TAYLOR HOBSON®

Aerospect SPS
Stack Prediction

Precision measurement systems for
Turbine/Engine alignment

AMETEK®
ULTRA PRECISION TECHNOLOGIES

Precitech

Aerospect SPS Stack Prediction Systems

Aerospect SPS is an industrial hardened engine alignment system which significantly reduces stacking time and optimises engine performance

Precision Air Bearing Spindle

The Aerospect system consists of a high load capacity air bearing spindle made from hardened tool steel mounted on a granite plate. This spindle provides a high degree of accuracy while maintaining shop floor robustness required during the engine build and alignment process.

Multi-gauge heads

Measurements are taken using 4 precision gauge heads (8 optional) mounted on two gauge posts ensuring fast simple set up. Special "swing away" gage arms allow the operator to load and unload components in a rapid and safe manner. The two post set up is particularly useful when utilising multiple gauges, access and versatility are greatly enhanced and do not have the physical limitations of single post systems.

Centre and level capability

The piece part or engine stack is held on a large diameter heavy duty table top with full centre and level capability. An intuitive set up screen and real time profile display greatly enhances the set up process and ensures fast and accurate component alignment.

Industrial PC and enclosure

The Aerospect systems computer can be provided with a tamper proof industrial surround ensuring protection from the shop floor environment.

Aerospect Stack Prediction software

The Aerospect stack prediction software enables the operator to align pre-measured parts through an intuitive software aid. This facility significantly reduces engine build time and avoids the need for re-assembly with a first time build in 98% of cases.

Part programs can be written for specific operations or engine builds, these programs provide instructions for the operator simplifying the build process. Part programs also enable cost effective introduction of new engine line and assemblies by ensuring predictable engine build schedules.

Engine Reliability and Efficiency

The precision air bearing spindle and gauging combined with the dedicated Aerospect software enable first time build of engines to a tighter specification. This has an large impact on engine efficiency by enabling a reduced rotor to stator clearance but also reduces time between maintenance by reducing vibration and increasing engine life.

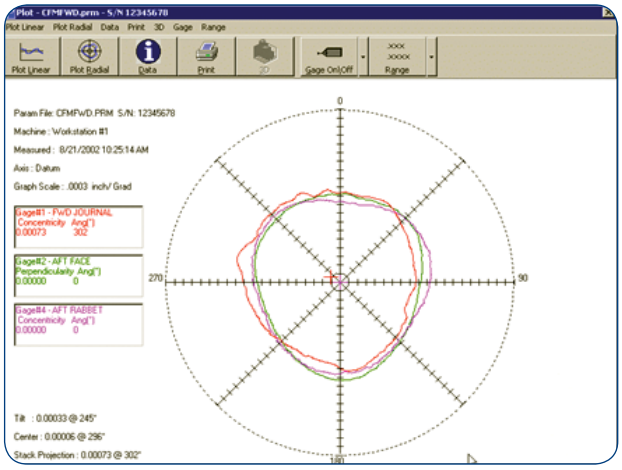
Parameters Include

- Flatness
- Roundness
- Concentricity
- Squareness
- SP indication for part alignment

Features include

- Part programming
- Tilt and centre user aide
- On line system diagnostics
- Polar and linear graphical display
- Part inventory
- Password protection

Multi-gauge measurement for component stacking



Polar results

Specifications are subject to change without notice.
Note, not all features are included with all instruments.

Aerospect SPS Software

Dedicated to the analysis and alignment of Gas Turbine and Jet Engines

Utilising a unique set of Algorithms the Aerospect SPS software is a windows based package developed for the measurement and alignment of stacked components within the Turbine engine build.

Form Parameters Include

- Roundness
- Concentricity
- Perpendicularity
- Parallelism
- Flatness

Stack Prediction parameters

- Stack Prediction Value (SP) value
- Stack Prediction angle (SP) angle

Software features include

- An Intuitive Centre and level menu
- User aids for piece part measurement
- Set up Programs and templates
- Polar and linear plots
- Multi plane views
- Networking

Intuitive Set up Menus

The Aerospect software consists of simple set up menus allowing the operator to define analysis and measurement parameters for individual components.

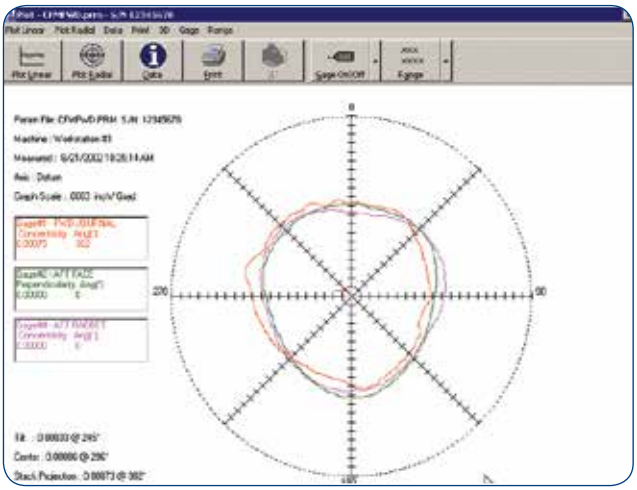
A typical system utilises 4 gauges (8 optional) in roundness or flatness mode on internal/external or upper/lower surfaces respectively by simply identifying their orientation on the set up menu.

As well as orientation these gauges can be used on both sides of the systems air spindle by associating each gauge with a specific spindle angle.

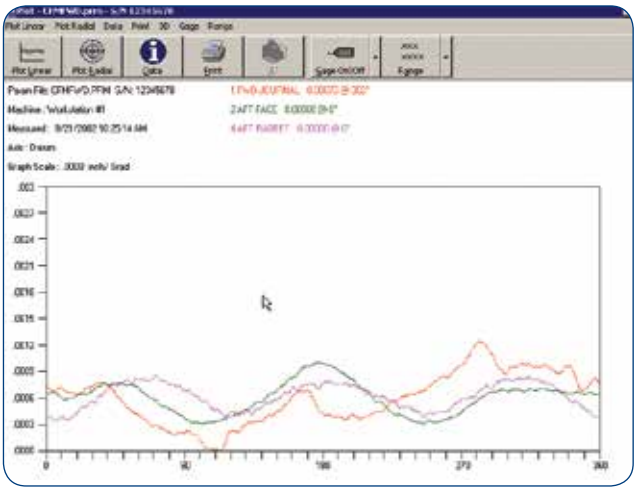
To make things even clearer the each individual gauge can be associated with a measurement feature name including the features height and diameter.

A special feature of the software is the "measurement set up" button, this button can be used to display an image, photograph or instruction to the user, this option greatly simplifies the measurement process.

Once all set up criteria is complete the user can save the set-up file ready for later user.

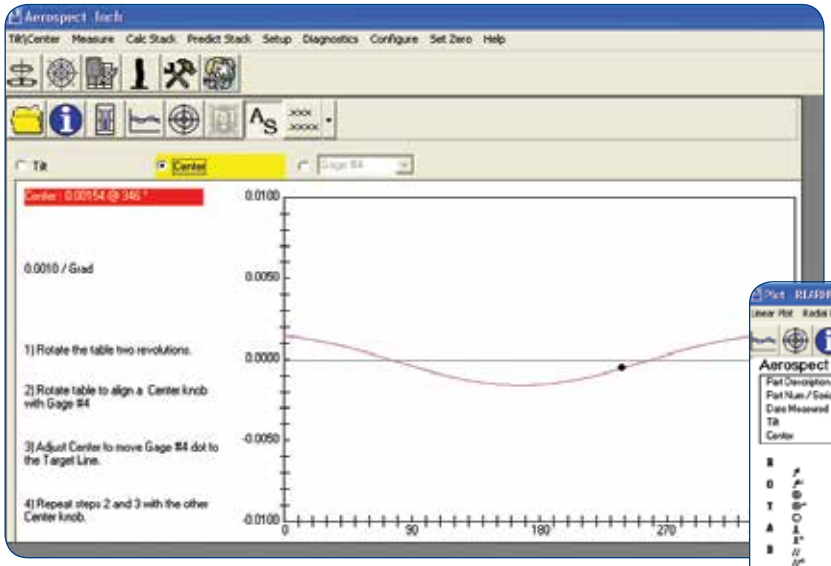


Polar format – Multiple Roundness/flatness results can be shown in polar or linear (See above and below)



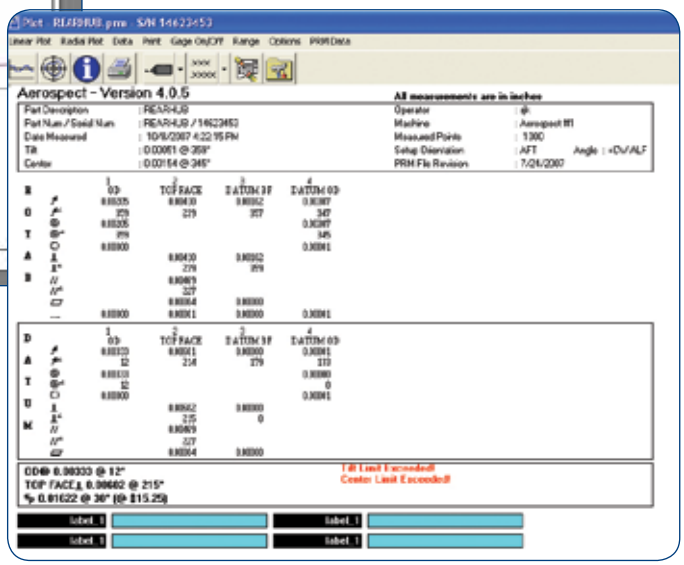
Set Up Program- individual gauges can be associated with measurement features by a simple set up menu

User friendly software for Jet Engines and Gas Turbines



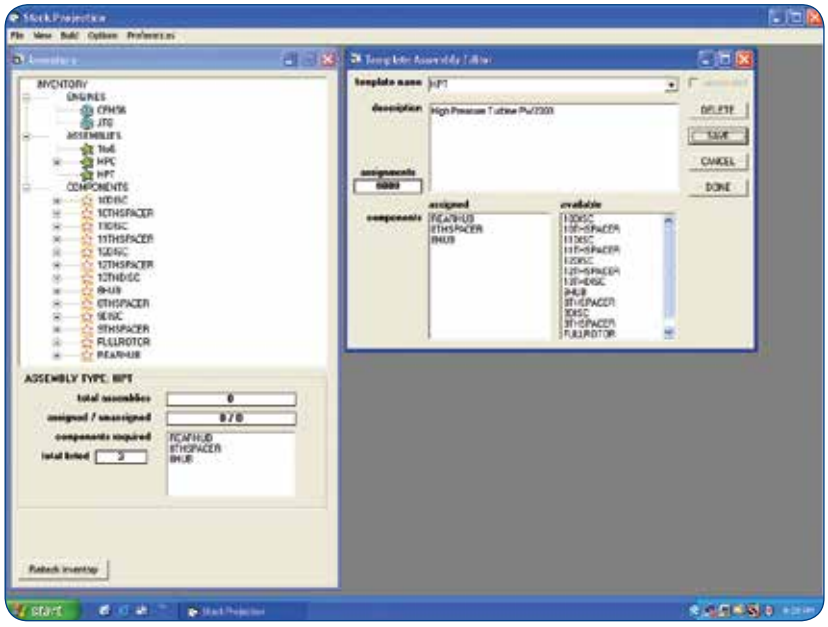
Centre and Levelling

- The centre and levelling interface simplifies the alignment process by providing guidance to the operator
- A flying spot and real time trace assists in the alignment process by visualisation



Data Storage

- Measurement reports are clearly defined with full historic data for traceability
- Output and measurement data can be stored on the hard drive or onto a network



Stacking module

- Components can be chosen from an Inventory and "what if" scenarios can be evaluated rapidly and efficiently prior to building the stack
- A Stack optimizer utility provides the best orientation for the components to minimize stack errors

User programmability

A major benefit of Aerospect system is the ability for the user to create or modify the program. Users or shop foreman can quickly create a program to measure a new component this greatly reduces the cost of use and provides flexible manufacturing.

Accurate \ Repeatable measurements

Worry free measurements using an intuitive interface allows for quick understanding of part measurement and stacking. Consistency of the build is virtually assured with quick / repeatable measurements increasing productivity and performance.

Not all features supported on all instruments, please see instrument analysis section.
Specifications are subject to change without notice. Availability of some features is dependent on instrument type or optional licence.

Aerospect SPS 1000L Specification

General	
Post Height	1196 mm (48 in) (optional 1575 mm (62 in))
Arm Length	457 mm and 610 mm (18 in and 24 in) (optional 762 mm (30 in))
Granite	1524 x 609.6 x 203.2 mm thick (60 x 24 x 8 in thick)
Worktable Height	584 mm (23 in)
Machine Weight	790 kg (1740 lbs)
Air bearing	
Load capacity	454 kg (1000 lbs)
Radial / Axial accuracy	±0.125 µm (5 µin)
Tilt Error Motion (coning)	< 0.025 µm/25mm (< 1 µin/in)
Tilt & center	
Tilt Adjustment	+/- 1°
Center Adjustment	+/-3 mm (0.125 in)
Axis of Tilt	95 mm (3.8 in) Above Worktable
Work Table Diameter	455 mm (18 in) (optional 500 mm, 605 mm (19.6 in, 24 in))
Gage Heads (4 - Std, 8 - optional)*	
Cartridge Style	0.375 in OD, +/- 1 mm (0.040 in) travel
Lever Style	+/- 0.30 mm (+/-0.012 in) travel
Ultra Small	+/- 0.25 mm (+/- 0.010 in) travel
Measurement resolution	0.25 µm (10 µin)

SPS 1000L

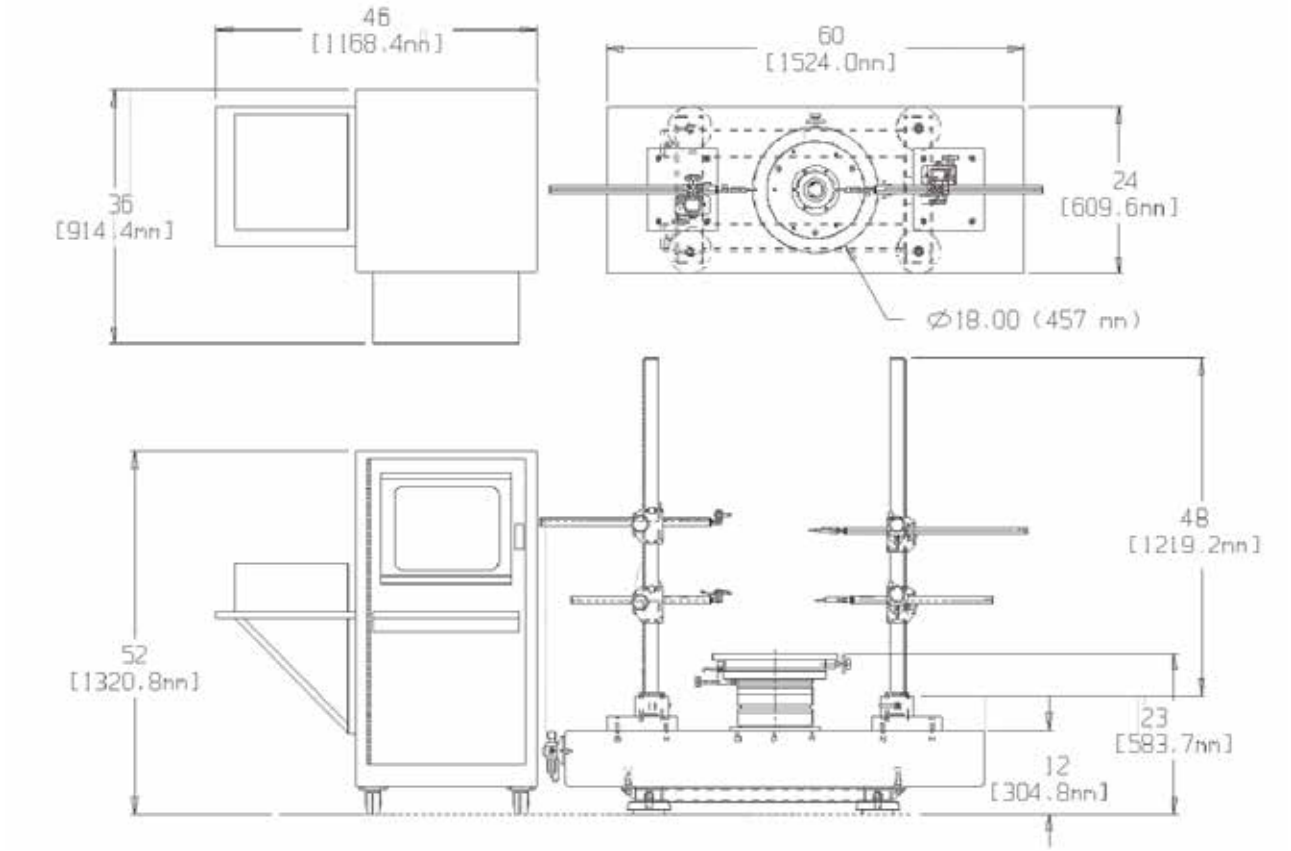
Low Profile Measurement and Stacking System.

Convenient working height for most medium thrust commercial turbines.

Electrical	
Encoder	1000 line
Equipment	Flat screen LCD Display, Industrial Computer, CE Approved, Printer
Power	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption	500 VA
Air Requirements	Pressure: 50 – 80 psig
Air Usage	1.5 scfm @ 60 psig, (42 l/min)
Electrical Cabinet Weight	235 kg (515 lbs)

*Note: Other Gage heads available upon request

Floor Plan



NOTE: AMETEK Precitech pursues a policy of continual improvement due to technical developments. We therefore reserve the right to deviate from catalog specifications.

Aerospect SPS 1000T Specification

General	
Post Height	1196 mm (48 in) (optional 1575 mm (62 in))
Arm Length	457 mm and 610 mm (18 in and 24 in) (optional 762 mm (30 in))
Granite	1524 x 609.6 x 203.2 mm thick (60 x 24 x 8 in thick)
Worktable Height	838 mm (33 in)
Machine Weight	790 kg (1740 lbs)
Air bearing	
Load capacity	454 kg (1000 lbs)
Radial / Axial accuracy	±0.125 µm (5 µin)
Tilt Error Motion (coning)	< 0.025 µm/25mm (< 1 µin/in)
Tilt & center	
Tilt Adjustment	+/- 1°
Center Adjustment	+/-3 mm (0.125 in)
Axis of Tilt	95 mm (3.8 in) Above Worktable
Work Table Diameter	455 mm (18 in) (optional 500 mm, 605 mm (19.6 in, 24 in))
Gage Heads (4 - Std, 8 - optional)*	
Cartridge Style	0.375 in OD, +/- 1 mm (0.040 in) travel
Lever Style	+/- 0.30 mm (+/-0.012 in) travel
Ultra Small	+/- 0.25 mm (+/- 0.010 in) travel
Measurement resolution	0.25 µm (10 µin)

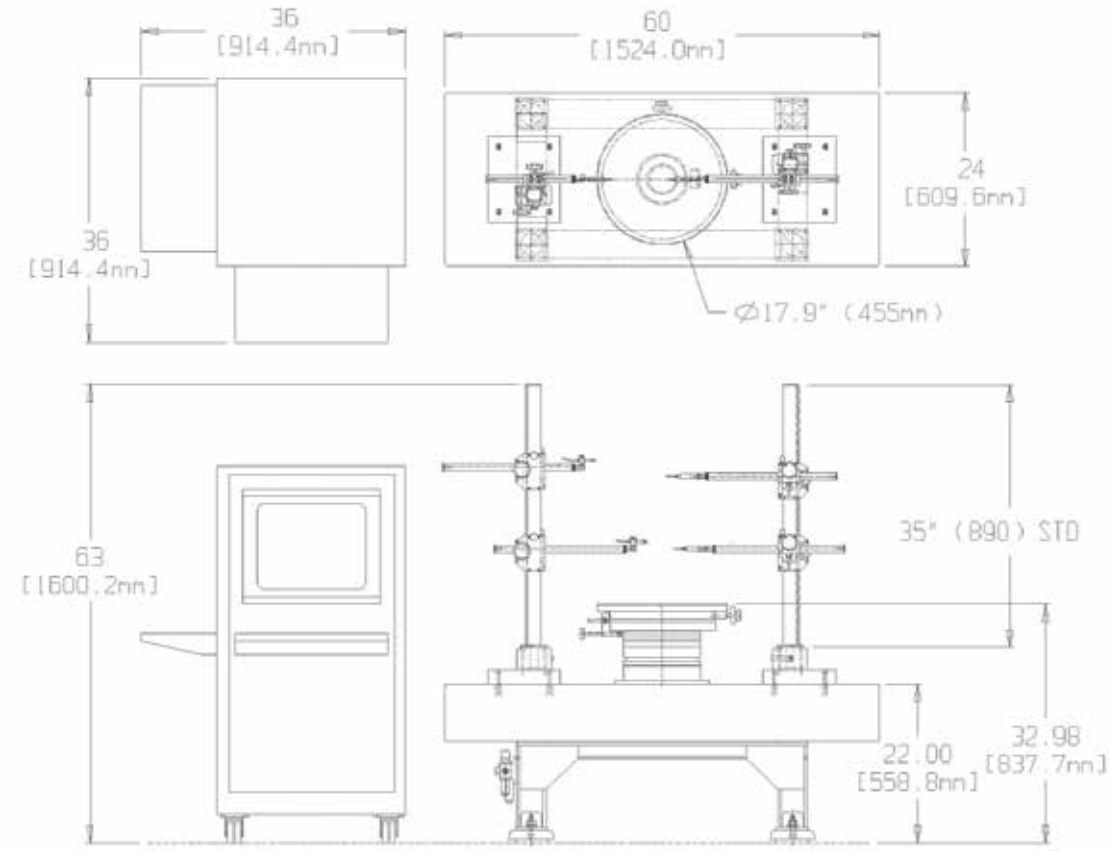
*Note: Other Gage heads available upon request

SPS 1000T

Raised Table Profile Part Measurement and Stacking System.
Convenient working height for piece part measurement and short stacks

Electrical	
Encoder	1000 line
Equipment	Flat screen LCD Display, Industrial Computer, CE Approved, Printer
Power	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption	500 VA
Air Requirements	Pressure: 50 – 80 psig
Air Usage	1.5 scfm @ 60 psig, (42 l/min)

Floor Plan



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Aerospect SPS 2500L Specification

General	
Post Height	1196 mm (48 in) (optional 1575 mm (62 in))
Arm Length	457 mm and 610 mm (18 in and 24 in) (optional 762 mm (30 in))
Granite	2032 x 914 x 406 mm (80 x 36 x 16 in) thick
Worktable Height	777 mm (30.6 in)
Machine Weight	2095 kg (4608 lbs)
Air bearing	
Load capacity	1136 kg (2500 lbs)
Radial / Axial accuracy	±0.125 µm (5 µin)
Tilt Error Motion (coning)	< 0.025 µm/25mm (< 1 µin/in)
Tilt & center	
Tilt Adjustment	+/- 1°
Center Adjustment	+/-3 mm (0.125 in)
Axis of Tilt	95 mm (3.8 in) Above Worktable
Work Table Diameter	455 mm (18 in) (optional 500 mm, 605 mm, 800 mm (19.6 in, 24 in, 32 in))
Gage Heads (4 - Std, 8 - optional)*	
Cartridge Style	0.375 in OD, +/- 1 mm (0.040 in) travel
Lever Style	+/- 0.30 mm (+/-0.012 in) travel
Ultra Small	+/- 0.25 mm (+/- 0.010 in) travel
Measurement resolution	0.25 µm (10 µin)

*Note: Other Gage heads available upon request

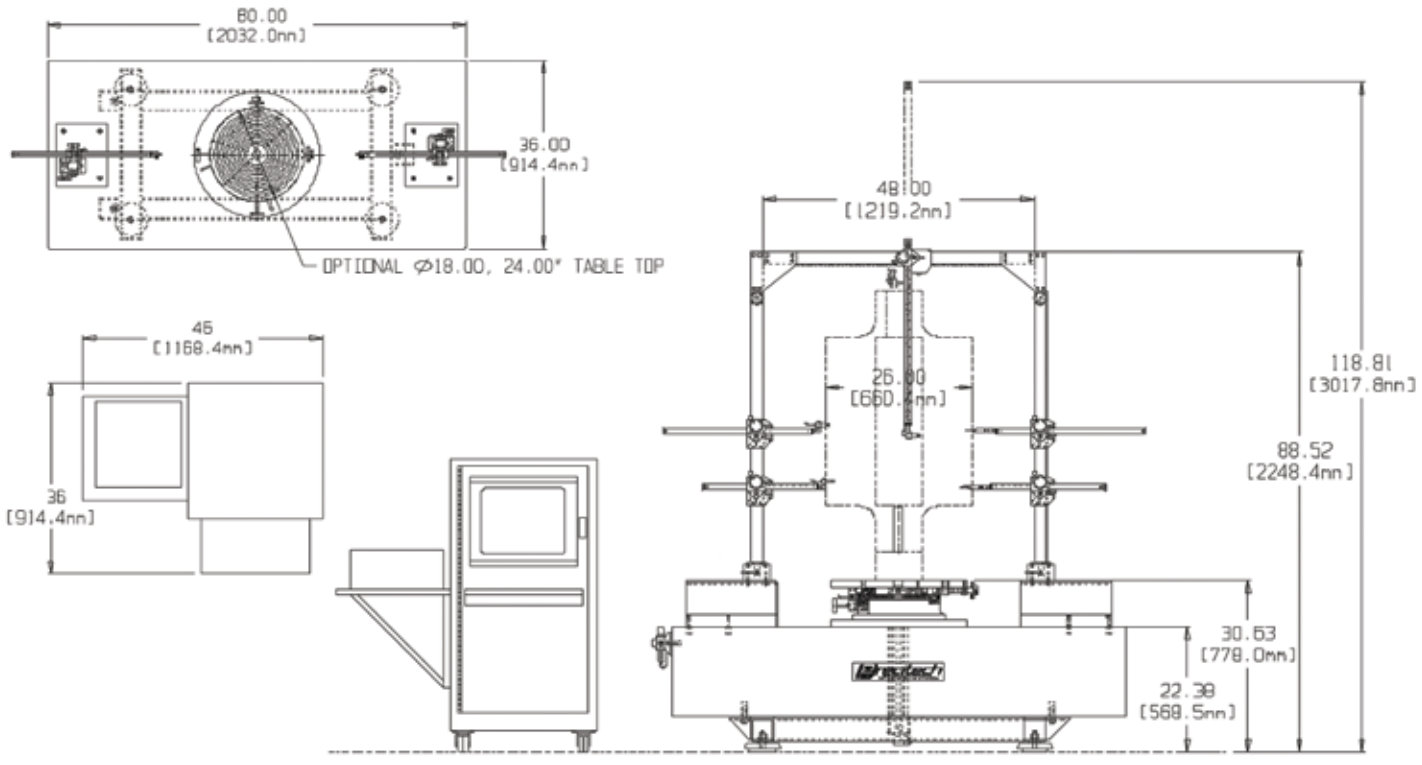
SPS 2500L

Raised table profile part measurement and stacking system.

With gantry for deep bore measurement (optional).

Electrical	
Encoder	1000 line
Equipment	Flat screen LCD Display, Industrial Computer, CE Approved, Printer
Power	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption	500 VA
Air Requirements	Pressure: 50 – 80 psig
Air Usage	1.5 scfm @ 60 psig, (42 l/min)
Electrical Cabinet Weight	235 kg (515 lbs)

Floor Plan



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Aerospect SPS 2500C Specification

General	
Column Height	2641 mm (104.00 in)
Max Diameter	1160 mm (45.66 in)
Granite	1524 x 918 x 254 mm thick (60 x 36 x 10 in thick)
Worktable Height	675 mm (26.6 in)
Machine Weight	1859 kg (4090 lbs)
Air bearing	
Load capacity	1137 kg (2500 lbs)
Radial / Axial accuracy	±0.125 µm (5 µin)
Tilt Error Motion (coning)	< 0.025 µm/25mm (< 1 µin/in)
Tilt & center	
Tilt Adjustment	+/- 1°
Center Adjustment	+/-3 mm (0.125 in)
Axis of Tilt	95 mm (3.8 in) Above Worktable
Work Table Diameter	455 mm (18 in) (optional 500 mm, 605 mm, 800 mm (19.6 in, 24 in, 32 in))
Gage Heads (4 - Std, 8 - optional)*	
Cartridge Style	0.375 in OD, +/- 1 mm (0.040 in) travel
Lever Style	+/- 0.30 mm (+/-0.012 in) travel
Ultra Small	+/- 0.25 mm (+/- 0.010 in) travel
Measurement resolution	0.25 µm (10 µin)
Electrical	
Encoder	1000 line
Equipment	Flat screen LCD Display, Industrial Computer, CE Approved, Printer
Power	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption	500 VA
Air Requirements	Pressure: 50 – 80 psig
Air Usage	1.5 scfm @ 60 psig, (42 l/min)
Electrical Cabinet Weight	235 kg (515 lbs)

SPS 2500C

2500 lbs load capacity. 2300 mm tall parts and assemblies may be conveniently measured and stacked.

* Floor plan available on request

***Note: Other Gage heads available upon request**

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Aerospect SPS Portable Specification

General

The SPS Portable system enables Stack prediction measurements of components or stacks.

Measurements can be made on any axis of rotation, such as machine tools or balancing systems. Easy to use Aerospect software allows the creation of SP values and orientation. Industrial hardened computer, encoder wheel, and gaging electronics make for a very versatile metrology system.

Gage Heads	
Cartridge Style	0.375 in OD, +/- 1 mm (0.040 in) travel
Lever Style	+/- 0.30 mm (+/-0.012 in) travel
Ultra Small	+/- 0.25 mm (+/- 0.010 in) travel
Measurement resolution	0.25 µm (10 µin)

Electrical	
Encoder	200 line
Equipment	Flat screen LCD Display, Industrial Computer, CE Approved, Printer

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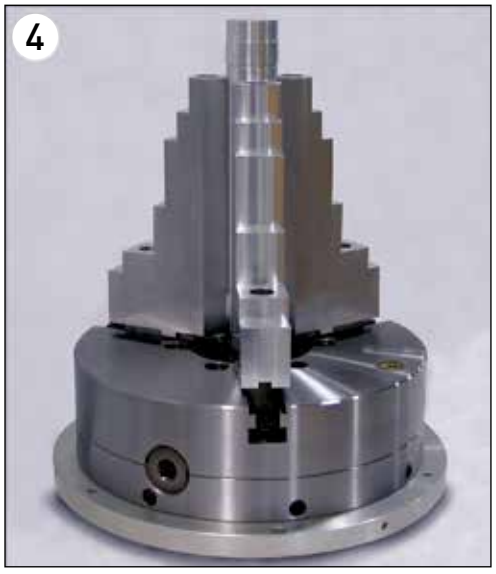
Fixtures and spin tables

Engine Specific Fixturing	
CFM56	HPCR Hydraulic Arbor
LM-2500	Hydraulic arbor
CF6-50	3-Jaw Chuck
CF6-80C LM6000	HPCR Hydraulic Arbor
CF6-80C	3-Jaw Chuck
CFM56-7	3-Jaw Chuck
CF34-8C	3-Jaw Chuck HPCR Piece Part & Assembly
CFM56	Arbor

Spin Tables - Top / Base (in)	Load Capacity rated at 60 psig
RT-18/14	(750 lbs / 341 kg)
RT-18/18	(1400 lbs / 636 kg)
RT-24/18	(1200 lbs / 545 kg)
RT-36/24	(2500 lbs / 1136 kg)
RT-36/30	(4400 lbs / 2000 kg)
RT-48/30	(3800 lbs / 1727 kg)
RT-36/36	(5500 lbs / 2500 Kg)
RT-48/36	(4950 lbs / 2250 kg)
RT-48/42	(7200 lbs / 3273 kg)
RT 60/60	(25,000 lb / 11,363 kg)
RT-72/72	(32,000 lbs / 14,545 kg)

Spin Table Accuracy	
Radial	0.5 µm (20 µin)
Axial	0.25 µm (10 µin)

1. Low profile Air / Ball Spin Tables used for off line Turbine assembly.
2. Christmas Tree Arbor 3 Jaw Chuck for CFM56
3. Expanding Hydraulic Arbor for LM2500
4. Christmas Tree Arbor 3 Jaw Chuck CF6-50



Diverse range of product solutions

Taylor Hobson's contact and non-contact measurement systems

Roundness - Talyrond® 500H

A revolutionary concept in automated roundness inspection

- Automated high precision roundness, surface finish, contour
- Five measurements in one
- Powerful software tools help improve your process - harmonic analysis, cylindrical mapping, ball and lead screw analysis

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Measurement systems to improve design, throughput and performance

- Full suite of dedicated software analysis packages
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- Precision systems for surface finish, contour and 3D measurements
- Ideally suited for automotive, gears bearings and many other applications

Alignment & level

A range of instruments for measuring angle, straightness, flatness, squareness and parallelism

- Accurate measurement of small angular deviations from a datum angle
- Main applications include checking straightness of machine tool slideways
- Most accurate and stable level in the world with a resolution of 0.1 secs

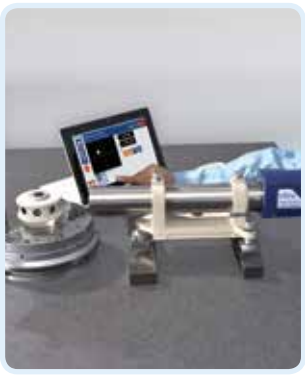
Bench top / Handheld - Surtronic® range

A range of roundness, surface finish and roughness products robust enough for the shop floor and accurate enough for any inspection room.

- Bench top roundness - High speed roundness measurement systems
- Handheld - A range of portable and robust surface roughness tester
- Bench top surface - Precision shop floor solutions for surface finish and contour measurement

Talyrond® 500 H Series

Form Talysurf® i-Series



Ultra Autocollimator

Surtronic® range

TAYLOR HOBSON®

AMETEK®
ULTRA PRECISION TECHNOLOGIES

The Metrology Experts

Established in 1886, Taylor Hobson is the world leader in surface and form metrology and developed the first roundness and surface finish measuring instruments.

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