

SURFACE MEASUREMENT

PRE1164(5)



**Sophisticated, powerful and economical:
Surface measuring machines from Mitutoyo.**

Mitutoyo

It's your job to deliver quality!

Surface testing. Perfection through and through giving the best possible results.

Precise surface testing requires in-depth technological expertise. As the world's most diversified supplier of production measuring technology, Mitutoyo sets the standard in knowledge and experience in its field. A carefully structured range of sophisticated solutions for modern surface measurement has been put together in this brochure; Users with difficult requirements will find here the right configuration for the perfect measurement of roughness and waviness in production and laboratory.

This brochure gives an overview of the multi-faceted Mitutoyo range of surface testing machines – from practical hand-held mobile units through to stand-alone reference-plane measuring systems that set the standard in their class. It will provide you with a fast, reliable and efficient guide to the best solution for your particular surface measuring requirements. More detailed machine-specific brochures will give you further guidance on configuring the system of your choice, the wide range of available accessories and the impressive range of software.

Whichever system you choose: a coordinate measuring machine from Mitutoyo means that you can draw on the experience, competence and performance of a world-leading measurement technology specialist, and on customer-focused service that will not fail to impress.

Mitutoyo: top of the class in measurement technology

SURFACE MEASURING
MACHINES

EST



We'll help you achieve this goal, with top-class user and task-oriented surface measurement technology.

| | Model | Description |
|-------------|-----------------|---|
| Skid system | SURFTEST SJ-201 | The mobile solution for precise, effective and uncomplicated surface testing in the production environment. With a large, easily legible display for the clear representation of measured values. |
| | SURFTEST SJ-301 | Mobile surface testing device with dust-proof touch-sensitive control panel and integral printer. For rapid portable measurement in the production environment itself. |



| | Model | Description |
|------------------------|------------------------------------|--|
| Reference plane system | SURFTEST SJ-401 SURFTEST SJ-402 | Machines that can be used as mobile or stationary units. For portable reference- plane measurement of surface roughness and waviness as well as contact area ratio and amplitude distribution. |
| | SURFTEST SJ-500 | Practice-relevant diversity for measuring room and laboratory. Economically efficient reference plane measuring device for mobile and stationary use with an impressive range of features and excellent standard software. |



SURETEST SJ

SURFTEST SJ

Device-specific properties

- Automatic dynamic calibration function
- High-resolution probe head with broad measuring range
- Removable feed unit for measurements where space is restricted
- Overhead measurement option

- Uncomplicated storage of up to five different measurement conditions and measurement and statistical data records (expandable with optional memory card)
- Data output via integrated thermal-printer and in various formats via external computer
- Standard RS-232-C interface and DIGIMATIC data output

| Model | Feed | Tripod with granite plate | |
|---------------|---------|---------------------------|-----------------------|
| | | Height adjustment | Base plate dimensions |
| SJ-201 | 12,5 mm | optional | |
| SJ-301 | 12,5 mm | optional | |

Device-specific properties

- Evaluation of surface parameters and contact area ratio and amplitude distribution on large touchscreen display
- Printout via integral printer with high output-speed
- Standard RS-232-C interface and DIGIMATIC data output

- Top quality ceramic axis
- Measuring head can swivel 90° for transverse measurement
- Analysis of roughness and primary profiles, waviness and geometric characteristics
- TFT color display (touch screen)
- USB, RS-232C, SPC interfaces

| Model | Feed | Tripod with granite plate | |
|---------------|-------|---------------------------|-----------------------|
| | | Height adjustment | Base plate dimensions |
| SJ-401 | 25 mm | optional | |
| SJ-402 | 50 mm | optional | |
| SJ-500 | 50 mm | optional | |

Complex reference plane systems in the SurfTest SV series

Reference plane system

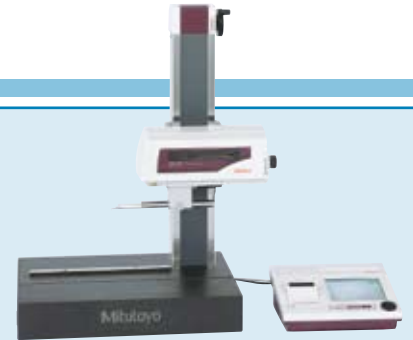
Model

Description

SURFTEST SV-2100

Stationary reference plane system for capturing primary, roughness and waviness profiles and geometric characteristics.

The series comprises models with manual and servo powered pillars.



SURFTEST SV-3100

Stationary reference plane measuring system for sophisticated measuring tasks to capture primary, roughness and waviness profiles in the measuring room.

FORMTRACEPAK software for control of all servo powered axes and comprehensive analysis of surface measurements.



SURFTEST SV-3000CNC

High performance measuring system belonging to the MITUTOYO CNC EXTREME series.

The stationary reference plane system is designed for sophisticated measuring tasks to capture primary, roughness and waviness profiles fully automatically.

All axes are servo powered.



SURFTEST SV-M3000CNC

High performance measuring system belonging to the MITUTOYO CNC EXTREME series. Fitted with a moving/measuring pillar. The stationary reference plane system is designed for sophisticated measuring tasks to capture primary, roughness and waviness profiles fully automatically.

All axes are servo powered. At the same time, they can be moved at the highest positioning speeds.



SURETEST SV

SURFTEST SV

Device-specific properties

- Ceramic axis with 100 mm measuring range
- Measuring head can swivel 180° for top/bottom measurement
- Analysis of roughness, primary and waviness profiles, and geometric characteristics
- TFT color display (touch screen)
- USB, RS-232C, SPC interfaces

- Ceramic axis with 100 mm or 200 mm measuring range
- Servo powered pillar with ABS scale
- Measuring head with collision protection
- Forward travel with angle adjustment
- High positioning speed
- Windows-based FORMTRACEPAK software
- Analysis of roughness, primary and waviness profiles

- Ceramic axis with 200 mm measuring range
- Servo powered axes can be positioned simultaneously
- Collision protection
- Highest positioning speed
- Standard model with stand and active vibration damping system
- Windows-based FORMTRACEPAK software
- Analysis of roughness, primary and waviness profiles

- Ceramic axis for forward travel
- Servo powered axes can be positioned simultaneously
- Collision protection
- Highest positioning speed
- Standard model with stand and active vibration damping system
- Windows-based FORMTRACEPAK software
- Analysis of roughness, primary and waviness profiles

| Model | Feed | Height adjustment (servo powered) | Base plate dimensions |
|-----------------|--------|-----------------------------------|-----------------------|
| SV-2100M | 100 mm | 350 mm* | 600 x 450 mm |
| SV-2100S | 100 mm | 350 mm | 600 x 450 mm |
| SV-2100H | 100 mm | 550 mm | 600 x 450 mm |
| SV-2100W | 100 mm | 550 mm | 1000 x 450 mm |

* manual

| | | | |
|------------------|--------|--------|---------------|
| SV-3100S4 | 100 mm | 300 mm | 600 x 450 mm |
| SV-3100H4 | 100 mm | 500 mm | 600 x 450 mm |
| SV-3100W4 | 100 mm | 500 mm | 1000 x 450 mm |
| SV-3100S8 | 200 mm | 300 mm | 600 x 450 mm |
| SV-3100H8 | 200 mm | 500 mm | 600 x 450 mm |
| SV-3100W8 | 200 mm | 500 mm | 1000 x 450 mm |

| | | | |
|-------------------|--------|--------|--------------|
| SV-3000CNC | 200 mm | 300 mm | 600 x 450 mm |
| SV-3000CNC | 200 mm | 500 mm | 600 x 450 mm |

| | | | |
|---|--------|--------|--|
| SV-M3000CNC | 200 mm | 500 mm | |
| with 800 mm measuring Y axis (movable pillar) | | | |

SJ-201 and SJ-301 Mobile unit.

Mobil

SJ-201

Probe stroke: 350 μm
Feed: 12.5 mm



Parameter display Ra



Parameter display Rz with tolerance evaluation

SURFTEST SJ-201

With automatic dynamic calibration function

- Uncomplicated measuring and display of values in accordance with standards
- Sturdy workshop design
- Convincing price/performance ratio
- Measurement using a single key operation
- Clear display with large, easy-to-read characters
- Suppression of parameters that are not needed
- Automatic calibration function with all probes
- Automatic probe transport protection
- Measurement even in a very restricted space with the detachable feed unit
- Optional overhead measurement
- Probe stroke 350 μm
- Resolution 0.01 μm
- Feed: 12.5 mm
- Storage of up to 10 measurement conditions
- Wide range of accessories
- Network adapter and rechargeable batteries
- External printer (optional)
- Printout of profile and measured values via external printer possible (optional)



19 parameters

Ra, Rq, Ry, Rz, R3z, Rt, Rp, S, Sm, Pc, mr, Rk, Rpk, Rvk, Mr1, Mr2, A1, A2, Vo



Powerful, portable unit for precise, uncomplicated measurement in workshop and production environment – directly on the machine, directly on the workpiece



SJ-301

Probe stroke: 350 μm
Feed: 12.5 mm

SURFTEST SJ-301 With touch-panel display and integral printer

Features identical to the SURFTEST SJ-201 plus:

- Output of measured values and profiles via display and integral printer
- Data output via external computer as an option
- RS-232-C interface and DIGIMATIC data output
- Touch panel including stylus
- Storage of up to five measurement and statistical data records (expandable with optional memory card)
- Integrated statistical function



Auto-calibration function



Specific function selection

S drive unit for SJ-201/ SJ-301 with transverse scanning

The new S drive with transverse scanning measures surface roughness in the axial direction rapidly and reliably. The transverse scanning function simplifies surface-roughness measurement even in very restricted areas, which has hitherto been a problem for conventional measuring units with longitudinal scanning.

37 parameters

Ra, Rq, Ry, Rz, R3z, Rt, Rp, Rk, Rpk, Rvk, Mr1, Mr2, S, Sm, SK, Pc, Ppi, mr, A1, A2, Rv, R, Rx, W, Wt, Wx, Wte, mrd, HSC, AW, AR, Vo, Ku, Lo, δc , Δa , Δq



SJ-400: Rapid, portable reference-plane measurement of surface roughness and waviness. On site and on the move, stationary or mobile.

SJ-400

Probe stroke: 800 μm
 Feed: 25 mm (SJ-401)
 50 mm (SJ-402)

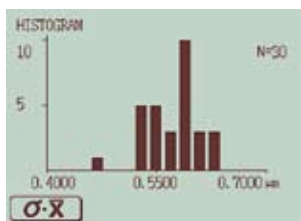
SURFTTEST SJ-400

With automatic compensation for radius and inclination

- Measurement of roughness, waviness and primary profile
- Sturdy workshop design
- Clear display with large, easy-to-read characters
- Suppression of parameters that are not needed
- Automatic calibration function
- Probe height adjustment in mobile operation over 10 mm
- Inclination setting
- Optional measurement with and without skid
- Optional overhead measurement
- Probe stroke 800 μm
- Resolution 0.0001 μm
- Feed: either 25 or 50 mm
- Very small cut-off 0.08 mm
- After a roughness measurement, waviness or the primary profile can be determined in a new calculation
- Storage of up to 5 measurement conditions (expandable by memory card)
- Integral statistical function
- PC connection with SURFPAK-SJ software (optional)
- Wide range of accessories
- Mains adapter and rechargeable batteries



Specific function selection



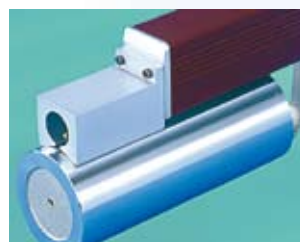
Histogram



Surface profile representation

Parameters

Ra, Rmax (VDA), Rz1max, Rc, Rq, Ry, Rz, R3z, R3zi, Rt, Rti, Rp, Rpi, Rpm, Rpk, Rk, Rvk, Rvi, Rvmax, Mr1, Mr2, S, Sm, SK, Pc, mr, A1, A2, Rv, R, Rx, W, Wx, Wte, mrd, HSC, AW, AR, Vo, Ku, Lo, Lr, δc , Δa , Δq , λa , λq



ationary or mobile



SJ-402

SJ-401

Feed rate 25 mm (SJ-401) to 50 mm (SJ-402)



SURETEST SJ-500

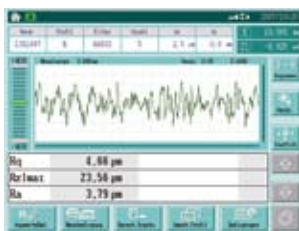
SURFTEST SJ-500



Surftest SV-2100

SV-2100M

Probe stroke: 800 μm
Forward travel: 1000 mm



Presentation of roughness result



Joystick activation



Retrieval of up to 10 measurement variables



Selection of indicators

SURFTTEST SV-2100M (semi-automatic)

Reference plane measuring system with manual height adjustment for analyzing

- Roughness profile
- Waviness profile
- Primary profile
- Evaluation of geometric characteristics

User friendly display and simple operation

- The surface measuring device is equipped with a 7.5" high-resolution TFT color display with touch screen function for user friendly and simple operation.

Secure positioning

- A joystick integrated into the control unit allows secure and rapid positioning of the touch probe system. Manual fine adjustment using the joystick to finely position the probe system, for example when measuring small bores.

Diverse analysis options

- 46 surface indicators are available to analyze surface roughness (e.g. Rmax according to VDA), together with a wide range of form analyses, such as: radius, angle, steps and coordinate difference.

Thermal printer

- Integrated high-speed printer with high graphic resolution.



SURETEST SV

SURFTEST SV

SV-2100S/H/W

SURFTEST SV-2100S/H/W (semi-automatic)

Reference plane measuring system with manual height adjustment for analyzing

- Roughness profile
- Waviness profile
- Primary profile
- Evaluation of geometric characteristics

User friendly display and simple operation

- The surface measuring device is equipped with a 7.5" high-resolution TFT color display with touch screen function for user friendly and simple operation.

Secure positioning

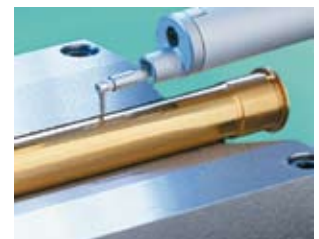
- A joystick integrated into the control unit allows secure and rapid positioning of the touch probe system. Manual fine adjustment using the joystick to finely position the probe system, for example when measuring small bores.

Diverse analysis options

- 46 surface indicators are available to analyze surface roughness (e.g. Rmax according to VDA), together with a wide range of form analyses, such as: radius, angle, steps and coordinate difference.

Thermal printer

- Integrated high-speed printer with high graphic resolution.



User-defined interface

Stand-alone performance: stationary reference plane system setting standards in test room and laboratory analysis.

Star

SV-3100

Probe stroke: 800 μm
Feed: 100 mm
200 mm

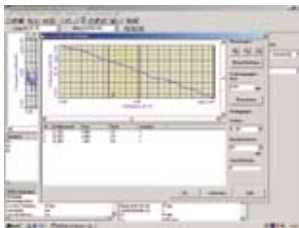
SURFTEST SV-3100

The high-end solution for the most exacting demands in surface testing

- Measurement of roughness, waviness primary profile
- Automatic calibration function
- Probe stroke 800 μm
- Resolution 0.0001 μm
- Feed 100 or 200 mm
- Very small cut-off 0.025 mm
- Ceramic straightness guide
- Wide range of probe tips available for various measurement tasks
- Simple exchange of probe tips
- SURFPAK software included as standard
- Wide range of accessories
- Automatic levelling table (optional)
- ABS scale in Z2 axis
- High-speed travel
- Collision prevention
- Supports CNC functions



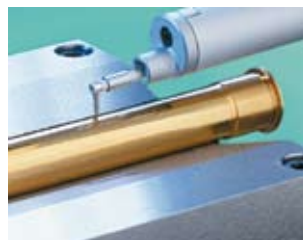
Evaluation screen SURFPAK-SV software



Re-calculation function

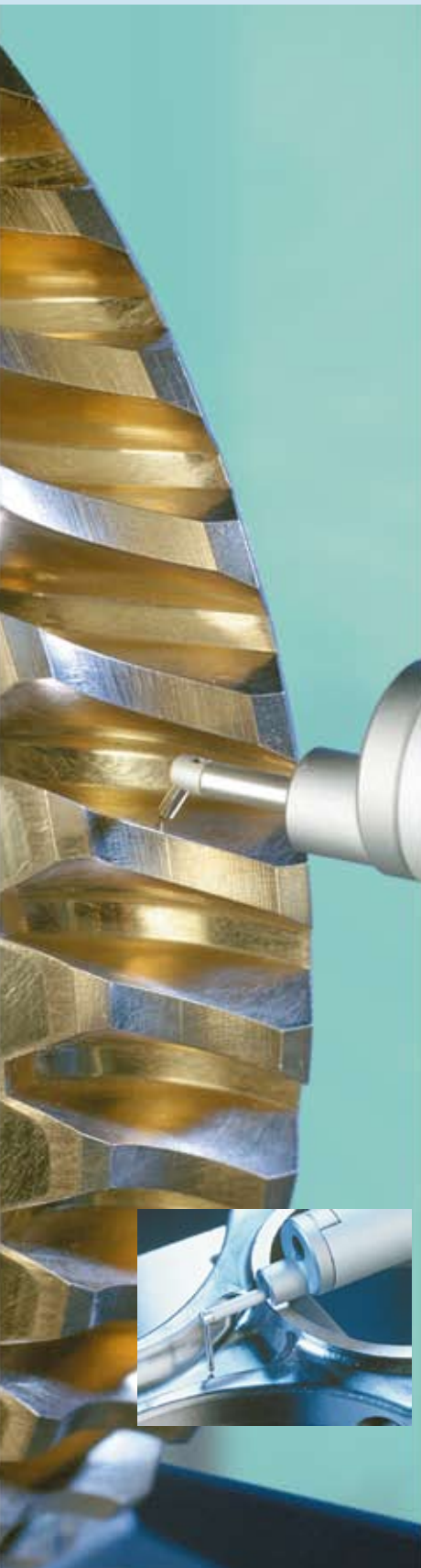
55 parameters

Ra, Rq, Ry, Rz, R3z, Rt, Rp, Rk, Rpk, Rvk, Mr1, Mr2, S, Sm, Pc, mr, A1, A2, Rv, R, Rx, W, Wx, Wte, mrd, HSC, AW, AR, Vo, Δa , Δq , Ku, δc , Lo, Sk, Rti, R3zi, R3y, Rc, Rpmax, Rpi, Rvmax, plateau ratio, λa , λq , Lr, SR, SAR, NR, NCRX, CPM, SW, SAW, NW, Vo



Mitutoyo

nd-alone



ABSOLUTE™

Absolute System Patented by MITUTOYO

Not only has Mitutoyo developed, patented and perfected its ABSOLUTE System. Mitutoyo is the only supplier in the world to translate original Absolute technology into calliper gauges, dial gauges, touch probes and numerous external screw type micrometers. Devices fitted with this system will operate without constantly having to start back at zero. Reference back to zero is automatic and the absolute value of the length being measured can therefore be indicated at any point. This means that you only once start at zero, which the instrument automatically remembers, even when it is switched off. When it is reactivated, you can continue measuring from any point – without having to restart from zero – absolutely error-free.

To put it more simply, Absolute instruments don't count. They always "know" where they are at any one point. They don't "traverse" a length to be measured in the way that conventional instruments do. Rather, they "see" them. This ensures precise, convenient and time-saving work in every situation.

Registered Mitutoyo patents*

| | | | | | |
|------------|------------|------------|------------|-----------|-----------|
| Patent no. | US4879508 | US4878013 | US5053715 | US6329813 | US6400138 |
| | JP1783035 | JP1783036 | JP1745485 | JP3436510 | JP1745486 |
| | EP0248165 | EP0404980 | EP0240020 | EP1014041 | |
| | CN87102580 | CN87102624 | CN89106051 | CN1272620 | |

Mitutoyo patents applied for

Patent No. CN1272620

* Correct at time of printing: April 2009

CNC measuring system

SV-3000CNC

Probe stroke: 800 μm
Forward travel: 200 mm

SURFTEST SV-3000CNC

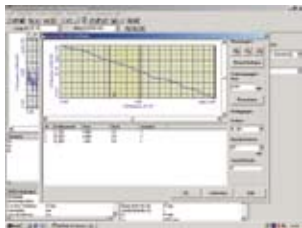
The system offers the same impressive features as the SV-3000 basic model but enhanced with innovative CNC technologies – coupled with the tangible cost benefits of standard production.

At last: high precision surface measurement can be incorporated cost efficiently straight into rapid production processes.

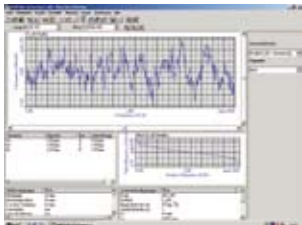
The device offers additional capabilities for quick use in a CNC manufacturing environment, such as the ability to activate six different axes, or full collision protection.



Analysis screen



Re-calculation function



Analysis screen with measurement variables

- High rate of travel up to 200 mm/s
- Ceramic X axis, straightness deviation 0.5 $\mu\text{m}/200$ mm
- As many as 6 axes can be moved simultaneously.
- Standard model with active vibration damping system
- High performance Formtracepak software for controlling all axes and analyzing roughness, waviness and primary profiles



SURETEST SV

SURFTEST SV



PLEASE NOTE: Products of this series come equipped with a safety system for detecting functionality impairing shocks to the measuring system. Activation of this safety system leads to a delayed shutdown. Without any machine down-time, however, system functions may be fully restored by requesting Mitutoyo service personnel for system clearance.

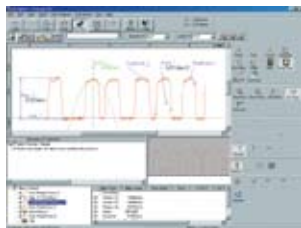
CNC measurement system with measuring pillar

SV-M3000CNC

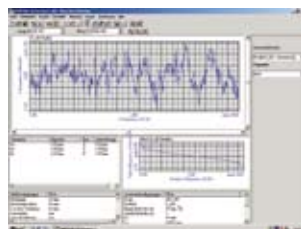
Probe stroke: 800 μm
Forward travel: 200 mm
Y axis measurement range:
800 mm



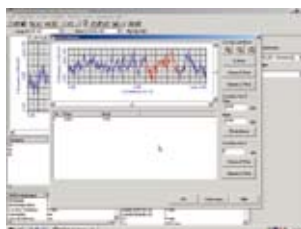
Analysis screen



Analysis screen



Analysis screen with measurement variables



Merging of relevant areas

SURFTEST SV-M3000CNC

This standard surface analysis device offers all of the outstanding features of the SurfTest SV-3000 CNC basic model.

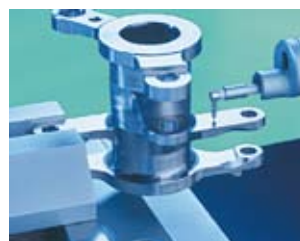
Special feature: This high precision surface roughness measuring device is equipped with a movable measuring Y axis. The entire Z2 axis can move in Y direction of measurement when measuring large work pieces, for example. Allowing measurements to be performed over a large area at points that are otherwise difficult to access, even on large work pieces.

It travels at an astonishing speed of 200 mm/s. The straightness deviation quality of the Y axis is excellent: 2 μm / 800 mm resp. 0.5 μm / 50 mm.

- Fully automatic measurement of complex components
- Measuring Y axis (movable pillar) over 800 mm
- Equipped with active vibration damping system
- Optionally available with rotation detector unit (for top, bottom and lateral measurements)
- High performance Formtracepak software for controlling all axes and analyzing roughness, waviness and primary profiles



Model with granite plate

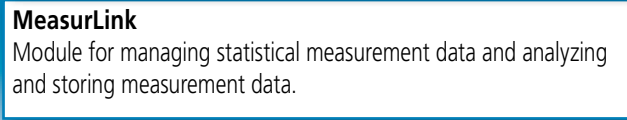


SURETEST SV

SURFTEST SV



PLEASE NOTE: Products of this series come equipped with a safety system for detecting functionality impairing shocks to the measuring system. Activation of this safety system leads to a delayed shutdown. Without any machine down-time, however, system functions may be fully restored by requesting Mitutoyo service personnel for system clearance.



SURFPAK
The SURFPAK version is the solution for the SJ-200, SJ-300 and SJ-400 series of hand-held devices, offering the same outstanding features as the stationary test equipment. For example, SURFPAK offers a wide range of roughness parameters, including analysis charts; every single surface characteristic can be analyzed, including steps and distances.

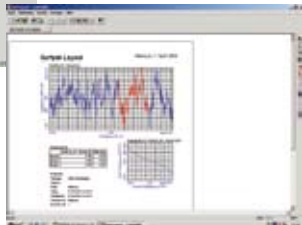
With this intelligent software, even the mobile Mitutoyo surface measuring device can become part of a top quality desktop analysis system.

FORMTRACEPAK
FORMTRACEPAK performs the following tasks on all SV3100 and higher series and, as such, for all CNC models:

- Control of all servo-powered axes
- Definition of measurement variables
- Analysis of roughness profile I, waviness profile I, primary profile I
- Wide choice of indicators for each respective profile
- Definition of tolerance limits
- Automatic part program sequence
- Automatic calibration
- Creating test reports
- Export and archiving of results



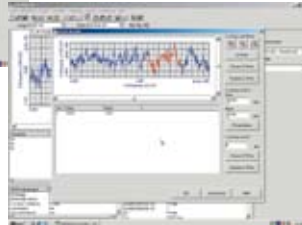
Analysis screen



Sample report



Presentation of Formtracepak results



Presentation of Formtracepak results

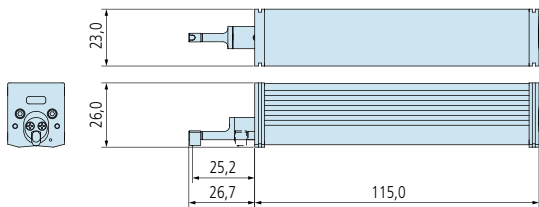
Sample accessories for skid systems and probe elements for reference plane systems

Skid system



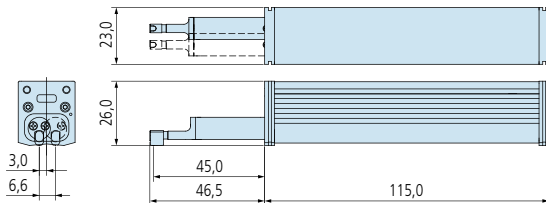
Standard forward travel For SJ-201P/SJ-301

Basic model with standard forward travel



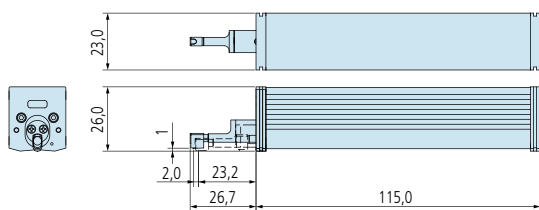
S forward travel For SJ-201S/SJ-301S

S forward travel was developed for special measuring tasks and is only used for measurements in Y direction (transverse to the standard direction of measurement)



R forward travel For SJ-201R/SJ-301R

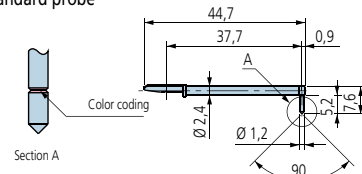
This forward travel (front lift model) represents an extension of the basic model (measurement in the direction of measurement of the X axis).



The probe tip is not touching the work piece at the start of measurement. Once measuring begins, the probe system lowers to the surface of the work piece while the forward travel moves in the direction of measurement. Once measurement is completed, the probe system initially remains on the surface of the work piece. The probe system is raised from the work piece surface during the return travel and before the measurement start position is reached.

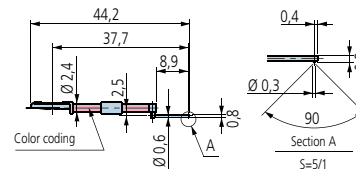
Reference plane system

Standard probe



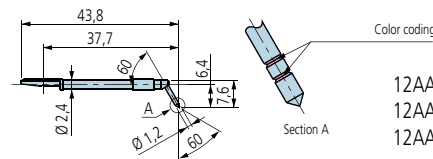
12AAC731 (2 μm)
12AAB403 (5 μm)
12AAB415 (10 μm)

Small bores



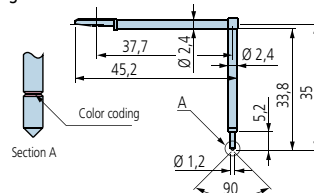
12AAC734 (2 μm)
12AAB406 (5 μm)
12AAB418 (10 μm)

Gear tooth systems



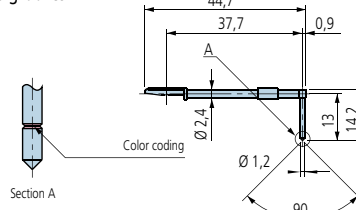
12AAB339 (2 μm)
12AAB410 (5 μm)
12AAB422 (10 μm)

Deep grooves*



12AAC737 (2 μm)
12AAB407 (5 μm)
12AAB419 (10 μm)

Deep grooves*



12AAC735 (2 μm)
12AAB409 (5 μm)
12AAB421 (10 μm)

* Measurement force is not guaranteed if this probe is used.

Probe tip angle 60° at probe tip radius of 2 μm

Probe tip angle 90° at probe tip radius of 5 μm resp. 10 μm

Please ask for our other general brochures!



ROUNDFORM MEASUREMENT

Individual solutions for perfect measurement of rotationally-symmetrical workpieces – from particularly easy-to-operate compact instruments with an integral printer through to the high-accuracy class reference model.



CONTOUR MEASUREMENT

Contour measurement with profile for efficiency-oriented results. Whether you choose the digital solution for mobile applications or stationary use: Mitutoyo offers individual systems, sophisticated technologies and convincing concepts. Based on world-recognised competence and experience.



CONTOUR AND SURFACE MEASUREMENT

The machines in the Formtracer series combine the technologies of contour and surface measurement in a single space, time and cost saving system. This reaps the benefits of both methods, even where space is limited, with efficiency and economy in perfect combination.

| | |
|--|-------|
| Coordinate Measuring Machines | ===== |
| Vision Measuring Systems | ===== |
| Form Measurement | ===== |
| Optical Measuring | ===== |
| Sensor Systems | ===== |
| Test Equipment and Seismometers | ===== |
| Digital Scale and DRO Systems | ===== |
| Small Tool Instruments and Data Management | ===== |

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