

LEGEX 300/500/700/900/1200

Catalog No.E16012



Legex - the ultimate coordinate measuring machine in the world. Produced by combining Mitutoyo's long experience in the field of high-precision metrology and machining with state-of-the-art technologies in design, electronics, computing, sensors and materials.

Mitutoyo

Designed for Premium Performance and Exceptionally Low Measuring Uncertainty.

High-speed traverse: 200mm/s (7.87"/s)

Ultimate accuracy: $MPE_E = (0.35 + L/1000)\mu\text{m}^*$

Legex12128: $(0.6 + 1.5L/1000)\mu\text{m}$

Wide operating temperature range:
18°C to 22°C (64.4°F to 71.6°F)

Low measuring force: 0.03N*

*Using MPP-310Q



XYZ measuring range:
574: 510x710x460mm



XYZ measuring range:
774: 710x710x460mm
776: 710x710x610mm

Mitutoyo

Premium Performance

High-speed scanning: 120mm/s*

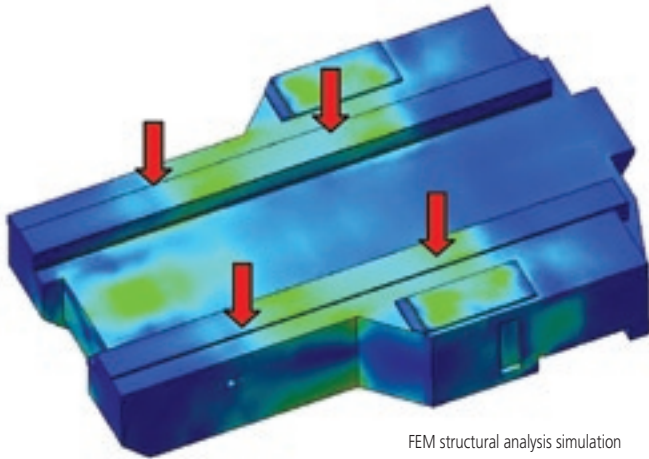
*Using MPP-310Q or SP80



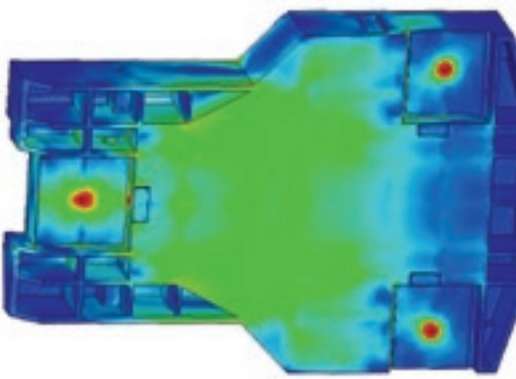
XYZ measuring range:
12128: 1210x1210x810mm

XYZ measuring range:
9106: 910x1010x610mm

LEGEX



FEM structural analysis simulation



Spheroidal graphite ductile cast iron

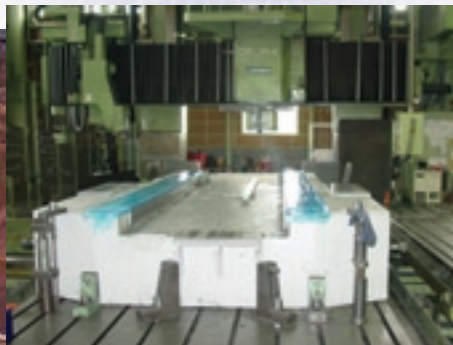
Regular cast iron (gray iron) is a ferroalloy that includes carbon, silicon, manganese, phosphorus, and sulfur, in which the carbon is precipitated as flakes in the ferrite or pearlite material, whereas ductile cast iron is made by adding magnesium and other elements which precipitates the carbon in spherical form instead and results in an ideal material for making castings free of cavities and pin holes (defects) of 0.1mm and larger. Ductile cast iron has high hardness, close to that of steel, as well as excellent ductility, toughness, and wear-resistance characteristics, making it the material of choice for critical machine components.

BASE DESIGN

High rigidity

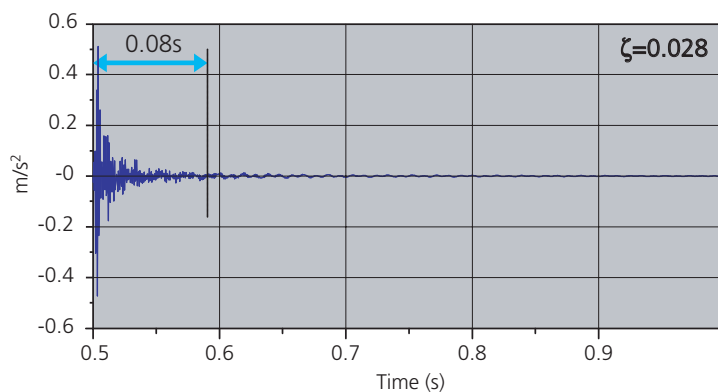
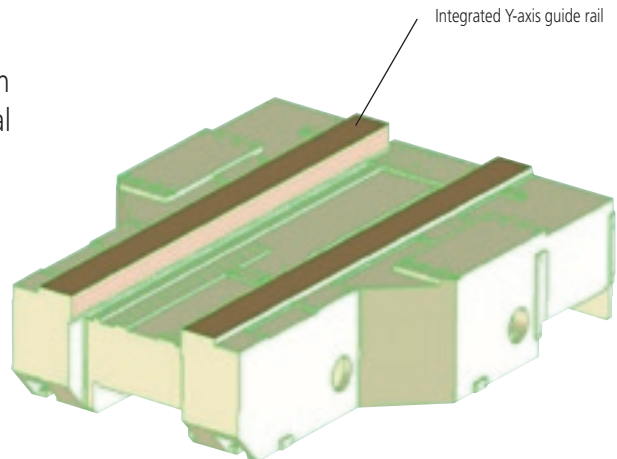
The base of the Legex is made from special spheroidal graphite ductile cast iron to a sealed-structure design that provides high rigidity and vibration attenuating characteristics. Mitutoyo engineers used FEM analysis during the design phase to optimize the final configuration and ensure outstanding geometric accuracy by minimizing deformations caused by normal machine operation.

EVOLUTIONAL
TECHNOLOGIES



Integrated Y-axis guide rail

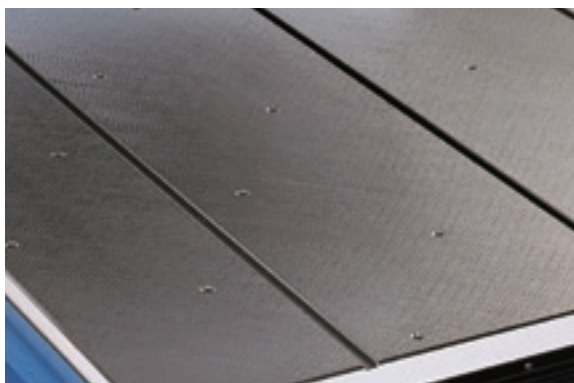
The ceramic-plasma coated Y-axis guide rail is cast as an integral part of the base to improve rigidity and thermal stability. This design feature practically eliminates distortion due to changing machine temperatures.



Attenuation characteristics

The Legex quickly attenuates traverse-induced vibrations and so reduces any adverse effect on measurements. This characteristic also allows ultra-high scanning accuracy to be realized.

WORKTABLE

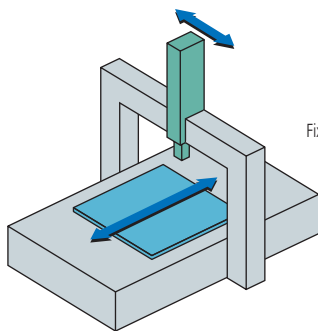


Standard hand-flake finished worktable

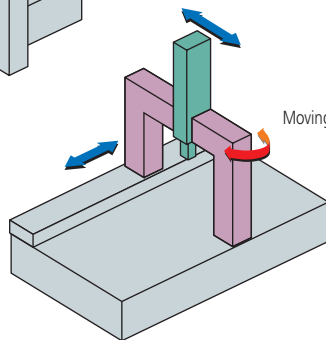
The standard worktable is hand-flake finished but an easy maintenance, ceramic-coated worktable is available as an option.



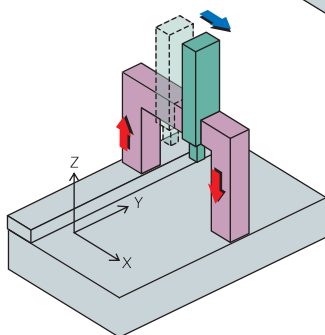
Optional ceramic-coated worktable



Fixed-bridge type structure



Moving-bridge type structure



The centre of gravity of a moving bridge type machine is moved according to the X-axis motion. This movement of the bridge CG changes the load distribution and therefore alters the consequential deformations.

CONSTRUCTION

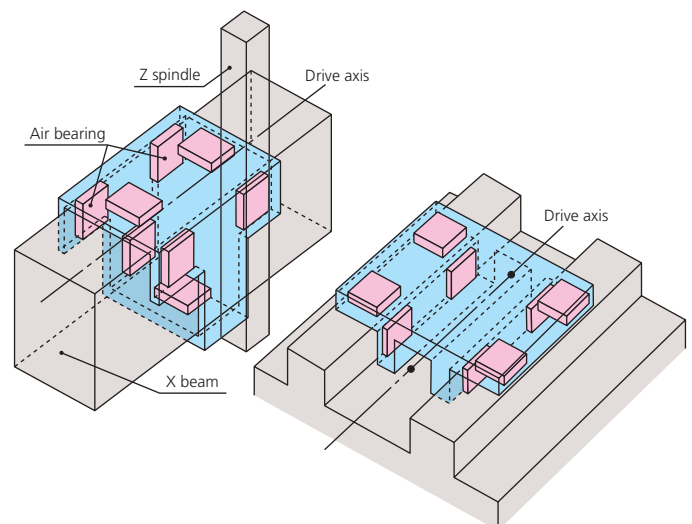
Pitch and yaw errors eliminated

The Legex uses a fixed-bridge type structure. This is the ideal CMM architecture and virtually eliminates pitch and yaw errors. Most other CMMs use a moving-bridge design with a single drive unit under the column, which tends to cause yawing and pitching during slide movements.

DYNAMIC ACCURACY

X- and Y-axis independence and a 'center of gravity' type drive system

The fixed-bridge design of the Legex allows the axes to operate totally independently. Movement of the X-axis slide does not change the loading on the Y-axis slide, and so does not cause deformation. Also, the 'center of gravity' type drive system places the drive units near the center of gravity of each slide. This feature allows very high speed, highly accurate measurements by reducing inertia-induced deflections during acceleration and deceleration.



VIBRATION CONTROL

Isolating floor vibration

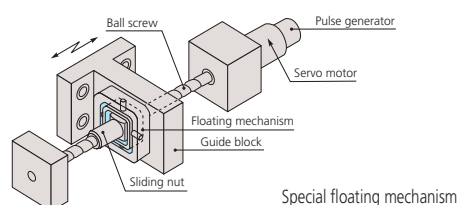
The Legex is hardened against floor induced vibration by use of 'air-damped spring isolators' with an auto-leveling function. This virtually eliminates factory floor vibrations from the entire machine structure.



Air-damped spring isolators

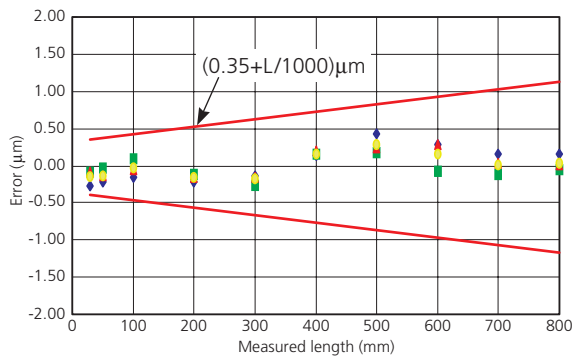
Floating mechanism reduces internal vibration

To reduce the effects of internally generated vibration, the Legex uses a special floating mechanism to couple each ballscrew to its guide block. This isolates the slide from the servo motor as it turns the ballscrew and thus prevents transmission of motor vibrations, especially during acceleration and deceleration.



Special floating mechanism

Inspection results of volumetric accuracy (MPE_E) (ex.: Legex 774)



LENGTH STANDARD

Linear glass scales with virtually zero thermal expansion coefficient

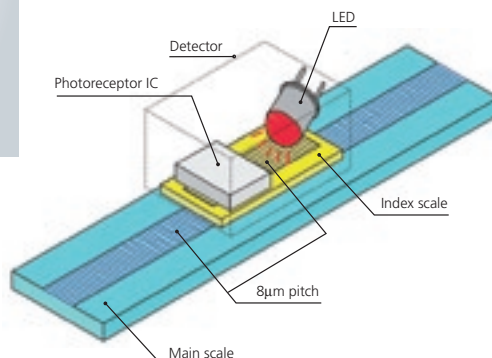
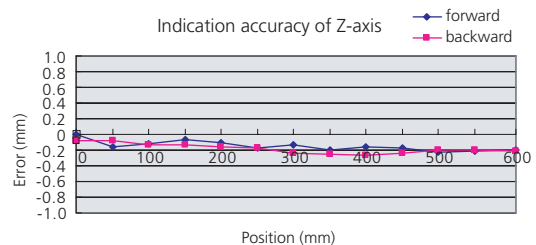
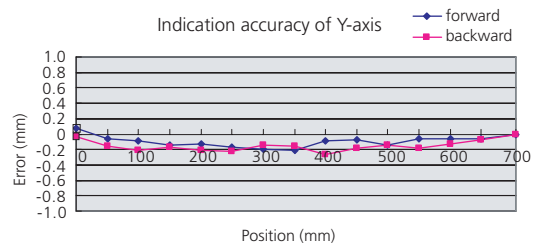
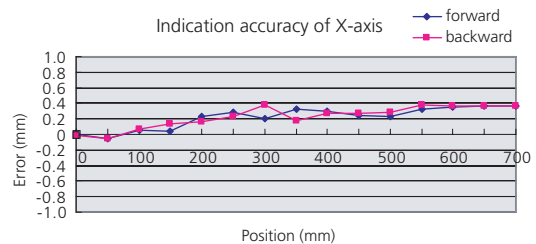
The Legex is equipped with a new crystallized-glass scale with a resolution of $0.01 \mu m$ and an ultra-low linear expansion coefficient of $0.01 \times 10^{-6}/K$. This virtually zero thermal expansion coefficient means the Legex can maintain its extreme accuracy in spite of thermal changes. The scales are also mounted in a unique way that reduces the hysteresis error to 1/5 that of previous models. The inspection chart right shows the hysteresis error that results from this new mounting method.

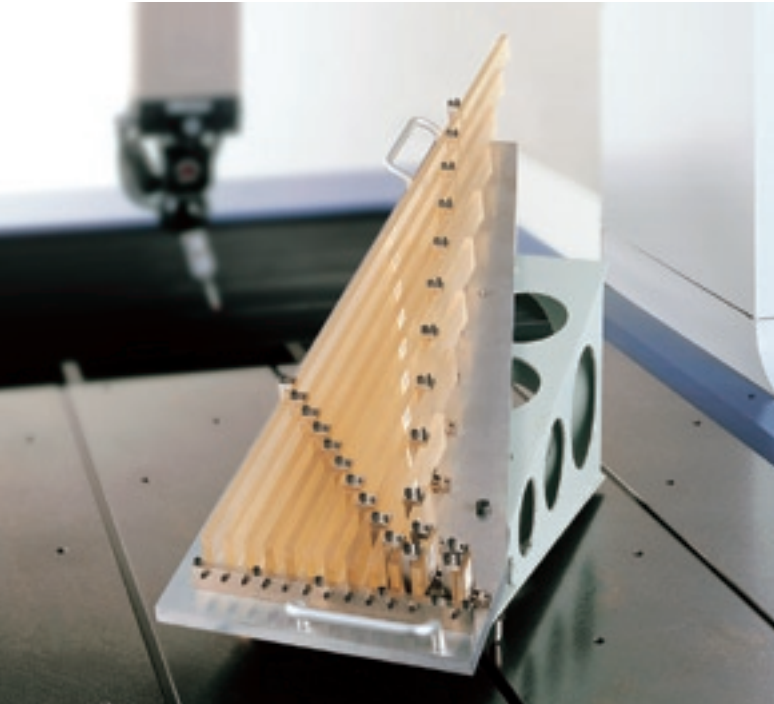


TEMPERATURE COMPENSATION

Effective over the 18°C to 22°C (64.4°F to 71.6°F) temperature range

While conventional very high accuracy CMMs require fairly strict temperature controlled environments, the Legex has been designed to improve the thermal stability of each component to minimize deformation. In addition, temperature sensors on each axis and for the workpiece itself detect temperature changes in real time and are used to compensate back to 20°C.





CRYSTALLIZED-GLASS STANDARD

- optional -

Minimizing external thermal influence at calibration

Thermal insensitivity is also critical to the calibration of high-end machines like a Legex. Mitutoyo offers a special calibration standard that uses crystallized-glass gauge blocks with a thermal expansion coefficient of $0.08 \times 10^{-6}/K$ - the same material as used for the linear glass scales. Using this standard prevents calibration error caused by ambient temperature fluctuations. All gauge blocks in the standard are measured by interferometer to 0.00001mm resolution in Mitutoyo's Accredited Calibration Laboratory (JCSS No. 0030).

TEMPERATURE STABILIZED

- optional -

Temperature-stabilized air supply

Generally speaking, temperature compensation and thermally insensitive materials can widen the usable range of ambient temperature and gradients. To eliminate a common source of temperature variation, the Legex is also available with a special air-server. In addition to the standard air cleaning and drying functions, this air server can stabilize the temperature of air drawn from the factory air supply to $20^{\circ}\text{C} \pm 0.1^{\circ}\text{C}$. In combination with the machine-enclosure design and thermally insensitive glass scales, temperature-stabilized air supplied to the air bearings can produce the exceptional thermal isolation needed for low measuring uncertainties. This air supply is also used for the MPP-300 probe to provide stabilized scanning.



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Controlled

Open

System

for

modular

operation

Support

MCOSMOS

- Mitutoyo Controlled Open System for
Modular Operation Support -



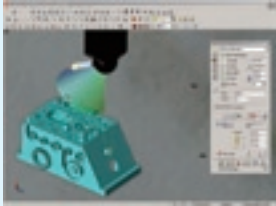

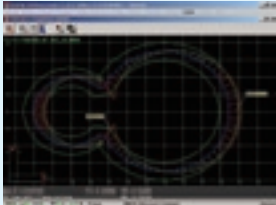
A wide variety of program modules for each manufacturing step, from design to production and to inspection, are available. Not to mention a quality assurance module, they also include modules that support various types of CAD data processing, in-line measurement, data feedback system, and process managing system.

System performance from every viewpoint

Software

Performance features of standard software packages

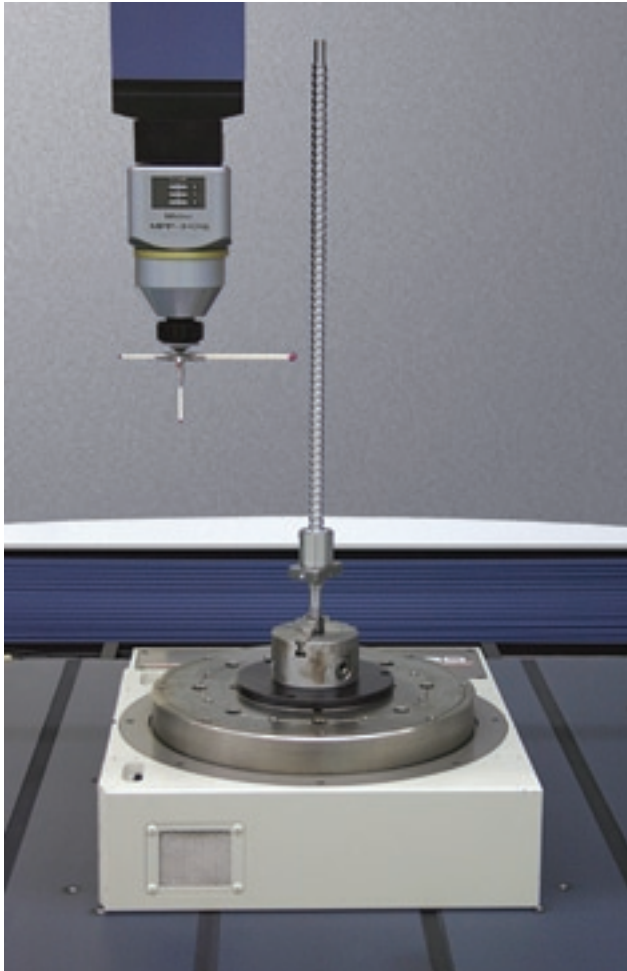
The optimum program for your particular application can be selected from the software packages listed below.

Software packages		MCOSMOS 1	MCOSMOS 2	MCOSMOS 3
PART MANAGER The control center from which the software package is initialized, and individual part programs are managed.		●	●	●
GEOPAK For (online/offline) part program creation, using the measurement of geometric elements. Extensive tolerance comparisons and output functions are included.		●	●	●
CAT1000P For (online/offline) part program creation, using the measurement of geometric elements directly from the CAD model, with automatic collision avoidance.			●	●
CAT1000S CAD model-based generation of surface measurement points, and comparison of actual/nominal data, with graphical output.				●
SCANPAK For the scanning and evaluation of workpiece contours, and 3D digitizing of surfaces.				●

Other Optional Software Packages

A wide variety of optional software packages that meet customer needs is available, including MAFIS for evaluating the shape of an airfoil, GEARPAK for evaluating gear measurements, NC-Auto Measure for generating CAD models from NC data, RepeatPak2700 for executing older data-processing programs, and the MeasurLink statistical processing program.

Probes and accessories



MRT320

The Legex can be used with the MRT320 rotary table as the 4th axis. It is very efficient for gear, cylinder cam and impeller measurements.

Specifications:

- Table diameter: 320mm
- Resolution: 1/10000 degree
- Maximum workpiece load: 100kg

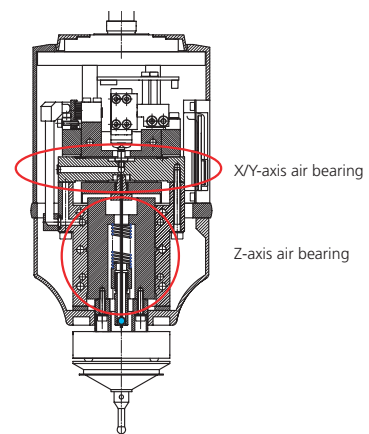
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MPP-310Q

Mitutoyo's MPP-310Q probe can be used for point-to-point measuring and continuous scanning applications. If the workpiece requires the maximum accuracy, the MPP-310Q can offer 'zero-point' data acquisition for statistical measurement. In this mode the MPP-310Q obtains the measurement data after all the CMM slides have come to a complete standstill. This statistical measurement is intended to eliminate dynamic effects on measurement.

Specifications:

- Resolution: 0.01 μ m
- Repeatability (σ): 0.1 μ m
- Scanning accuracy (V2): 0.3 μ m (3mm/s scanning speed)
- Measuring force: 0.03N min.



High-speed scanning



Point-to-point measurement

Probes

Probes

The Legex supports a wide range of probes to cover all your measurement applications.

Legex 500/700/900/1200



SP80
Ultra-high accuracy
scanning probe

Legex 500/700/900/1200



PH10MQ



TP7M
High accuracy
touch-trigger probe



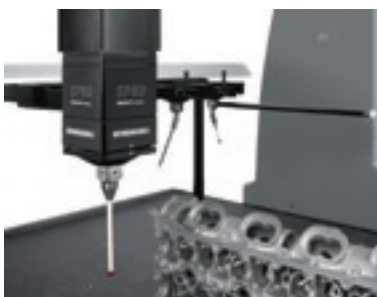
SP25M
High accuracy
scanning probe



QVP
Vision probe



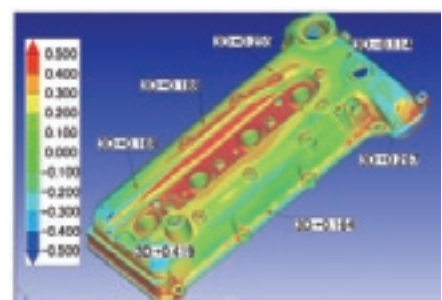
SurfaceMeasure606



SP80 scanning probe
120mm/s scanning speed and 500mm long stylus



QVP Vision probe

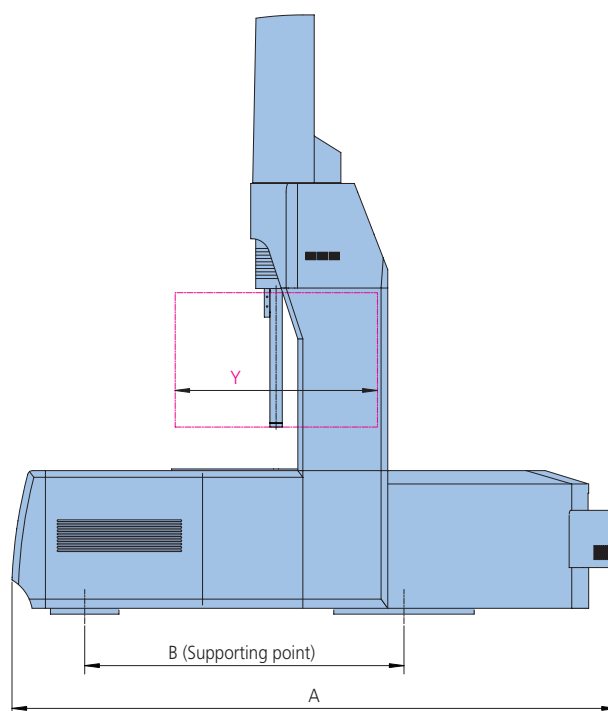
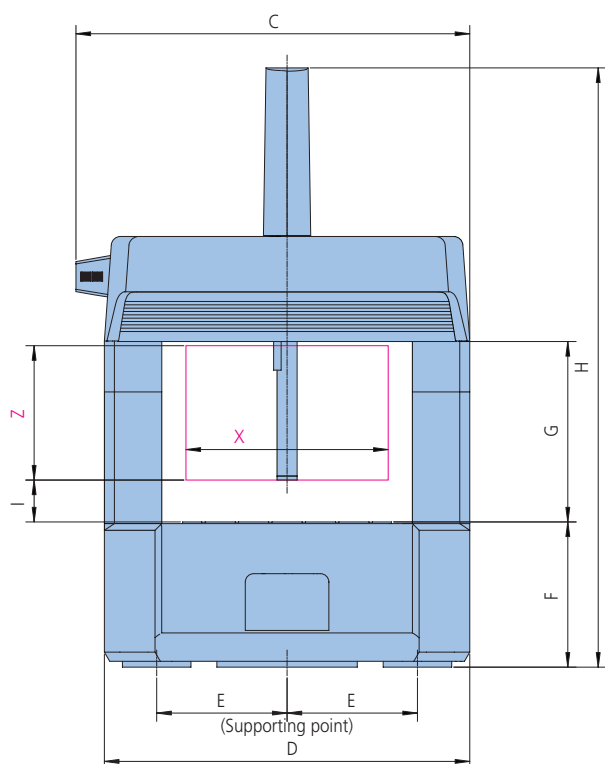


Scanning result of SurfaceMeasure Probe

Technical Data

Dimensions

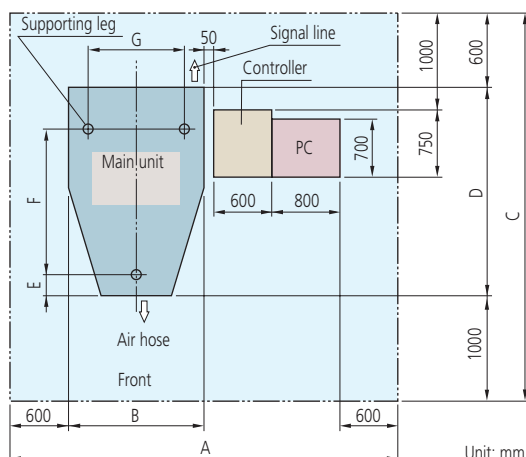
Legex 500/700/900/1200



Model	X	Y	Z	A	B	C	D	E	F	G	H	I
Legex 574	510mm	710mm	455mm	2540mm	1390mm	1586mm	1436mm	445mm	647mm	745mm	2595mm	256mm
Legex 774	710mm	710mm	455mm	2596mm	1410mm	1856mm	1686mm	560mm	600mm	745mm	2585mm	246mm
Legex 776	710mm	710mm	605mm	2596mm	1410mm	1856mm	1686mm	560mm	600mm	895mm	2885mm	267mm
Legex 9106	910mm	1010mm	605mm	3250mm	1780mm	2056mm	1886mm	660mm	732mm	905mm	3030mm	261mm
Legex 12128	1210mm	1210mm	805mm	3622mm	1910mm	2356mm	2186mm	780mm	870mm	1081mm	3590mm	256mm

Technical Data

Floor layout



Model	A	B	C	D	E	F	G
Legex 574	4086mm	1436mm	4140mm	2540mm	368mm	1390mm	890mm
Legex 774	4336mm	1686mm	4196mm	2596mm	378mm	1410mm	1120mm
Legex 776	4336mm	1686mm	4850mm	3250mm	378mm	1410mm	1120mm
Legex 9106	4536mm	1886mm	4850mm	3250mm	420mm	1780mm	1320mm
Legex 12128	4836mm	2186mm	5222mm	3622mm	435mm	1910mm	1560mm

Specifications

Model		Legex 574	Legex 774	Legex 776	Legex 9106	Legex 12128
Measuring range	X axis	500mm	700mm	700mm	900mm	1200mm
	Y axis	700mm	700mm	700mm	1000mm	1200mm
	Z axis	450mm	450mm	600mm	600mm	800mm
Measurement standard		Ultra-high precision linear encoder				
Resolution		0.00001mm				
Accuracy (ISO 10360-2/4/5)*	$E_{0,MPE}$	$(0.35+L/1000)\mu m$, L: measured length (mm)				$(0.6+1.5L/1000)\mu m$
	$P_{FTU,MPE}$	0.45 μm				0.6 μm
	MPE_{THP}	1.4 μm				1.8 μm
Guide method		Air bearings				
Maximum drive speed		200mm/s				
Maximum acceleration		1000mm/s ²				
Worktable	Material	Cast iron (ceramic coating: optional)				
	Working area	550x750mm	750x750mm	750x750mm	950x1050mm	1250x1250mm
	Tapped inserts	M8x1.25mm (for workpiece clamping)				
Maximum workpiece height		706mm	696mm	876mm	861mm	1056mm
Maximum worktable loading		250kgf	500kgf	500kgf	800kgf	1000kgf
Air pressure, consumption		0.4MPa (4kgf/cm ²), 120L/min (normal state)			0.5MPa, 120L/min	0.4MPa, 120L/min
Mass		3900kg	5000kg	5100kg	6500kg	10500kg

*Probe used: MPP-310Q probe

Temperature limits: 18°C/64.4°F to 22°C/71.6°F (range), 0.5°K/hour (variation), 1°K/m (gradient)

Note: This machine incorporates a main unit Startup system (relocation detection system), which disables operation when an unexpected vibration is applied or the machine is relocated. Be sure to contact your nearest Mitutoyo Sales Office prior to relocating this machine after initial installation.



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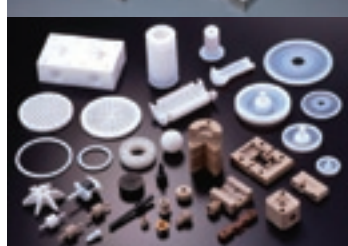
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| (2) Chichibu Fuji Co., Ltd. | URL http://www.ccf.co.jp |
| (3) Ariake Materials CO, LTD. | URL http://www.ariake-materials.co.jp |
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