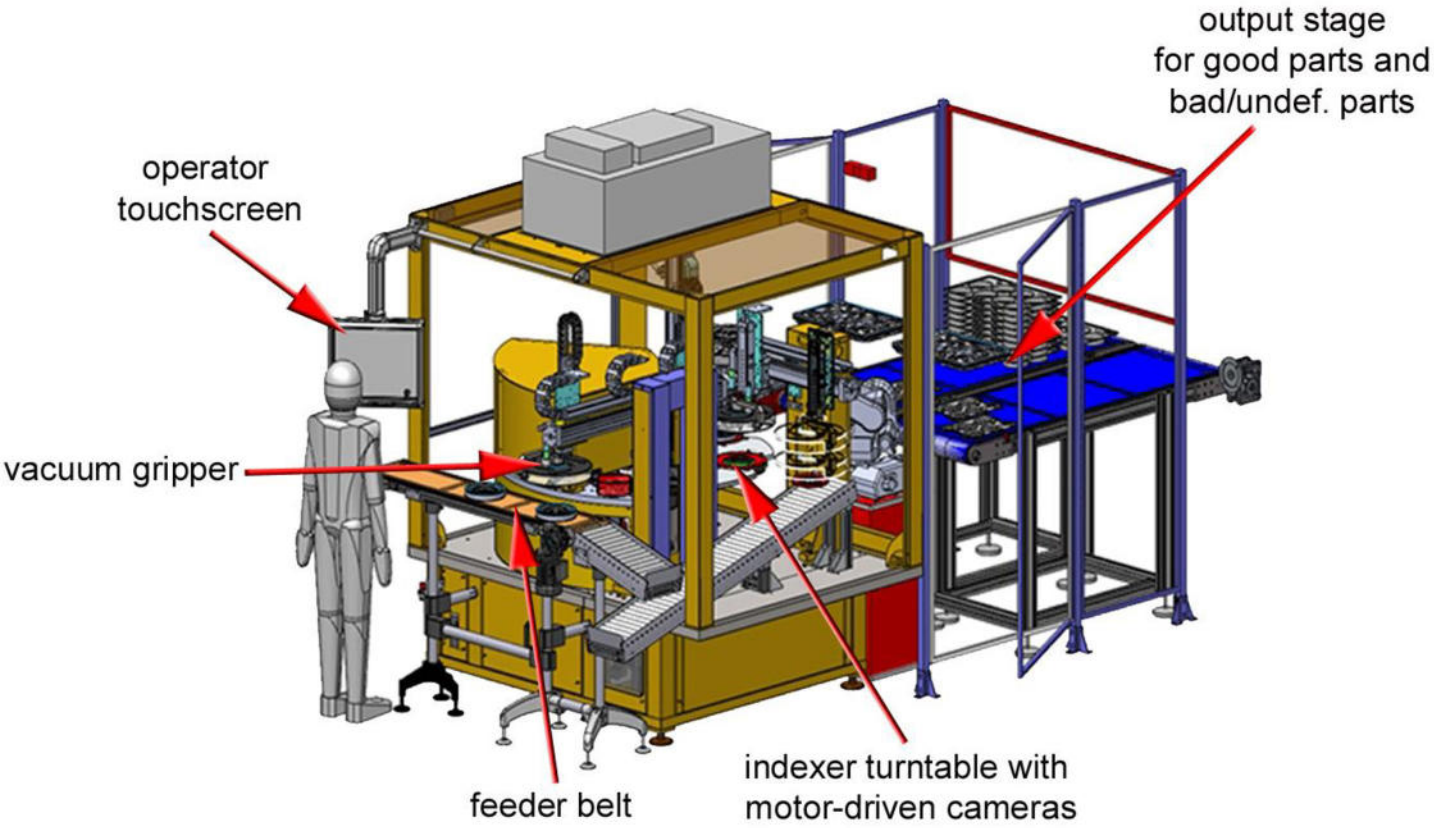
Product Information

High performance 2D/3D testing system for oil seals and other complex rotary seals and parts, either made out of metal, plastic, rubber or a combination of these with an external diameter of up to 200 mm OD

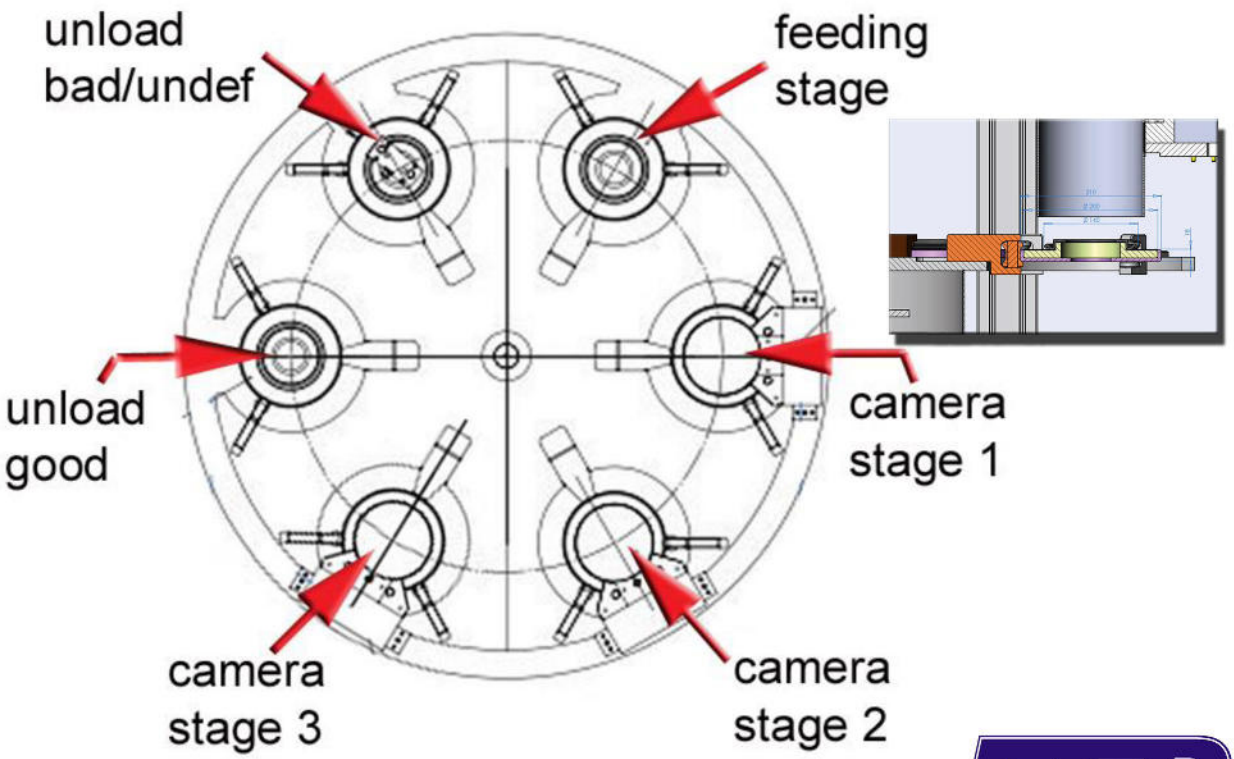
This KTstep inspection system provides specific surface inspection placing the parts on a rotating disc with a centering groove. the parts themselfs are rotating while being inspected. This system has the advantage of high flexibility and quick set up changes.

The KTstep has a solid and stable index table as basic machine with various extension and connection options, including the possibility of integration into existing production cells (de-molding, trimming) as well as packaging.

The KTstep inspection system is based on an indexer turntable with 6 stages. Each 3 stages can be equipped with camera moduls, the other 3 stages serve loading and unloading.

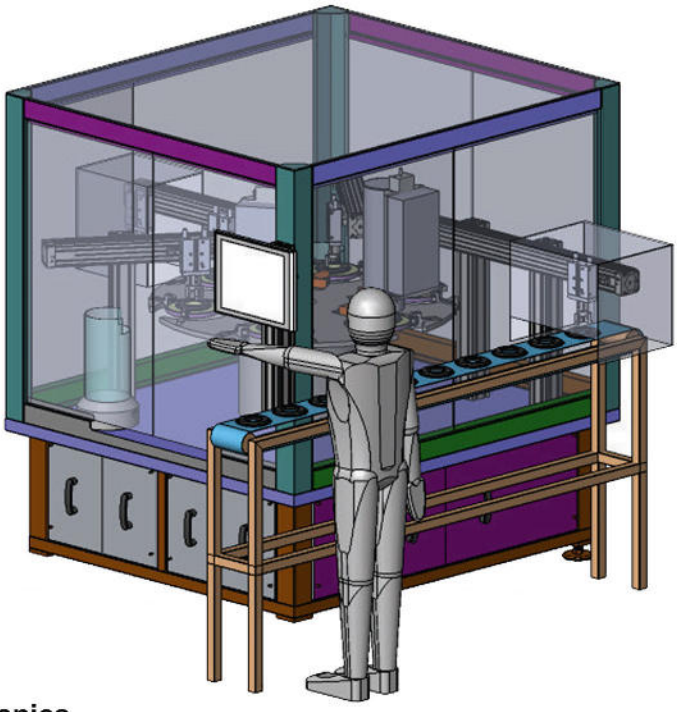


indexer turntable with motor-driven cameras



■ Features

- Testing Area up to 200 mm
- Solid and stable index table as basic machine with various extension and connection possibilities including the integration in existing production cells (de-molding, trimming) as well as packaging.
- HMI with touch screen
- Automatic Set up
- Simple choice of severity



KT Optimized Mechanics

A stable, service-friendly engineering and optimized for elastomers flow of parts form the backbone for sensor and actuator systems. Easy access allows rapid conversion to other parts and a quick cleaning. The round design represents not only a visual highlight; it is also designed to optimally place.

Sensors

KT Sensors are solid-camera-systems, equipped with their own computing power and work autonomously. Only the results and the test instructions are exchanged via a network to the control computer.

Technical data

■ Verifiable part sizes:	from 50 mm to 200 mm
■ Min. surface defects:	0,1 x 0,1 x 0,08 mm (length x width x depth)
■ Min. grey scale contrast	25 grey scales
■ Cycle time	2 – 10 sec / part depending on part size

KTwave

EEP Maschinenbau & Elastomerrecycling GmbH

TÜVRheinland ZERTIFIZIERT

KTVision Systems

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KTwave

Product Information

Vision System for round seals with variable elongation

Details and advantages

This system comes up with the best in class inspection software and unique sensors for high quality and output for most of the rubber parts from 40 up to 200mm diameter.

Get impressed by the innovative, new to the world Auto Setup. Why defining illumination, positioning and testing severity when the system can do it much better with the experience of 25 years of image processing?

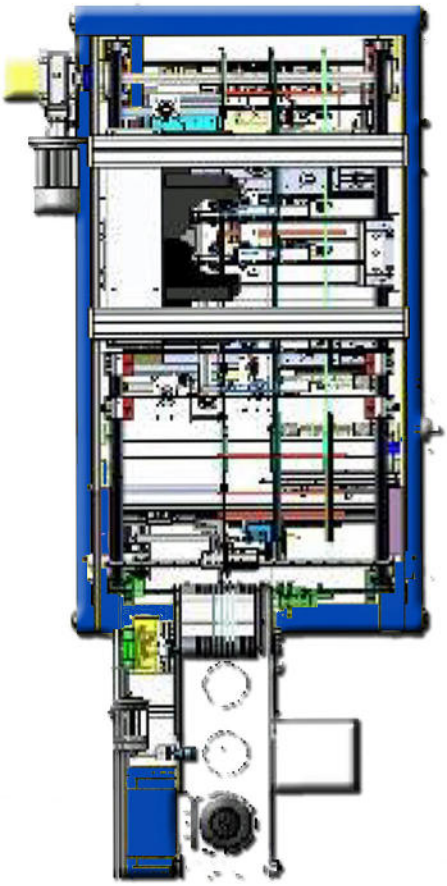
Testing with variable elongation, the very unique mechanical solution allows an elongation of the parts before testing.

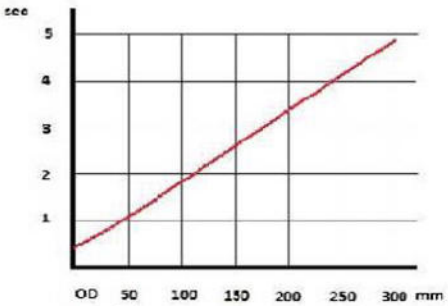
The inspection of the surface itself takes place in stretched condition. This enables us to detect even small cracks and cuts maintaining high productivity.

Technical Data

Product features

- Testing area 40 to 200mm OD
- Cross section 1,5 to 5 mm
- testing under stretched conditions
- variable elongation (crack detection)
- HMI with Touchscreen
- Auto Setup
- Pattern recognition
- simple choice of severity





possible inspection time

field of view (*)	10 mm
Pixel resolution [mm]	0,01
Min. defect size [mm]	0,1

(*) Values with the built-in 1 Megapixel camera for safe defects recognition with sufficient contrast (20-30 grey values) and depth of defect of 0,08mm.

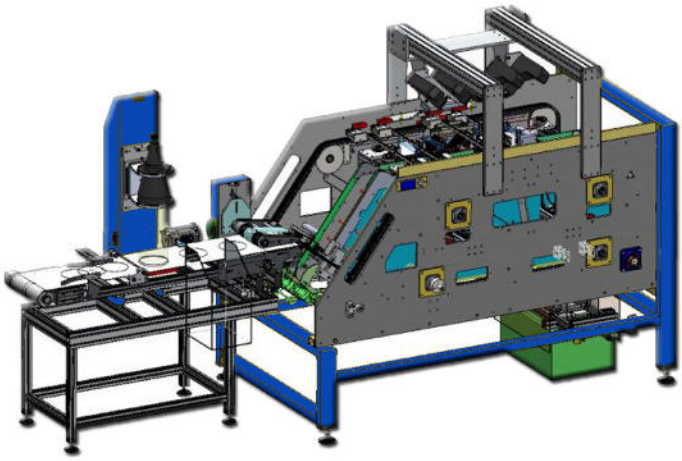
The Performance of the system must be tested and confirmed in each single case with master samples.

Basis model

Double sensor unit with conveyor belt

2 x KT Sensor
Surface defects inspection with 4 x 1 Megapixel camera
Complete view over the circumference of the cross section, part size up to max. 200mm outer diameter
Integrated LED flash for optimum illumination and contrast

Option KT Measurement Sensor
5 Megapixel camera and telecentric objective
Measurement: outside-/inside diameter, cross-section
Monitoring +/- 0,1mm, GR&R for tolerances from +/- 0,5mm (OD 100mm)
Monitoring +/- 0,15mm, GR&R for tolerances from +/- 1mm (OD 150mm)



KT Software - KTvision

The KT Software is especially designed for rubber seals, but also useable for other materials. Rubber is called a living material and the surface condition of rubber seals has a wide varity of different looking. Therefore the rubber surface examination needs a special algorithm.

The KT software consists of all necessary tools for a vision inspection machine. Features are:

- modern designed GUI
- a special feature is the active user guidedance
- facilitation for the user: auto-setup modus for usual seals like o, v, or q-ring, break seals, frame seals and so on
- expert setup modus for complex seals and for general optimization after auto-setup
- pattern recognition: the software recognizes the general type of defect
- all size limits displayed and prompt in mm or inch
- informative statistic
- machine operation (PLC)

For more informative details, please see our brochure „Ktsoftware“