CONTRACER CV-3100/4100

PRE1304(2)

The ABSOLUTE system for contour measurements: CNC-enabled, precise and fast

Mitutoyo

CONTRACER CV-3100/CV-4100:
Contour measurements in unparalleled quality

CNC potential, precision and speed for next generation contour measurement in laboratories, measuring rooms and production: The stationary, semi-automatic CONTRACER CV-3100 and CV-4100 systems allow users to gain the maximum benefit offered by flexible, cost-efficient and highly accurate contour measurement and analysis. Fitted with Mitutoyo's patent protected ABSOLUTE system and prepared for CNC support, they meet even the highest standards demanded of quick serial measurements.

Performance and features that set standards

CONTRACER CV-3100 and CV-4100 truly are best in class. They are the only appliances to be fitted with Mitutoyo's unique ABSOLUTE system (ABS).
The CV-4100 version clearly represents the benchmark for performance within its product segment with its use of a laser holoscale on the Z1 axis to register measured values. This pioneering technology reduces the length measurement deviation of this high-end system to just (0.8+| 0.5H |/25) µm – truly convincing.

Both CONTRACER models are, moreover, already equipped to take on CNC functions. As such, if required and fitted with the appropriate accessories, these semi-automatic devices are fit for uses that come extraordinarily close to those offered by fully automated systems.

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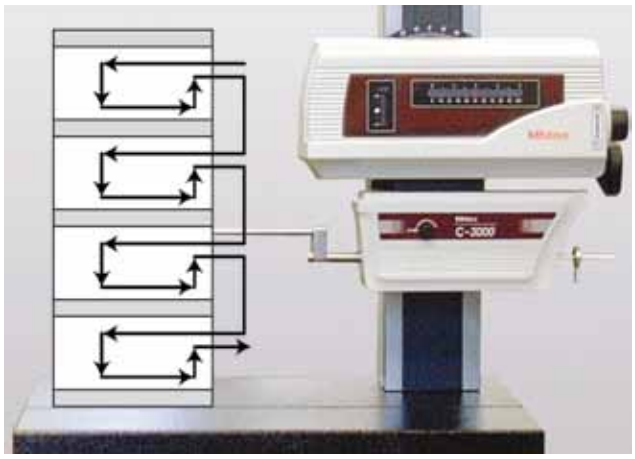
CV-3100/4100

- Digital glass scale on the X axis
- Digital glass scale on the Z1 axis (CV-3100)
- Laser holoscale on the Z1 axis for high-precision measurements (CV-4100)
- ABSOLUTE scale on the Z2 axis
- Traversing range of up to 500 mm on the Z2 axis
- Rate of travel: 80 mm/s on the X axis, 20 mm/s on the Z2 axis
- Ceramic straightness guide on the X axis (forward travel)
- Straightness deviation of X axis (0.8 + 2 L / 100) µm on the CONTRACER CV-4100 (CV-3100: [1 + 2 L / 100] µm)
- Servo-powered Z column
- Forward travel gradient ± 45°
- Freely positionable scanning arm
- Probe tip is raised and lowered automatically
- Joystick box
- Full collision protection
- Standard equipped with high-performance FORMPAK measuring and analysis software (Windows-based)
- Easy, quick measurements, analysis and documentation of measuring results
- CNC function support
- Data transmission via USB

CONTRACER CV-3100/CV-4100: Facts and benefits



ABSOLUTE™

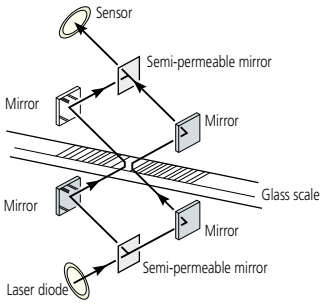
Absolute System Patented by MITUTOYO

ABSOLUTE scale on the Z2 axis

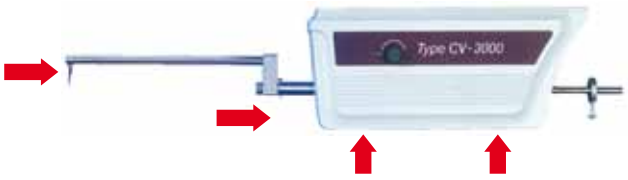
Both the CONTRACER CV-3100 and the CV-4100 use Mitutoyo's patent protected ABSOLUTE system (ABS) for the scale on the Z2 axis. The ABS technology allows the system to identify its position on the axis at any time.
The ABSOLUTE system allows the CONTRACER to efficiently handle complex part programs including free travel positions at high rates of both travel and workpiece throughput.

Laser holoscale for high-precision measurements

The CONTRACER CV-4100 is equipped with a laser holoscale on the Z1 axis whose length measurements deviate by just (0.8+| 0.5H |/25) µm. The laser holoscale is a glass scale that uses the interference caused by laser beam refraction on a holographic grid to perform measurements. A photoelement converts the ensuing refraction pattern into an electric sinus wave. This process produces a resolution of up to 0.05 µm.



Protection against collision with the workpiece is particularly important when measuring contours using semi-automatic equipment. Mitutoyo's CONTRACER is therefore equipped with full automatic collision protection. The joystick box, which is equally part of the standard equipment, ensures secure and easy manual positioning with comfortable, precision targeting.



Automatic calibration function

The automatic calibration of the system is superbly comfortable and utterly simple for the operator. Just a few manual adjustments by the operator are all it takes for the CONTRACER to automatically calibrate first the gradation, then the symmetry balance and finally the radius compensation.
This user-friendly automated process enables simple yet exact calibration of the system.

Prepared for CNC use

CONTRACER CV-3100 and CV-4100 are already optimally prepared to support numerous CNC functions. Once the available accessories are fitted, the semi-automatic appliances develop performance capabilities that come very close to fully automated systems in many respects.

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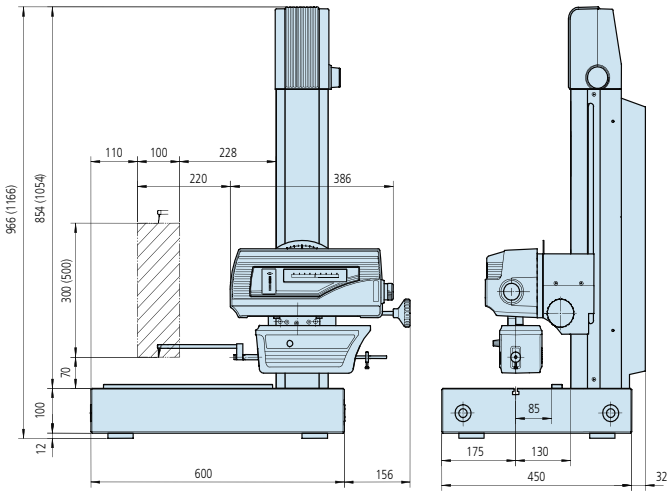
Technical specifications

		CV-3100S4 CV-4100S4	CV-3100H4 CV-4100H4	CV-3100W4 CV-4100W4	CV-3100S8 CV-4100S8	CV-3100H8 CV-4100H8	CV-3100W8 CV-4100W8
Measuring range	X axis	100 mm			200 mm		
	Z1 axis	50 mm					
Column travel range		300 mm	500 mm	500 mm	300 mm	500 mm	500 mm
Angular adjustment of the X axis (forward travel)		± 45°					
Measuring system	X axis	Linear scale					
	Z1 axis	Linear encoder/Length measurement system (CV-3100 series), laser holoscale (CV-4100 series)					
	Z2 axis (column)	ABS scale					
Resolution	X axis	0.05 µm					
	Z1 axis	0.2 µm (CV-3100 series), 0.05 µm (CV-4100 series)					
	Z2 axis	1 µm					
Rate of travel	X axis	0 - 80 mm / s					
	Z2 axis (column)	0 - 20 mm / s					
Measuring speed		0.02 – 5 mm / s					
Straightness deviation (horizontally aligned X axis)		0.8 µm / 100 mm			2 µm / 200 mm		
Length measurement deviation (at 20 °C) CV-3100 series	X axis	± (1+0.01L) µm L = Forward travel (mm)			± (1+0.02L) µm L = Forward travel (mm)		
	Z1 axis	± (2+I4HI/100) µm H: Measuring height above horizontal position (mm)					
Length measurement deviation (at 20 °C) CV-4100 series	X axis	± (0.8+0.01L) µm L = Forward travel (mm)			± (0.8+0.02L) µm L = Forward travel (mm)		
	Z1 axis	± (0.8+I0.5HI/25) µm H: Measuring height					
Direction of measurement		pull / push					
Measuring force		30 mN					
Measurement		Increasing: 77°, decreasing 87° (Standard probe tip; depending on surface characteristics)					
Probe tip (standard accessory)		Carbide, tip angle 12°, radius 25 µm					
Base dimensions (width x depth)		600 x 450 mm		1000 x 450 mm	600 x 450 mm		1000 x 450 mm
Base		Granite					
External dimensions (width x depth x height) [mm]	Main device	756 x 482 x 966	756 x 482 x 1166	1156 x 482 x 1176	766 x 482 x 966	766 x 482 x 1166	1166 x 482 x 1176
	Controller	221 x 344 x 490					
	Joystick box	248 x 102 x 62.2					
Weight	Main device	140 kg	150 kg	220 kg	140 kg	150 kg	220 kg
	Controller	14 kg					
	Joystick box	0.9 kg					
Temperature (during operation)		15 - 25 °C (max. deviation between calibrating and measuring temperature ± 1 °C)					
Humidity (during operation)		20 – 80 % RH (without condensation)					
Storage temperature		-10 to 50 ° C					
Humidity (during storage)		5 – 90 % RH (without condensation)					
Power supply		100 – 120 V, 200 – 240 V ±10 %, AC50/60 Hz					
Power consumption (main device)		400 W					

Dimensions

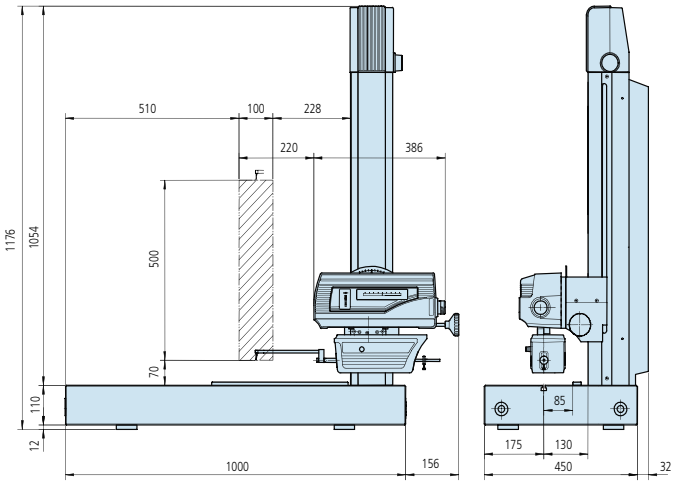
CV-3100S4/H4, CV-4100S4/H4

Unit: mm

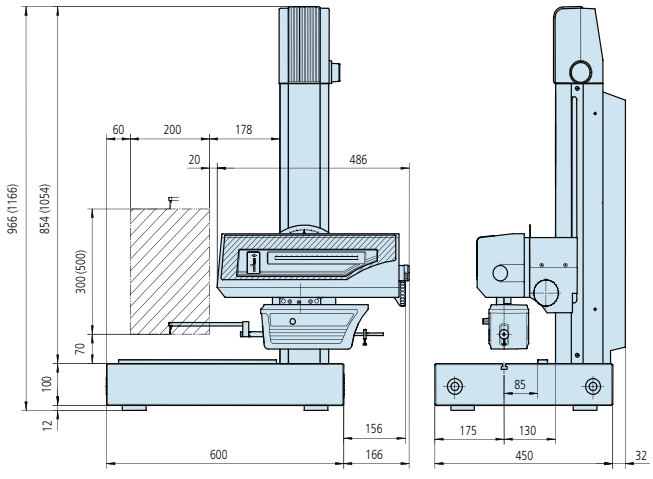


The dimensions in brackets refer to type H4.

CV-3100W4, CV-4100W4

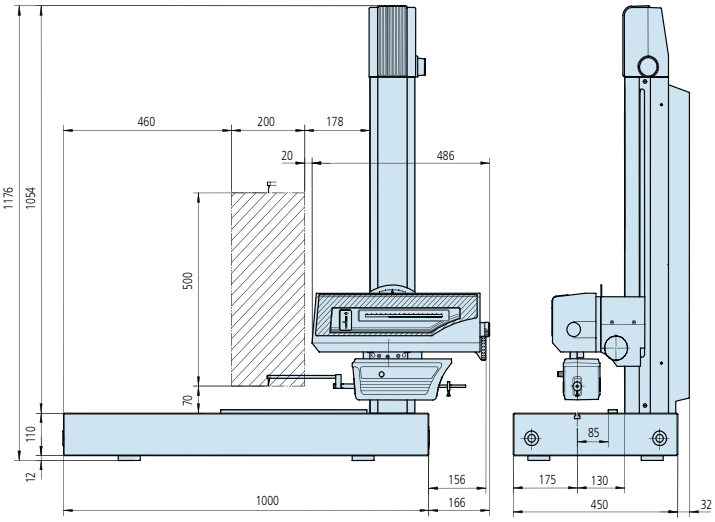


CV-3100S8/H8, CV-4100S8/H8

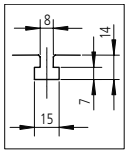


The dimensions in brackets refer to type H8.

CV-3100W8, CV-4100W8



Working area



T groove dimensions

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Special accessories

Tensioning aids

Cross table
218-001
- Size: 280 x 180 mm
- XY moving distance: 100 x 50 mm

Rotating vice 218-003
- Vice (two jaws)
- Max. size of workpiece: Ø 60 mm
- Smallest increment: 1°

Riser for center support 172-142
- Max. diameter of workpiece: 120 mm
- 60 mm riser optionally available **(172-143)**

Riser for center support 172-143
- Used with a center support. **(172-142)**
- Max. diameter of workpiece therefore: 240 mm

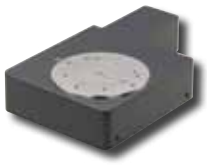
Swivel center support 172-197
- Max. diameter of workpiece: 80 mm, 65 mm when swiveled 10°
- Max. length of workpiece: 140 mm

Holder with clamp 176-107
- Max. height of workpiece: 35 mm

V-block with clamp 172-234, 172-378
- Max. diameter of workpiece: 50 mm (172-234), 25 mm (172-378)

For positioning workpieces and and mounting the 1 axis / 2 axis

θ1 axis * 12AAD975
For positioning workpieces in the θ1 rotary axis and for mounting the θ2 axis



θ
For positioning workpieces in the θ2 rotary axis

Use the servo-powered axes to software control the positioning of the workpieces; they can be used both on their own or in combination. Activating the servo-powered axes allows several workpieces to be automatically measured in sequence during pallet operation.

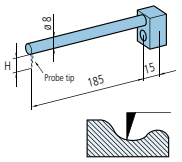
* Adapter plate 12AAE630 is necessary when using the θ1 axis directly on the granite plate
** Adapter plate 12AAE718 is necessary when using the θ2 axis directly on the granite plate

Measuring arms and probe tips

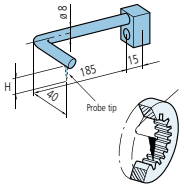
List of measuring arms

Designation	Arm no.	Order no.	Compatible probe tips	H (mm)
Straight	ABH-53	**12AAE294**	SPH-51, 52, 53, 54, 55, 56, 57	H = 6
	ABH-63	**12AAE295**	SPH-61, 62, 63, 64, 65, 66, 67	H = 12
	ABH-71	**996506**	SPH-71, 72, 73, 74, 75, 76, 77, 79	H = 20 [1*]
	ABH-81	**996507**	SPH-81, 82, 83, 84, 85, 86, 87	H = 30
	ABH-91	**996508**	SPH-91, 92, 93, 94, 95, 96, 97	H = 42
Angled	ABH-52	**996509**	SPH-51, 52, 53, 54, 55, 56, 57	H = 6
	ABH-62	**996510**	SPH-61, 62, 63, 64, 65, 66, 67	H = 12
	ABH-72	**996511**	SPH-71, 72, 73, 74, 75, 76, 77, 79	H = 20
	ABH-82	**996512**	SPH-81, 82, 83, 84, 85, 86, 87	H = 30
	ABH-92	**996513**	SPH-91, 92, 93, 94, 95, 96, 97	H = 42
For small bores	ABH-21	**12AAE296**	SPH-21, 22, 23, 31, 32, 33	—

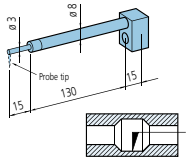
Straight



Angled



For small bores

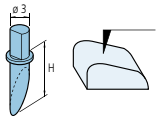


List of probe tips

Designation	Probe tip no.	Order no.	Compatible measuring arms	H (mm)
One-sided cut	SPH-51	**354882**	ABH-52, 53	H = 6
	SPH-61	**354883**	ABH-62, 63	H = 12
	SPH-71	**354884**	ABH-71, 72	H = 20 [1*]
	SPH-81	**345885**	ABH-81, 82	H = 30
	SPH-91	**354886**	ABH-91, 92	H = 42
Two-sided cut	SPH-52	**354887**	ABH-52, 53	H = 6
	SPH-62	**354888**	ABH-62, 63	H = 12
	SPH-72	**354889**	ABH-71, 72	H = 20
	SPH-82	**354890**	ABH-81, 82	H = 30
	SPH-92	**354891**	ABH-91, 92	H = 42
Tapered Probe tip angle 20° Tungsten carbide	SPH-57	**12AAE865**	ABH-52, 53	H = 6
	SPH-67	**12AAE866**	ABH-62, 63	H = 12
	SPH-77	**12AAE867**	ABH-71, 72	H = 20
	SPH-87	**12AAE868**	ABH-81, 82	H = 30
	SPH-97	**12AAE869**	ABH-91, 92	H = 42
Tapered Probe tip angle 30° Sapphire (* diamond probe tip, probe tip angle 50°)	SPH-53	**354892**	ABH-52, 53	H = 6
	SPH-63	**354893**	ABH-62, 63	H = 12
	SPH-73	**354894**	ABH-71, 72	H = 20
	SPH-79	**355129***	ABH-71, 72	H = 20
	SPH-83	**354895**	ABH-81, 82	H = 30
	SPH-93	**354896**	ABH-91, 92	H = 42
Tapered Probe tip angle 30° Tungsten carbide	SPH-56	**12AAA566**	ABH-52, 53	H = 6
	SPH-66	**12AAA567**	ABH-62, 63	H = 12
	SPH-76	**12AAA568**	ABH-71, 72	H = 20
	SPH-86	**12AAA569**	ABH-81, 82	H = 30
	SPH-96	**12AAA570**	ABH-91, 92	H = 42
Knife-edged	SPH-54	**354897**	ABH-52, 53	H = 6
	SPH-64	**354898**	ABH-62, 63	H = 12
	SPH-74	**354899**	ABH-71, 72	H = 20
	SPH-84	**354900**	ABH-81, 82	H = 30
	SPH-94	**354901**	ABH-91, 92	H = 42
Ball tip	SPH-55	**354902**	ABH-52, 53	H = 6
	SPH-65	**354903**	ABH-62, 63	H = 12
	SPH-75	**354904**	ABH-71, 72	H = 20
	SPH-85	**354905**	ABH-81, 82	H = 30
	SPH-95	**354906**	ABH-91, 92	H = 42
For small bores (one-sided cut)	SPH-21	**12AAE297**	ABH-21	H = 0,4
	SPH-22	**12AAE298**	ABH-21	H = 1,0
	SPH-23	**12AAE299**	ABH-21	H = 2,5
For small bores (tapered)	SPH-31	**12AAE870**	ABH-21	H = 0,4
	SPH-32	**12AAE871**	ABH-21	H = 1,0
	SPH-33	**12AAE872**	ABH-21	H = 2,5

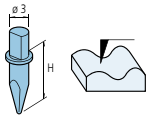
[1*] Standard

One-sided cut



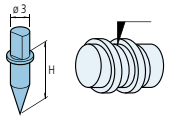
Probe tip angle: 12°
Probe radius: 25 µm

Two-sided cut



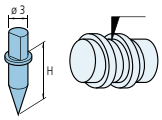
Probe tip angle: 20°
Probe radius: 25 µm

Tapered



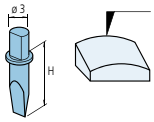
Probe tip angle: 30° / 50°*
Probe radius: 25 µm
Sapphire or tungsten carbide

Tapered



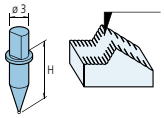
Probe tip angle: 20°
Probe radius: 25 µm

Knife-edged



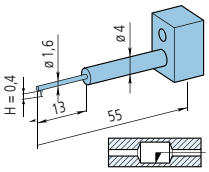
Probe tip angle: 20°
Edge width: 3 mm
Probe radius: 25 µm

Ball tip



Ball diameter: 1 mm

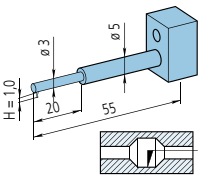
For small bores



SPH-21
Probe tip shape:
One-sided cut
Probe tip angle: 20°
Probe radius: 25 µm

SPH-31
Probe tip shape: Tapered
Probe tip angle: 30°
Probe radius: 25 µm

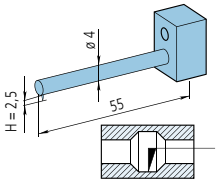
For small bores



SPH-22
Probe tip shape:
One-sided cut
Probe tip angle: 20°
Probe radius: 25 µm

SPH-32
Probe tip shape: Tapered
Probe tip angle: 30°
Probe radius: 25 µm

For small bores



SPH-23
Probe tip shape:
One-sided cut
Probe tip angle: 20°
Probe radius: 25 µm

SPH-33
Probe tip shape: Tapered
Probe tip angle: 30°
Probe radius: 25 µm

Mitutoyo

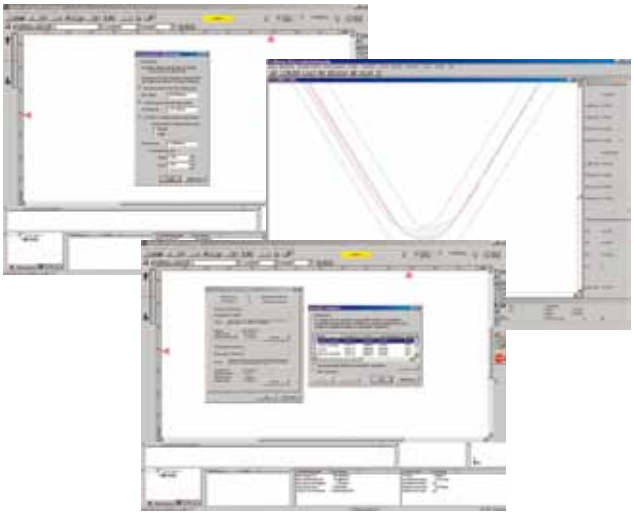
FORMPAK-1000 Software

MiCAT
Mitutoyo Intelligent Computer Aided Technology
the standard in world metrology software
FORM

Measuring screen – everything visible at a glance

The clearly understandable structure of the FORMPAK software interface makes it easy for operators to quickly find the menus they need for performing all of the settings required for the measuring task, such as:

- User defined interface
- Measuring condition
- Measuring arm and probe tip
- Calibration
- Graphic target/actual comparison
- Control of the servo-powered axes
- Part program selection
- Test reports

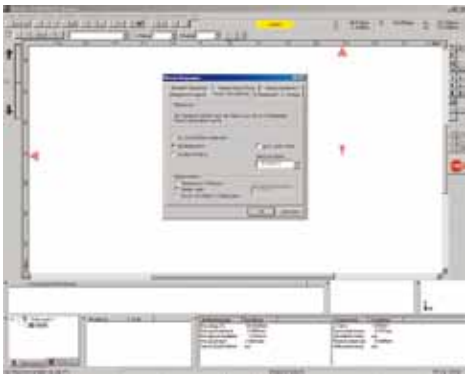


Measuring screen during contour recording

Contour analysis

A large range of useful tools are available for professional contour analysis:
In order to produce a coordinate system, for example, the contour is aligned by defining a line (around any axis) and a zero point generated, e.g., using the point of intersection of two lines.

Standard tools not only define individual elements on the measured contour, such as line, circle, point, angle, highest or lowest contour point, but are equally useful for generating intersection points, performing thread functions, or even generating theoretical points, parallel lines or freely definable lines.

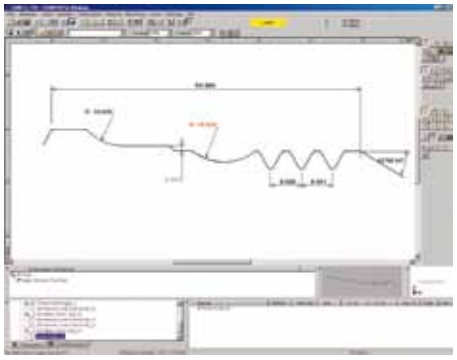


Measuring conditions

FORMPAK-1000 Software

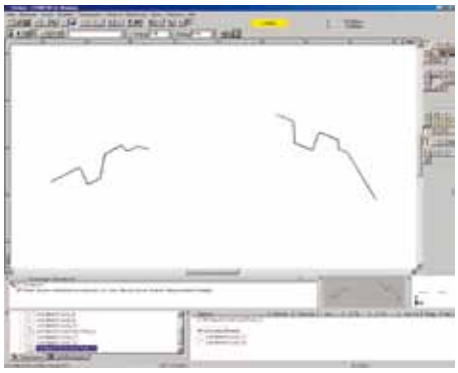
Contour analysis

Operators can define the tolerance limits right in the menu for the respective element. FORMPAK offers the option, not only of setting maximum limits, but also of setting intervention limits at any point. A table is generated following the contour analysis that shows whether the tolerance limits have been reached. The large number of otherwise confusing results are even enhanced by the addition of clear symbols that enable the position of the results within the tolerance range to be identified at a glance using the number of [-] and [+] symbols.



Results screen

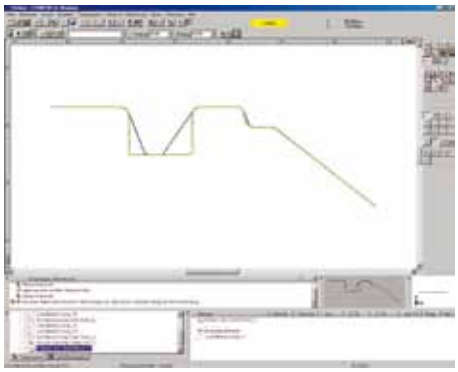
Graphic illustrations offer a further option for presenting and clearly allocating results. If desired, the freely definable color of the measured value indicates immediately whether intervention or tolerance limits have been reached. Even on graphic illustrations containing a large number of results the color coding of the measured values immediately indicates whether tolerance limits have been reached.



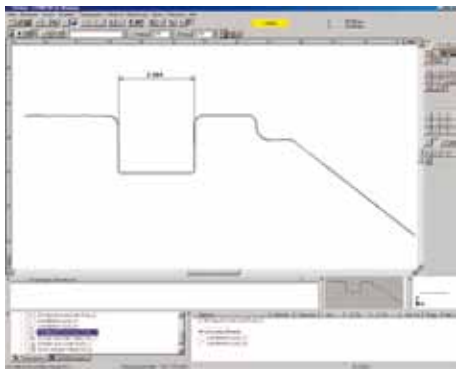
Both contours measured separately

Joining contours

In the case of workpieces that cannot be measured in one clamping process because of their geometry (e.g., 90° grooves), FORMPAK offers the option of first measuring separate parts of the required contour and then joining the two contours and deleting those contour points that are no longer needed. A part program can be defined to repeat these work steps.



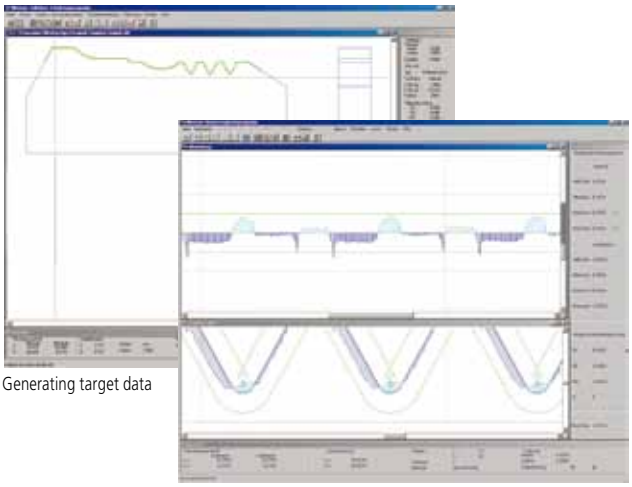
Both contours joined



Analysis of the combined contour

Mitutoyo

FORMPAK-1000 Software



Generating target data

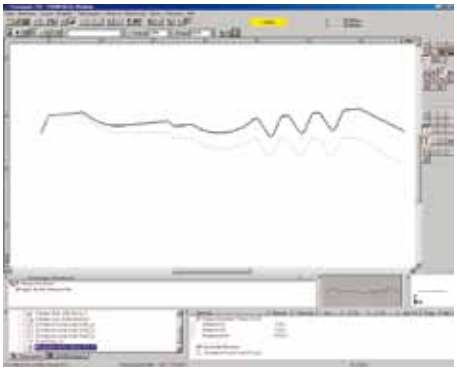
Graphic target/actual comparison

Graphic target/actual comparison

This menu uses CAD data to produce a graphic comparison of the measured contour with the target contour. Operators can use DXF or IGES data to define which areas of the contour should be subjected to this comparison. Freely definable tolerance limits are available for assessment purposes. A target contour can be generated not only from CAD data but also using the data set of a measured contour. This method is particularly suitable for examining wear or for generating reference contours.

Best fit

Once a contour has been filed in a part program, FORMPAK uses the data relating to this contour to match a new, differently positioned contour to the contour filed in the part program when performing a repeat measurement. As such, every newly measured contour is within the "catchment" area of the analysis tools. The workpiece can then be fully automatically aligned as defined in the part program and the required contour analysis subsequently performed.



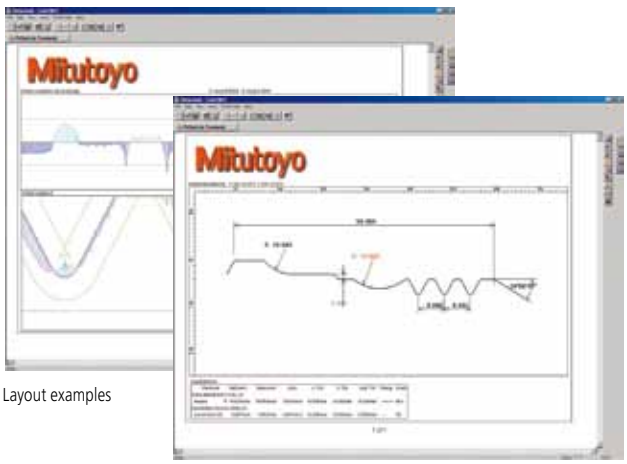
Best fit for part program sequence

Layout editor

The layout editor enables test reports to be structured and compiled as required. These might consist, for example, of:

- Graphic illustration of the contour with dimensions
- Results list
- Table of measuring results with tolerance limit
- Graphic target/actual comparison
- Measuring conditions
- Comments and random remarks
- Photo of a workpiece
- Your company logo

The layout needs to be structured just once and can then be stored and assigned to a part program. The respective layout is called up automatically when a measurement is performed; the new results are updated and, if required, automatically saved under a new file name.



Layout examples

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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