The Quantimet 720 Image Analysing Computer

IMANCO
Image Analysing Computers
A division of Metals Research Instrument Corporation
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A high capacity Quantimet 720 installation.
Image Analysing Computers

make automatic assessments of selected features in photographs or in electron, x-ray or optical images, by recognising and isolating such features and then counting, measuring and classifying them. They do this so much more quickly, accurately and reproducibly than human operators that they have made valuable but previously impossible tasks in research and quality control both feasible and economic.

The Quantimet® 720

is based on an entirely new design which embodies experience gained over the past five years from more than 200 Quantimet B installations. The 720 modules described in this leaflet are parts of a complex, powerful, versatile and wholly integrated image analysis system, capable of both measurement and pattern recognition.

The 720

is built on a modular design allowing the easy addition of many extra modules to an entirely compatible basic system. It
— makes extremely accurate and reproducible measurements.
— offers a choice between radically new, low noise, high uniformity image scanners designed specifically for precision image analysis.
— is digital throughout, ensuring easier calibration and increased stability.
— divides an image into the maximum number of discrete picture points so giving optimal sampling and statistical accuracy.
processes the output of any raster scanning device, including scanning electron microscopes.
provides extremely high-speed performance.

® Quantimet is a registered trade mark and IMANCO a trade mark of Metals Research Limited.
Advances in image analysis technology in the Quantimet 720

The 720 makes several significant advances in the technology of image analysis.*

Optical scanning performance

Two new 720-line Image Scanners, designed specifically for image analysis, allow the best possible scanning performance to be achieved across the whole range of image analysis problems.

The 720 Vidicon Image Scanner optimises system performance on images with a wide range between the brightest and dimmest features to be measured and when an adequate amount of light is available.

The 720 Plumbicon Image Scanner optimises system performance on images with a narrow range between the brightest and dimmest features to be measured and when the amount of light available is low.

The 10.8 frame per second scanning standard optimises resolution and grey level discrimination on either Image Scanner.

Better counting and sizing logic

The 720 has two counting and sizing modes. It also incorporates a special anti-coincidence point (ACP) counting principle (described below) which eliminates counting and sizing errors made by other scanning instruments.

Full Feature Count
Whatever their shape, features are always correctly counted and size distributions are completely accurate even for single fields of view. Some very complex features have a dead-spot paralysis region but this can be shown on the 720 Computer Display and is seldom troublesome.

End Count
Overlapping features, like fibres, are counted separately. Size distributions of non re-entrant features are accurate when many fields are averaged. There is no paralysis region but some re-entrant features may be counted more than once.

Anti Co-incidence Point Count
A feature is always counted at its anti co-incidence point, or ACP, which is in a fixed position relative to the feature and does not move with sizing. Uncorrectable errors arise when a movable counting point is used, as in some other image analysis systems.

*The many innovations described in this brochure are covered by British and Foreign patents and patent applications.
Guard region

Other scanning instruments have had only one mask delineating the area being measured. When features intersect this mask, serious errors are made.

Earlier scanning instruments measure the length of feature A as $b$ rather than $a$.

The 720 has an inner mask — the Live Frame — around which is a Guard Region. Both Live Frame and Guard Region are shown on the 720 Computer Display. The computer is able to probe into the Guard Region and measure correctly features which intersect the Live Frame.

The 720 counts features only if their ACP lies within the Live Frame.

Long features which intersect the Live Frame twice in two adjacent fields are counted incorrectly by other scanning instruments. In the 720, the ACP principle and the Guard Region together ensure that such features are counted and sized correctly, even for a single field of view.

Digital picture point concept

The new 720 scanners are precision measuring instruments rather than mere scanning or viewing devices. Built-in, digital, picture point scan controls, superimpose a matrix of 650,000 precisely positioned fixed picture points. This allows all processing after detection, including sizing, to be digital. Together with their much lower drift and higher linearity characteristics, this enables 720 scanners to achieve the maximum in accuracy.

The fixed picture point scan control of the Quantimat 720 high precision scanners and their higher linearity ensure maximum accuracy — while their low drift characteristics ensure better reproducibility of results and maximise operator convenience.

The drifting line scan and lower linearity associated with television cameras give rise to obvious inaccuracies, making results less reproducible and create inconveniences for operators, who need constantly to adjust for analogue drift.
The 720 system is a third generation design by Image Analysing Computers Limited. It incorporates more than five years' experience on over 200 image analysis installations throughout the world. This experience has been used to define not only performance specifications but also operator needs and reliability and servicing criteria.

The 720 has been designed for ease of operation

The 720 meets the needs of the operator. Although highly complex in concept and powerful in performance, it is easy to understand and easy to use.

A fully integrated modular system

The 720 is a fully integrated, modular, image analysis system. Each module is defined by its image analysis rather than its electronic function.

Each 720 module has the minimum of necessary controls, carefully grouped to make operations easy for the experienced and inexperienced operator alike.

Superimposed displays and read out

The 720 Computer Display presents results just where the operator wants them — on the screen above the image being analysed. It also shows the operator exactly which features are being measured and the parameters in terms of which they are being detected.

Quick and easy programming

Simple programming can be performed by manual switching or by the insertion of plug-in program boards which have previously been set up using screw-in connectors in the matrix. Boards for frequently used programs can be kept permanently plugged up ready for immediate use.

High Level programming involves changes in the relationships between modules, to give a different overall arrangement of the system, and requires changes to be made in interconnections on the High Level program panel at the back of each module. Easy access is provided by the swivelling base on which the 720 is mounted. This enables the operator to turn the instrument through 180°. The hinged back then gives access to the High Level program panels of each module in the system.

The 720 has been designed for maximum reliability

The 720 is mechanically robust, reliable in use and quick and easy to service. Its circuitry is solid state throughout — except for the image tubes — and uses the latest digital computer construction techniques for high performance and reliability.
Performance of the Quantimet 720

The 720 is accurate, fast and versatile. It...

**Selects and measures features**

in PHOTOGRAPHS and RADIOGRAPHS

in images from MICROSCOPES, ELECTRON PROBES, ELECTRON and SCANNING ELECTRON MICROSCOPES

in a variety of objects from BRICKS to BACON and from COAL to CONVEYOR BELTS

**Measures the Number, Area and Length of features and classifies them by Length, Area and Shape**

**Detects maximum number of grey levels**

with or without automatic shading correction

**Makes extremely reproducible measurements**

COUNTS with absolute accuracy

SIZES to better than 1% of the maximum field of view

MEASURES AREA to better than 1% for features occupying more than 1% of the field of view

**Measures an image in less than 1/10th second**
## Applications of the Quantimet 720

### Materials Science

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<td>White area detected and measured</td>
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<td>Area of niobium phase obtained</td>
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<td>Metallurgy</td>
<td>Grains in aluminium microsection</td>
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<td>Dark boundaries detected, total number of intersects, variation of</td>
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<td>intercepts with chord size measured</td>
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<td></td>
<td>Mean grain size, mean number of grains per unit area and chord size</td>
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<tr>
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<td>distribution calculated</td>
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<tr>
<td>Metallurgy</td>
<td>Non-metallic inclusions in polished steel microsection</td>
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<tr>
<td></td>
<td>Two types of feature — oxides and sulphides — detected separately,</td>
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<td></td>
<td>each type of feature counted and sized</td>
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<td>Mean percent and spatial variation of inclusion content obtained</td>
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<td>*Photograph by permission of Chemistry Division, NPL Teddington, England</td>
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<td>Mineralogy</td>
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<tr>
<td></td>
<td>Six phases detected separately, area and total number of intersects</td>
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<td></td>
<td>measured — up to 25 phases in all can be detected</td>
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<td>Percentage and mean size of various phases derived</td>
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<td>Cement technology</td>
<td>Polished section of cement clinker</td>
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<td></td>
<td>All phases detected separately, area and total number of intersects</td>
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<td>Percentage and mean size of phases derived</td>
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<td>*Photograph by courtesy of Building Research Centre, England</td>
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<td>Particle size</td>
<td>Dry dispersion of polystyrene spheres</td>
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<td></td>
<td>Dark spheres and white diffraction centres detected correctly together,</td>
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<tr>
<td></td>
<td>counted and sized</td>
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<td>Size distribution derived</td>
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Applications for Quantimet image analysis systems have been found in most research disciplines and in several areas of quality control and automatic inspection in industry. These pages illustrate applications in the Life Sciences, in Materials Science and in several other scientific and quality control disciplines.
Metallurgy
Grains and dark phase in etched steel microsection
Dark area of second phase and grain boundaries detected separately; area and total number of intersects of second phase measured; total number of intersects with grain boundaries measured
Percentage of second phase and mean size derived
Mean grain size derived

Metallurgy
Non-metallic stringers in polished steel microsection
Dark areas detected either as single features or as agglomeration; area and size measured
Area and size of individual features making up stringer and total length of stringer derived

Metallurgy
Mixture of porous and non-porous metal fragments in grey matrix
Black and white areas detected. Total white features and features having small black-not-grey islands counted
Proportion of porous to non-porous metal fragments derived

Biology
Cross section of wood stem showing lumina
White central areas detected, counted and sized, area measured
Size distribution and area percent of lumina derived

Neurology
Nerve sections showing end plates
Darkest area detected and measured
Area of nerve ending derived

Histochemistry
Non-specific esterase in mouse skin
Area of dark stain detected and measured
Effect of esterase quantified

Histology
Carbon particles in avian liver
Dark particles detected, counted and area measured
Spatial distribution of carbon quantified
Autoradiography
Tritiated thymidine labelled cells in rat lung
Dark features detected, counted and area measured
Spatial distribution and uptake of thymidine derived

Histology
Goblet cells in rat gut
Dark features detected; area measured
Percentage goblet cells derived

Pathology
Colloid in rat thyroid
Dark area detected and measured
Percentage colloid derived

Aerosols
Agricultural spray droplets on magnesium oxide
White rings and dark centres detected separately
Number of dark features counted and sized
Number of white rings counted and sized
Size distribution of droplets and coverage of spray calculated

Powder chemistry
Transmission electron micrograph of titanium dioxide
Dark particles detected, counted and sized, total projection and area measured
Size distribution derived. If distribution law is known, mean size and standard deviation can be calculated without sizing

Fibre technology
Dry dispersion of randomly oriented fibres on glass slide with cover slip
Fibres detected, counted, total intercepts and area measured
Mean diameter and mean length derived

Fibre reinforcement
Bundle of aligned composite fibres sectioned at angle to length
White areas detected, counted, sized
Size distribution of diameters and area derived
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Paint Technology
Quantimet 720 system

A specimen is imaged by a Microscope (with optional automatic specimen handling) or an Epidiascope or a 35mm Film Projector which projects the image on to the 720 Vidicon or Plumbicon Image Scanner whose output — or that from a self scan system — is passed to a 720 Detector which selects the features to be measured and passes pulses from these to a 720 Amender which allows modification or 'amendment' of detected signals before they are passed on to a 720 Computer which measures the number, area and length of the features selected and classifies them by area, length and shape.

A 720 Display shows the features being measured, provides special computer displays and presents accumulating digital displays of measured parameters. Alternatively or additionally results can be passed to one of the several 720 Data Processing Systems (e.g. teletype, desk top computer, etc) or to a 720 Supervisor module.

The entire process can be automatically controlled by a 720 Programmer or can be manually controlled by switches.
Description of the Quantimet 720

The title of each 720 module defines its basic function. Some modules however have been designed in alternative versions so that a choice can be made of the most appropriate for a given speed or other requirement. For example: the M series of any module gives the best in resolution and grey level discrimination; the S series gives the best performance when slow speeds only are required — as, for example, with scanning electron microscopes and stage scan systems.

Individual 720 Data Sheets — available on request from Image Analysing Computers — describe in detail the performance specifications of each module and the alternative versions of each module.

Imaging and Scanning Devices

The 720 Microscopes have all the usual research microscope facilities. The Microscope Stage can be programmed to give controlled steps in 'X', 'Y' and 'Z' directions. For large objects and photographs a specially designed Epidiascope is available.

The new 720 Vidicon and Plumbicon Image Scanners convert the image into the signals required by the 720 Detector (see below). These new Image Scanners are designed specifically to meet the requirements of precision image analysis, with special scan standards, digital scan control, very low noise and many other unique features. A 720 line scan system is used, with no interface, and with a frame repetition rate of 10.8 times per second. Additionally an Automatic Shading Compensator corrects for variations in Image tube response and background light levels and allows uniform detection over the whole image.

The 720 Image Scanners can be fitted to all types of light microscope and to most types of electron microscope and 35mm film projector. Scanning electron microscopes, microprobe analysers and other slow scan devices can be coupled directly into the 720 system through the System Interface Module and do not require an Image Scanner.

Detectors and Amenders

The 720 Detector selects features for measurement according to their grey levels. Its resolution control allows scratches and other incidental features to be counted or ignored at will and enables the best compromise to be made between resolution and grey level discrimination. A Ground Cut Control minimises the effects of gradual changes in background intensity when, for example, very thin features need to be picked out from an uneven background.

The 720 Amender enables an operator to suppress or stretch detection to vary slightly or to 'amend' the detected image, e.g. to fill in white holes in a feature which should be consistently black or to agglomerate adjacent features (for treatment as one larger particle of the size of envelope surrounding the selected features).

Computer and Display

The 720 Standard Computer counts features and intercepts, measures area, and makes size distributions in radically new and useful ways. It can also be used to classify features by other visual criteria.

The precision 720 Display shows a 720 line picture and has comprehensive facilities for mixing the video signals to monitor the operations of the system. It also displays the results of the measurements being made in two accumulating digital displays, which appear above the picture on the monitor screen itself, where they are easy and convenient to read. The Guard Region around the Live Frame is also displayed and there is provision for electronically superimposing a calibration scale.

Programming and Data Handling Systems

Programming the simplest 720 system involves no more than turning a switch and writing down results shown on the screen of the 720 Display.

For more complex problems a special 720 Programmer is provided, which sweeps the controls through all the required parameters on each field of view. Measurements are then recorded and analysed rapidly and automatically by one of several alternative data handling and printing systems, before the computer controlled stage moves to the next field of view.

The program is defined by a plug-in matrix board. Any required program can be easily and rapidly set up by screwing plugs into appropriate positions on the board. Program boards can be changed in seconds and a complex program set up in no more than a few minutes.

High Level programming involves rearrangements of interrelationships between the image analysis modules in the system in order to obtain different overall computer characteristics. New modules can be added or interrelationships between existing modules changed to provide the program best suited to a particular problem — e.g. to provide higher speeds, further discrimination, etc.

Special purpose connections allow certain advanced multiphase analyses to be made and, when combined with special purpose modules now in development, will enable the system to make judgments based on pattern recognition criteria.
**SECTION 1: IMAGING AND SPECIMEN HANDLING SYSTEMS**

- Scanning Electron Microscope, Micro analyser, Stage Scan System or other external Scanner or conventional TV Camera
- Transmission Electron Microscope, Telescope, Special Light Microscope or other external Imaging System
- 35mm Film Projector
- EpiScope
- Unstabilised Power Supply
- Stabilised Power Supply
- Unstabilised Power Supply
- Stabilised Power Supply
- W. Halogen Lamp
- C.S.I. Lamp
- Transmission Microscope
- Universal Microscope
- Incident Microscope
- Microscope Accessories
- Manual Stage
- Automatic Stage
- X by Y Stage Controller
- Image Rotation Control

**SECTION 2: IMAGE SCANNING SYSTEMS**

- Phosphor Scanner Head
- Phosphor System Control

**SECTION 3: IMAGE PROCESSING SYSTEMS**

Notes:
1. More than one module of any type can be used for almost any combination of series/parallel operation.
2. Any solid line-path from SPECIMEN to RESULTS is a viable system.

- Variable Frame and Scale
- Standard Detector
- Special Detectors
- Coordinate
- Densitometer
- Ammeter
- Size Distributor
- Variable Frame and Scale
- Special Computer
- Standard Computer
- Size Distributor

**SECTION 4: PROGRAMMER**

- Programmer

**SECTION 5: DATA HANDLING FACILITIES**

- Teletype Drive
- Supervisor 1
- Supervisor 3
- Accumulator Display
- Multiple Accumulator
- Others on request
- Calculator Drive
- Calculator
- Digital read-out on display screen
Description of 720 modules

Modules shown opposite in black are in production and those in colour are under development. Each module is described and specified in more detail in the relevant Data Sheet:

Section 1: Imaging and Specimen Handling Systems

**Microscopes**
incident transmission and universal research microscopes with all the normal research microscope facilities, power supplies and light sources.

**Microscope stages and controls**
- Stage X and Y Control.
- Stage Z Control.

**Epidiascope**
for imaging photographs, bricks and other large objects.

**35 mm Film reader**
for projecting 35mm film.

**Image rotation control**
for automatic rotation of the image scanning tube for perfectly centred image rotation.

Section 2: Image Scanning Systems

**System interface**
interfaces with scanning electron microscopes and other scanning instruments, including television cameras, with display mixer, accepts shading corrector.

**Scanner heads**
ew Plumbicon and Vidicon Image Scanners.

**System control**
accepts shading corrector and includes data accumulator and system mode control.

**Display**
for monitoring the image and computer operation and displaying the results — includes display mixer.

Section 3: Image Processing Systems

**Detectors**
Standard Detector.
Special Detectors.

**Amender**
for filling in gaps in features, agglomerating clusters as single features, simple chord size distribution, etc.

**Computers**
Standard Computer measures 'full feature' and 'end' counts, intercept and area size distributions.
Special Computers.

**Variable frame and scale**
for varying the live or blank frame. Also provides precision graticule scale for direct manual measurement.

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7200/9
7201/1
7201/2

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Section 4: Programmer

for programming the 720 to sweep through range of measurements automatically — 16 or 32 instruction modules available.

Section 5: Data Handling Facilities

**Analysers**
for measuring the ratio of two parameters on each feature and classifying by this ratio.

**Accumulators**
for displaying results in systems without the Display

**Supervisors**
for accepting or rejecting fields of view when they exceed preset values of various parameters. One and three criteria versions available.

**Multiple accumulator**
for rapidly accumulating up to eight information channels for subsequent read out channel by channel of the total on the monitor or other digital display.

**Calculator drive**
interface module between the 720 and the calculator.

**Calculator**
for carrying out further data processing and recording results.

**Teletype drive**
interface module between the 720 and the teletype.

**Teletype**
for printing out results and preparing punched paper tape.
Choice of the most cost effective Quantimet 720

There are up to 1,000 possible variations in the assembly of a series of 720 modules. Selection of the most suitable configuration is therefore a question primarily of value analysis i.e. of selecting the system which can solve a problem with maximum versatility at minimum cost.

Image Analysing Computers will be pleased to offer advice on systems most appropriate to the solution of any particular image analysis problem. A preliminary selection can however be made from the descriptions of modules on p. 9 and the diagram on p.8. Please note that in using the diagram on p.8 it is necessary to complete at least one solid line between SPECIMEN and RESULT.

Three typical 720 systems

Three typical 720 systems, drawn from the diagram on p.8, are described. The first is a simple, manually operated system; the second a system with some automatic operation and the third a fully automatic system. Converting the first or the second to the third involves no more than purchasing the extra modules required and simply plugging them into the existing system.

Note: The diagrams show a line between SPECIMEN and RESULT and suggest that these lines be completed.

System 1

A simple manually operated system with minimum data read out.

Section 1
Imaging and specimen handling modules
User's own microscope with manually traversing stage and non stabilised power supplies

Section 2
Image scanning modules
720 Vidicon Image Scanner with system control
720 Display

Section 3
Image processing modules
720 Standard Detector

Section 4
Programming modules
None: system is operated by switches

Section 5
Data processing modules
None: results are given on accumulating numerical displays on the 720 Computer Display

Notes on System 1

Measurements
Area and number of intercepts.

Advantages
Simple and inexpensive.

Disadvantages
External power must be stable; microscope must have even illumination and correct alignment; data acquisition and read out facilities are limited; grey level discrimination is limited unless 720 Automatic Shading Compensator is added; Live Frame is fixed.

Speed
Measurement of area and projection for 100 fields takes no more than 40 minutes. Accumulating area or projection alone, for 100 fields, takes no more than 15 minutes.
System 2

A more powerful system with some data handling facilities

Section 1
Imaging and specimen handling modules
720 Universal Microscope

Section 2
Image scanning modules
720 Vidicon Image Scanner with scan control
720 Automatic Shading Compensator
720 Display

Section 3
Image processing modules
720 Standard Detector
720 Amender
720 Size Distributor
720 Standard Computer with Variable Frame and Scale Module.

Section 4
Programming modules
720 16-instruction Programmer

Section 5
Data processing modules
720 Accumulator

Notes on System 2

Measurements
Area, number of intercepts, count (two modes) and size distribution, on all four parameters.

Advantages
Handles all System 1 measurements and provides additional count and sizing facilities.
720 Amender allows both 'correction' of detected features and agglomeration of adjacent particles into one feature; 720 16-instruction Programmer with 720 Accumulator allows automatic sweep through 16 parameters in 0.4-1.6 seconds and instantaneous accumulation of results on several fields of view; fully variable Live Frame allows selection of any part of field; X and Y scale allows precise measurement of features; automatic shading correction gives very high grey level discrimination and correspondingly greater accuracy.

Disadvantages
Stage must be moved manually; operator required during entire period over which measurements are being taken; no data print out or processing facilities; no record of measurements on individual fields of view.

Speed
Measurements of area and of number in six different size ranges are accumulated over 100 fields in no more than 6 minutes — or 3.6 seconds per field of view.

System 3

A fully automatic 720 image analysis system

Section 1
Imaging and specimen handling modules
720 Universal Microscope with stabilised power supply and 'X' and 'Y' Automatic Stage and Control Module
720 Epidiascope
720 Image Rotation Control Module

Section 2
Image scanning modules
720 Two Vidicon Image Scanners with Automatic Shading Compensators
720 System Interface Module
720 Display

Section 3
Image processing modules
720 Standard Detector
720 Amender
720 Size Distributor
720 Standard Computer
720 Variable Frame and Scale Module

Section 4
Programming modules
720 16-instruction Programmer

Section 5
Data processing modules
720 Supervisor Module
720 Teletype Drive Module and Teletype
720 Accumulator

Notes on System 3

Measurements
Area, number of intercepts, count (two modes) and size distribution on micro and macro specimens.

Advantages
Two scanning heads allow quick changeover from microscope to epidiascope, automatic stage control allows measurements on up to 1,000 fields of view automatically in 17 minutes, i.e. at one field per second; 720 Image Rotation Control allows measurements for anisotropy; 720 Supervisor Module allows setting of three critical parameters which, if satisfied alone or in combination, stop the instrument with visible or audible warning signals, recording automatically all fields in which critical parameters are exceeded; Teletype prints out data for reading or feeding into a general purpose computer; measurements are made entirely automatically, so freeing up operator time.

Speed
Similar measurements to those made with a System 2 configuration are recorded — using the 720 Accumulator — in 3.5 minutes (vs. System 2 — 6.0 minutes); using the 720 Teletype Drive Module and Teletype — in 18 minutes.

Note: the pattern recognition capability of all the above systems will be considerably expanded by 720 modules now in development.
Overall specification of the 720 system

The full specification of all the 720 modules is set out in individual technical Data Sheets (see page 9).

Resolution

Dimensions — from a few Angstrom units upwards depending on the imaging system in lines — 720 lines scan sampled to give 890 picture points horizontally.

Dimensions — 650,000 square picture points cover the image (the picture point is 10% smaller than the scanner resolution thus utilising the full scanner performance).

Grey level discrimination

Grey level discrimination is measured on a uniform specimen with a live frame of 5 x 10^6 picture points and threshold limit at 5% breakthrough using standard detector.

<table>
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<th>Resolution Type</th>
<th>720 M Series</th>
<th>720 Plumbicon Scanner</th>
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<tbody>
<tr>
<td>With shading corrector</td>
<td>15</td>
<td>12</td>
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<tr>
<td>Without shading corrector</td>
<td>7</td>
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<td>9</td>
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</tr>
<tr>
<td>30</td>
<td>9</td>
<td>30</td>
</tr>
</tbody>
</table>

The discrimination of the S series is governed by the characteristics of the particular external scan system selected.

Speed

Linearity

Scanner : 1% Absolute Position

Display : 1% Absolute Position

Accuracy

This is a function of feature geometry, contrast and its size at the scanner. Taking fixed feature positions to avoid shading errors, standard deviation between ten operators using standard detector for round features is:

<table>
<thead>
<tr>
<th>Contrast %</th>
<th>Area %</th>
<th>Area accuracy % measured value</th>
<th>Count accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>10</td>
<td>10</td>
<td>Exact</td>
</tr>
<tr>
<td>100</td>
<td>1</td>
<td>Exact</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>10</td>
<td>Exact</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>1</td>
<td>Exact</td>
<td></td>
</tr>
</tbody>
</table>

Dimensions

Central Processor


Microscope and Plinth

Width : 60 cms. Depth : 70 cms. Height : 82, 104 cms depending on number of decks. Weight : 80 to 160 kilos depending on auxiliary equipment.

The Quantimet 720 is manufactured by Image Analysing Computers Limited at their factory in Cambridge, England.

Image Analysing Computers

A division of Metals Research Instrument Corporation