

TECHNOS

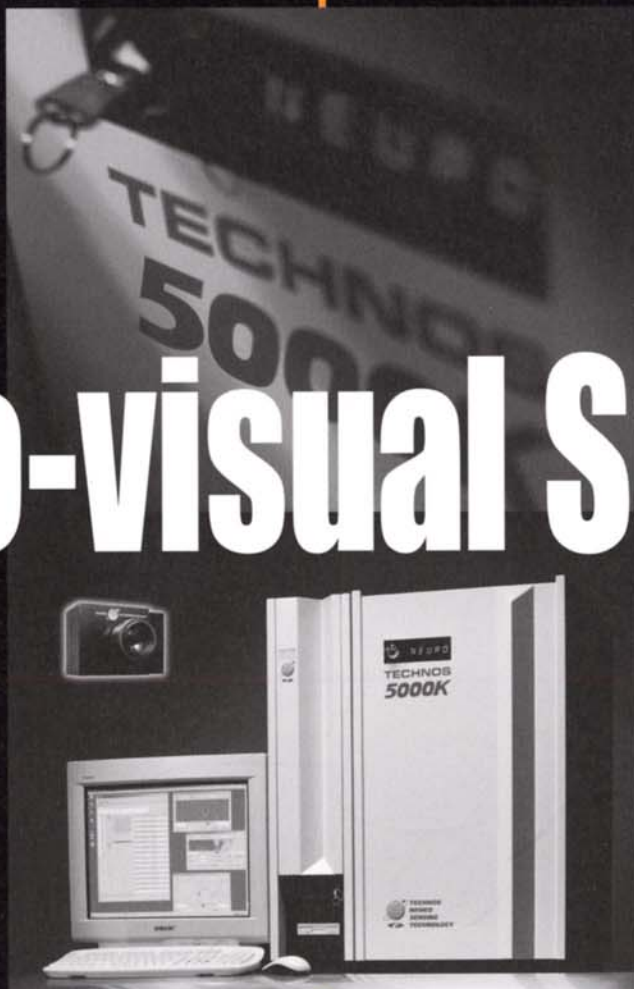
5000K

**Online Automatic
Visual Inspection System**

Flexible & Scalable



Neuro-visual Sensor[®]



International Patents

Japan	3100140
	3100144
	0732846
	H5-293527
	H6-288556
	H10-210227
	H10-2111
	H11-172877
USA	5953462
	5995137
Europe	0416114
	3264488
Korea	0240133
	123660

TECHNOS
JAPAN CORP.

World First

A visual inspection system, which brings about changes in the established concepts, entered the market.

Technos 5000K is a visual inspection system integrated with many excellent functions including those of the human eye, which is a product developed by the extension of the international-patent original technologies. The system is made flexible so that you can choose a specification suitable for detection accuracy required in an inspection.

Technos 5000K insures high accuracy 4.4 to 116.5 times that of visual acuity of the human eye, which is about 40 to 1,000 times that of a conventional CCD line-sensor camera with 4,000 pixels. Landmark products "Perceptive sensing", "Trend sensing" and "Tremor sensing", enable you to select a system grade, as you need.

Technos 5000K has only one super-high accuracy camera, which enables an inspection with accuracy equivalent to that of maximum 24 line-sensor cameras. It can be easily set up for operation in the existing every production or inspection line. It is an entirely new system with a simple configuration so that the maintenance can be easily done.

In addition to basic outputs of the OK/NG criteria of detection results, you can customize the system to suit your needs with the following routine programs: Map Navigator to display the locations of defects, Defect Navigator effective to search the main cause of defects, and Active Navigator to record automatically real images of defects, which is freely accessed on the network of system.

The system of Technos 5000K supports a wide-range of applications, for example in the following industries:

- *The steel industry, where heavy-duty systems operate full-time in-line.
- *The paper manufacturing industry, where paper feed machines and rollers operate at a line-speed up to 10,000 m per minute.
- *The manufacturing industry, including automakers etc., where parts with solid structures are assembled.
- *The semiconductor/photomask industry, where submicron-order chips are in need of inspection.
- *The glass and film industries, where transparent materials are finely inspected.



Flexible

You can configure the system to meet your inspection needs, and easily construct an automatic inspection system only by installing a super-high accuracy camera into the existing production line since the system consists of simple components.

Scalable

You can select any of three kinds of sensing system grade to meet the specification of inspection, and cope with the change in the shape of objects to be inspected or that in a required accuracy if you use additional options provided in the system. Thus you can attain the maximum investment efficiency of inspection without rendering the system obsolete. By using the original logic of electronic circuits internationally patented by simulating the functions of the human eye, the range of objects to be detected in various applications has been extended by leaps and bounds.

- | | | |
|---|-----------------------|---|
| Sensing system grades
with Technos 5000K | Perceptive
sensing | ● Detailed lightness data at each point taken by the super-high accuracy camera are processed by an algorithm that correlates the data at each point of space coordinate axes with that at another point along time axis. This perceptive sensing reduces theoretically a variation in nothing at all. This sensing grade exerts its effectiveness in inspection on foreign materials, surface flaws, extrusion/pultrusion molding and roll diffusion bonding products having the same shape of cross section, and cracks in a wafer. |
| | Trend
sensing | ● Electronic circuits that simulate the function of retinal cells in the human eye have been developed. As well as improving inspection accuracy with no need of increasing information, the inspection of irregular color or mottled appearance has been achieved for the first time in the world. Needless to say the ordinary defect detection, the inspection of PDP, liquid crystal, shadow mask, CRT and fiber can be conducted in several seconds. |
| | Tremor
sensing | ● World-class accuracy exceeding 100 times (116.5 times in practical accuracy) of visual acuity of the human being has been achieved by focusing attention on tremor (minute shaking movement of the human eye at a fixation) among minute-movement of eye at a fixation, which is a function of the human eye. Fine defects buried between pixels are detected, utilizing artificial vibration simulated by ultra high computation of pixel data. This technology enables to conduct every other inspection with high accuracy. |

Reliable

Technos products won some prizes for new excellent technology/products for three times, including a prize awarded by the Director-General of the SME (Small and Medium Enterprise Agency in Japan), and accordingly has been put a high value. Technos products has established delivery track records covering a wide variety of industries more than 70% of top 50 companies of manufacturing, and has proved to be supported by excellent technologies. Technos can suggest a system that best suits your needs, taking advantage of know-how cultivated in management system inherent in each industry.

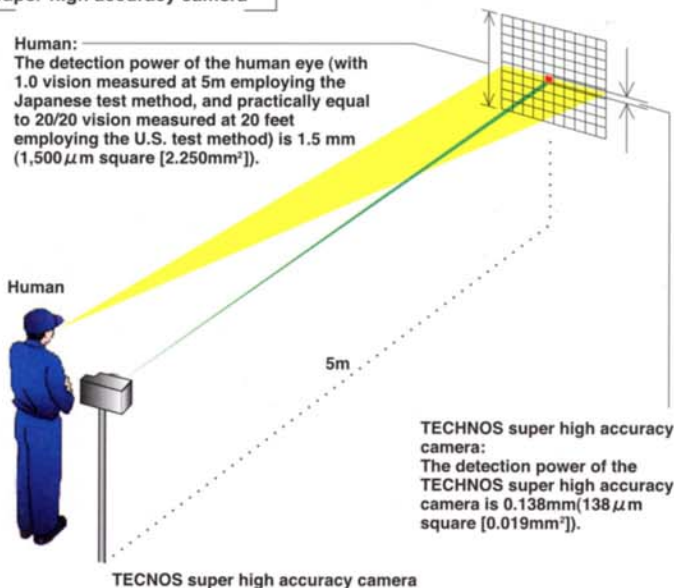
Advantages that can only be gained from using TECHNOS

1 World-class detection power more than 100 times that of the human eye.

By devising an electronic circuit that simulates the effect of minute shaking movements of the human eye (tremor), superior detection accuracy was achieved.

A comparison between the detection power of the human eye and that of the TECHNOS super-high accuracy camera

Human:
The detection power of the human eye (with 1.0 vision measured at 5m employing the Japanese test method, and practically equal to 20/20 vision measured at 20 feet employing the U.S. test method) is 1.5 mm (1,500 μ m square [2.250mm²]).



TECNOS super high accuracy camera

2 Super high-speed feedback

The non von-Neumann type supercomputer (controller) processes the data scanned by the TECHNOS super high accuracy camera at high speed while measured data can be outputted every fortieth of a second. Cameras equipped with this system can respond to the desired tact time every time.

3 Speedy inspection of a visual field width of 1,200mm by one operation

(to detect a 50 μ m square object)

Because of the superior resolving power (115,850 prediction accuracy) of the TECHNOS 5000K, it is possible to use just one TECHNOS camera to cover such broad inspection widths of 1,200mm and detect a 50 μ m object during practical use. Its performance is equal to that of 24 CCD line sensor cameras (with approximately 4,000 pixels). Certainly, the inspection width can be extended to a length greater than 1,200mm, but to the contrary by narrowing the visual fieldwidth, a minutely small defect such as 0.09 μ m can be detected.



TECNOS super high accuracy camera

4 Overwhelmingly large depth of field

Since the super-high accuracy camera has a larger depth of field than 6,000 times (at the time to detect a 50 μ m object) that of CCD line sensor camera, it can conduct an inspection of a solid object with a shape. The inspection does not affected by the vibration of the production line or the fluttering of an object.

5 Reliable inspection under the light of low illuminance

For automatic inspection under the light of low illumination in case of products related to display, Technos 5000K can conduct a reliable inspection under whatever condition, based on a super-high sensitivity more than 200 times that of the existing camera.

6 Capability to determine delicate irregular color or mottled appearance

World-patented technology of Technos enables reliable inspection of low contrast defects with accuracy more than 14 times that of visual inspection.

7 Easy installation into the existing production/inspection line

The unit system design based on online concept of Technos enables easy installation into the existing plant line and immediate inspection without making adaptation or minor adjustment. Besides no specific space to be occupied for inspection is needed.

8 Easy operation

No specific operation skills are needed, except the operation of user-friendly Open Window OS of Technos PC (DOS/4).

9 A wide selection of system support for integration management

From a wide variety of software for analyses and management, you can select one of them for adapting the uses of inspection.

10 Maintenance-free

Regular adjustment of alignment, focus and so on is scarcely needed unlike the existing multiple camera methods. No adjustment of quantity of light is needed, because an algorithm pre-installed into the system automatically follows up time-varying illumination of light source.

A concept of functional-beauty waste-cut and simple is embodied in Technos

A component system that can be easily installed into the users' production line has been realized based on a basic design of Technos 5000K

◆Technos super-accuracy camera

The super-accuracy camera takes the images of a detection object with the lightness in 256 levels at the speed of 100 million points per second, and the 10-bit digital data of the images are output.

Technos sensing technologies has achieved the accuracy surpassing by far that of the human eye and made it possible to detect even the surface irregularities, which has been thought to be difficult to detect until now, needless to say fine defects.

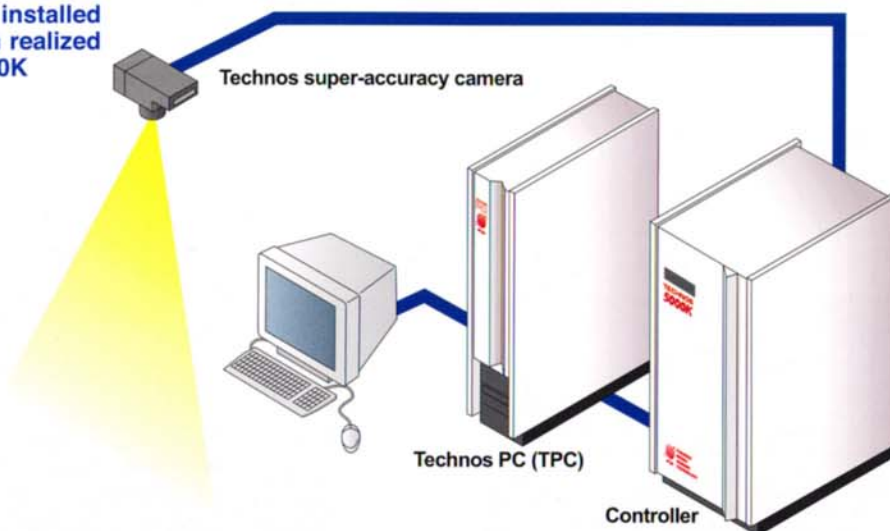
◆Controller

Technos 5000K equips a supercomputer that can perform the calculation at the operation speed of maximum 8.8 billions per second, and an image memory capable of processing 64 million data. Equipping the image memory and a real-time image-cutout processor enables to capture automatically defect images during an online inspection.

◆Technos PC (TPC)

TPC is a man-machine interface, which has the console function to achieve easily a high power function of super-computer (controller) in the Windows environment and has the function to display detection results with Navigator etc.

The setting of parameters, the real time view of inspection results and defect images, and the analysis of defect images during inspection are possible. Furthermore, all defect images obtained during inspection are stored in this TPC.



Accuracy comparison table

	Technos 5000K			Human	CCD system	Laser system
	Perceptive	Trend	Tremor			
Visual-width accuracy (theoretical)	29,540	81,920	115,850	approximately 2,700	4,000	8,000
Visual-width accuracy (practical)	7,000	20,480	24,140	approximately 700	1,000	2,000
Lightness resolution	256	28,416	28,416	1,600	256	3,000
Integrated value	—	111	111	80	—	—
50μm-object detection distance	525mm	1,500mm	1,800mm	200~240mm	75mm	250mm

Selection Free

Wide choice of options allows any requirement of specification to be satisfied.

Technos 5000K allows for you to make a required selection from three kinds of sensing grade.

As for Technos 5000K, you can select a sensing grade for the system to construct in accordance with a required accuracy needed for an inspection, and can achieve the maximum capital investment efficiency.

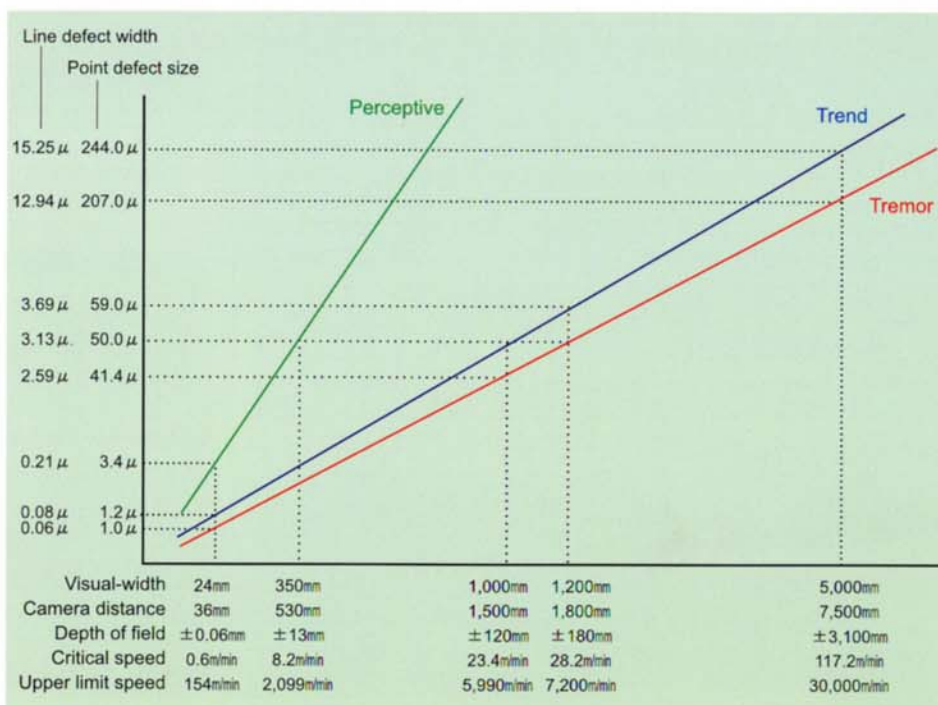
◆Selection from among kinds of objective defect

Online processor

- Case of either micro defects or irregular or irregular colors.....1 unit
- Case of both micro defects and irregular and irregular colors.....multiple units (Maximum four units)

◆Selection of output mode (a combination is possible)

- OK/NG signal
- Map display
- Defect Navigator
- Active Navigator



Abundant integrated management software supports the operator

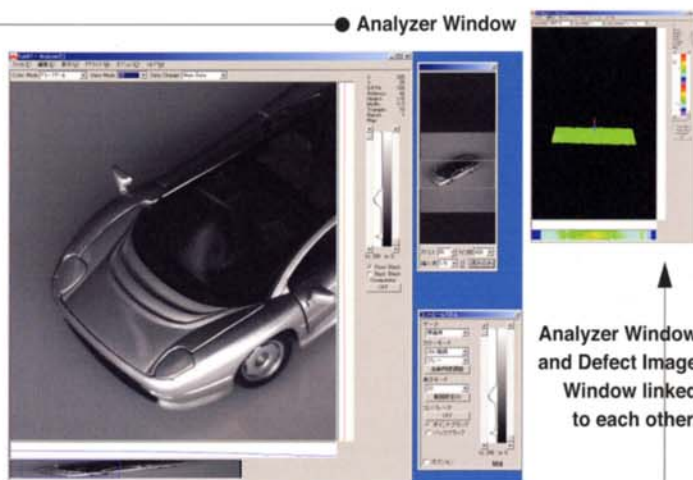
Analyzer (Image analysis software) ●

Analyzer software is available for image analysis to determine the optimum parameters (setting values) at the time of online inspection. The data (5,120 x 12,800 pixels) captured from a targeted object are processed to perform the following various simulations and analyses:

1. The gray-scale display of an original image at 256 levels of lightness
2. 2-D or 3-D contrast highlighting display with pseudo-color
3. 360° arbitrary rotation of all or part of an image
4. Isolating the display of defects after the setting of a threshold value
5. The light adjustment of all images described above

The parameters can be easily determined in a visually appealing window of various functions prepared in Analyzer, in addition to the simply using the operable DOS/V window. Along with the determination of parameters, Analyzer functions are extensively applied to development for use in experiments and research other than inspection sites.

The Analyzer Window processing image data are linked to Defect Image Window of Active Navigator, enabling a detailed analysis of defective images in parallel with online inspection.



Active Navigator ●

The Active Navigator determines whether a product is OK/NG with reference to the parameters being set based on the data of Analyzer, and outputs the signals of OK/NG after 1/40 second while simultaneously displaying the document data of defect images.

Active Navigator consists of a Defect Navigator Window and Defect Image Window.

Defect Navigator Window provides information on the whole line and Defect Image Window provides information on individual defects, serving to diagnose the cause for the occurrence of defects.

Defect Navigator Window ●

Defect Navigator Window displays a map of defects detected in real time at the lower part of the window, and simultaneously displays the position and detailed inspection data of all previously detected defects at the upper part of the window.

This window allows for the user to find out the locations of occurring defects on a sheet with the sheet's sequence number counted (or the meters measured) from the start of the inspection. Besides, as action of the monitoring function (patent pending), the window displays short-, medium- and long-term inspection data in parallel on the left side of the window, which can be enabled by a large data storing capacity up to a maximum 80,000 m (or 80,000 pieces). In addition, the window allows for the user to conduct integrated management of an inspection using the document data of each block, such as maximum value, minimum value, and the determined upper and lower limits of a defect area.

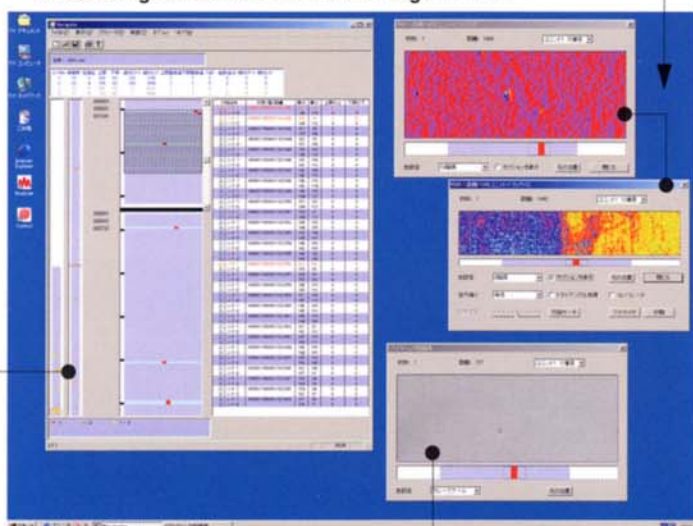
In the location information display, the location of defects are intelligibly coded by color depending on the type of defects in a window, so that the size and type of defects can be classified. The color-coding helps an operator to grasp at a glance the number of occurring defects and the type of defects that periodically occur, providing the advantage of analyzing their cause.

Defect Image Window ●

When a defect is detected, image data around the defect is automatically cut out in real time and is displayed in the window. In addition, the previously stored images of several defects searched for in the Defect Navigator Window are simultaneously displayed to make it possible to easily compare the images of defects separated in their respective locations.

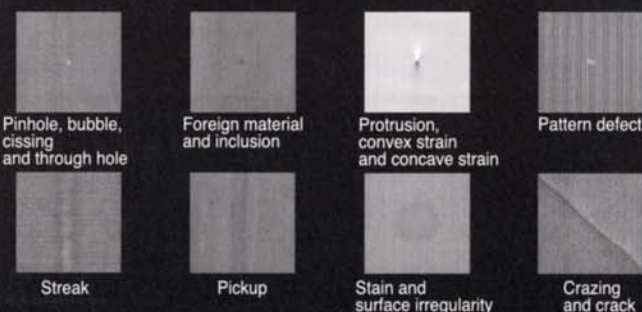
Since Defect Image Window is linked to Analyzer software, all of the functions of Analyzer can be operated in the window. Thus great flexibility has been designed into the window so that other parameter determination and analyzing work can be carried out during inspections.

Active Navigator consists of Defect Navigator Window and Defect Image Window



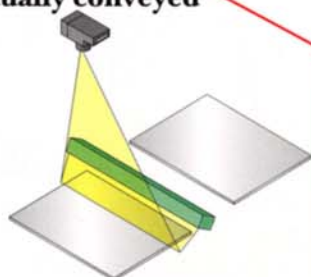
Typical example of detected defects

The same system detects various defects.

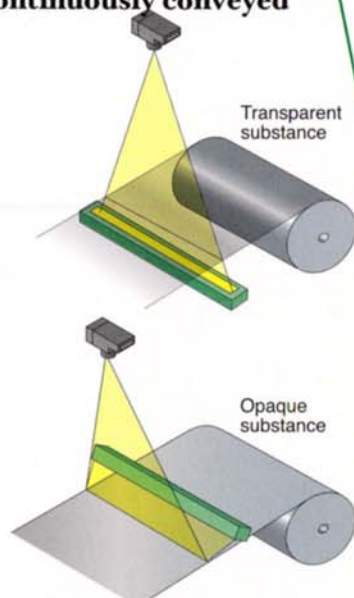


The real accomplishment of deliveries to various industries assures evidence of reliability

A. Products/Materials that are individually conveyed



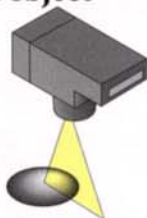
B. Products/Materials that are continuously conveyed



C. Cylindrical objects



D. Discoid object



E. Micro objects

F. Cylinder shape objects

	Inspection Method	Defect	Remarks
Plasma display panel	Reflection	Surface irregularity, Flaw, Foreign materials, Cissing	<i>*Inspectable materials</i> Electrode plate, Back plate, Rib materials, Phosphor
CRT	Transmission	Foreign materials, Pinhole, Surface irregularity, Through defect	<i>*Inspectable materials</i> CRT curved surface, Good advantage of a large depth of field of camera <i>*Track records in exportation</i>
Glass covered with film	Transmission, Reflection	Flaw, Pinhole, Uneven thickness, Foreign materials, Protrusion	<i>*Inspectable defects</i> Film thickness, Fine defects
Glass substrate	Transmission, Reflection	Foreign materials, Stain, Strain, Bubble, Inclusion, Internal strain, Edge chip, Crack, Polished state	<i>*Inspectable materials</i> Fine glass, Building material, Glass for use in cars <i>*Inspectable objects</i> Depth of defects, Surface state
Shadow mask	Transmission	Bright/Dark pinhole (Pore size difference)	<i>*Inspectable objects</i> Milky Way-like surface irregularities <i>*Track records in inspection after doming</i>
Back panel	Lighting test	Bright/Dark dot, Surface irregularity, Foreign materials, Through defect	<i>*Inspectable materials</i> Graded panel <i>*Inspectable objects and conditions</i> Uneven low contrast illuminance
Color filter	Transmission, Reflection	Flaw, Pinhole, Through defect, Color irregularity, ITO malfunction	<i>*Inspectable objects</i> Color irregularity peculiar to CF <i>*Inspection conditions</i> Moire-free by Making use of International patented Chess-Magic
Ceramic substrate	Reflection	Crack, Craze, Chip, Color irregularity	<i>*Inspectable objects</i> Invisible defects such as minute crazing or cracks
Resin materials/ Integrated insulator material	Reflection, Transmission	Fish eye, Resin bank, Color irregularity, Flaw, Foreign materials	<i>*Inspection conditions</i> Simultaneous detection of fine defects and low-contrast irregular defects

Film	Reflection, Transmission	Flaw, Cissing, Fish eye, Surface irregularity, Line irregularity	<i>*Inspection conditions</i> Stable inspection unaffected by work fluttering to good advantage of a large depth of field of camera <i>*Inspection conditions</i> High accuracy 14 times more than that of human eye
Coated steel plate	Reflection	Protrusion, Surface irregularity, Flaw, Streak	<i>*Inspectable materials</i> Electronic parts with high quality and accuracy Embossed material like external-wall materials <i>*Track records in coated steel plate for more than 10 companies</i>
Umbrella material	Reflection	Streak, Pickup, Dent	<i>*Inspectable objects</i> Defects in formations peculiar to umbrella materials <i>*Track records in having found periodic defects using Technos Navigation</i>
Glass fiber	Transmission	Stain, Foreign materials, Slip, Dirty, Thick sets marks, Pitch irregularity	<i>*Inspection conditions</i> Moire-free peculiar to fibers by reducing with Technos' international patent Chess-Magic
Copper foil/ copper-clad laminate	Reflection, Transmission	Copper powder, Flaw, Foreign materials, Pinhole	<i>*Inspectable objects</i> Gloss such as copper foil and metallic paper <i>*Inspection conditions</i> Stability unaffected by warping and the distribution of illuminates
Battery materials	Reflection, Transmission	Flaw, Foreign materials, Pinhole	<i>*Inspection conditions</i> Stability unaffected by the change of formation using Technos Trend Sensing technologies
Paper	Transmission, Reflection	Foreign materials, Inclusion, Pinhole, Stain, Surface irregularity	<i>*Inspection conditions</i> High speed, Easy maintenance, Because of using only one camera with super high accuracy and taking the position of the camera separated from an object
Steel plate (iron, stainless and titan)	Reflection, Transmission	Flaw, Dent, Foreign materials, Surface irregularity, Pinhole	<i>*Inspection conditions</i> Hot condition, Easy maintenance, Because of using only one camera with super high accuracy and taking the position of the camera separated from an object

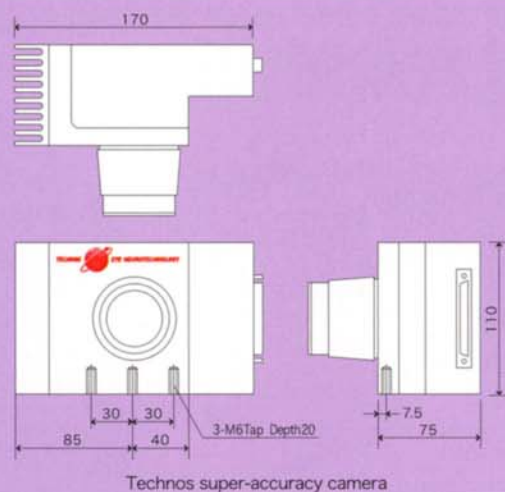
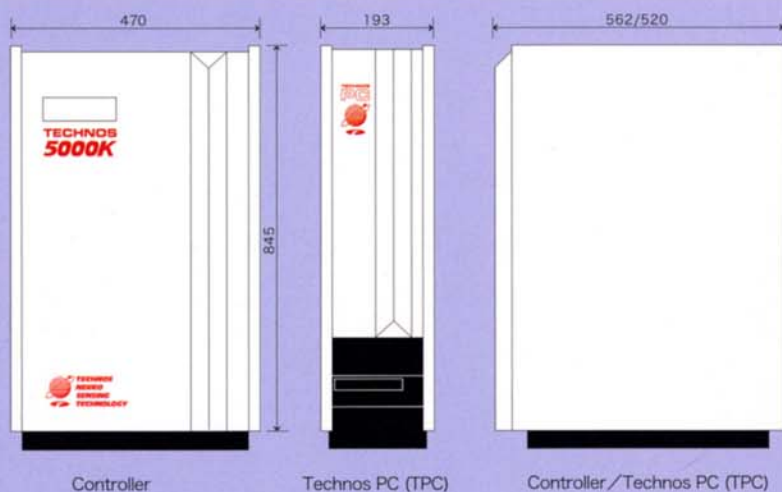
Sensitive drum	Reflection	Uneven defects, Flaw, Uneven coating	<i>*Inspectable materials</i> Photoreceptor <i>*Inspectable objects</i> Layer thickness <i>*Inspectable objects</i> Uneven irregular and fine defects
Rubber roller	Reflection	Uneven defects, Flaw	<i>*Inspectable objects</i> Low contrast defects such as dark defects on black backgrounds
Rolling role	Reflection	Flaw, Uneven polish	<i>*Inspectable objects</i> Partially polished rolling role made of iron, aluminum, stainless steel and titan after re-polishing and before assembling

Lens system	Transmission	Flaw, Stria, Surface irregularity, Haze	<i>*Inspectable objects</i> Shape inferiority and flaws of micro-lens mounted on a chip of imaging element Both the inside surface and back surfaces simultaneously, because of a large depth of field of camera
Wafer, CD, DVD etc.	Reflection	Flaw, Protrusion, Irregularity, Coating irregularity, Edge chip	<i>*Inspection conditions</i> Not only the surface, but the edge of an object on a rotating work

Imaging element	Reflection	Flaw, Foreign materials	<i>*Inspectable materials</i> Sensor chip of an imaging element used for an electronic camera
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Rod-like steel/ Cylinder shape cable	Reflection	Flaw, Dent	<i>*Inspection conditions</i> Unaffected by vibration because of a large depth of field of camera
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TECHNOS 5000K



Specification

Basic specification

Super-neuro engine (All basic parts meet a common specification)

●Technos 5000K: Neuro visual sensor

Operation method Inspection-line electronic reading method

◆Camera unit

Lens system PENTAX-K mount

F1.4-50 mm standard

Imaging method Three-dimensional method

Simultaneous reading of position (X) and lightness (Z)

Position/Time (Y) developing method

Resolution Position(X) = 5,120 equally divided parts

Lightness (Z) = 256 levels

Position/Time (Y) axis = without limitation

Inspection-line speed 2,000 scans/sec (equivalent to 32,000 scans/sec)

Master clock 10 MHz

Interface Binary parallel characteristic 10 bits

◆Control unit

Camera interface Binary parallel original 10 bits

Image signal monitor High speed D/A system 8 bits

Video processor (Max 4 Units)

Control method Non-von Neumann super-computer (depending on grade)
8,880MIPS (when Max Unit are equipped)

Feature extraction system Perceptive, Trend and Tremor architecture
International patent original architecture

Feature extraction method Perceptive, Trend and Tremor sensing method

Detection system Software system/Hardware system

Base processor Separate setting values of the upper limit from the lower limit of binarization: 256 levels above the upper limit area and lower limit area

Post processor

Control method Stored program method

Computing method 16 bit binary parallel Computing method

Computation program method Software method

Computing chip 68,000 system

Master clock 16MHz

Memory capacity 16 Mbyte Max

Tag counter 32 Bits relative method

Navigator Defect Navigator and Active Navigator

Control method bi-directional original method

Video memory (Max 2 units)

Control method DMA method

Halt control Software control

Memory capacity 64 Mbyte (5,120 bits x 12,800 lines x 256 levels)

Real time printout processor

Interface USB

RS422

Trigger circuit Open collector input

Terminal interface unit

Communication method SCSI — 7 sec/100 kbyte

RS422 — 4,800-57,600 bps

Power unit

Method (digital unit) Switching method 5v60A

(analogue unit) Series method with noise canceller

Connection cable Camera cable 5 m

Power cable 2 m

Integrated specification

Size Sketched in outer dimension drawing

Installation environmen Temperature range 10-40°C, Humidity 50-85%

Power condition AC 100 V \pm 5% 50/60Hz

◆Camera unit (option)

Automatic iris diaphragm adjustment unit

Automatic focusing unit

Filter switching unit

◆Control unit (optional)

Defect image processor

Control method Hardware automatic cut out

Data volume 256 x 50/block

Real time parallel output processor

Channel 20 ch x 4 Max

60 ch

120 ch

Output time Within 1/40 seconds after detection of defects

◆Terminal personal computer unit TPC (option/details as stated in the accompanying sheet)

Analyzer/online Technos PC

Keyboard

17-inch multi-scan monitor

◆Camera interface (option/details in consultation)

Optical fiber

Computing speed reaches as fast as maximum 8.8 billion bits per seconds.



TECHNOS JAPAN CORP.

4-2-3 MINATO-KU SHIBA 108-0014 TOKYO

■TEL : +81-3-3453-9111

■FAX : +81-3-5484-6785

■URL <http://www.technos.jp>