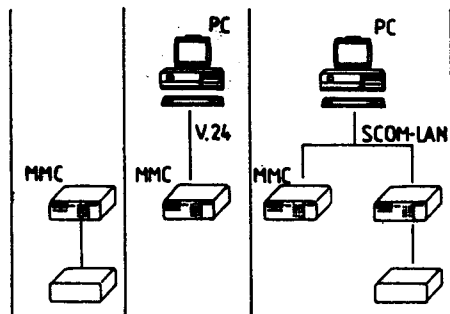
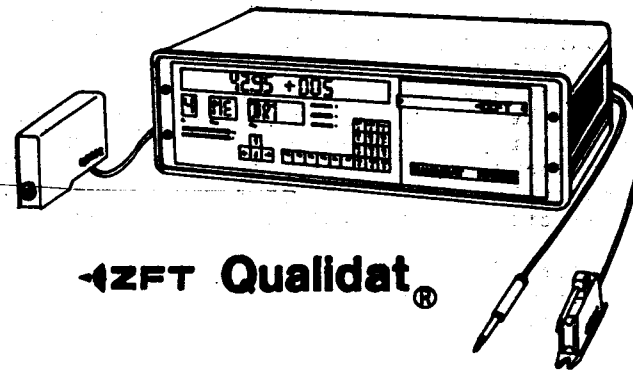


Unit Assembly QUALIDAT – Hardware and Software Module which can be Used in Statistical Process

Dr. rer. nat. **B. Lux**, Dresden/GDR

QUALIDAT Multi-measuring-controller (MMC 01)

The MMC 01 is a microcomputer gauging and control device which is specially designed for application in the field of industrial metrology, where it supports the statistic quality control of the production and the quality control according to sampling plans. There are applications as stand-alone gauging equipment, as 19" plug-in unit as well as in high flexible interconnection in a complex system like CAQ /1/.



The MMC 01 is a multiprocessor system based on the 8 bit single-chip microprocessor and an exchangeable permanent memory EPROM. For the data acquisition various intelligent sensors by employment of

- max. 32 linear action inductive measuring probes
- max. 4 CCD-linear arrays
- and their combination

are used on multi-gauging fixtures. Because of the modular structure there are many ways of extension. The connection with pneumatic-capacitive sensors and digital manual measuring instruments is prepared. The measuring operation is determined by a programme which controls the sensor microprocessor. During the measuring operation one intelligent sensor is able to acquire 16 size dimensions. The sensor mikroprocessor combines and compares the measured values with the tolerance limits.

The MMC 01 is equipped with control outputs which not only announce GOOD/REJECT statements but which can also supply other informations for instance:

- . the results of classifying for sorting
- . the decision that a workpiece has to be re-worked.

All informations of the quality control can be presented by alphanumeric display with 21 characters (16 segments). The measuring programme, the dimensional deviation of the setting master, the tolerance limits and other needed informations are kept in a permanent memory. The tolerance limits may be altered by entry over the keyboard. The possibility of connection various printer types allows to get documentations of the measuring results. By interconnection with a personal computer bulky and extensive statistical evaluation are possible.

Electro specifications

Memory capacity	:	32 KByte static RAM battery buffering (option + 32 KByte)
Interfaces	:	V.24 to the test computer; option: SCOM-LAN V.24 to the printer 12 bit output (static, relay) 12 bit input (static, optically decoupled) 2 bit input (dynamic)
Power supply requirements	:	220 V +/- 10 %, 50 Hz
Power consumption	:	max. 75 W

Mechanical specifications

Size (LWH)	:	17.72" (450mm), 11.81" (300mm), 5.12" (130mm)
Weight	:	42.34 ounces (1200 gramms)

QUALIDAT CCD-linear array sensor (ICS)

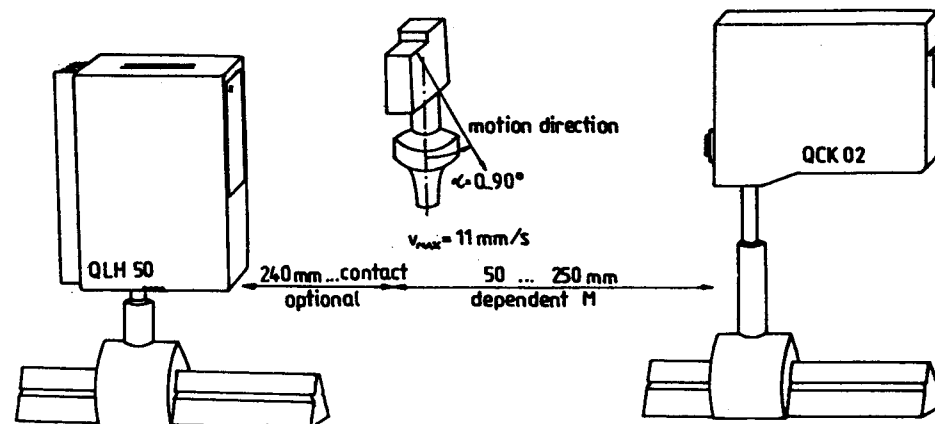
The ICS is one of the intelligent sensors of the MMC 01 making possible rapid, accurate non-contact measurement of size, shape, and position for control of manufacturing progresses. Two CCD-linear arrays are used for measuring as well as for organization of measuring under observance of fixed dimension range for realization of a self-controlled two-dimensional measurement. Because of subpixel-resolution, special signal filtering, and analogue signal preprocessing a high accuracy of measurement and a minimal dependence on light variations is realized. The preprocessing by 4 ASIC's allows a variable, programmable data acquisition.

assemblies:

QUALIDAT line scan camera	QCK 02
QUALIDAT video processing unit	QSI
QUALIDAT backlighth illuminator	QLH 50

measuring conditions:

Working distance	:	1.97" (50mm) ... 9.84" (250mm)
Object magnification	:	2 ... 10
Field of view	:	0.26" (6.6mm) ... 1.30" (33mm)
Object resolution	:	0.008" (0.2mm) ... 0.03" (0.8mm)
Subpixel-resolution	:	32 times
Object accuracy	:	0.10mil (2.5µm) ... 0.49mil (12.5µm) = 0.038%
Line scan time	:	4.2 ms
Measuring frequency	:	250 Hz



QUALIDAT line scan camera (QCK 02)

The QCK 02 is a complex gauging camera especially designed for use in multi-gauging fixtures. Two CCD-linear arrays are coupled by a semitransparent mirror and orthogonal placed in the camera therefore a two-dimensional measuring is possible. The small width of the camera allows measuring of high concentrated size dimensions. The optics is adjusted to the CCD-linear array and to small objects which are to be measured. Other optics are possible too. One ASIC was designed to get the timing signals for the CCD-linear arrays. The videosignals are produced by a sample-and-hold circuit and are presented by two bars with 16 LED's.

Electro/optical specifications

Sensor type : 2 x L110 C VEB Werk fuer Fernseh-
 Pixel format : 1 x 256 elektronik Berlin
 Center-to-center
 spacing : 13 um
 Saturating exposure : 0.5 uJ/cm
 Clock (pixel) rate: 100 kHz ... 1.25 MHz

Video output : Vss = 0 ... 2 V
 Control output : 2 x 16 LED

Optics : TESSAR 4/24 VEB Carl Zeiss Jena

Power supply
 requirements : + 5 VD C +/- 5% / 0.16 A
 + 15 VD C +/- 1% / 0.18 A
 Power consumption : max. 3.5 W

Mechanical specifications

Size (LWH) : 5.24" (133mm), 1.46" (37mm), 6.57" (167mm)
 Weight : 30.35 ounces (860 grams)
 Mounting : 1/4 x 5 0.25 DP or M 6

QUALIDAT video processing unit (QSI)

The QSI provides an efficient method for the utilization of the videosignals. The unit get the informations about the measuring programme from the MMC 01 permanent memory.

The informations are:

- terms of the size dimensions
- tolerance limits of the size dimensions
- dimension ranges of the size dimensions
- getting instructions of the size dimensions
- start/stop-instructions
- order of size dimensions
- utilizations algorithm.

There is a special signal filtering and analogue preprocessing of the videosignals to realize a edges detection by a differential method for the subpixel-resolution /2/. In the binary signal each edge is distinguished by a L/H spike.

The digital preprocessing by the 4 ASIC's is possible simultaneous with four various edge-signals /3/. The ASIC's are programmable by the sensor microprocessor. By the software-conformable initialization of the ASIC's it is determined with two spaces of time between the edges (2 of 64 possible edges per edge-signal) are counted (max. 16 bit).

The sensor microprocessor calculate the max., min. and mean actual size dimensions within the given dimension range.

Electro specifications

Power supply
 requirements : + 5 VD C +/- 5% / 0.34 A
 + 15 VD C +/- 1% / 0.22 A
 Power consumption : max. 5 W

Mechanical specifications

Size (LW) : 13.78" (350mm), 4.33" (110mm)
 Weight : 10.60 ounces (300 grams)

QUALIDAT backlight illuminator (QLH 50)

The QLH 50 is a separately light source designed and built specifically for use with QUALIDAT line scan camera. The unit is intended for use in backlight applications. The working distance is dependent on system field of view.

Electro/optical specifications

Lamp type : halogen 12 V/50 W VEB Narva Berlin
 Optics : opal glass diffuser
 size (WH): 2.80" (72mm), 4.30" (109mm)
 Working distance : up to contact ... 9.45" (240mm)
 Power supply requirements : 220 V +/- 10%, 50 Hz
 Power consumption: max. 35 W

Mechanical specifications

Size (LWH) : 4.60" (117mm), 3.86" (98mm), 6.97" (177mm)
 Weight : 24.70 ounces (700 grams)
 Mounting : 1/4 x 5 0.25 DP or M 6 (2 times)

- /1/ Modular System Qualidat firm publication, VEB Zentrum fuer Forschung und Technik Dresden
 Betrieb des Kombirates Spezialtechnik Dresden
 PSF 40, Dresden 8080, GDR
- /2/ Lux, B.; Koehler, M.; Grimm, W.: Schaltungsanordnung fuer hochgenaue Messung mittels Lichtquelle und CCD-Bildsensor, Patent DD WP G 01 B/289315-5
- /3/ Lux, B.; Koehler, M.; Helms, H.: Anordnung zur Messung geometrischer Groessen in mehreren Dimensionen mittels CCD-Zeilensensoren, Patent DD WP G 01 B/301817-2