

MARPOSS

M39s

SCANNING SYSTEM

M39s is a very high precision measuring system for checking matched cylindrical components, with the facility to provide a graphical display of the surfaces to be matched. You can inspect the internal diameter of the bore and the external diameter of the shaft/pin along the entire length of the surface.

The resulting measurements can be used for checking and grading individual parts, or for checking the matching condition of a pair of parts.

Applications

Scanning technology is an essential tool for making dimensional and form checks on matching mechanical parts with very tight clearance tolerances (Fig. 1 next page). The richness of metrological data and the immediacy of the graphical representation of the surface profiles enable you to fully control the critical production processes of these components.

The M39s can be used in manually loaded systems, or in fully automatic systems, thanks to the ease with which it can be integrated with part handling equipment.

The range of possible applications includes:

- Quality control stations beside the production line
- Pre-process measurement (e.g. to determine the ideal diameter to machine a male part to match with finished female part or vice versa)
- Post-process measurement (e.g. to provide an immediate check of the results of a critical machining operation, with the possibility to provide tool compensation feedback to the machine tool)
- Stations for grading parts
- Measurement stations in assembly lines (e.g. to determine the grade of parts required to obtain the required clearance)

The use of precise, interchangeable standard components, together with the careful design of the basic system guarantees excellent metrological performance over a period of years in typical production environments.



M39s "Twin"

Measurement Technology

The standard model includes:

- Air gauging plug for checking internal diameters
- Air gauging ring for checking external diameters

Special applications with contact/electronic measurement are also available.

Measurement Principle

A gauging plug is moved at a constant speed inside the bore to be gauged and the diameter reading is continuously stored. For gauging external diameters, generally the part itself is moved within the fixed ring gauge (Fig. 2).

Drive System

The slide which moves the gauging plug or the part is driven by a high-precision recirculating ball-screw. A brushless motor with encoder guarantees very high precision of position and perfect control of the speed of movement. Positions and speeds of the measuring system are programmed in the E9066™ gauge computer which controls the complete system.

With the option of having the master built into the gauge it is possible to zero the gauge automatically, thus guaranteeing high precision and stability of the measurements.

Retooling

The measuring station is designed for rapid retooling when changing between various, similar, part types. The station can also be changed over from internal to external diameters or vice versa, using a suitable kit of parts. The measurement program in the E9066™ can be quickly and simply changed to suit any new part.

Versions Available

Single station M39s for individual ID or OD checks.

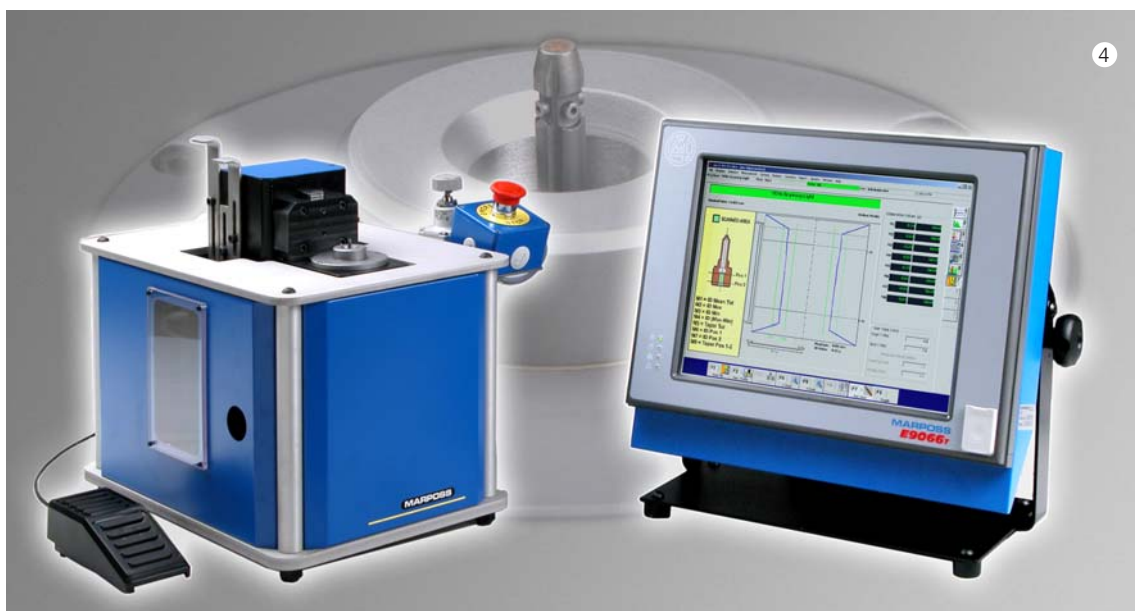
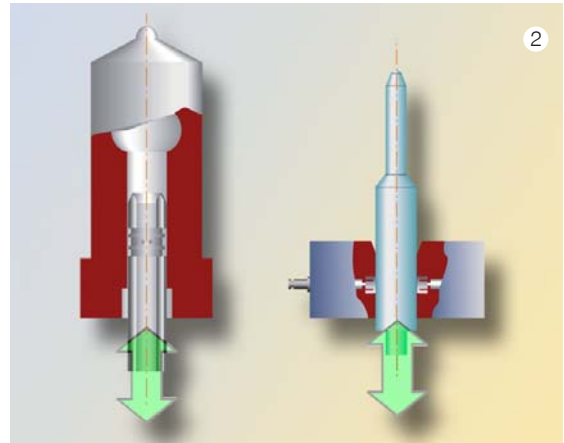
Twin station M39s for simultaneous or alternate checking of ID's and OD's with the facility to calculate the clearance.

M39s with rotary table for automatic part loading-unloading while another part is gauged, for cycle time reduction in automatic cells (Fig. 3).

M39s Light for basic scanning measurements (Fig. 4).

Special solutions using "single lip" air/electronic technology.

Version with optical linear encoder on the measuring slide.



Hardware: Standard Configuration for M39s

Applications can be provided using Marposs PC-based systems E9066N™ Flat Panel or E9066T™ with Gage Box™ or with Easy Box™

E9066N Flat Panel	E9066T
12.1" TFT SVGA display (brightness 250 cd/m ²)	15" TFT XGA display (brightness 250 cd/m ²)
Intel® Pentium® III 1GHz 256MB RAM	Intel® Celeron® 1.2GHz 256MB RAM
40 GB hard disk drive	
4 serial ports (2 x RS232, 2 x RS232/422/485)	3 serial ports (2 x RS232, 1 x RS232/422/485)
Built-in Ethernet port (10BaseT, 100BaseT with RJ45 connector)	
2 x USB1.1 ports (USB2.0 beginning from 2006)	4 x USB ports (2 x USB1.1, 2 x USB2.0)
IP65 rated front panel	

OPTION	
E9066N Flat Panel	E9066T
15" TFT XGA display	17" TFT UXGA display
Internal CD ROM 24x or CD RW/DVD	
Touch screen (analog-resistive)	

Software: standard configuration for M39s

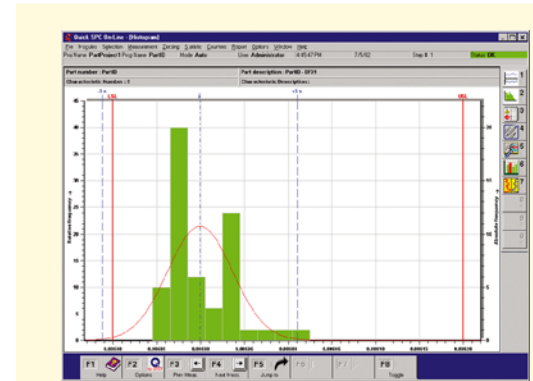
- Quick SPC™ software for process and quality control
- Integrated qs-STAT® statistical software (Fig. 5,6)
- Dedicated "Add-on" scanning software for the graphical display of the surface profiles and for the measurement calculations (Fig. 7, 8)
- Operating System Microsoft® Windows® 2000 /XP

On-Line

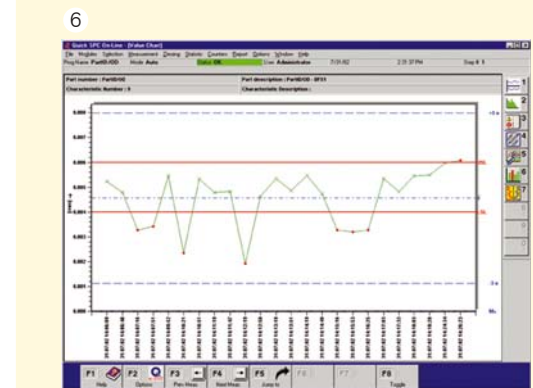
- Graphical display of the surface profile
- Double profile display for the clearance check in the M39S Twin Station version
- Zoom functions available in the axial and radial directions, for a more detailed display of the profile
- Manual exploration of the total profile
- Facility to display the measuring point diagram beside the profile display
- Facility to store and export files containing the measured profile data

Gauge Explorer

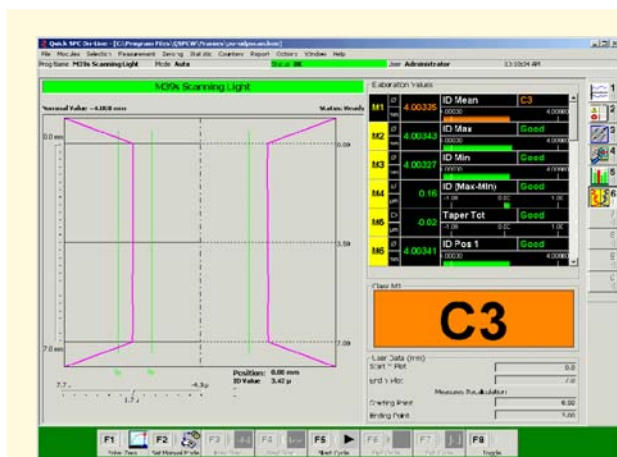
- Fast programming interface for movements and measuring cycles
- A complete library of possible measurement calculations
- Programmable filtering parameters to allow measurement of interrupted surfaces



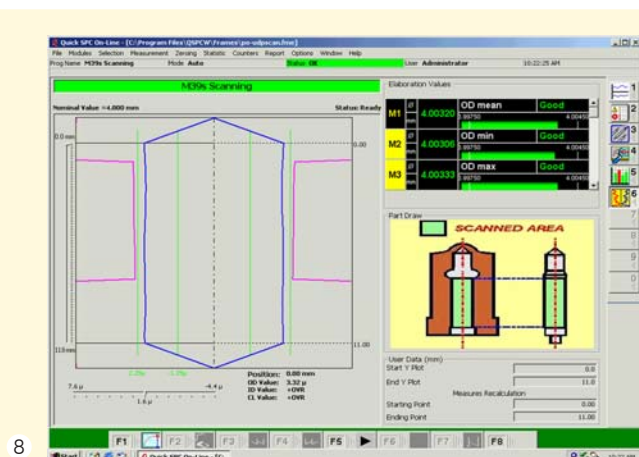
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Measurement Calculations

From the samples acquired during the scanning cycle various measurements can be calculated:

- Max, min and mean diameters calculated over the total length or over sections of the scanned profile
- Diameters in programmed positions along the length of the part
- Maximum variation of diameter calculated over the total length or over sections of the scanned profile
- Evaluation of the taper or barrel-shape error in accordance with various criteria
- Evaluation of the matching clearance in accordance with various criteria (e.g. max, mean, min clearance, or clearance in specified positions)

Air / Electronic Gauging System

Where air gauging is used, an extremely precise and flexible air/electronic converter is used which gives excellent metrological results in a wide range of applications. The standardised design of the gauging plugs and rings guarantees the interchangeability necessary for rapid retooling without the need for re-adjusting the converter (Figs. 9 & 10). Gauge plugs and rings with two or more jets are available to suit different measurement requirements. Applications with annular jets or the so-called "single-lip" technology are also available.



Accuracy of Measurement

The system has been designed to guarantee excellent metrological performance in the gauging of very precise parts, with extremely tight tolerances and matching conditions. Within a measuring range of 10 μm (depending on the condition of the part) it is possible to guarantee repeatability and linearity errors within 0.1 μm . The system can also be used to check parts with larger tolerances.

Technical Data		
Type of measures	Inner Diameter - Outer Diameter - Clearance	
Measured diameters	Min 2 mm	Max 20 mm
External part diameter		Max 60 mm
Measuring length	Min 0,2 mm	Max 80 mm
Workpiece weight (ID)		Max 2 kg
Workpiece weight (OD)		Max 0,5 kg
Measuring speed	Min 0,5 mm/sec	Max 10 mm/sec
Maximum speed		Max 50 mm/sec
Data acquisition		Max 32.000 samples
Sampling period	Min 0,4 msec	

Typical measuring performances (for a measuring range of 10 μm)			
	Annular ring jet	4 Air jets	2 Air jets
Resolution		0,01 μm	
Repeatability range	$\leq 0,07 \mu\text{m}$	$\leq 0,1 \mu\text{m}$	$\leq 0,15 \mu\text{m}$
Thermal drift		$\leq 0,05 \mu\text{m}/^\circ\text{C}$	
Linearity error		$\leq 0,1 \mu\text{m}$	

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D6M39S02G0 - Edition 07/2005 - Specifications are subject to modifications
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