

Aerospect SPS Stack Prediction

Precision measurement systems for
Turbine/Engine alignment



Aerospect SPS Stack Prediction Systems

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

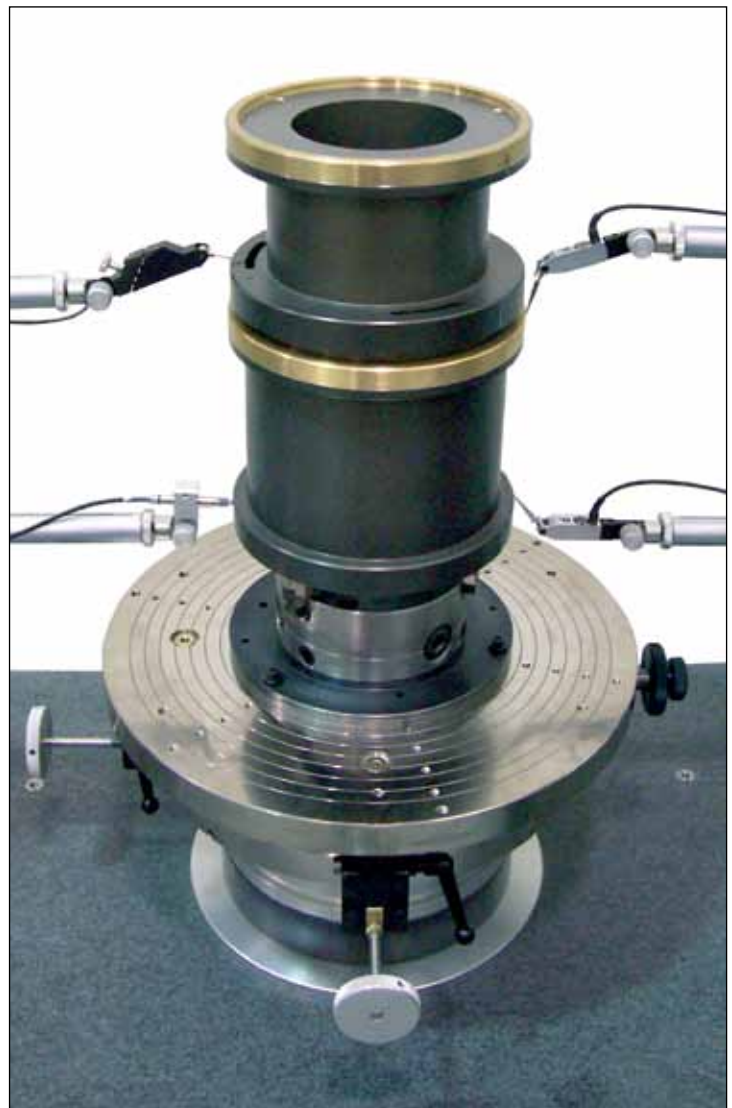
The precision air bearing spindle and gauging combined with the dedicated Aerospect software enable first time build of engines to a tighter specification. This has a large impact on engine efficiency by enabling a reduced rotor to stator clearance but also reduces time between maintenance by reducing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

Parameters Include

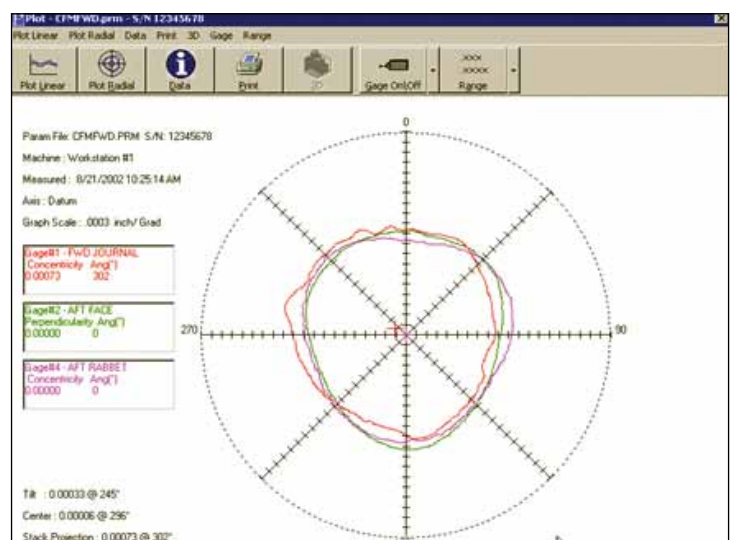
- Flatness
- Roundness
- Concentricity
- Squareness
- SP indication for part alignment

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.

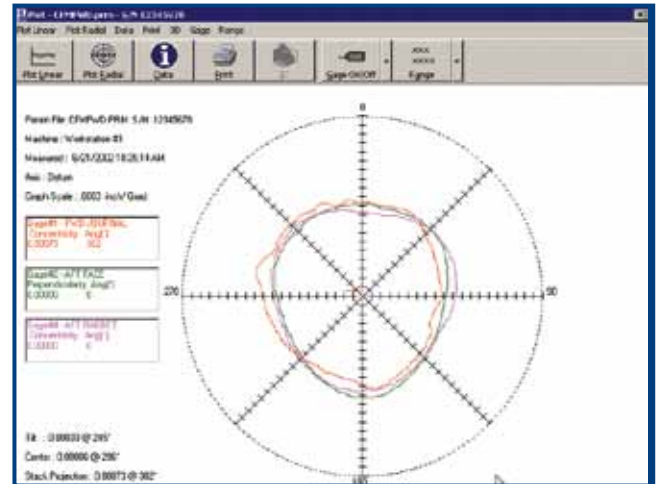
A typical system utilises 4 gauges (8 optional) in roundness or flatness mode on internal/external or upper/lower surfaces respectively by simply identifying their orientation on the set up menu.

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.

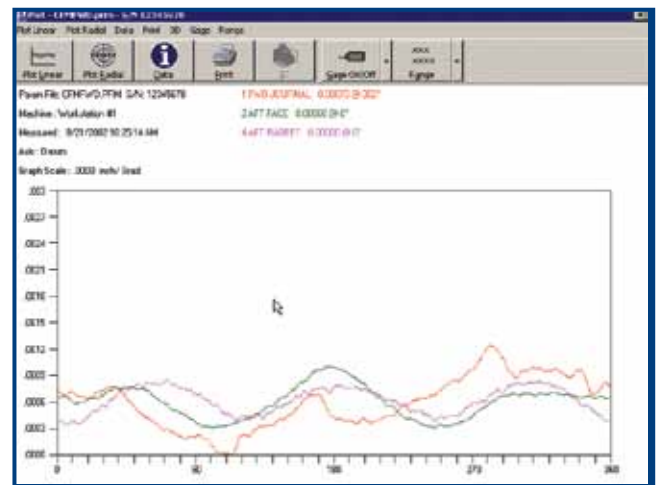
To make things even clearer the each individual gauge can be associated with a measurement feature name including the features height and diameter.

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



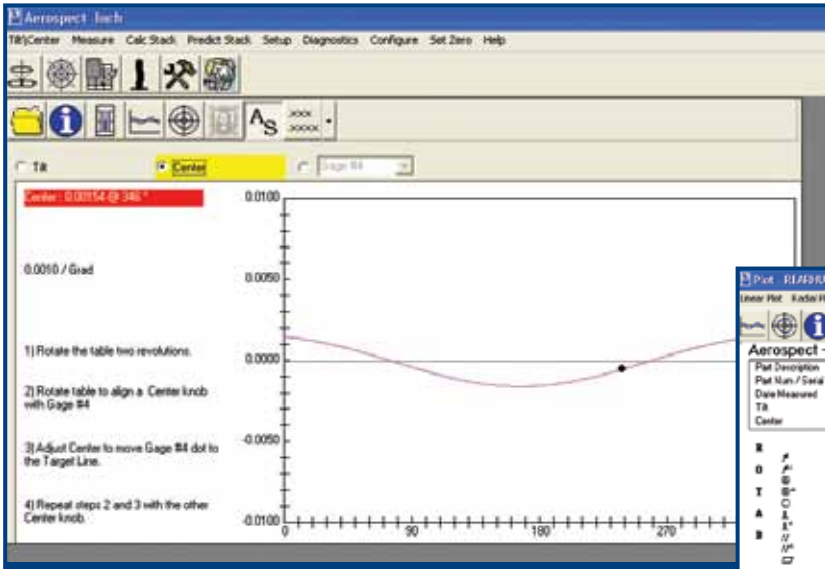
Polar format – Multiple Roundness/flatness results can be shown in polar or linear (See above and below)



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

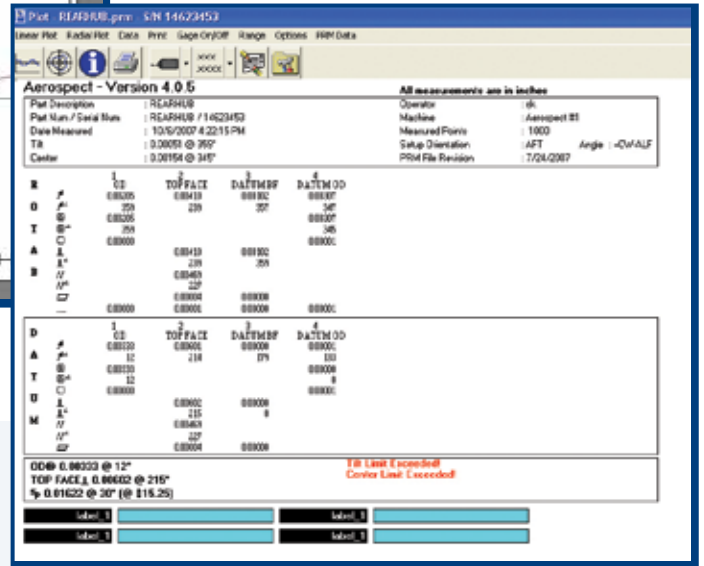


User friendly software for Jet Engines and Gas Turbines



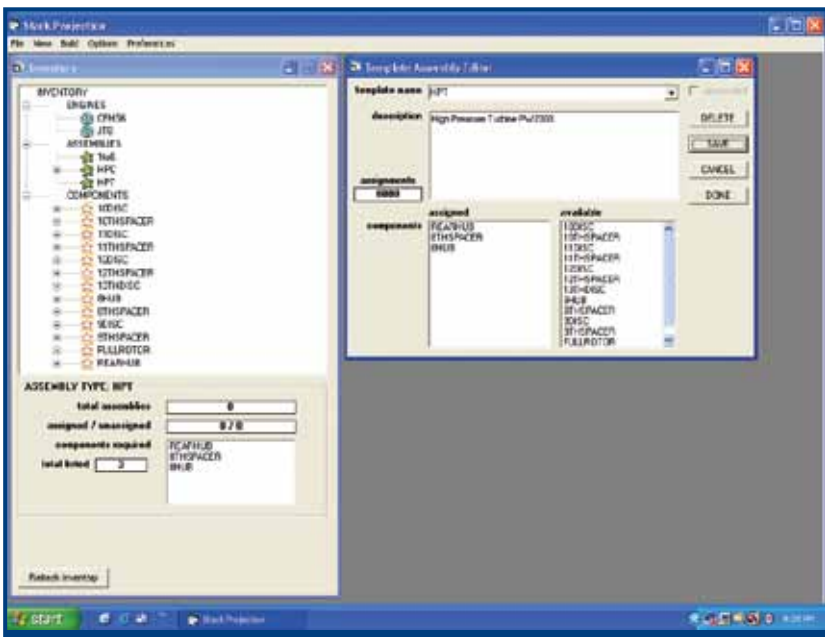
Centre and Levelling

- 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 1524 mm (60 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.

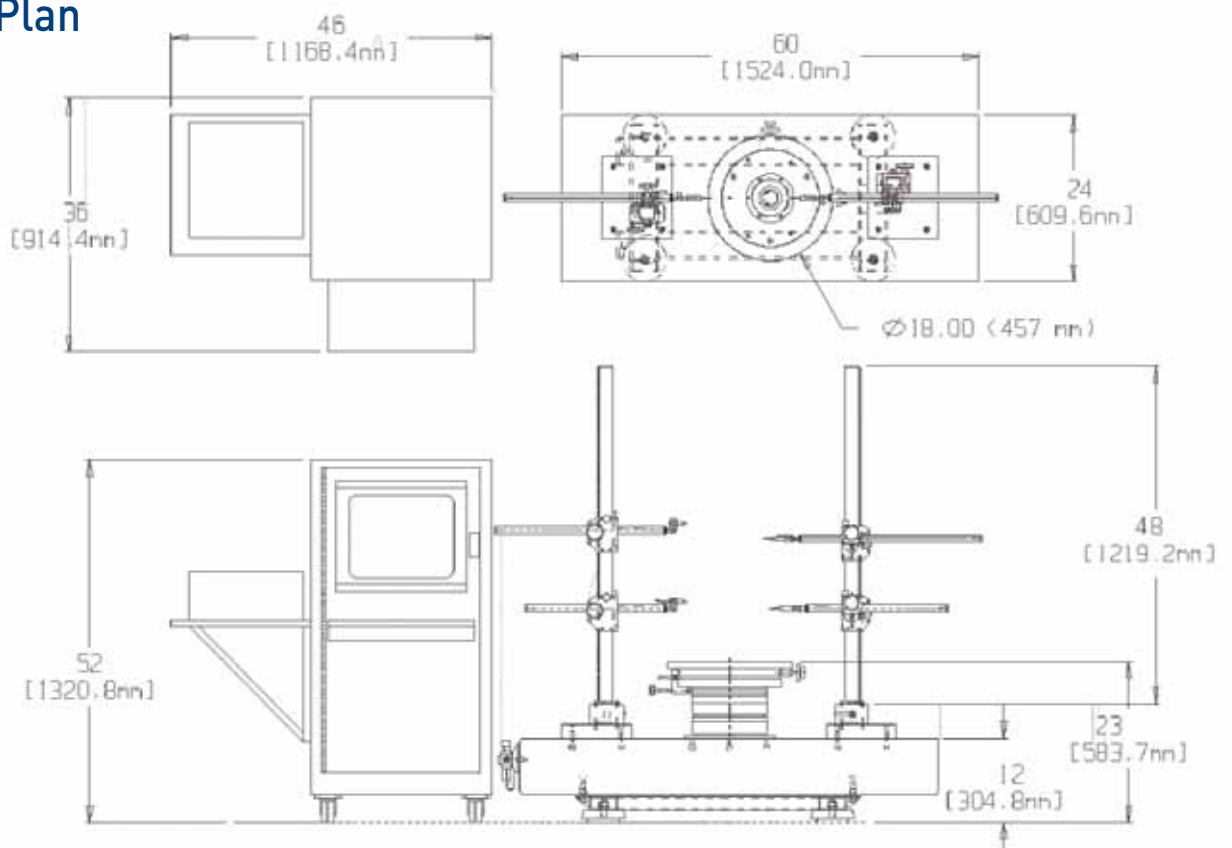
Convenient working height for most medium thrust commercial turbines.



Electrical	
Encoder:	1000 line
Flat screen LCD Display	
Industrial Computer	
CE Approved	
Printer included	
Power:	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption:	500VA
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 1524 mm (60 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) optional 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 (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)

SPS1000T
Raised Table Profile Part Measurement and Stacking System.

Convenient working height for piece part measurement and short stacks

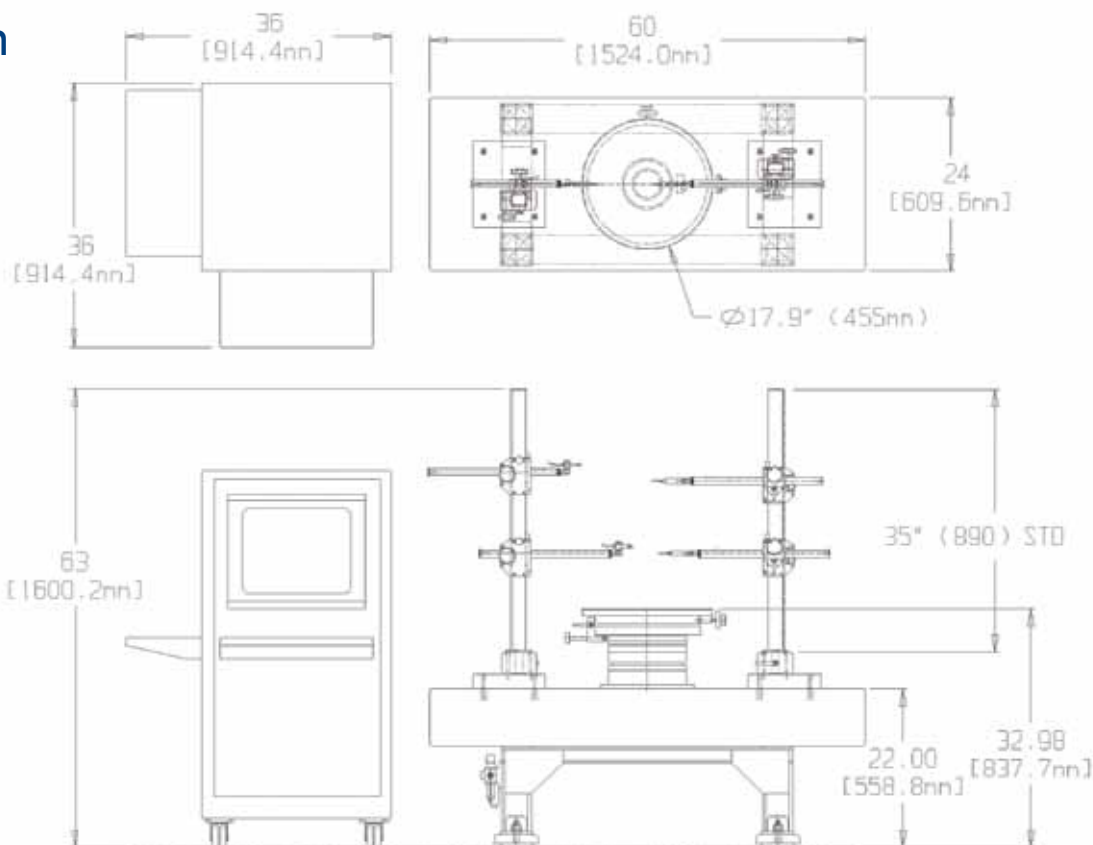


Electrical

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

*Note: Other Gage heads available upon request

Floor Plan



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Aerospect SPS 2500 L Specification

General	
Post Height:	1196 mm (48 in) optional 1524 mm (60 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:	777mm (30.6 in)
Machine Weight:	2095 kg (4608 lbs)
Electrical Cabinet Weight:	235 kg (515 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:	+/- 0.30mm (+/-0.012 in) travel
Ultra Small:	+/- 0.25 mm (+/- 0.010 in) travel
Measurement Resoluton:	0.25 µm (10 µin)

SPS 2500LC

Raised table profile part measurement and stacking system.

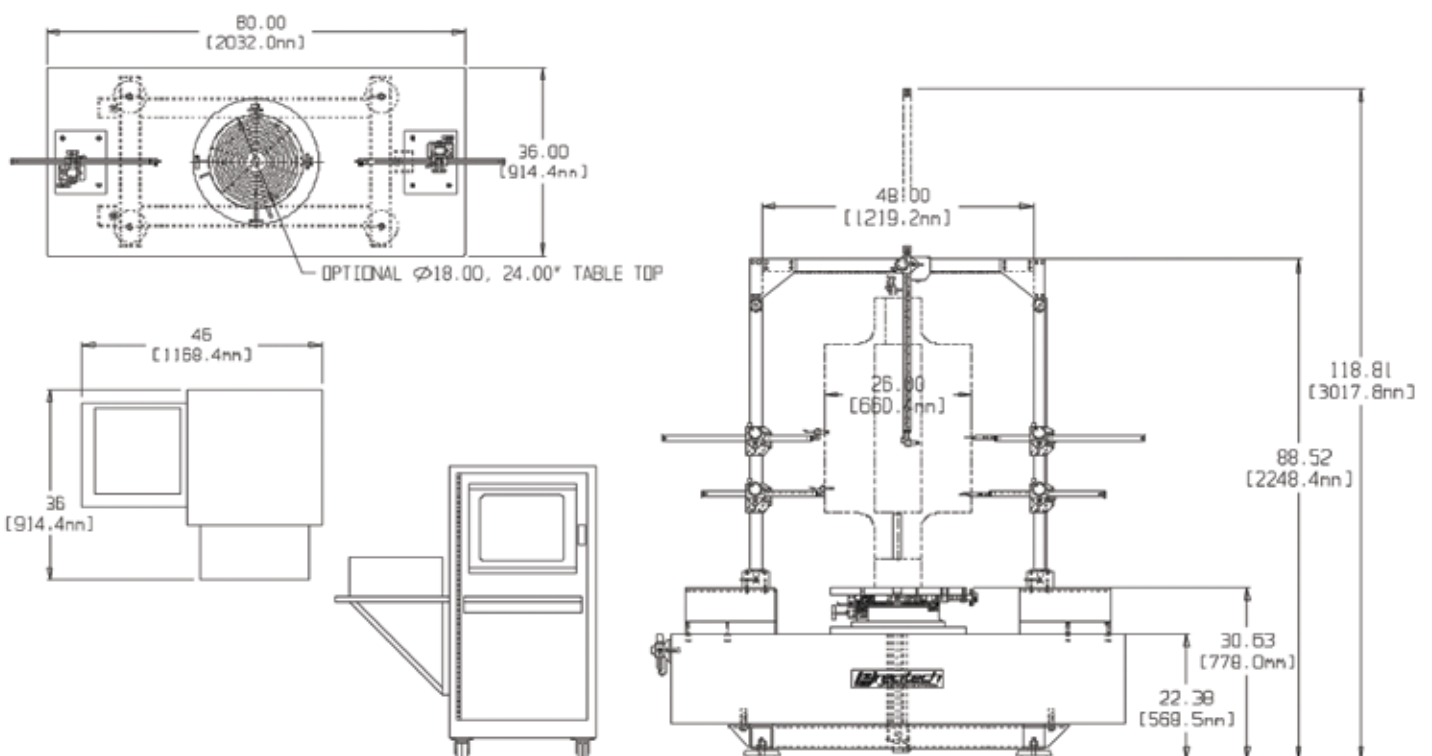
With gantry for deep bore measurement (optional).



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

* Note: Other Gage heads available upon request

Floor Plan



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Aerospect SP-150DT Specification

General	
Post Height:	508 mm (20 in) optional 635 mm, 762 mm (25 in, 30 in)
Arm Length:	457 mm (18 in)
Granite:	762 mm x 508 mm x 152mm thick (30 in X 20 in X 6 in thick)
Worktable Height:	1016 mm (40 in)
Machine Weight:	720 lb (327 kg)
Air Bearing	
Load Capacity:	150 lb (68 kg)
Radial / Axial:	± 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:	51mm (2 in) above worktable
Work Table Diameter:	200 mm (8 in) optional 250 mm, 300 mm (10.6 in, 12 in)
Gage Heads (4- Std, 8- optional)*	
Cartridge Style:	0.375 in OD, +/- 1 mm (0.040 in) travel
Lever Style:	+/- 0.30mm (+/- 0.012 in) travel
Ultra Small:	+/- 0.25 mm (+/- 0.010 in) travel
Measurement resolution:	0.25 µm (10 µin)

SPS-150DT
150 lbs capacity. Perfect for small turbine components and assemblies.

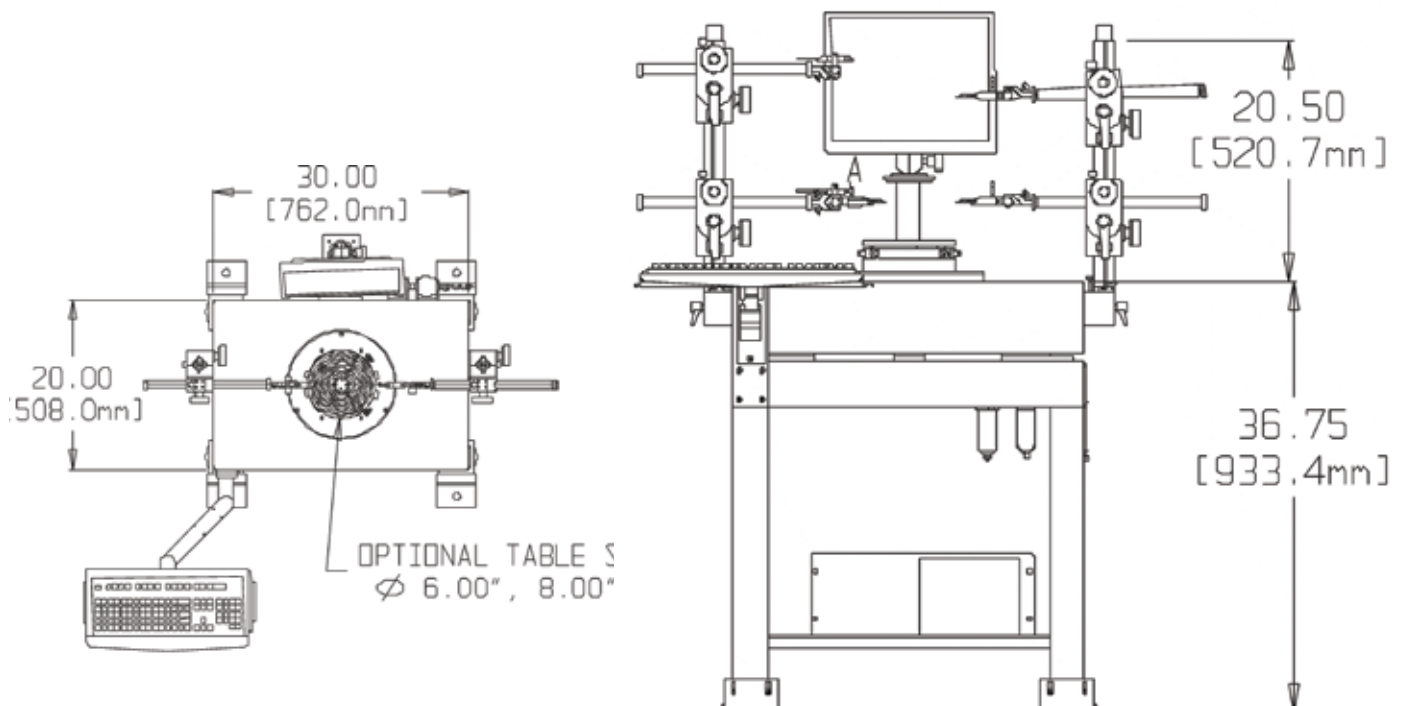
Optimize your high speed engine stacks.



Electrical	
Encoder:	1000 line
Flat screen LCD Display	
Industrial Computer	
CE Approved	
Printer included	
Power:	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption:	500VA
Air Requirements:	Pressure: 50 – 80 psig
Air Usage:	1.0 scfm @ 60 psig, (28 l/min)

*Note: Other Gage heads available upon request

Floor Plan



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Aerospect SPS 2500 C Specification

General	
Column Height:	2641 mm (104.00 in)
Max Diameter:	1160 mm (45.66 in)
Granite:	1524 x 918 x 254mm thick (60 X 36 X 10 in thick)
Worktable Height:	675 mm (26.6 in)
Machine Weight:	1859 kg (4090 lbs)
Electrical Cabinet Weight:	234 kg (515 lbs)
Air Bearing	
Load Capacity:	Optional 2500 lbs (1137 Kg)
Radial accuracy:	± 0.125 µm (5 µin)
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:	+/- 3.1mm (0.125 in)
Axis of Tilt:	95mm (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" OD, +/- 1 mm (0.040") travel
Lever Style:	+/- 0.30mm (+/-0.012") travel
Ultra Small:	+/- 0.25 mm (+/- 0.010") travel
Measurement resolution:	0.25 µm (10 µin)
Note: Other Gage heads available upon request	
Electrical	
Encoder:	1000 line
Flat screen LCD Display	
Industrial Computer	
CE Approved	
Printer included	
Power:	120VAC-50/60hz or 220 VAC-50/60hz
Power Consumption:	500VA
Air Requirements:	Pressure: 50 – 80 psig
Air Usage:	1.5 scfm @ 60 psig, (42 l/min)



SPS Column

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

* Floor plan available
on request

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: +/- 0.30mm (+/-0.012 in) travel

Ultra Small: +/- 0.25 mm (+/- 0.010 in) travel

Measurement resolution: 0.25 μm (10 μin)

Note: System delivered with 4 off cartridge style gauges, other gauge heads available upon request

Electrical

Encoder: 200 line

Flat screen LCD Display

Industrial Computer

CE Approved

Printer included

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

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
CFM 56	Fan Rotor Arbor and lifting Cylinders

Spin Tables

Top / Base (in)	Load Capacity rated at 60psig
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 μ m (20 μ in)
Axial	0.25 μ m (10 μ in)

- 1 Low profile Air / Ball Spin Tables used for off line Turbine assembly.
- 2 CFM 56 fan rotor with lift cylinders allowing underside access
- 3 Christmas Tree Arbor 3 Jaw Chuck for CFM56
- 4 Expanding Hydraulic Arbor for LM2500
- 5 Christmas Tree Arbor 3 Jaw Chuck CF6-50



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Serving a global market

Taylor Hobson is world renowned as a manufacturer of precision measuring instruments used for inspection in research and production facilities. Our equipment performs at nanometric levels of resolution and accuracy.

To complement our precision manufacturing capability we also offer a host of metrology support services to provide our customers with complete solutions to their measuring needs and total confidence in their results.

Contracted Services from Taylor Hobson

- **Inspection services**
measurement of your production parts by skilled technicians using industry leading instruments in accord with ISO standards
- **Metrology training**
practical, hands-on training courses for roundness and surface finish conducted by experienced metrologists
- **Operator training**
on-site instruction will lead to greater proficiency and higher productivity
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certification for artifacts or instruments in our laboratory or at customer's site

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or call: **+44 116 276 3779**

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email: taylor-hobson.sales@ametek.com
or call: **+44 116 246 2034**



Taylor Hobson UK

(Global Headquarters)
PO Box 36, 2 New Star Road
Leicester, LE4 9JQ, England
Tel: +44 116 276 3771 Fax: +44 116 246 0579
email: taylor-hobson.uk@ametek.com



Taylor Hobson France

Rond Point de l'Épine Champs
Batiment D, 78990 Elancourt, France
Tel: +33 130 68 89 30 Fax: +33 130 68 89 39
taylor-hobson.france@ametek.com



Taylor Hobson Germany

Postfach 4827, Kreuzberger Ring 6
65205 Wiesbaden, Germany
Tel: +49 611 973040 Fax: +49 611 97304600
taylor-hobson.germany@ametek.com



Taylor Hobson India

1st Floor, Prestige Featherlite Tech Park
148, EPIP II Phase, Whitefield, Bangalore – 560 006
Tel: +91 1860 2662 468 Fax: +91 80 6782 3232
taylor-hobson.india@ametek.com



Taylor Hobson Italy

Via De Barzi
20087 Robecco sul Naviglio, Milan, Italy
Tel: +39 02 946 93401 Fax: +39 02 946 93450
taylor-hobson.italy@ametek.com



Taylor Hobson Japan

3F Shiba NBF Tower, 1-1-30, Shiba Daimon Minato-ku
Tokyo 105-0012, Japan
Tel: +81 (0) 3 6809-2406 Fax: +81 (0) 3 6809-2410
taylor-hobson.japan@ametek.com



Taylor Hobson Korea

#310, Gyeonggi R&DB Center, 906-5, Iui-dong
Yeongtong-gu, Suwon, Gyeonggi, 443-766, Korea
Tel: +82 31 888 5255 Fax: +82 31 888 5256
taylor-hobson.korea@ametek.com



Taylor Hobson China Beijing Office

Western Section, 2nd Floor, Jing Dong Fang Building (B10)
No.10, Jiu Xian Qiao Road, Chaoyang District, Beijing, 100015, China
Tel: +86 10 8526 2111 Fax: +86 10 8526 2141
taylor-hobson.beijing@ametek.com



Taylor Hobson China Shanghai Office

Part A, 1st Floor, No. 460 North Fute Road
Waigaoqiao Free Trade Zone, Shanghai, 200131, China
Tel: +86 21 5868 5111-110 Fax: +86 21 5866 0969-110
taylor-hobson.shanghai@ametek.com



Taylor Hobson Singapore

AMETEK Singapore, 10 Ang Mo Kio Street 65
No. 05-12 Techpoint, Singapore 569059
Tel: +65 6484 2388 Ext 120 Fax: +65 6484 2388 Ext 120
taylor-hobson.singapore@ametek.com



Taylor Hobson USA

1725 Western Drive
West Chicago, Illinois 60185, USA
Tel: +1 630 621 3099 Fax: +1 630 231 1739
taylor-hobson.usa@ametek.com



www.taylor-hobson.com