

PALMGREN[®]

a CH Hanson brand

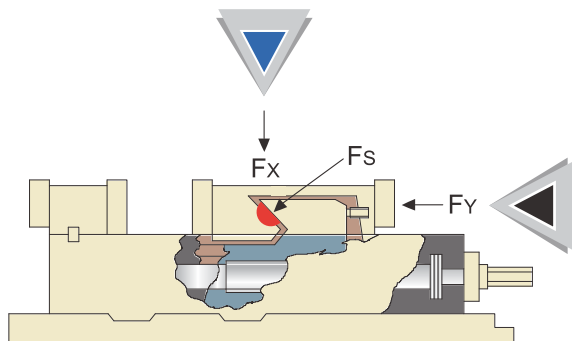
Designed to do more.



Vise Workholding Solutions

A Foundation of Innovation and Quality

Since 1919 Palmgren has the reputation of offering the best multi-function workholding and positioning products that deliver exceptional quality and money saving solutions. Palmgren offers you more choices and more value than any other source.



Dual Force Design
The hardened spherical force (F_s) produces all directional alignment. 1/2 pound of downward force (F_x) for every pound of horizontal force (F_y).

Palmgren’s Dual Force line of precision machine vises are all designed for precision part clamping and are ideal for use in running production parts where datum’s, flatness and parallelism is key. The Dual Force design allows the moveable jaw to deliver a 1/2 pound of downward force for every pound of horizontal force, reducing jaw deflection up to 80% while producing “all directional alignment” of the moveable jaw. This unique design prevents parts from lifting upward under heavy clamping and machining loads. All Dual Force vises deliver workholding efficiencies by providing the strength and rigidity to hold parts securely and accurately.

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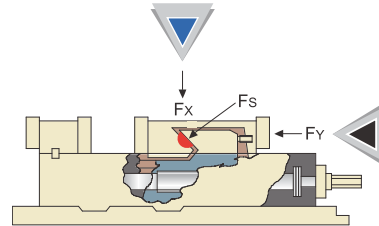
Vises

Dual Force Precision Premium Machine Vises



Palmgren's premium CNC vises combines quality, high precision and wide clamping capacities at an affordable price. Ideal for everyday use from high production environments to rapid prototyping machine shops. Our precision premium machine vises will optimize your manufacturing workholding processes.

- ◆ Equipped with Dual Force anti-lift mechanism
- ◆ Sealed friction reducing needle thrust bearing help increase clamping pressure and reduce drag
- ◆ Vise nut does not extend beyond the end of the vise body
- ◆ Hardened jaw plates
- ◆ Hardened vise bed
- ◆ Repeatability within 0.001"
- ◆ Bed heights matched to +/- 0.0004"
- ◆ Parallelism of keyways on the bottom of the vise bed to the jaw face +/- 0.0008"
- ◆ 80,000 PSI stress relieved ductile iron castings
- ◆ LIFETIME GUARANTEE



Dual Force Design
The hardened spherical force (Fs) produces all directional alignment. 1/2 pound of downward force (Fy) for every pound of horizontal force (Fx).



9625928



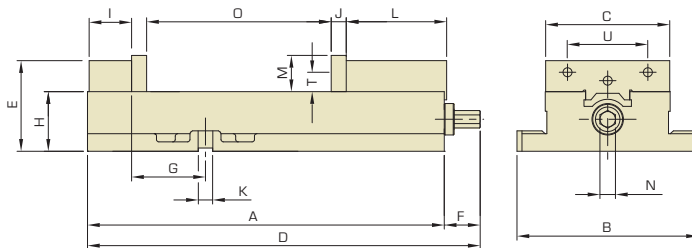
9625927



9625929



9625930



See optional Swivel Base on page 11.

Dual Force Precision Premium Machine Vises Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	T	U	Wt. Lb.
9625927	12.638	6.299	4.173	14.212	3.372	1.575	2.795	2.250	1.382	0.590	0.472	4.016	1.378	0.551	6.024	0.689	2.500	31
9625928	17.008	9.252	5.945	18.740	4.371	1.732	4.252	2.875	2.047	0.709	0.688	4.843	1.752	0.748	7.559	0.937	3.874	80
9625929	17.205	8.740	5.945	18.937	4.371	1.732	3.563	2.875	2.047	0.709	0.688	4.843	1.752	0.748	8.898	0.937	3.874	80
9625930	21.850	11.614	8.110	23.032	5.279	1.181	4.950	3.310	2.284	0.953	0.813	6.181	2.205	0.748	10.433	1.260	4.724	151

Description	Jaw Width (In.)	Jaw Opening (In.)	Throat Depth (In.)	Jaw Deflection	Item No.	Model No.
Dual Force Precision Premium Machine Vise w/Stationary Base	4	6	1.378	0.001" @ 4000 lb.	9625927	MPS40
Dual Force Precision Premium Machine Vise w/Stationary Base	6	7.5	1.752	0.001" @ 4000 lb.	9625928	MPS67
Dual Force Precision Premium Machine Vise w/Stationary Base	6	8.9	1.752	0.001" @ 4000 lb.	9625929	MPS68
Dual Force Precision Premium Machine Vise w/Stationary Base	8	10	2.205	0.001" @ 4000 lb.	9625930	MPS80

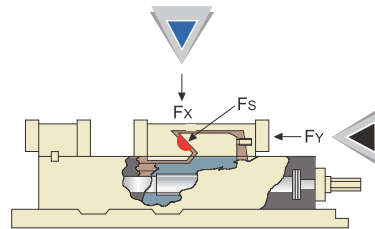
Vises

Dual Force Precision CNC Machine Vises



Built for use on all types of CNC machines where high precision part clamping is a necessity. This is an ideal vise for applications that require multiple vises to be mounted parallel to each other.

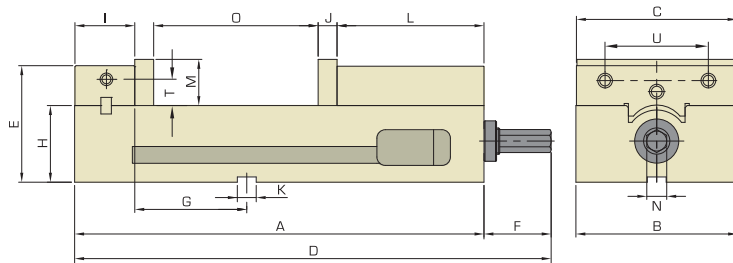
- ◆ Both sides are precision ground square to the bottom of the vise with in .0004"
- ◆ The vise can be mounted on its base/bottom, on either side or positioned on its end in the vertical position
- ◆ Parallelism of keyways on bottom of vise bed to the jaw face +/- 0.0008"
- ◆ 80,000 PSI ductile iron castings
- ◆ Hardened jaw plates
- ◆ Hardened vise bed
- ◆ Equipped with Dual Force anti-lift mechanism
- ◆ LIFETIME GUARANTEE



Dual Force Design
The hardened spherical force (Fs) produces all directional alignment. 1/2 pound of downward force (Fx) for every pound of horizontal force (Fy).



9626600



Dual Force Precision CNC Machine Vise Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	T	U	Wt. Lb.
9626600	12.992	4.134	4.016	14.646	3.937	1.654	3.252	2.677	1.843	0.827	0.709	4.173	1.575	0.551	4.921	0.689	2.500	46
9626610	15.354	6.063	5.945	17.913	4.370	2.560	4.843	2.874	2.244	0.709	0.709	5.512	1.752	0.748	5.827	0.937	3.874	81

Description	Jaw Width (In.)	Jaw Opening (In.)	Throat Depth (In.)	Item No.
Dual Force Precision CNC Machine Vise	4	5	1.575	9626600
Dual Force Precision CNC Machine Vise	6	6	1.752	9626610

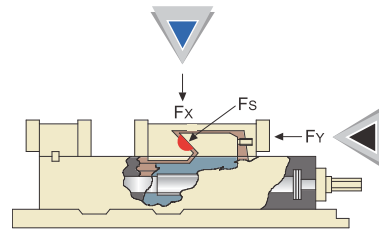
Vises

Dual Force Precision Multi-Function Machine Vises



The Multi-Function line-up of vises provides a unique solution for quick and easy work piece clamping for most CNC machining applications. This lighter design makes the vise easier to mount and handle than other styles of vises.

- ◆ Model 9625932 is standard with the traditional push style moveable jaw
- ◆ Model 9625933 is standard with a pull style moveable jaw. This configuration provides an added benefit of easier part programming in the "Y" axis. It also reduces the reach-over distance, making part loading and unloading safer and easier for the machine operator.
- ◆ The vises can be mounted on its base/bottom, on either side or upright. They can also be mounted back to back to create a fast, easy and economical vise tombstone.
- ◆ 0.0005" clamping repeatability
- ◆ Bed heights matched to +/- 0.0004"
- ◆ Parallelism of keyways on bottom of vise bed to the jaw face +/- 0.0008"
- ◆ Equipped with Dual Force anti-lift mechanism
- ◆ 80,000 PSI ductile iron castings
- ◆ LIFETIME GUARANTEE



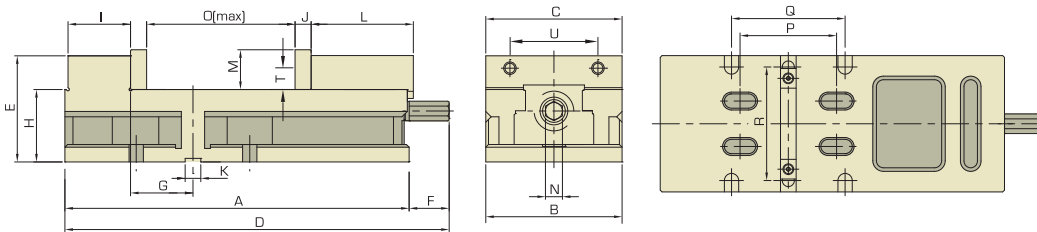
Dual Force Design
The hardened spherical force (Fs) produces all directional alignment. 1/2 pound of downward force (Fx) for every pound of horizontal force (Fy).



9625932



9625933



Dual Force Precision Multi-Function Machine Vises Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	T	U	Wt. Lb.
9625932	15.158	6.002	5.945	17.000	4.673	1.843	2.750	3.190	2.752	0.709	0.709	4.500	1.752	0.748	6.417	4.250	5.0	5.0	0.937	3.874	69
9625933	15.158	6.002	5.945	17.000	4.673	1.843	2.750	3.190	2.752	0.709	0.709	4.500	1.752	0.748	6.417	4.250	5.0	5.0	0.937	3.874	69

Description	Item No.
Right Station Vise	9625932
Left Station Vise	9625933

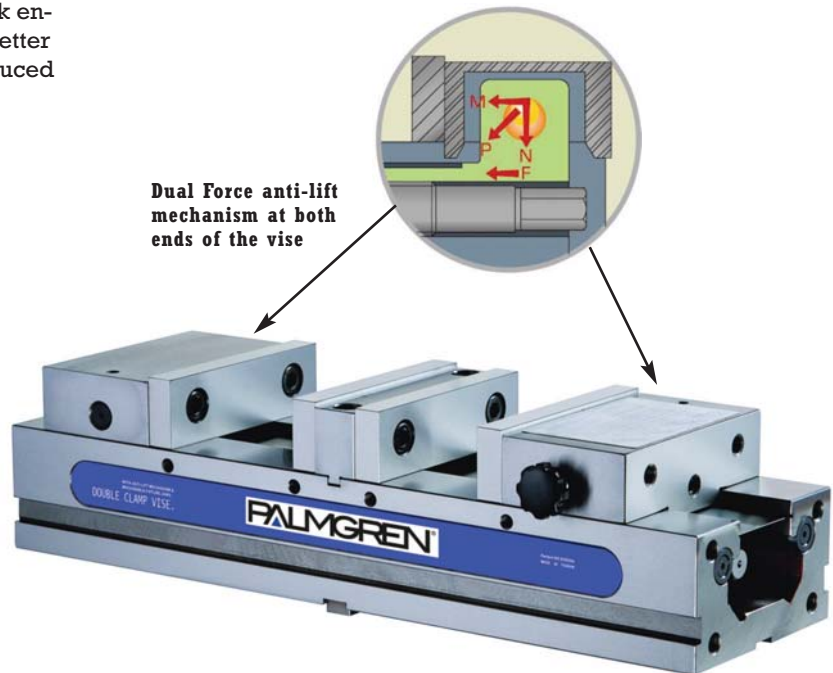
Vises

Dual Force Precision Double Station Machine Vises



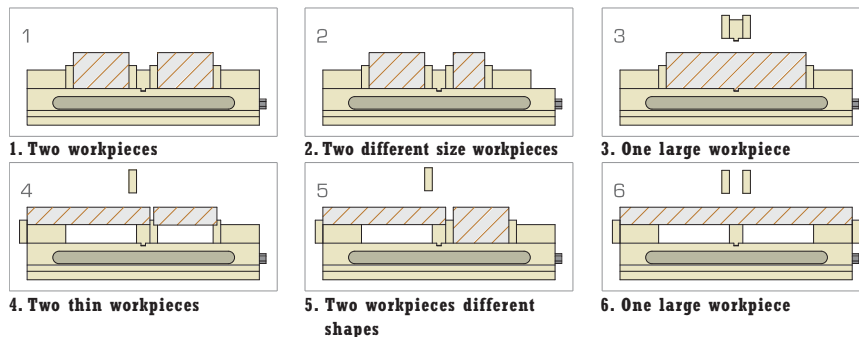
This double station vise offers cost saving productivity by maximizing the number of parts in the machine's work envelope. It allows for multiple part workholding for better spindle utilization, reduced tool change time and reduced machine travel from part to part.

- ◆ 1/2 pound of downward force for every pound of horizontal force on both moveable jaws
- ◆ 80,000 PSI ductile iron casting delivers the strength, rigidity and long term accuracy required while absorbing machine vibration
- ◆ Can be mounted horizontally or vertically
- ◆ One handle operates the two moveable jaws
- ◆ Unit can clamp two of the same size parts or different size parts
- ◆ Clamping force equalization - the same force is applied to both parts whether they are the same size or not
- ◆ Precision ground on all sides
- ◆ Height tolerance is within $\pm 0.0004"$ so several vises can be lined up parallel to each other
- ◆ Repeat clamping accuracy of $.0002"$
- ◆ Fixed center jaw has a machined keyway for accurate alignment and set up
- ◆ 6 different work piece clamping applications
- ◆ LIFETIME GUARANTEE

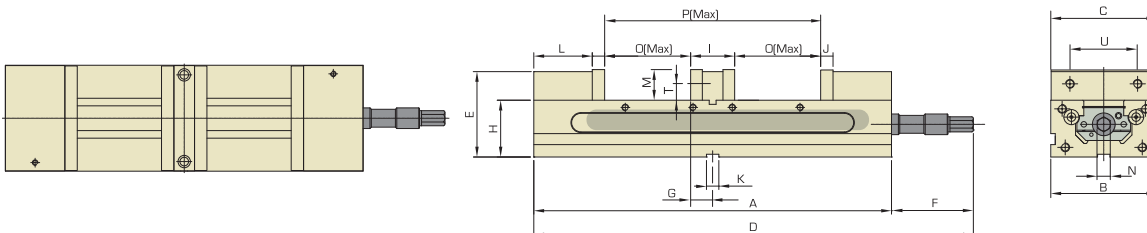


Dual Force anti-lift mechanism at both ends of the vise

CLAMPING APPLICATIONS



Patented auto memory mechanism gives you an advantage especially when clamping different size parts. The two jaws are auto set to the proper position for the two workpieces - then each time you open and close the vise the jaws maintain their set position allowing for quick repeat loading and unloading of the vise.



Dual Force Double Station Machine Vise Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	T	U	Wt. Lb.
9625935	15.945	4.094	4.016	18.071	3.799	2.126	1.083	2.500	2.165	0.591	0.709	2.717	1.496	0.551	3.543	9.252	0.689	2.500	44
9625936	20.472	6.063	5.984	21.102	4.884	0.630	1.300	3.250	2.598	0.709	0.709	3.406	1.752	0.748	4.921	12.441	0.937	3.874	115

Description	Jaw Width (In.)	Jaw Opening (In.)	Throat Depth (In.)	Item No.
Dual Force Double Station Machine Vise	4	0-9.252	1.496	9625935
Dual Force Double Station Machine Vise	6	0-12.441	1.752	9625936

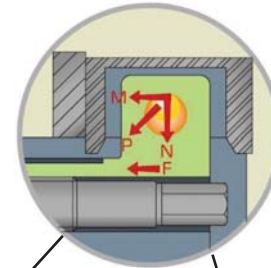
Vises

Dual Force Precision Self-Centering Machine Vise

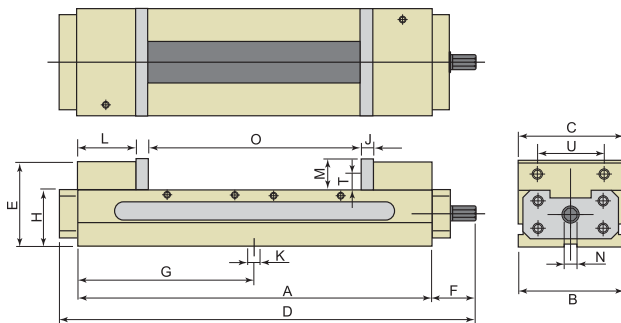


This self-centering vise can be used on both vertical as well as horizontal machining centers. Centering accuracy from minimum to maximum opening is 0.0006" with 0.0002" repeatability. Both moveable jaws incorporate the Dual Force design with zero deflection and lift while providing quick, accurate centering of the workpiece.

- ◆ Equipped with Dual Force anti-lift mechanism in both jaws
- ◆ Precision ground on all sides
- ◆ Height tolerance is within +/- 0.0004" so several vises can be lined up parallel to each other
- ◆ 80,000 PSI ductile iron castings deliver the strength, rigidity and long term accuracy required while absorbing machine vibration
- ◆ Hardened bed ways
- ◆ Hardened jaws
- ◆ LIFETIME GUARANTEE



Dual Force anti-lift mechanism at both ends of the vise



Dual Force Precision Self-Centering Machine Vise Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	T	U	Wt. Lb.
9625934	20.472	6.063	5.984	24.016	4.884	2.520	10.236	3.250	-	0.709	0.709	3.346	1.752	0.748	2.283-12.362	-	0.937	3.874	115

Description	Jaw Width (In.)	Jaw Opening (In.)	Throat Depth (In.)	Item No.
Dual Force Self-Centering Machine Vise	6	2.283-12.36	1.752	9625934

Vises

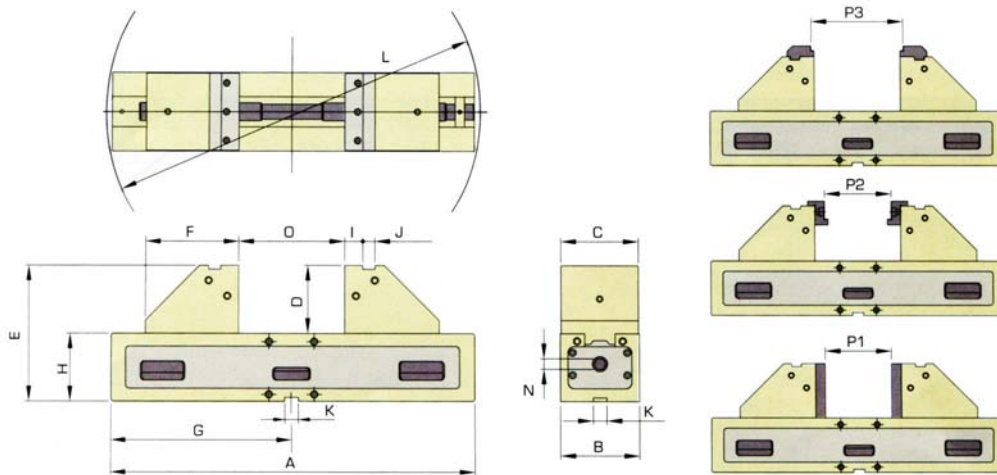
Dual Force Precision 5-Axis Machine Vises



Designed especially for multi-face machining of simple to complicated workpieces with a single clamping operation. These vises are small but have a large holding capacity making them ideal for 5-sided machining. Equipped with a variety of jaw options to cover a wide range of workholding applications. These unique vises deliver unrestricted all around access to the workpiece and are equipped with our Dual Force anti-lift mechanism to counter the lifting effect on the part while being machined.

The Optimal Solution for 5-Axis Machining:

- ◆ Designed for space saving, obstruction free 5-Axis machining allowing machining operations close to the workpiece with low risk of collision
- ◆ Simple, robust construction, smooth surfaces, easy cleaning
- ◆ 80,000 PSI Ductile iron castings for rigidity and dimensional stability
- ◆ All sides are hardened and ground
- ◆ Both clamping jaws move simultaneously, self-centering to shorten the clamp and un-clamp times
- ◆ From the center of the workpiece to the bed of the vise is perpendicular to 0.0004"
- ◆ Repeatable and controllable high clamping force up to 4500 lbs.
- ◆ Dual Force design completely prevents spreading of the clamping jaws and workpiece lift
- ◆ Suitable for raw or pre-machined, cubical, round or odd shaped parts are easily clamped



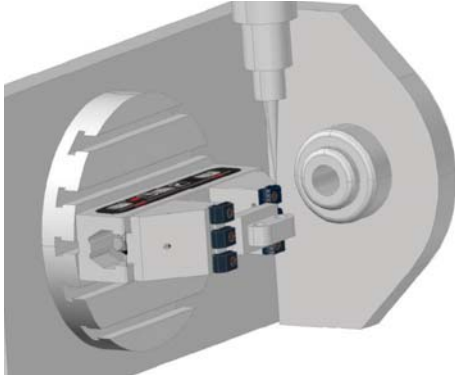
Dual Force Precision 5-Axis Machine Vises Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	N	O	P1	P2	P3	Force	Wt.
9625940	12.755	4.095	4.016	3.543	7.087	4.921	6.378	3.543	0.945	0.630	0.709	13.780	0.551	2.913	1.732	1.654	3.307	4500 lb	44 lb
9625941	19.055	4.095	4.016	3.543	7.087	4.921	9.528	3.543	0.945	0.630	0.709	19.685	0.551	7.244	4.016	7.874	9.449	4500 lb	66 lb

Description	Jaw Width (In.)	Jaw Opening (In.)	Throat Depth (In.)	Item No.
Dual Force Precision 5-Axis Machine Vise	4	1.732-3.307	3.543	9625940
Dual Force Precision 5-Axis Machine Vise	4	4.016-9.449	3.543	9625941

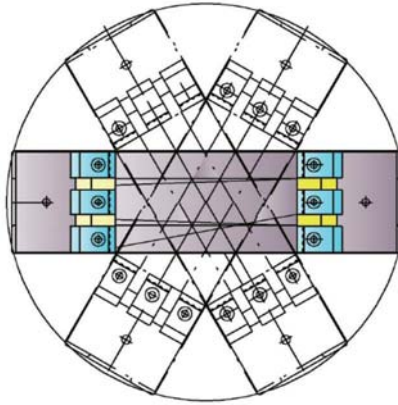
Vises

Dual Force Precision 5-Axis Machine Vise Features



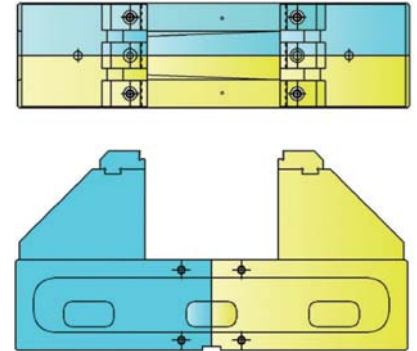
Obstruction Free 5-Axis Machining

These unique vises deliver unrestricted all around access from 5 sides to the workpiece



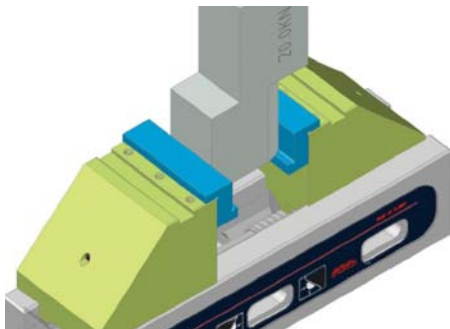
Space Saving Design

Within an operating window up to a 500mm diameter the spindle, nut or handle do not extend beyond the end of the vise body eliminating any interference.



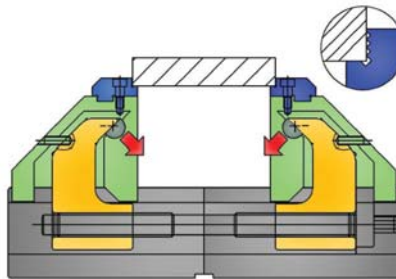
Symmetrical Positioning

The center line of the opening of the vise is symmetrical to the sides and the length of the vise body for accurate machining on multiple axis.



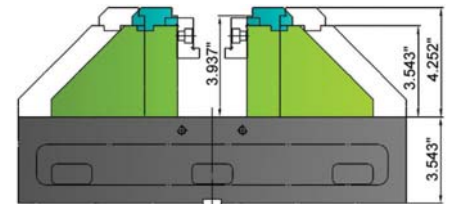
High Clamping Force

Repeatable and controllable clamping forces up to 4500 pounds.



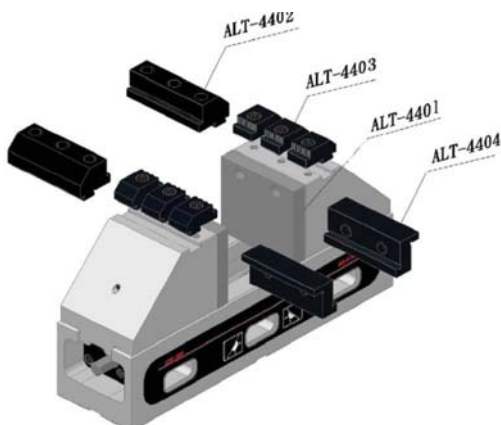
Dual Force Anti-Lift Mechanism

Dual force design produces all directional alignment with 1/2 pound of downward force for every pound of horizontal force.



Vise Structure

The higher structure delivers a well-balanced design that provides better clearance for movements of the machine spindle, the worktable, and the part itself, without creating interference areas.



Comprehensive Jaw Selection

Each Palmgren 5-axis vise comes with a versatile range of 4 different jaw sets.

ALT-4401 - Block Jaw Plates

ALT-4402 - Step Jaw Plates for small parts

ALT-4403 - Serrated Tooth Jaw Plates for round and odd shaped parts

ALT-4404 - Step Jaw Plates for large parts

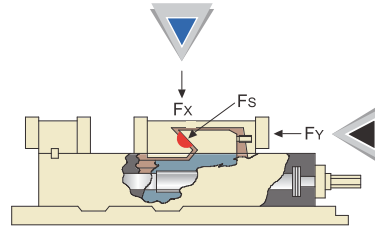
Vises

Dual Force Standard Machine Vises

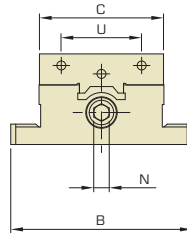
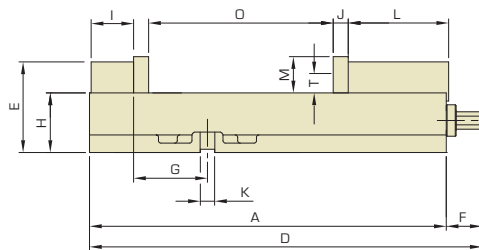


This economical Dual Force standard machine vise is recommended for milling, drilling, boring, tapping and finishing operations on most parts. These vises can be used on your machining centers as well as your basic manual machine tools.

- ◆ Equipped with Dual Force anti-lift mechanism
- ◆ Friction reducing needle bearings reduce clamping friction
- ◆ Hardened jaw plates
- ◆ Hardened vise bed
- ◆ Semi-hard steel screw
- ◆ Extra-large opening
- ◆ 60,000 PSI ductile iron castings
- ◆ LIFETIME GUARANTEE



Dual Force Design
The hardened spherical force (F_s) produces all directional alignment. 1/2 pound of downward force (F_x) for every pound of horizontal force (F_y).



9626604

Dual Force Standard Machine Vises Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	T	U	Wt. Lb.
9626604	17.205	8.740	5.945	18.937	4.371	1.732	3.563	2.875	2.047	0.709	.636 / .709	4.843	1.752	0.748	8.897	0.937	3.874	80
9626608	17.205	8.740	5.945	18.937	4.371	1.732	3.563	2.875	2.047	0.709	.636 / .709	4.843	1.752	0.748	8.897	0.937	3.874	80

Description	Jaw Width (In.)	Jaw Opening (In.)	Throat Depth (In.)	Jaw Deflection	Item No.	Model No.
Dual Force Standard Machine Vise w/Swivel Base	6	8-3/4	1-3/4	0.001" @ 4000 lb.	9626604	MPS60SB
Dual Force Standard Machine Vise w/Stationary Base	6	8-3/4	1-3/4	0.001" @ 4000 lb.	9626608	MPS60S

Swivel Base

Swivel bases for use with Palmgren's Dual Force Standard Machine Vises.

- ◆ Allows positioning in 1° increments
- ◆ Comes with 11/16" keyways to align the vise to the machine table

Description	Item No.
Swivel Base for use with 9626608 6-in. Vise	9626609



360° swivel base with 1° increments



9626609

Accessories

Speed Handles

Palmgren's speed handles reduce set-up and clamp times increasing machine productivity. Our handles do not interfere with the milling machine giving you rapid part loading and unloading. The steel construction will give you the versatility and reliability demanded by today's modern machine shops.

- Three spoke hand wheel for precise feel and proper tensioning
- Three sizes for our 4", 6" and 8" vises
- An integral part for your Dual Force machine vises
- Speed handles fit part numbers 9625927, 9625928, 9625929 and 9625930

Description	Item No.
Speed Handle for use with 9625927 4-in. Vise	9625912
Speed Handle for use with 9625928 6-in. Vise	9625913
Speed Handle for use with 9625930 8-in. Vise	9625914



Swivel Bases

Swivel bases for use with Palmgren's Dual Force Premium Machine Vises.

- ◆ Allows positioning in 1° increments
- ◆ Comes with 11/16" keyways to align the vise to the machine table

Description	Item No.
Swivel Base for use with 9625927 4-in. Vise	9625911
Swivel Base for use with 9625928 6-in. Vise	9625921
Swivel Base for use with 9625930 8-in. Vise	9625931



360° swivel base
with 1° increments



Accessories

Parallels

Palmgren's parallel sets are engineered and made from tool steel, hardened and precision ground on all 6 faces to a precise surface finish. Ideal for use with a mill, drill, CNC machine or any other machining operation that requires work to be held in a vise or with clamps to keep the work parallel or raised evenly for accurate clearance and machining.

18 Piece 4" & 6" Combination Set – Item number 9638974

- ◆ Set includes – plastic case, 8 pair of parallels and 1 pair position clamps
- ◆ Hardness: HRC 50 to HRC55 degrees
- ◆ 2 pieces – 0.197" x 0.630" x 3.937"
- ◆ 2 pieces – 0.236" x 0.709" x 3.937"
- ◆ 2 pieces – 0.315" x 0.945" x 3.937"
- ◆ 2 pieces – 0.394" x 1.181" x 3.937"
- ◆ 2 pieces – 0.472" x 1.417" x 5.906"
- ◆ 2 pieces – 0.551" x 1.890" x 5.906"
- ◆ 2 pieces – 0.709" x 2.362" x 5.906"
- ◆ 2 pieces – 0.866" x 2.441" x 5.906"
- ◆ 2 pieces position clamp



9638974



9638976

18 Piece 6" Parallel Set – Item number 9638976

- ◆ Set includes – plastic case, 9 pair of parallels
- ◆ Hardness: HRC50 to HRC55 degrees
- ◆ 2 pieces – 0.335" x 0.551" x 5.906"
- ◆ 2 pieces – 0.335" x 0.630" x 5.906"
- ◆ 2 pieces – 0.335" x 0.787" x 5.906"
- ◆ 2 pieces – 0.335" x 0.945" x 5.906"
- ◆ 2 pieces – 0.335" x 1.181" x 5.906"
- ◆ 2 pieces – 0.335" x 1.260" x 5.906"
- ◆ 2 pieces – 0.335" x 1.417" x 5.906"
- ◆ 2 pieces – 0.335" x 1.575" x 5.906"
- ◆ 2 pieces – 0.335" x 1.732" x 5.906"

8 Piece 8" Parallel Set – Item number 9638978

- ◆ Set includes – wood case, 6 pair of parallels and 1 pair position clamps
- ◆ 2 pieces – 0.315" x 0.945" x 7.874"
- ◆ 2 pieces – 0.472" x 1.417" x 7.874"
- ◆ 2 pieces – 0.866" x 1.575" x 7.874"
- ◆ 2 pieces position clamp



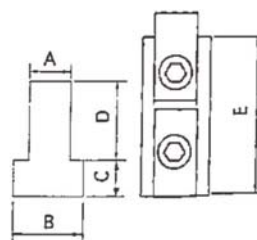
9638978

T-Slot Clamps

These low profile clamps are designed for use in the t-slots of machine tables. They provide 4,000 pounds of positive down force while maintaining a low profile. The hardened steel clamping element has a serrated clamping surface providing secure holding strength. The height of the clamp can be adjusted simply by turning the socket head adjusting screw.

- ◆ 5 t-slot sizes – 7/16", 1/2", 5/8", 11/16", 3/4"
- ◆ Each set has 4 t-slot clamps in a wooden storage box
- ◆ Quick, easy set-ups
- ◆ Small size allows more parts per load
- ◆ Simple low cost design

T-Slot Clamps Dimensional Specifications						
Item No.	T-Slot Size	A	B	C	D	E
9615500	7/16"	0.453	0.709	0.276	0.630	1.654
9615501	1/2"	0.531	0.866	0.315	0.709	1.654
9615502	5/8"	0.610	0.984	0.394	0.787	1.772
9615503	11/16"	0.689	1.102	0.433	0.945	1.772
9615504	3/4"	0.768	1.260	0.472	1.024	2.087



Accessories

Jack Screws

Very handy tool for leveling work on machine tables or fixtures, setting up machinery, and general use in the toolroom and machine shop.

- ◆ Each jack is designed with a quick acting height adjustment and a fine adjusting screw
- ◆ Height locking ring and capable of holding up to 2,000 pounds
- ◆ Available in standard and magnetic styles
- ◆ Magnetic style makes chip clean-up easier

Description	Height (In.)	Diameter (In.)	Item No.
Standard Adjustable Jack Screw	1.693 to 2.402	1.969	9638955
Standard Adjustable Jack Screw	2.559 to 3.150	1.496	9638956
Standard Adjustable Jack Screw	3.150 to 5.630	2.008	9638957
Standard Adjustable Jack Screw	4.921 to 9.450	2.126	9638958



Description	Height (In.)	Diameter (In.)	Item No.
Magnetic Adjustable Jack Screw	1.57 to 1.97	1.378	9638965
Magnetic Adjustable Jack Screw	1.97 to 2.56	1.378	9638966
Magnetic Adjustable Jack Screw	2.56 to 3.35	1.575	9638967
Magnetic Adjustable Jack Screw	3.35 to 4.33	1.575	9638968
Magnetic Adjustable Jack Screw	4.33 to 6.50	1.772	9638969



Jack Screw Sets

9638959 - Jack Screw Set Includes:

- ◆ 2 each – 2.75" to 3.74" jack screws
- ◆ 2 each – 3.94" to 5.90" jack screws
- ◆ 1 each – 6 different pads
- ◆ 1 each – storage rack

9638960 - Jack Screw Set Includes:

- ◆ 2 each – 3.94" to 5.90" jack screws
- ◆ 2 each – 5.51" to 9.06" jack screws
- ◆ 1 each – 6 different pads
- ◆ 1 each – storage rack

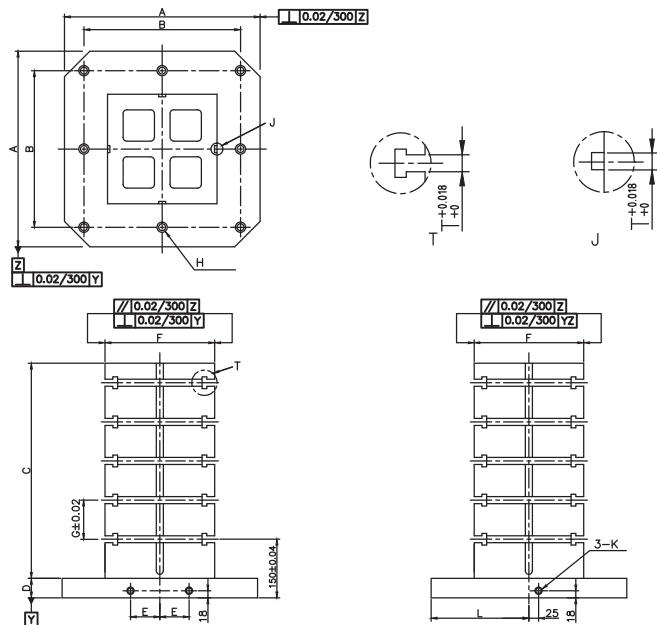


Accessories

Tombstones

Palmgren's tooling columns or tombstones provide a practical means of holding work accurately in a vertical or horizontal plane for CNC machining operations. They can be mounted directly on a machine table/pallet and come standard with key-ways running vertically and t-slots running horizontally on all four sides.

- ◆ FC300 Cast Iron / Heat treated (normalized)
- ◆ Excellent vibration dampening characteristics
- ◆ Strong, ridged construction
- ◆ Designed to fit all inch and metric pallets
- ◆ Fully machined on all sides
- ◆ Flat, parallel and square less than .001" over 12"
- ◆ 5/8" t-slots with 11/16" keyway
- ◆ Easy accepts machining center vises or standardized jig components



Tombstone Dimensional Specifications

Item No.	A	B	C	D	E	F	G	H	K	L	T	Wt. Lb.
9626650	15.75	12.60	17.71	1.97	2.16	9.84	3.94	M16	M16	7.87	0.69	343
9626651	19.68	15.74	21.65	1.97	2.95	11.81	3.94	M16	M16	9.84	0.69	587
9626653	24.80	19.68	25.60	1.97	3.94	13.78	4.92	M16	M16	12.40	0.69	808

Fractions, Decimals, Millimeters

		Decimal	MM
	$\frac{1}{64}$	.0156	0.396
$\frac{1}{32}$		.0312	0.793
	$\frac{3}{64}$	.0468	1.190
$\frac{1}{16}$		.0625	1.587
	$\frac{5}{64}$	.0781	1.984
$\frac{3}{32}$		.0937	2.381
	$\frac{7}{64}$	.1093	2.778
$\frac{1}{8}$		.1250	3.175
	$\frac{9}{64}$	.1406	3.571
$\frac{5}{32}$		.1562	3.968
	$\frac{11}{64}$	.1718	4.365
$\frac{3}{16}$		.1875	4.762
	$\frac{13}{64}$	.2031	5.159
$\frac{7}{32}$		.2187	5.556
	$\frac{15}{64}$	.2343	5.953
$\frac{1}{4}$		.2500	6.350
	$\frac{17}{64}$	.2656	6.746
$\frac{9}{32}$		.2812	7.143
	$\frac{19}{64}$	.2968	7.540
$\frac{5}{16}$		.3125	7.937
	$\frac{21}{64}$	.3281	8.334
$\frac{11}{32}$		.3437	8.731
	$\frac{23}{64}$	.3593	9.128
$\frac{3}{8}$		.3750	9.525
	$\frac{25}{64}$	.3906	9.921
$\frac{13}{32}$		.4062	10.318
	$\frac{27}{64}$	.4218	10.715
$\frac{7}{16}$		.4375	11.112
	$\frac{29}{64}$	.4531	11.509
$\frac{15}{32}$		.4687	11.906
	$\frac{31}{64}$	.4843	12.303
$\frac{1}{2}$		.5000	12.700

		Decimal	MM
	$\frac{33}{64}$	.5156	13.096
$\frac{17}{32}$		.5312	13.493
	$\frac{35}{64}$	.5468	13.890
$\frac{9}{16}$		.5625	14.287
	$\frac{37}{64}$	.5781	14.684
$\frac{19}{32}$		.5937	15.081
	$\frac{39}{64}$	.6093	15.478
$\frac{5}{8}$		.6250	15.875
	$\frac{41}{64}$	.6406	16.271
$\frac{21}{32}$		.6562	16.668
	$\frac{43}{64}$	.6718	17.065
$\frac{11}{16}$		.6875	17.462
	$\frac{45}{64}$	.7031	17.859
$\frac{23}{32}$		.7187	18.256
	$\frac{47}{64}$	.7343	18.653
$\frac{3}{4}$		.7500	19.050
	$\frac{49}{64}$	.7656	19.446
$\frac{25}{32}$		.7812	19.843
	$\frac{51}{64}$	.7968	20.240
$\frac{13}{16}$		.8125	20.637
	$\frac{53}{64}$	.8281	21.034
$\frac{27}{32}$		.8437	21.431
	$\frac{55}{64}$	.8593	21.828
$\frac{7}{8}$		.8750	22.225
	$\frac{57}{64}$	.8906	22.621
$\frac{29}{32}$		.9062	23.018
	$\frac{59}{64}$	.9218	23.415
$\frac{15}{16}$.9375	23.812
	$\frac{61}{64}$.9531	24.209
$\frac{31}{32}$.9687	24.606
	$\frac{63}{64}$.9843	25.003
1		1.0000	25.400



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