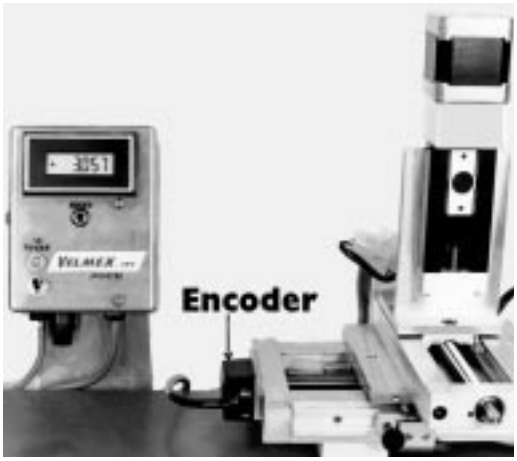
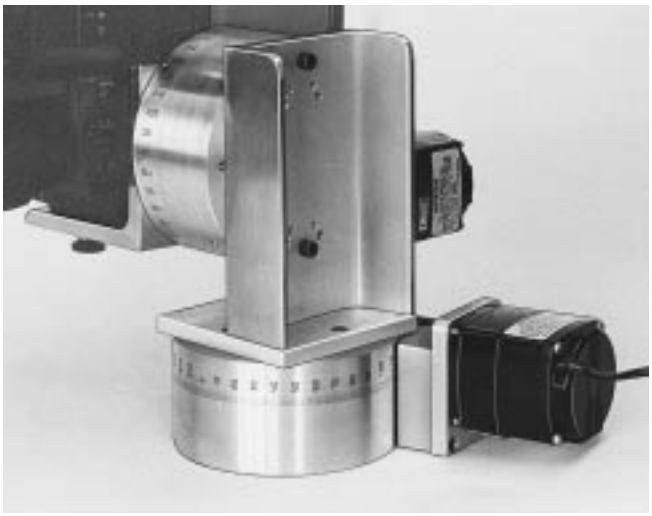
Examples

Velmex will design and manufacture custom positioning equipment to your specifications. Examples of previous applications include pill crushers, connector testers, tire manufacturing, tensile test stand equipment. See the inside back cover for more examples. Please contact our engineering staff or FAX your proposal and sketch to us using the back page of the price list as a guide.

A Reminder:
One of the chief benefits of Acrobat is the ability to search for any text string. Please take advantage of this when looking for specific information.

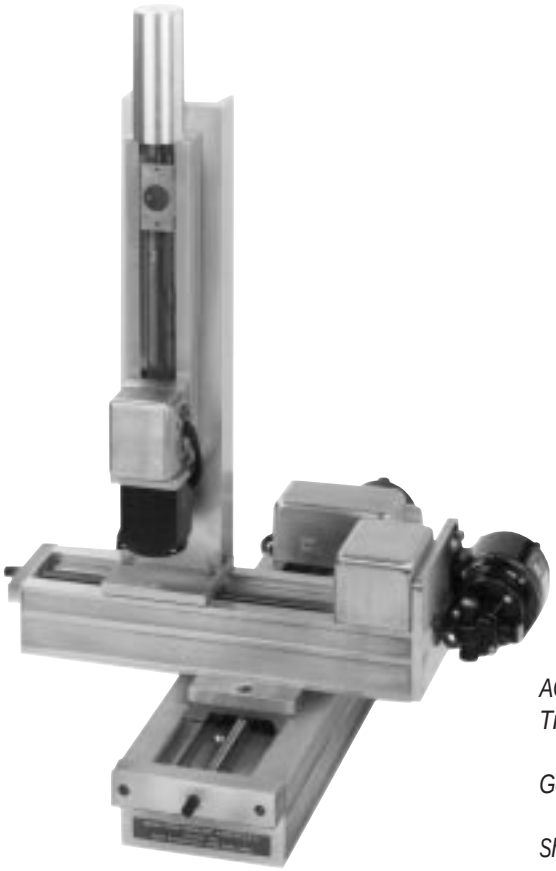


LCD read out with rotary encoder attached to lead screw shaft extension. Note also outboard limit switch assembly along front edge of UniSlide Assembly.



Two Series B4800 Rotary Tables mounted together using the A4001XZ Adapter Bracket. This produces a tilt and pan motion.

A Series MB4000 with two sliders and a left and right hand threaded lead screw for simultaneous reciprocal motion.



Z or vertical axis Model MB2509BJ-2.5 shown with Bodine AC Instrument Gear Motor #747 and Velmex Model 370 Gear Train Potentiometer Assembly Model MB4012BJ-S4.

Y or middle axis shown with Bodine Shunt Wound Worm Gear Motor #541.

X axis Model MB6018BJ-S6 shown with Bodine type N-1 D Shunt Wound Gear Motor #547.

Contents

Velmex, Inc. manufactures practical, reliable UniSlide® Assemblies in a wide choice of cross sections for medium or high accuracy positioning and scanning. Applications include instrumentation and light machining. The UniSlide Assemblies System offers you the opportunity to specify the slide width, length, lead screw and motor to precisely satisfy your requirements. Although there are numerous versions of UniSlide Assemblies, they all share a common design. The key to specifying the proper assembly is understanding the UniSlide Assembly Part Numbering System.

To begin, we recommend you develop a list of requirements for your application. Then, read the next four pages including the Engineering Information section where manufacturing tolerances are discussed. For a quick look, consult the enclosed price sheet which lists the Assemblies by Series (width) and travel length. Motors and controls are priced separately.

®UniSlide is a Reg. T.M. of Velmex, Inc.

Construction of Linear UniSlide Assemblies

Motor driven UniSlide Assemblies are constructed of type 6262T6 hard aluminum alloy dovetail base extrusion, or simply **base**. Tolerances for the base are given on page 5. The lead screw engages the drive nut which is secured to the movable sliding carriage called a **slider**. The slider travels on low friction polymer bearing pads and has an adjustment for side play.

There are two styles of dovetail base cross section. The “B” Style, with reinforcing ribs along the bottom, is designed specifically for most common motor driven applications. The standard “B” base incorporates a protective internal limit switch assembly to interface with the motor. This limit switch assembly is denoted by “J” in the part number. The “B” Style base also allows most motor units to be mounted directly on a flat surface.

In a limited number of applications, where reduced slide height is a concern, the “A” cross section extrusion can be used. Motors attached to the “A” cross section base will extend above and below the base. See page 8-20 for more information.

Catalog Organization

The catalog is divided into three thumb-indexed parts:

1. **UniSlide Assemblies** - Electromechanical linear slide assemblies, X-Y and rotary tables.
2. **Electrical** - Motors, motor controls and electrical options, including position readout.
3. **Appendix** - Drawings and more application photos.

Selection

To select a linear slide, you determine a part number based on the width (related to the load), length (related to travel) and lead screw pitch (a function of resolution and speed) for your requirements. Begin by selecting a UniSlide Series. A Series is a group of UniSlide stages with the same base width and height. For example, the *Series MB4000* units are 4" W x 2 $^{11}/_{16}$ " H and have a maximum horizontal load capacity of 100 lbs. Next, specify the slide base length. The length is the sum of the required travel plus the slider length. For the MB4012 (base length = 12"), with the standard 4" long slider the net travel is 8" (12 "- 4 " = 8 "). See page 6 for UniSlide Base Size and Lengths. Finally, the pitch of the lead screw is chosen. Our screws come in two accuracy grades: Standard and Precision. Please refer to Table II, page 6, for available lead screw choices. Motor and control selection is covered in Part 2 in the catalog.

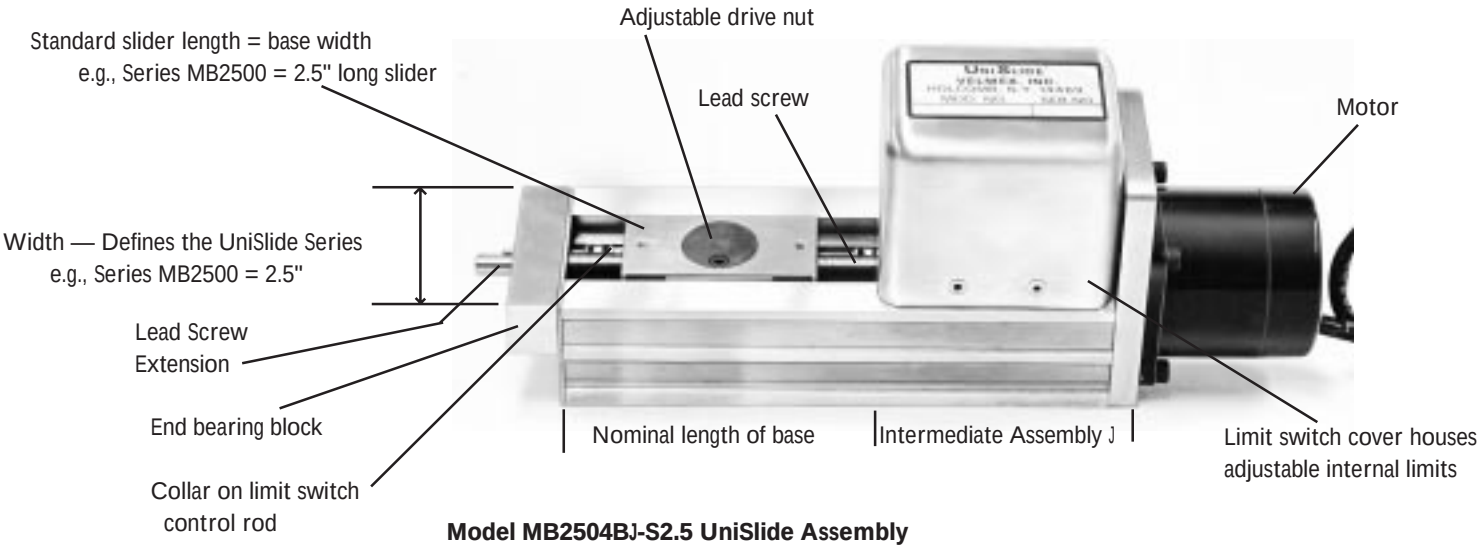
Application Requirements

Before beginning the reader should define his requirements thoroughly. Please determine the following:

1. Type of motion. See the Functional Classification discussion on page 30.
2. Human-to-Motor Control interface.
3. Motor control and motor type. See page 33.
4. Mechanical requirements of the system including:
   - Load (weight and moment on UniSlide Assembly)
   - Speed
   - Travel distance
   - Lead screw accuracy required (Standard or Precision Grade)
   - Resolution (smallest movement)
   - Life or number of duty cycles/day
   - Position indication system
   - Environmental conditions

After becoming familiar with the catalog, please call Velmex and our technical sales staff will assist you in the selection of UniSlide equipment.

UniSlide Assembly Components



Model MB2504BJ-S2.5 UniSlide Assembly
See the accompanying price list for specific model numbers

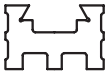
UniSlide Model Numbering System

For typical Model Number M B 25 12 C J - S2.5

M

Calls for motor mounting plate and motor coupling.

B

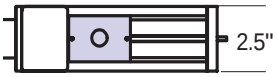


MB End View

Specifies **cross section type**.
B is the standard motor driven style.
A is the low profile design.

25

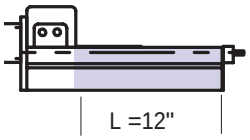
Top View



Specifies the UniSlide Assemblies **Series.** The Series is defined by the **base width** and is measured in tenths of inches. The example unit is Series MB2500. See Parameters by Series, page 6, for the available choices.

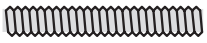
12

Side View



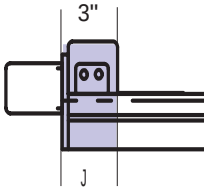
Specifies the **nominal length of the dovetail base** (L). This is the base length available for slider travel and excludes the length that the internal limit switch assembly J occupies. Standard base lengths increase in 3" increments.

C



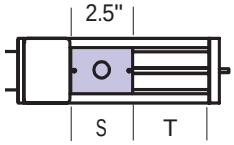
Designates the **lead screw.** See Table II, page 6, for available choices. In this example, C = 40 revolutions /in., in the Standard Grade.

J



Indicates Internal Limit Switch **J** is present. Consists of two adjustable limit switches, control rod with two collars and cover atop an additional 3" of dovetail base as shown. Outboard style limit switches may be ordered in place of, or in addition to, internal limit switches. See page 25.

S2.5



Top View

Defines the **slider length** (S), for either standard sliders or one of the optional lengths. See Table I, page 6, for the available choices. Travel (T) + slider length (S) = required nominal length of dovetail base (L). For this example, S = 2.5" and L = 12" which yields a travel of 9.5". See the price list for the travel of UniSlide Assemblies with standard length sliders.

Other letters:

Prefixes:

Z Indicates dovetail base is hard coat anodized and dyed black. See page 25.

MAXY Designates an assembled XY table, See page 23.

SP Designates an assembly with a special modification.

N Indicates dovetail base has electroless nickel coating

Suffixes:

Lead Screws: B, C, W1, W2, W4, WF, P2.5, P5, P10, P20, P40, K1 or K2, and Q1 or Q2. These indicate the lead screw grade and pitch. See page 6, Table II.

WC Way Covers.

PC xx Parallel coupled Assembly. xx represents the center-to-center separation distance.

BK Black anodized finish

See accompanying Price List for specific Model Numbers. All other options or details of a UniSlide Assembly should be described verbally in the *Description* portion of the order. *This includes the make and model number of the motor if it will be mounted separately.* Also see Catalog G for other UniSlide Assembly nomenclature.

Length summary

1. The length of the standard slider is always equal to the base width.
2. Travel length is the nominal base length minus the slider length.
3. Total length is the sum of the nominal base length plus 3" occupied by the Limit Switch Assembly, J, if present, plus the motor length, plus the length of the end bearing block plus the length of the lead screw shaft extension.

Refer to pages 11 through 22 for detailed drawings.

Engineering Information

Design Advantages of Linear UniSlide Assemblies

- Compact design yields long travel in a short work space
- A simple, reliable design – easily adaptable
- Modular components facilitate multiple axis system
- A broad variety of lengths, sizes and features

Straightness —Commencing with a 6262-T6 aluminum alloy extrusion having a straightness tolerance of half the normal commercial tolerance, the subsequent machining and lapping operations are designed to secure a high degree of straightness and parallelism in the dovetail ways. There are essentially three types of deviation from straightness that can occur. Referring to a UniSlide Assembly resting base down on a flat surface with its linear motion or longitudinal direction, X, there can be a departure from straightness in the upward direction, Z, which is designated as the bow error. There can be a deviation from straightness in the horizontal direction, Y, designated as horizontal run-out, or simply run-out. There can also be a twist in the direction of the slide, X.

The upper limits for these three deviations from straightness as determined by our manufacturing processes are:

Bow* 0.002" per foot
Run-Out 0.001" per foot
Twist 1 milliradian per foot

**As installed, bow can be affected by the degree of flatness of the supporting surface and relative tension in the mounting screws.*

If reduced straightness tolerances are required in the order of one half of the nominal values above, Velmex will select, measure and certify UniSlide Assemblies for the customer at an extra charge of $6/in.

Wear Resistance - The aluminum alloy dovetail base and low friction polymer pads of the slider give excellent performance as a bearing material combination. Under moderate and light loads, the sideways play developed by wear during the first 30,000 cycles of operation is approximately 0.00015 inches. Thereafter, the wear is further reduced, amounting to approximately 0.00005 inches during the next 50,000 cycles. The slider has adjustment screws to compensate for moderate wear. Replacement bearing pads can be laminated to the slider at a nominal cost to recondition the slide after long periods of use, if necessary. For harsh environments and/or a higher number of cycles, UniSlide assemblies are available with hard coat anodized ways. See page 25, *Options.*

Protective Limit Switch Assembly - Velmex recommends limit switches be included whenever motor torque could damage the lead screw or drive nut at the end of slider travel. This includes most applications except those with small stepper motors.

Vacuum Applications - UniSlide linear and rotary positioners can be used in a vacuum to 10^{-6} torr with modifications. We recommend substituting duPont Vespel® for the standard Delrin® AF drive nut in a high vacuum. We can clean the bearings and replace the standard lubrication with a high vacuum lubricant, however, we do not have clean room facilities for ultra-clean applications. In that case, we suggest the critical user reclean the assemblies. Check with us for pricing.

Stall force - The torque requirements of a light load on a horizontal assembly ranges from 20 to 30 oz.-in. and is affected by the pitch of the lead screw. When the maximum motor torque is converted into the direct (thrust) force in the direction of the lead screw axis, a figure designated as the maximum thrust load is obtained. This value is listed in the lead/translation speed tables later in the catalog. The maximum thrust load is limited by the lead screw thrust bearings design.

Nonmagnetic properties - The regular UniSlide Assemblies are made with Type 303 stainless steel fasteners. Lead screws are made of 303 stainless steel (except W2/P5 and W4/P2.5) and are slightly magnetic. Where an exceptionally high degree of nonmagnetic character is required, Velmex may supply plated brass fasteners and brass lead screws. Rotary tables have several essential steel ball bearing units. Electric motors are inherently magnetic.

Lengths - Catalog lengths are those listed, but longer units are also available. In-between lengths are available on special order. Slider lengths are only those listed.

Material Substitutions - Drive nuts: brass, oil-impregnated bronze, Vespel®. Lead screws: brass, in some sizes.

Notice - Failure, improper selection or improper use of the products described herein or related items may cause personal injury and property damage. This catalog from Velmex, Inc. provides product options for further investigation by users having technical expertise. It is important that you thoroughly analyze all aspects of your application and review the information in this catalog. Due to the variety of operating conditions and applications for these products, the user, through his own analysis and testing, is solely responsible for making the final selection of products and determining that all performance, safety and warning requirements of the application are met. The products, including, without limitation, product features, specifications, designs, availability and pricing are subject to change by Velmex, Inc. at any time without notice.
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Warranty, Cancellation and Repair Return Policies

Warranty - Velmex Inc. warrants all mechanical UniSlide Assemblies supplied by Velmex Inc. to be free from defects in materials and workmanship for one year from date of invoice. Velmex motor controls have a two year limited warranty. Velmex's sole obligation under this warranty is limited to furnishing, without additional charge, a replacement for, or at its option, repairing or issuing credit for any product which is returned freight prepaid. This warranty shall not apply to any unit which has been subjected to misuse, improper operating conditions, or any alterations. The seller makes no claim that it's products are intended for every use or purpose to which they may be put by the buyer. IN NO EVENT SHALL VELMEX INC. BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES.

Cancellation Policy - Cancellation of orders consisting of standard products, for any reason, is subject to a 15% cancellation charge. Cancellation of orders for special products and non standard UniSlide Assemblies are subject to a cancellation charge to be determined by Velmex Inc.

Repair Return Policy - Please contact Velmex for an RMA number. When returning a UniSlide Assembly, include a written explanation of the problem. Velmex will inspect the unit and notify you of the cost, if any, before any work is undertaken. If the unit is unrepairable it will be returned at the owner's expense. The charge for non-warranty work will be assessed at the current hourly rate.

Table I UniSlide Base Size, Length, and Slider Lengths by Series

UniSlide Assembly Series [1]	Width	Height	Nominal base length in inches [2]	Slider lengths in inches standard [2]	optional [2]
MA1500	1½"	9/16"	3 to 12	1.5	2,3
MB2500	2 ½"	1 11/16"	4 to 60	2.5	3,4
MA2500	2 ½"	13/16"	4 to 24	2.5	3,4
MB4000	4"	2 11/16"	6 to 90	4	6
MA4000	4"	1 1/16"	6 to 36	4	6
MB6000	6"	3 1/8"	9 to 90	6	8
MA6000	6"	1 ¾"	9 to 48	6	8
MB9000	9"	3 1/8"	12 to 90	9	12

Combining Unislide Assemblies: Velmex offers XY plates and XZ brackets with threaded hole patterns to match the UniSlide Assembly bases. Thus, UniSlide Assemblies are easily combined for multiple coordinate systems. For dimensions and compatibility information see Adapter Plates and Brackets on pages 50-54. See also pre-assembled Series MAXY X-Y tables on page 23.

1. Travel for specific model numbers are given in the accompanying price list.
2. Nominal length is the length of the base used for slider travel.

Travel + Slider length = Nominal Base Length.

Optional longer slider length increases the stability of large or offset loads but reduces free travel.

Lead Screws and Drive Nuts

A wide variety of lead screws are offered to allow you the greatest flexibility in designing the drive portion of your translation stage.

Lead screws are supplied in two quality grades and are priced accordingly. The *Standard* rolled screw may deviate in true pitch no more than 0.007"/10" (0.18mm/25.4cm). The *Precision* lead screw units, designated by the letter "P" if English or "Q" if Metric, have a lead error not to exceed 0.0015"/10" or 0.04mm/25.4cm. All screws are type 303 stainless steel except the W2/P5 and W4/P2.5 which are electroless nickel plated cold rolled steel. The standard drive nut is adjustable to minimize backlash and is made of Delrin AF®.

Velmex can also supply lead screws alone. Special lead screws with right and left hand thread for together-apart motion with two sliders can be installed. Please contact us for pricing.

Detrimental lead screw resonance or whip can develop at high RPM. This resonance is a function of lead screw diameter and RPM. All "B" type UniSlide Assemblies over 36" in length will have a resonance damper included to minimize whip. Lead screw RPM should not exceed 1000 RPM for the following models: B2500 Series longer than 12", B4000 Series longer than 18 " and B6000 or B9000 Series longer than 24 ".

Table II Lead Screws **Standard Accuracy - 0.007"/10" or better Letter codes C, B, W1, W2, W4, WF, K1 and K2** **Precision Accuracy - 0.0015"/10" or better Letter codes P40, P20, P10, P5, P2.5 Q1 and Q2**

Letter code Std. Accuracy	Precis.	Screw thread	Turns per inch	Advance/Rev. (Lead)	Lead screw diameter MA1500	MA/MB2500 MA/MB4000	MA/MB6000 MB9000	Efficiency
C	P40	40 UNS	40	0.025"	¼"	3/8"	½ "	0.14
B	P20	20 UNS/UNF	20	0.050"	¼"	3/8"	½ "	0.26
W1	P10	20 Acme Double Start	10	0.100"	NA	3/8"	½ "	0.46
W2	P5	20 Acme Quad Start	5	0.200"	NA	3/8"	½ "	0.64
W4	P2.5	10 Acme Quad Start	2.5	0.400"	NA	3/8"	½ "	0.73
WF[3]	--	5 Stub Acme Five Start	1	1.000"	NA	3/8"	3/8"	0.75
K1	Q1	1 mm	10/cm.	1.0 mm (0.0394")	7 mm	10 mm	14 mm	0.15
K2	Q2	1 mm ISO Double Start	5/cm.	2.0 mm (0.0787")	7 mm	10 mm	14 mm	0.33

3. WF lead screw is not available in Precision Grade or for Parallel Coupled Assemblies.

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Torque requirements - The minimum dynamic torque required to drive an assembly running horizontally can be calculated as

$$\text{Torque (oz-in)}_{\text{Horiz.}} = \frac{[(W \times 0.15) + 1.5] \times L}{0.39 \times E} + 10 \text{ oz. in.}$$

For a vertical or lifting load:

$$\text{Torque (oz-in)}_{\text{Vert.}} = \frac{(W + 1.5 \text{ lbs.}) \times L}{0.39 \times E} + 10 \text{ oz.-in.}$$

Where W = Weight of the load in pounds
L = Lead of the screw in in./rev. See Table II, above.
E = Efficiency of the lead screw. See Table II, above.
10 = Minimum Torque required to move slider with no load

Note: The calculated torque is a minimum.
Add 50% for safety margin.

Permissible Loading

The size of the slide selected for a given application will depend upon the user's requirements. Load and slide size are major variables to consider when choosing your UniSlide. This page gives general guidelines on load handling for horizontal, vertical and cantilevered loads.

Multi-axis systems require additional design engineering . In calculating the moment created by a cross slide you must determine the weight of the upper slide assembly. Weights are listed in the Price List. Be cognizant of deflection of an unsupported UniSlide base. For long transport in two or more axes, parallel coupled slide assemblies using our "B" dovetail base cross sections are recommended. Please see *Parallel Coupled UniSlide Assemblies*, page 26.

Working With Cantilever Loads

The X axis carries the weight of the Y axis, the Z axis and the attached load. For good stability, the X axis should be one model larger than the Y axis when the Y axis length (L) is longer than three times (3x) the width of the X.

Example 1: Two Model MB4012BJ-S4 UniSlides would be suitable in an X and Y configuration. These models are 4" wide and 12" long.

Example 2: If considering two MB4015BJ-S4 Unislides for an X and Y configuration, choose an MB6018BJ-S6 for the X axis instead. This will be more stable, since the MB6000 model is 6" wide. The MB4015BJ-S4 is only 15" long-not enough to meet the 3x criteria spelled out above.

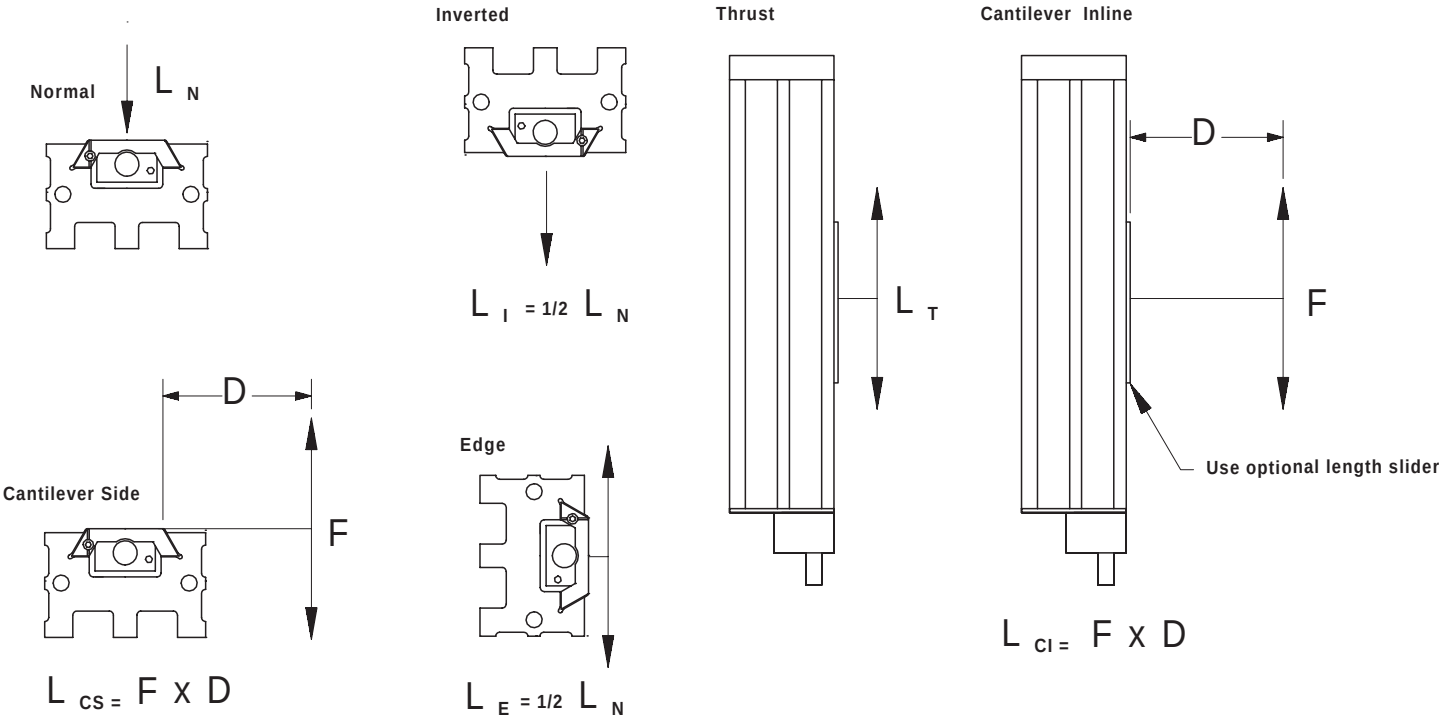
UniSlide Capability for Normal, Thrust and Cantilever Loads by Series

Normal Load (L_N)*

Recommended Range		Maximum			**Thrust Load (L_T)*** Recommended Range		Maximum	
Lbs	Kg	Lbs	Kg	**Series**	Lbs	Kg	Lbs	Kg
0 - 2	0 - 1	3	1	MA1500	0 - 1	0 - 0.5	1.5	1
0 - 20	0 - 9	30	14	MB2500	0 - 6	0 - 3	15	7
0 - 10	0 - 5	15	7	MA2500	0 - 3	0 - 1	7.5	3
0 - 40	0 - 18	100	45	MB/MA4000	0 - 20	0 - 9	50	23
0 - 80	0 - 36	200	91	MB/MA6000	0 - 40	0 - 18	100	45
0 - 140	0 - 63	400	182	MB9000	0 - 70	0 - 32	125	57

Cantilever Side Load (L_{CS})*

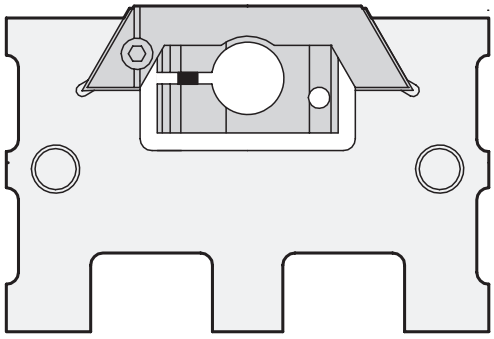
Recommended Range		Maximum			**Cantilever In Line Load (L_{CI})*** Recommended Range		Maximum	
Lb-In	Kg-Cm	Lb-In	Kg-Cm	**Series**	Lb-In	Kg-Cm	Lb-In	Kg-Cm
0 - 5	0 - 6	7	8	MA1500	0 - 5	0 - 6	7	8
0 - 15	0 - 17	40	46	MB2500	0 - 30	0 - 35	40	46
0 - 10	0 - 12	25	29	MA2500	0 - 20	0 - 23	25	29
0 - 32	0 - 37	130	150	MB/MA4000	0 - 64	0 - 74	130	150
0 - 80	0 - 92	320	369	MB/MA6000	0 - 160	0 - 185	320	369
0 - 120	0 - 139	480	554	MB9000	0 - 240	0 - 277	480	554



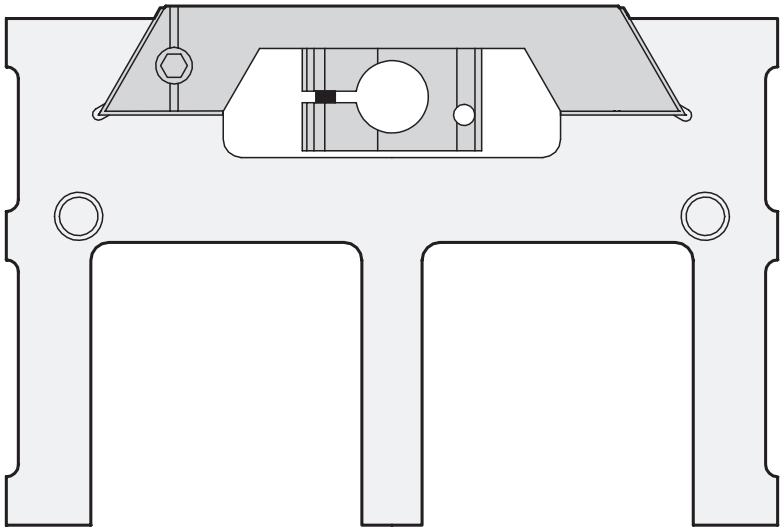
Actual Size Cross Sections of UniSlide Assemblies

Scale 1:1

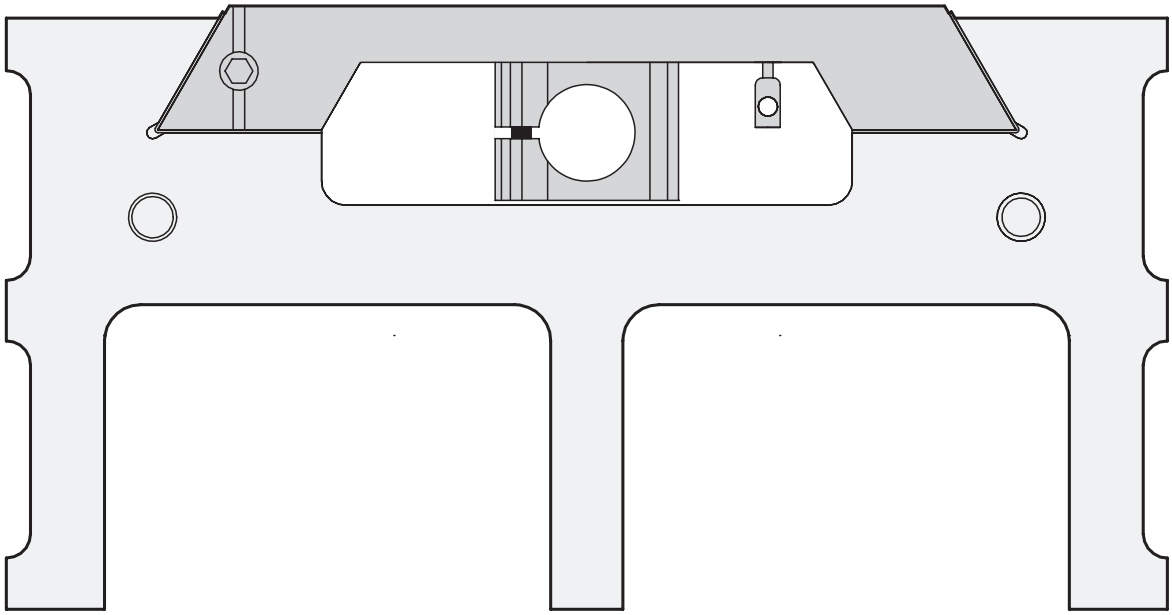
MB2500 SERIES



MB4000 SERIES



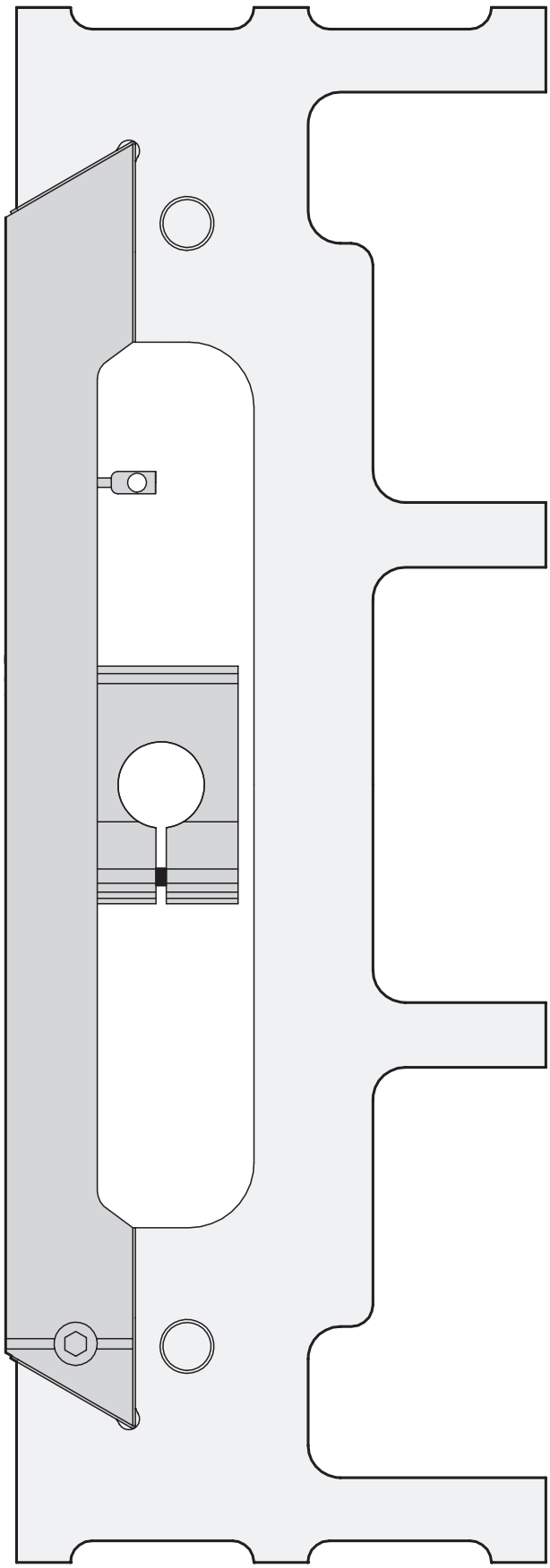
MB6000 SERIES



Actual Size Cross Sections of UniSlide Assemblies

Scale 1:1

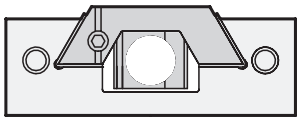
MB9000 SERIES



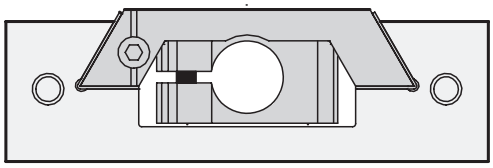
Actual Size Cross Sections of UniSlide Assemblies

Scale 1:1

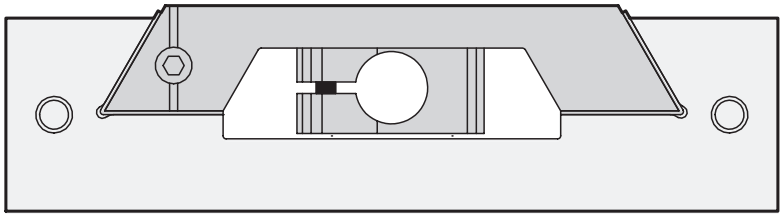
MA1500 SERIES



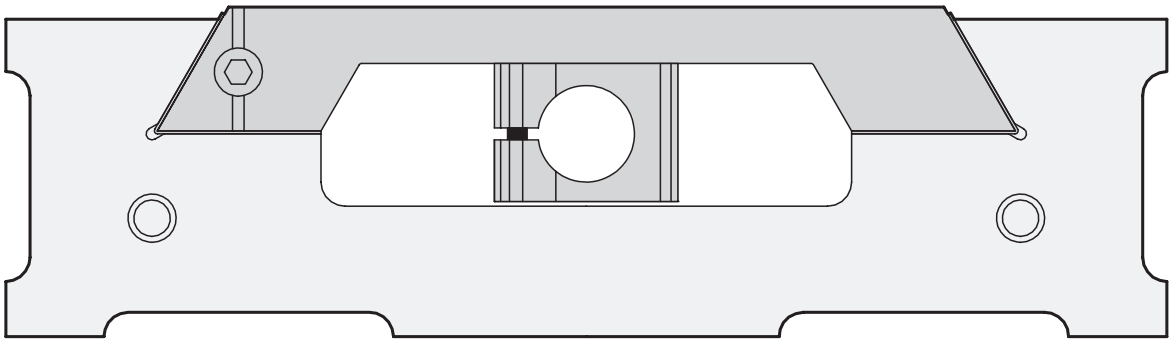
MA2500 SERIES



MA4000 SERIES



MA6000 SERIES



MA Base UniSlide Assemblies

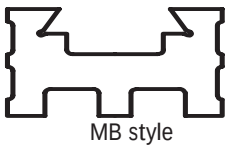
A comparison of dovetail base style:

MB Style - the standard motorized UniSlide Assembly

-Includes protective internal limit switches, J.
-Base is stiffer than the MA style reducing the deflection of unsupported sections.
-Added height allows most units to lie flat on a flat mounting surface.

MA Style - the low-profile design UniSlide Assembly

-A more compact design with reduced slide height and weight. Fewer base lengths available.
-Compatible with steppers, AC synchronous motors and PM motors only. Motors extend below slide base.
-Requires outboard limit switches unless used with NEMA 17 low torque motors.



MB style

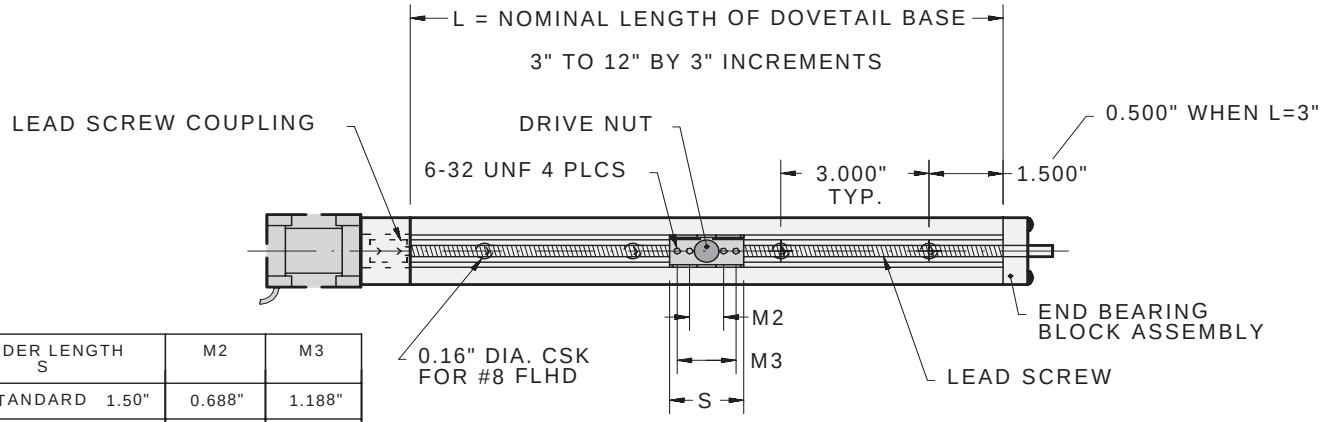
MA style
UniSlide Assembly Bases

Series MA1500

Series MA1500 Assemblies

Description

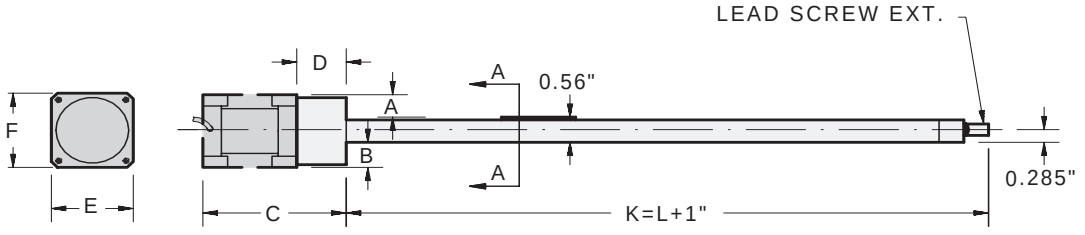
These small, low profile positioners are for light duty applications with light loads. The MA1500 is available in four lengths. The maximum recommended step rate is 1000 steps/sec. The base requires support along its full length except for the lightest loads (< 1 lb.). Way covers are not available. See page 5 of the Price List for MA1500 Series.



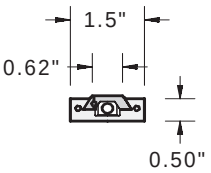
SLIDER LENGTH S	M2	M3
STANDARD 1.50"	0.688"	1.188"
OPTIONAL 2.00"	1.188"	1.688"
OPTIONAL 3.00"	1.188"	2.688"

LEAD SCREW EXTENTIONS:

0.50" X 0.218" DIA. FOR B/P20 LEAD SCREW
" 0.231" DIA. FOR C/P40 LEAD SCREW
" 0.250" DIA. FOR K1,K2/Q1,Q2 LEAD SCREW

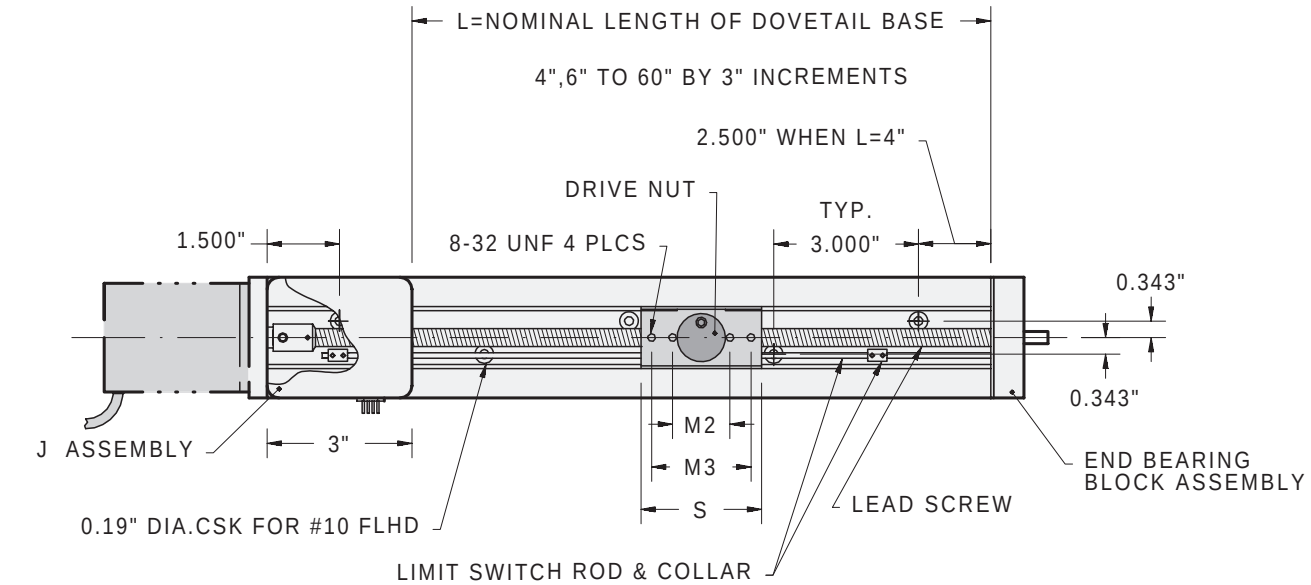


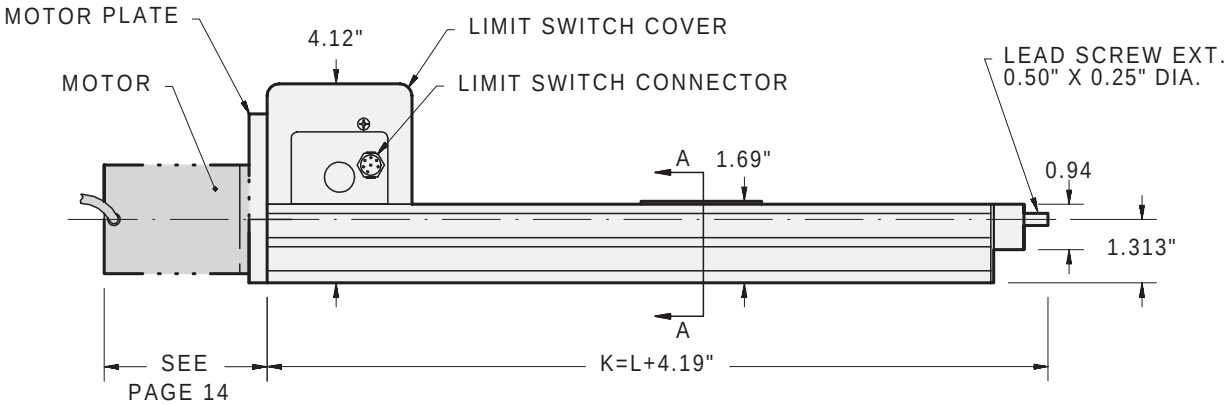
TRAVEL (T) = L-S

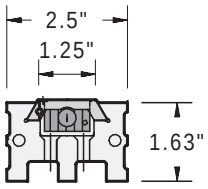


MOTOR TYPE	A	B	C	D	E	F
PITTMAN GM8000 SERIES	0.68"	0.14"	4.44"	1.15" *	1.5"	1.375"
STEPPER MOTOR NEMA 17	0.65"	0.46"	2.85"	1"	1.5"	1.5"

* (2) .125" PLATES & .900" SPACERS



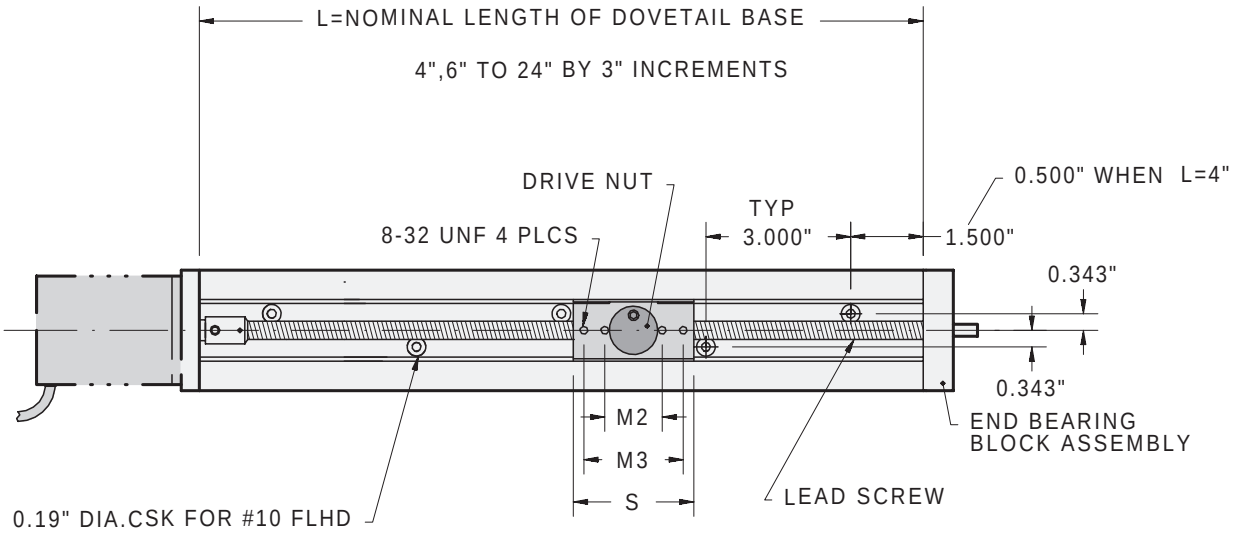


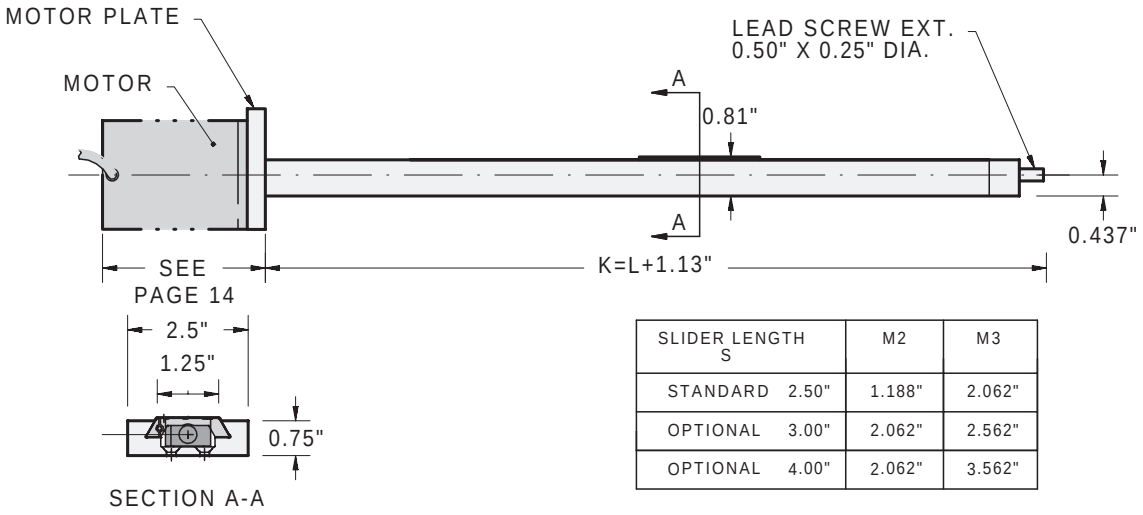


SECTION A-A

SLIDER LENGTH S		M2	M3
STANDARD	2.50"	1.188"	2.062"
OPTIONAL	3.00"	2.062"	2.562"
OPTIONAL	4.00"	2.062"	3.562"

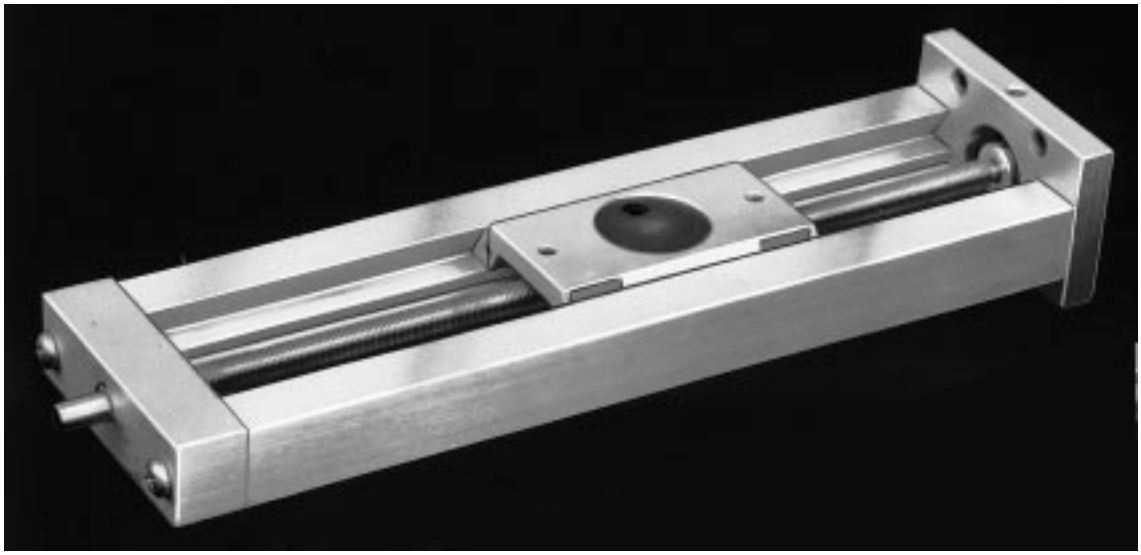
TRAVEL (T) = (L-S)

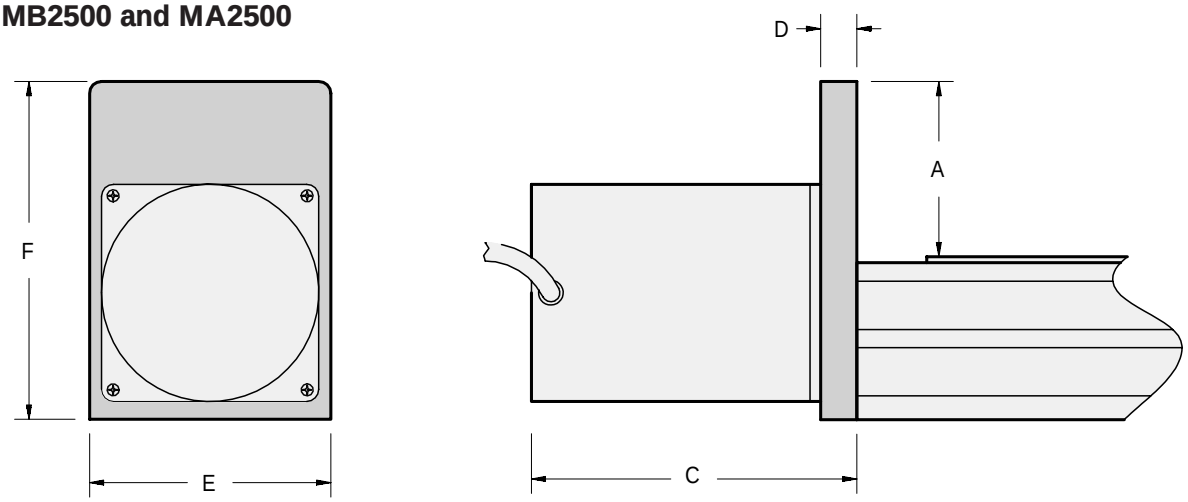




SLIDER LENGTH S	M2	M3
STANDARD 2.50"	1.188"	2.062"
OPTIONAL 3.00"	2.062"	2.562"
OPTIONAL 4.00"	2.062"	3.562"

TRAVEL (T) = (L-S) -1.0"

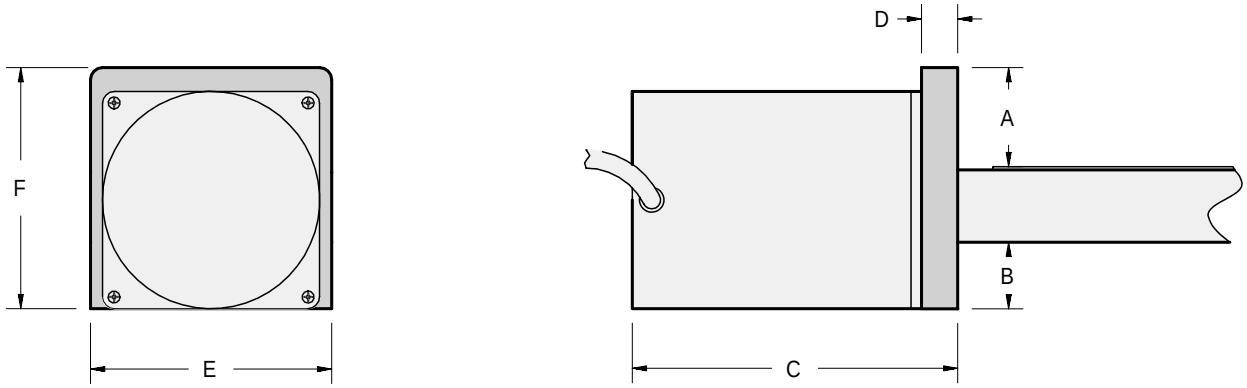




MB2500

MOTOR TYPE	A	C	D	E	F
BODINE TYPE K	1.81"	3.40"	0.375"	2.50"	3.50"
PITTMAN GM8000 SERIES	1.81"	3.66"	0.375"	2.50"	3.50"
NEMA TYPE 17 PX245 etc.	1.81"	3.23"	0.375"	2.50"	3.50"
NEMA TYPE 23T1 MO61-LS08 etc.	1.81"	2.40"	0.375"	2.50"	3.50"
NEMA TYPE 23T2 MO62-LS09 etc.	1.81"	3.40"	0.375"	2.50"	3.50"

OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33

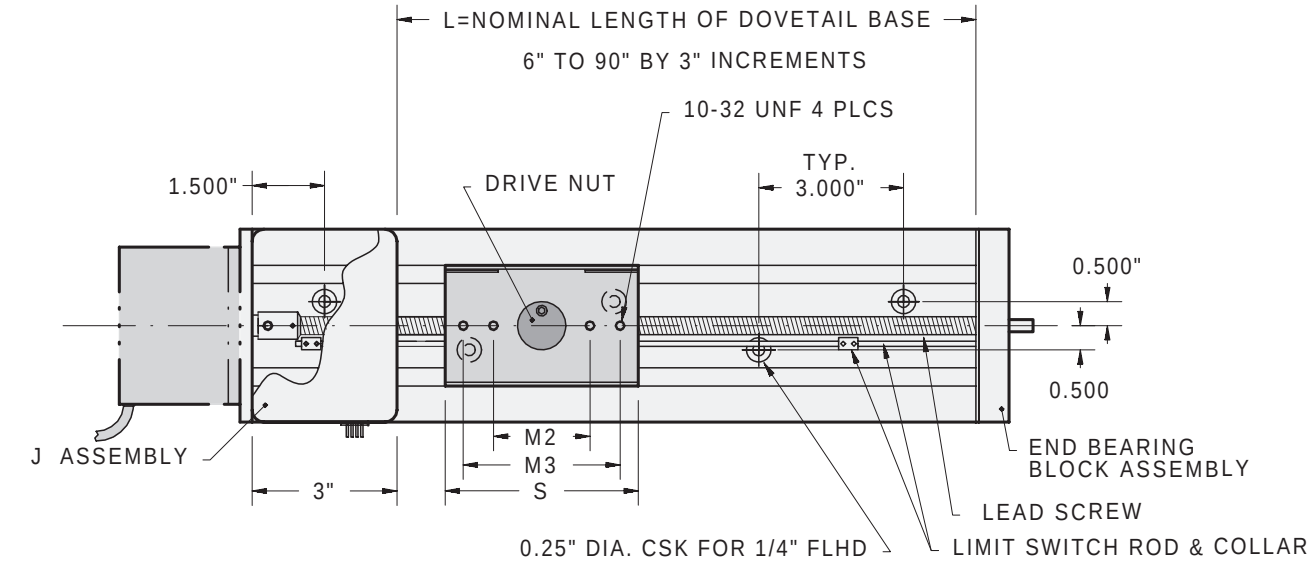


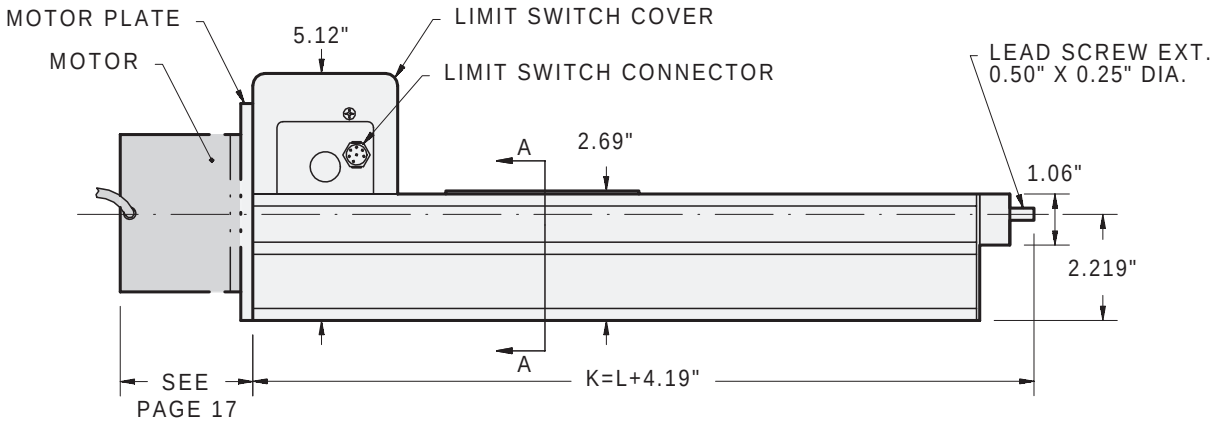
MA2500

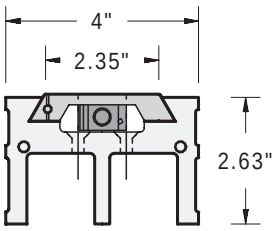
MOTOR TYPE	A	B	C	D	E	F
PITTMAN GM8000 SERIES	0.38"	0.31"	3.66"	0.375"	2.5"	1.50"
PITTMAN GM9000 SERIES	1.13"	0.31"	4.58"	0.25"	2.5"	2.25"
NEMA TYPE 17 PX245 etc.	0.38"	0.31"	3.23"	1.375"	2.5"	1.5" *
NEMA TYPE 23T1 MO61-LS08 etc.	0.75"	0.69"	2.40"	0.375"	2.5"	2.25"
NEMA TYPE 23T2 MO62-LS09 etc.	0.75"	0.69"	3.40"	0.375"	2.5"	2.25"

* (2) PLATES .375" X 1.5" X 2.5"
& 1" X 1" X 1.5"

OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33



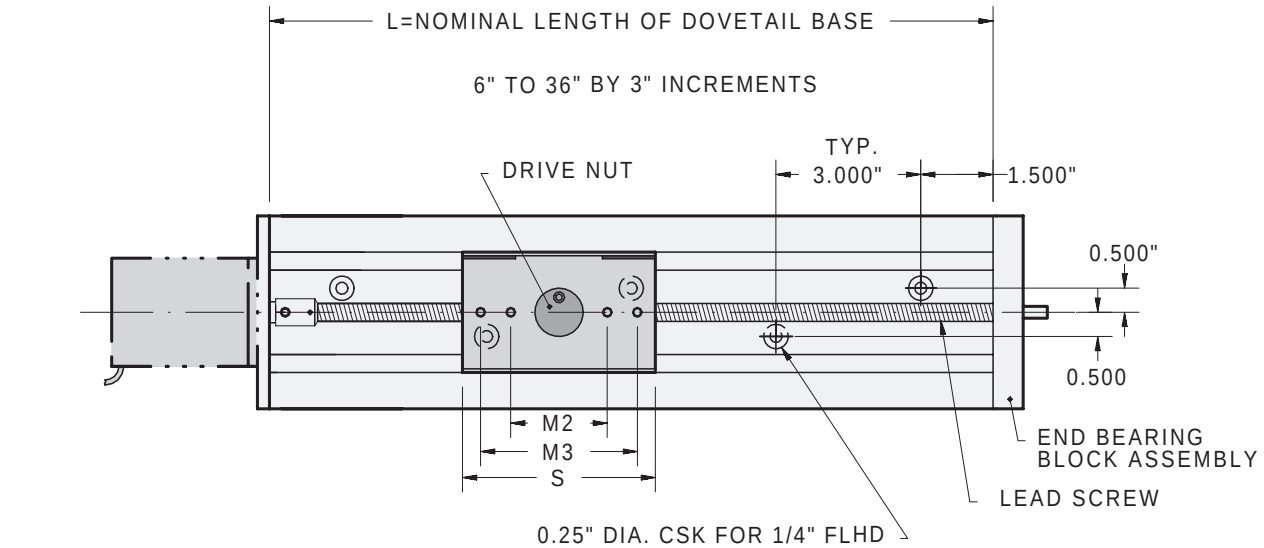


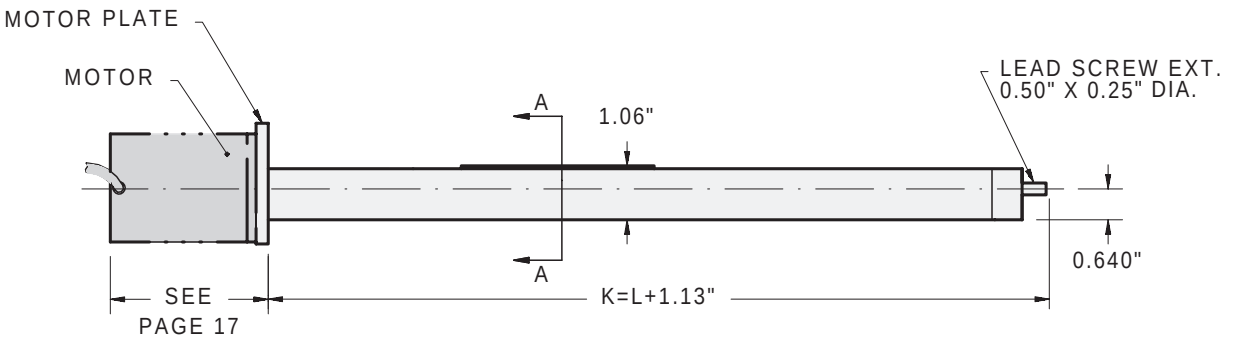


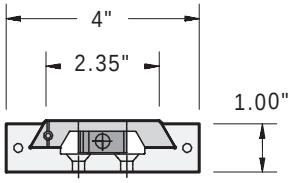
SECTION A-A

SLIDER LENGTH S	M2	M3
STANDARD 4.00"	2.000"	3.250"
OPTIONAL 6.00"	3.250"	5.250"

TRAVEL (T) = (L-S)





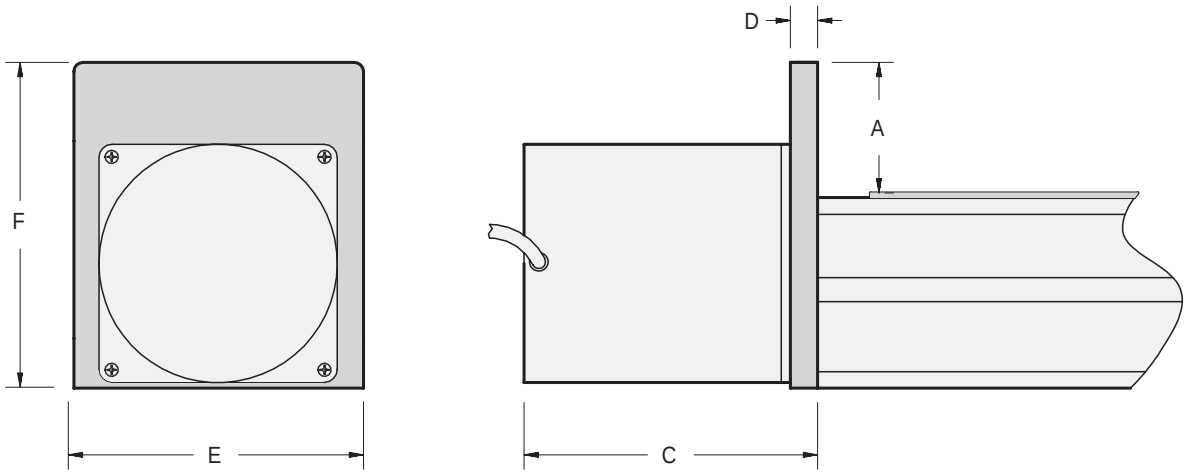


SECTION A-A

SLIDER LENGTH S	M2	M3
STANDARD 4.00"	2.000"	3.250"
OPTIONAL 6.00"	3.250"	5.250"

TRAVEL (T) = (L-S) -1.0"

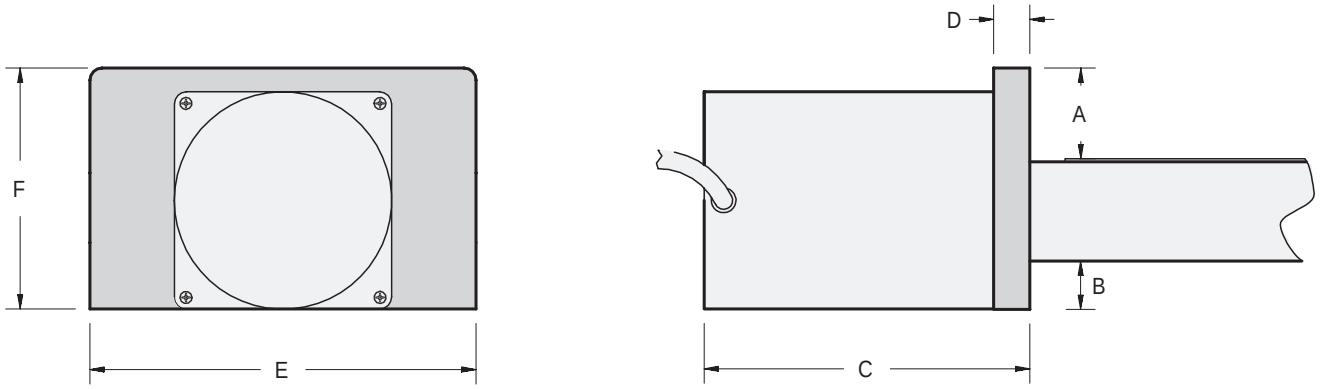
Series MB4000 and MA4000



MB4000

MOTOR TYPE	A	C	D	E	F
BODINE TYPE 24A4-D MODEL 0186 - 90	1.81"	7.10"	0.375"	4"	4.5"
PITTMAN GM 9000 SERIES	1.81"	4.71"	0.375"	4"	4.5"
NEMA TYPE 23T2 MO62-LS09,SS91L	1.81"	3.40"	0.375"	4"	4.5"
NEMA TYPE 34T1 MO91-FD09,SS-80	1.81"	2.85"	0.50"	4"	4.5"

OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33

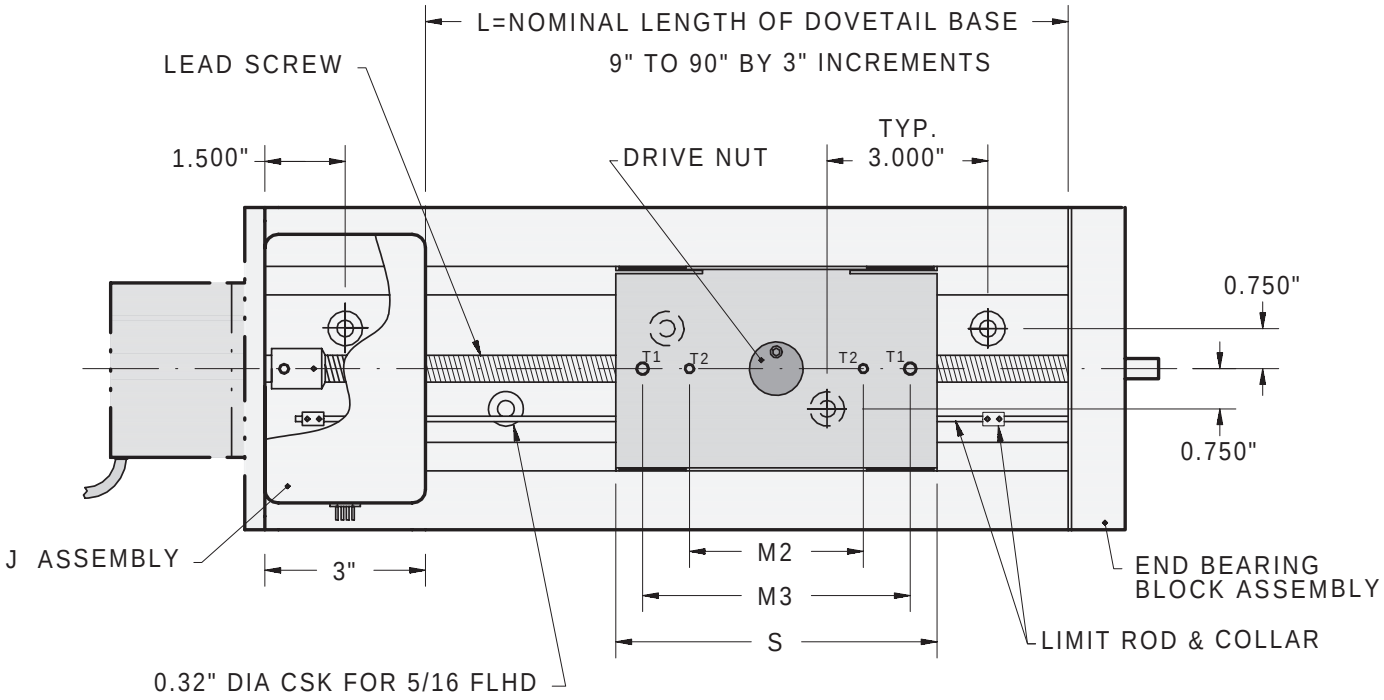


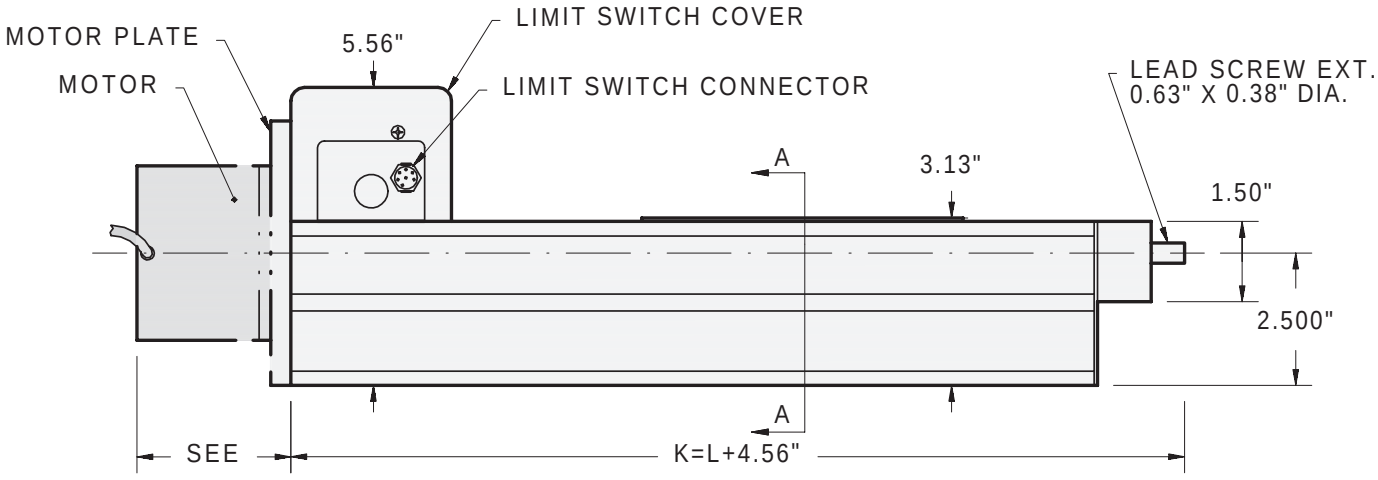
MA4000

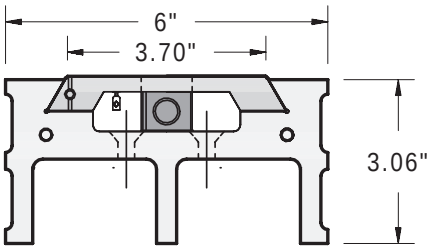
MOTOR TYPE	A	B	C	D	E	F
BODINE 24A-MODEL 0043	0.94"	0.50"	5.06"	0.375"	4"	2.5"
PITTMAN GM9000 SERIES	0.94"		4.71"	0.375"	4"	2"
NEMA TYPE 23T2 MO62-LS09,SS91L	0.69"	0.50"	3.40"	0.375"	4"	2.25"
NEMA TYPE 34T1 MO91-FD09,SS-80	1.44"	1.0"	2.85"	0.50" *	4"	3.5"

* (2) 0.25" PLATES

OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33



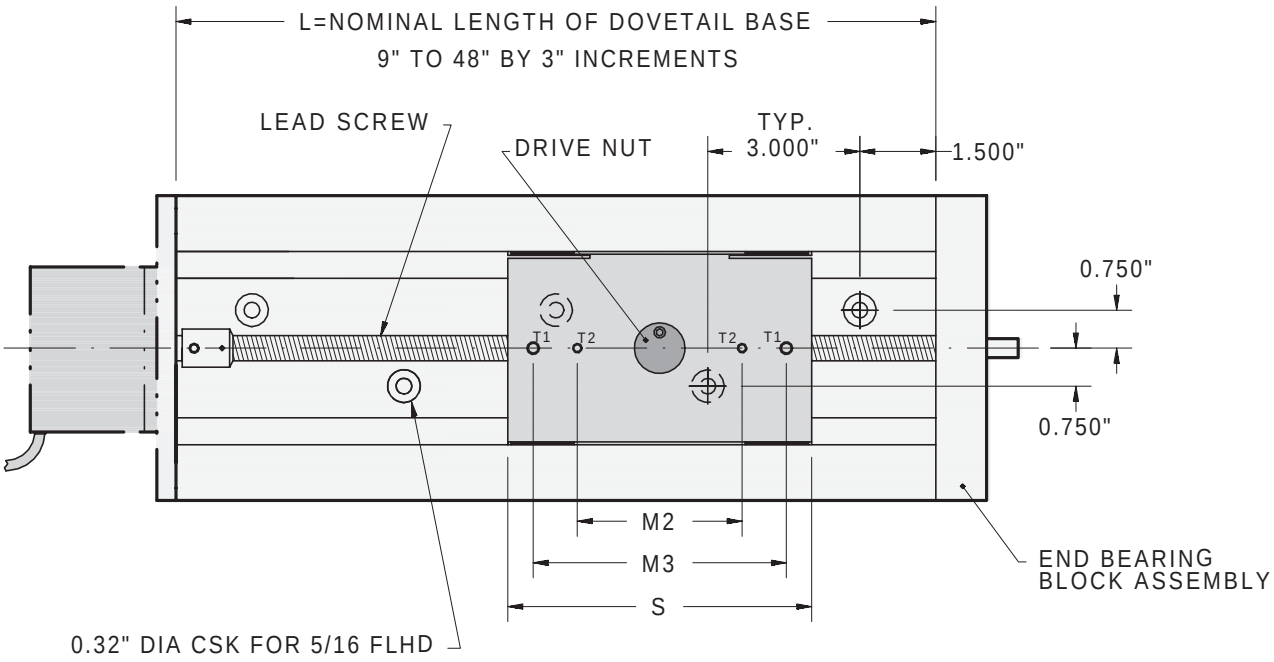


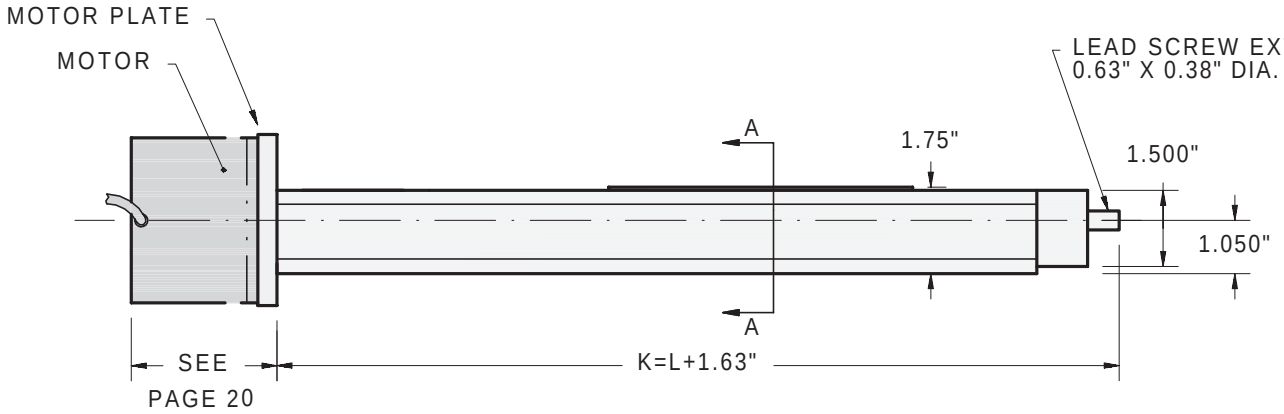


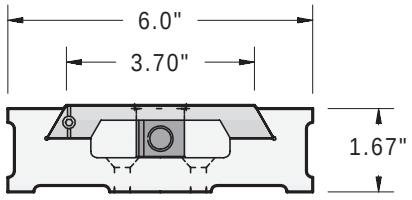
SECTION A-A

SLIDER LENGTH S	M2	M3	T1	T2
STANDARD 6.00"	3.250"	5.000"	1/4-20	10-32
OPTIONAL 8.00"	5.000"	7.000"	1/4-20	1/4-20

TRAVEL (T) = (L-S)



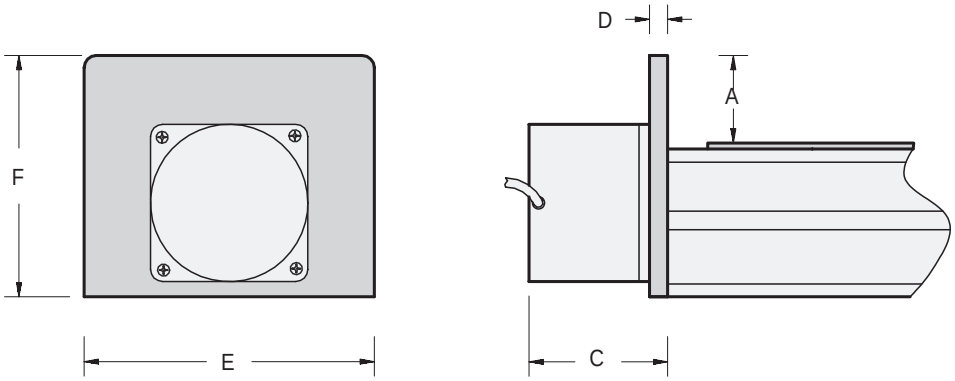




SECTION A-A

SLIDER LENGTH S	M2	M3	T1	T2
STANDARD 6.00"	3.250"	5.000"	1/4-20	10-32
OPTIONAL 8.00"	5.000"	7.000"	1/4-20	1/4-20

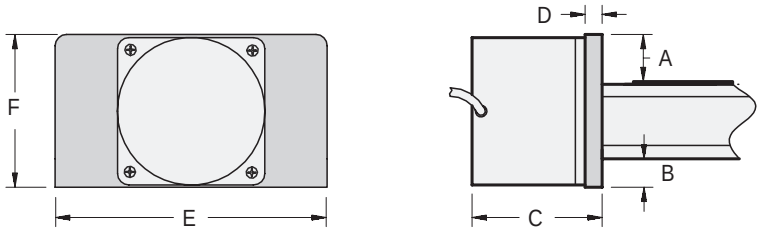
TRAVEL (T) = (L-S) -1.0"



MB6000

MOTOR TYPE	A	C	D	E	F
BODINE TYPE 30R-D MODELS 5470-5474	1.87"	5.86"	0.375"	6"	5"
BODINE TYPE 24 A4-Z MODELS 0157-0163	1.87"	8.20"	0.375"	6"	5"
NEMA TYPE 23T2 MO62-LS09,SS91L	1.87"	3.40"	0.375"	6"	5"
NEMA TYPE 34T2 MO92-FD09	1.87"	4.10"	0.375"	6"	5"

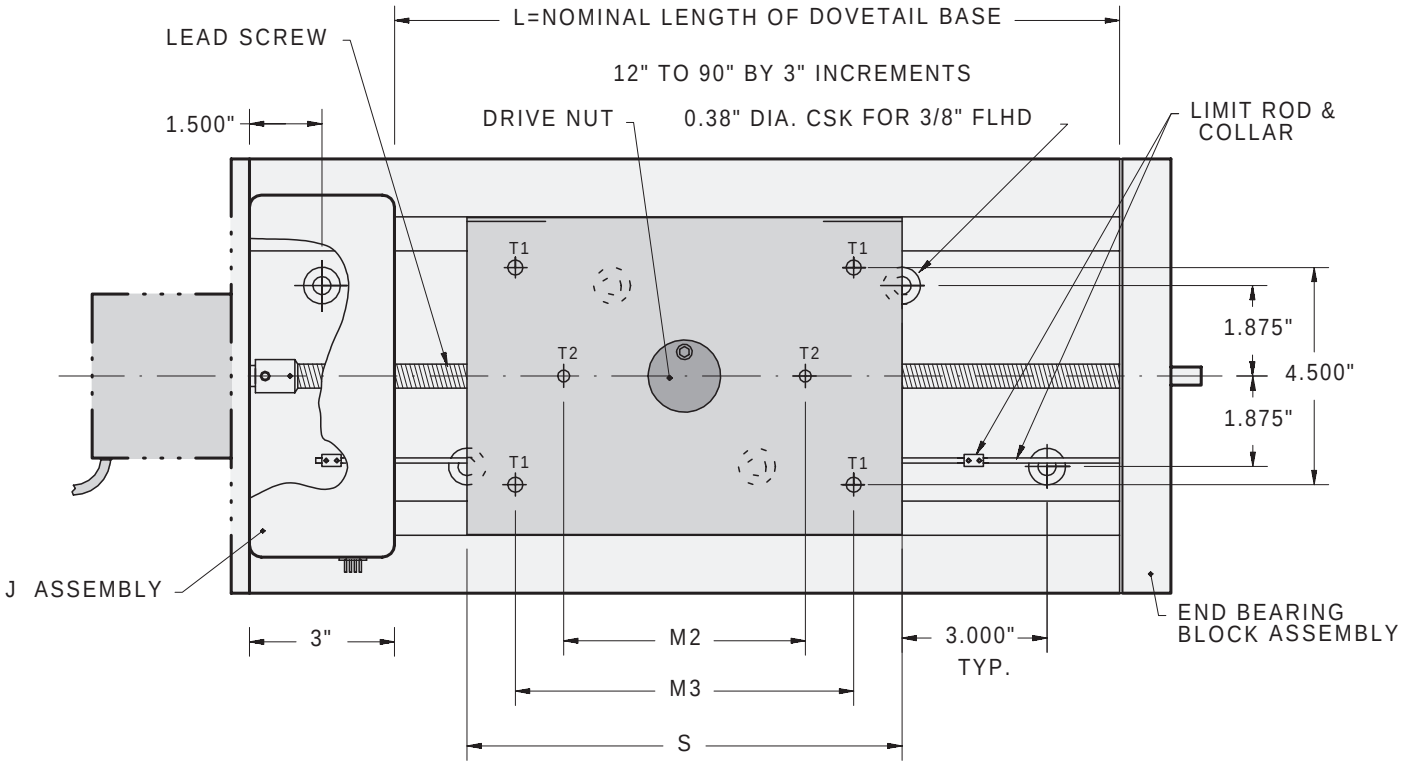
OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33

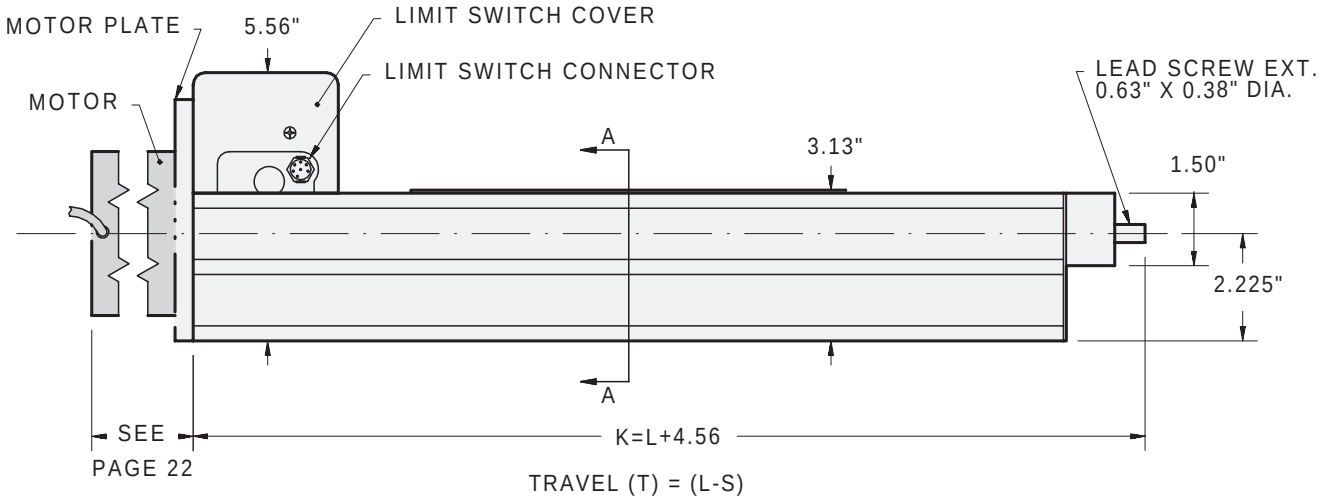


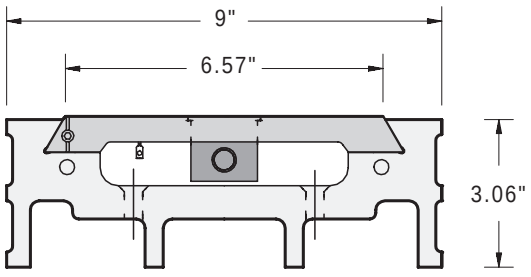
MA6000

MOTOR TYPE	A	B	C	D	E	F
PITTMAN 9000 SERIES	0.25"		4.71"	0.375"	6"	2"
NEMA TYPE 23T2 MO62-LS09,SS91L	0.40"	0.10"	3.40"	0.375"	6"	2.25"
NEMA TYPE 34T1 MO91-FD09,SS-80	0.93"	0.70"	2.85"	0.375"	6"	3.375"

OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33

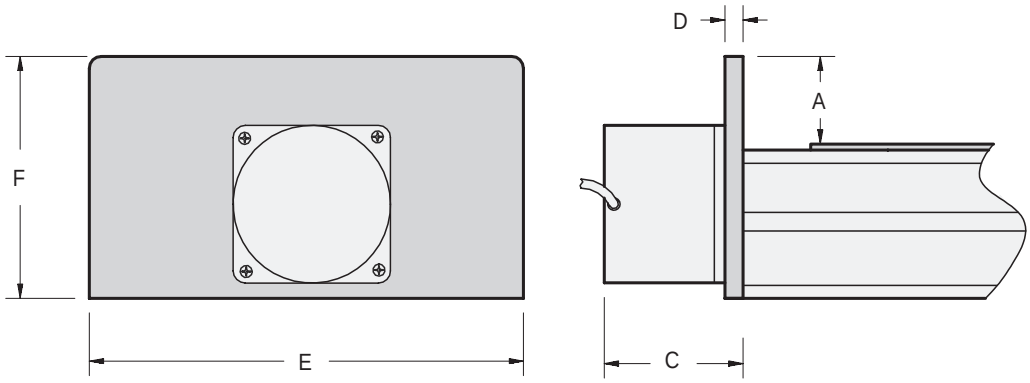






SECTION A-A

SLIDER LENGTH S	M2	M3	T1	T2
STANDARD 9.00"	5.000"	7.000"	5/16-18	1/4-20
OPTIONAL 12.00"	5.000"	10.000"	5/16-18	1/4-20



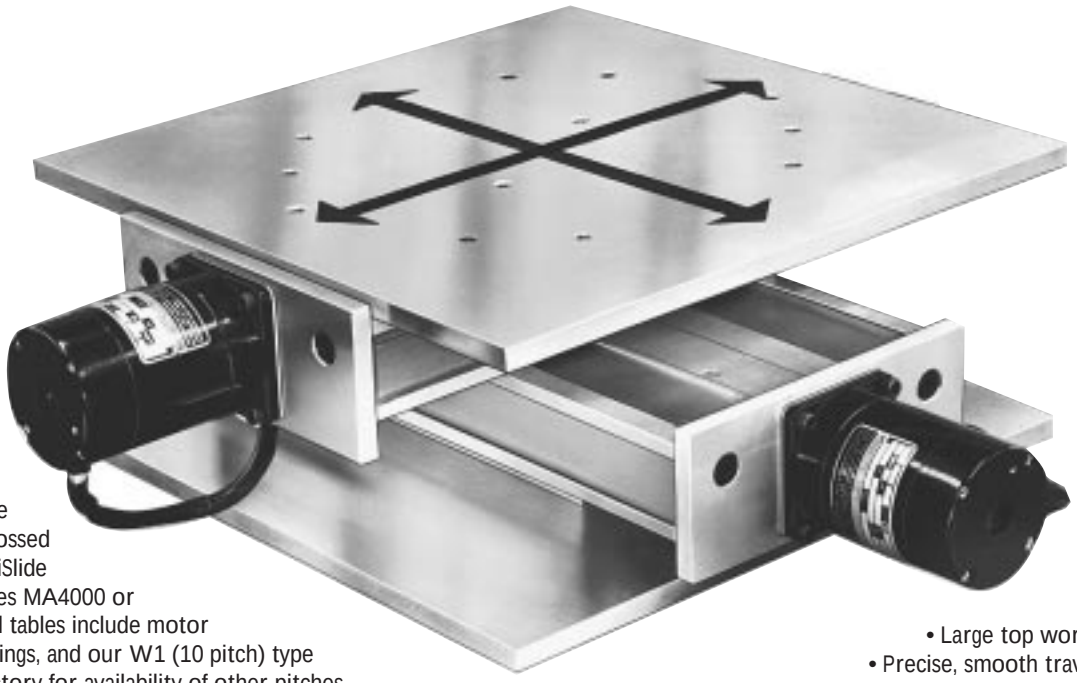
MB9000

MOTOR TYPE	A	C	D	E	F
SLO-SYN SS451C	1.87"	6.53"	0.375"	9"	5"
NEMA TYPE 34T2 MO92-FD09	1.87"	4.10"	0.375"	9"	5"
BODINE TYPE 30R-D MODELS 5470-5474	1.87"	5.86"	0.375"	9"	5"
BODINE TYPE 24 A4-Z MODELS 0157-0163	1.87"	8.20"	0.375"	9"	5"

OTHER MOTOR OPTIONS AVAILABLE SEE PAGE 33

Series MAXY4000 and MA6000 Assembled X-Y Tables

Model MAXY6012W1-S6



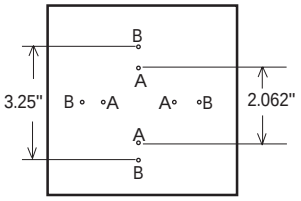
In addition to the numerous XY systems possible with any two UniSlide Assemblies, we offer these units. These sturdy tables are constructed of two crossed and inverted linear UniSlide Assemblies of the Series MA4000 or MA6000. The standard tables include motor mounting plates, couplings, and our W1 (10 pitch) type lead screws. Check factory for availability of other pitches. Order motors, limit switches, and controls separately.

FEATURES

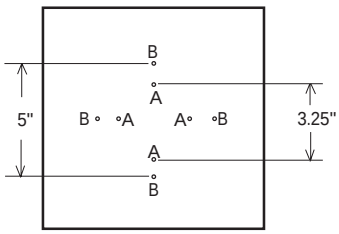
- Large top work surface area.
- Precise, smooth travel, low profile.
- Plug-in compatibility with UniSlide motor controls
- Assembled X-Y table with 2", 3", 5", 6" or 9" of travel.

TOP PLATE *All holes are tapped*

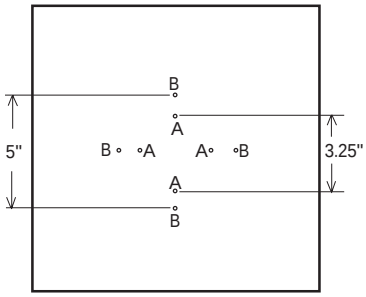
MAXY4006W1 & MAXY4009W1



MAXY6009W1

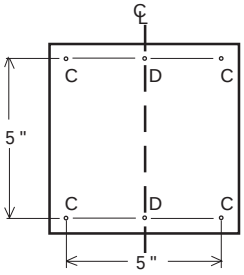


MAXY6012W1 & MAXY6015W1

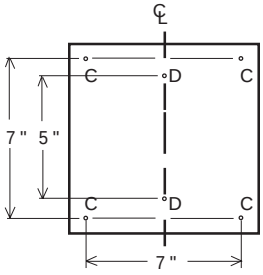


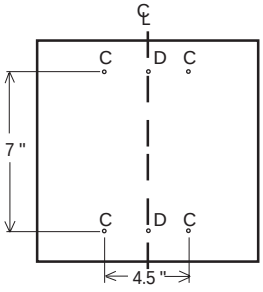
BASE PLATE *All are clearance holes*

MAXY4006W1



MAXY4009W1





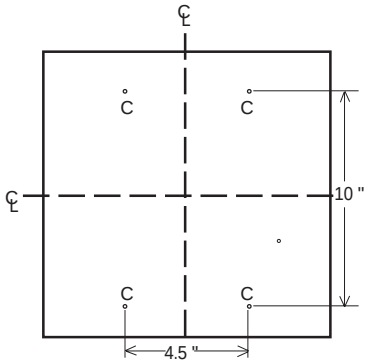


Plate Specifications

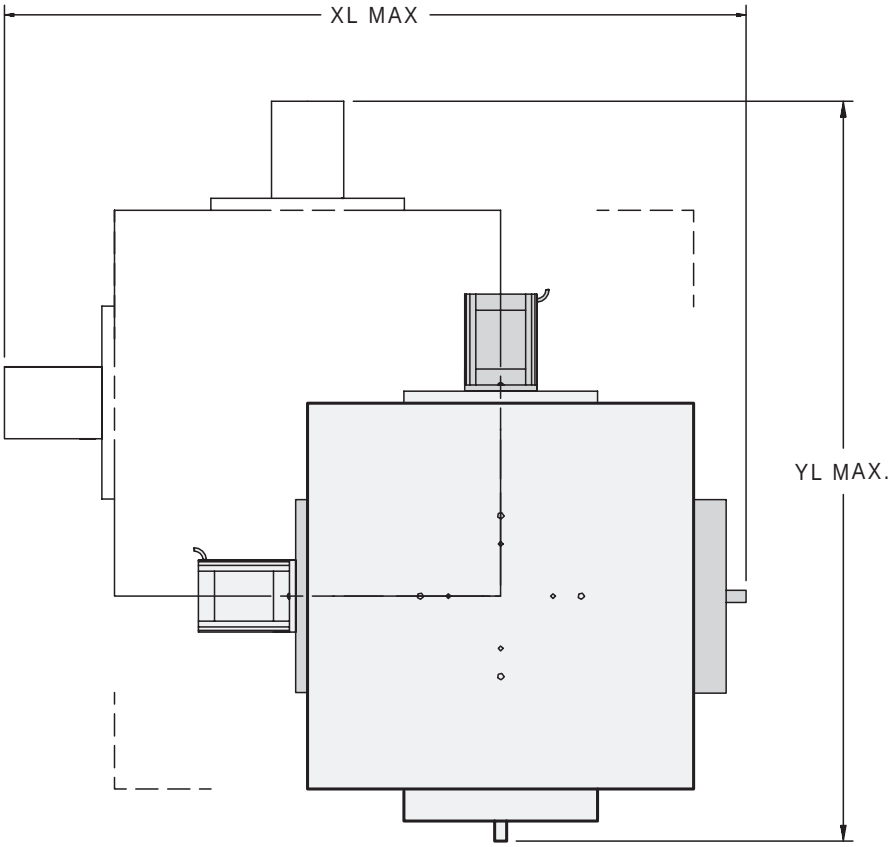
Catalog Number	Top/Bottom Plates	Plate Thickness Top/Bottom	A Threaded Hole for	B Threaded Hole for	C C'snk clrnc for FHMS	D on ℄ C'snk clrnc for FHMS
Series A4000						
MAXY4006W1-S4	6" x 6"	1/2" / 3/8"	8 -32 on 2.062" B.C.	10-32 on 3 1/4" B.C.	1/4"	1/4"
MAXY4009W1-S4	9" x 9"	1/2" / 3/8"	8 -32 on 2.062" B.C.	10-32 on 3 1/4" B.C.	1/4"	1/4"
Series A6000						
MAXY6009W1-S6	9" x 9"	3/8"/3/8"	10-32	1/4 - 20	5/16"	1/4"
MAXY6012W1-S6	12" x 12"	3/8"/ 3/8"	10-32	1/4 - 20	5/16"	--
MAXY6015W1-S6	.12" x 12"	3/8"/3/8"	10-32	1/4 - 20	5/16"	--

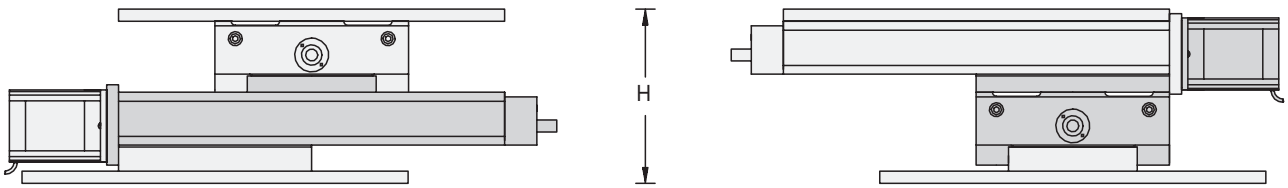
To order, call 1 800 642-6446 or 1 716 657-6151

Physical Specifications

Catalog Number	Travel	H Height	Load Capacity	XL and YL Max. Work Envelope[4]
Series MAXY4000				
MAXY4006W1-S4	2" x 2"	4.13"	60 lbs.	12 1/2" x 12 1/2"
MAXY4009W1-S4	5" x 5"	4.13"	25 lbs.	18 1/2" x 18 1/2"
Series MAXY6000				
MAXY6009W1-S6	3" x 3"	5.47"	100 lbs.	17 " x 17 "
MAXY6012W1-S6	6" x 6"	5.47"	60 lbs.	25 " x 23"
MAXY6015W1-S6	9" x 9"	5.47"	30 lbs.	29" x 29"

[4] With NEMA 23T2 Motor

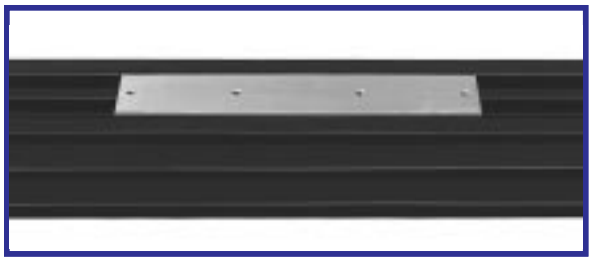




Options

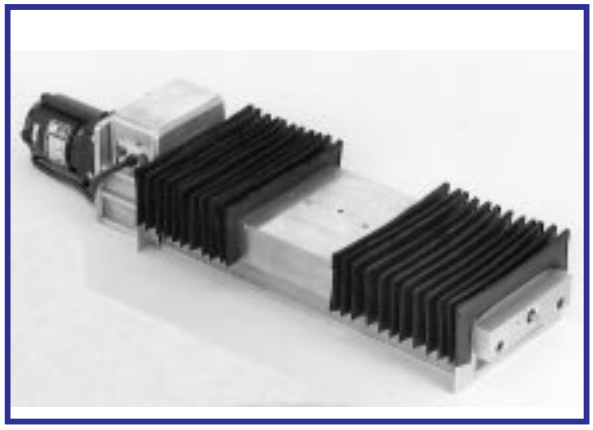
- Available without the top plate for users who want to attach their own surface plate.
- Adjustable outboard limit or fixed end-of-travel switches.
- Precision grade or different pitch lead screw. See Table II, page 6.
- Cosmetic black anodized finish or hard coat anodized ways dyed black.
- Additional threaded or clearance holes can be provided at extra charge.

Longer slider length increases stability.

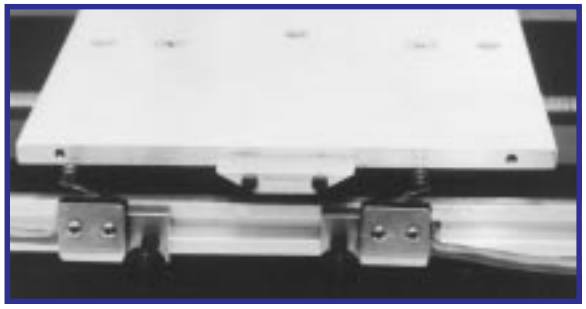


Model ZMB2524BJ-S2.5 with hard anodized ways

Way covers on Model MB4027P10-S4J



Detail of outboard limit switches



Options

Longer length and additional sliders

Longer length sliders provide greater stability for large or cantilevered loads. The amount of bearing surface area remains the same as the standard sliders. Mounting holes consist of two pairs of holes. One pair is identical to the standard slider, referenced from the center of the slider. The other pair is identical to standard slider referenced from the slider end.

Additional passive or floating sliders may also be added to the UniSlide Assembly to lend additional support to long, bulky loads.

Hard coat anodized dovetail ways

If a motorized UniSlide Assembly will accumulate more than 200,000 cycles of operation or will be used in a production capacity 8 hours per day, a hard coat anodized finish can be applied to the dovetail ways to prolong life. This coat is 0.002" thick, measures Rockwell C 70 and is dyed black. This option is specified by prefacing the part number with the letter "**Z**", i.e. **Z**MB4015BJ-S4. The price formula for each Series is given in the price list. Electroless nickel coating is also available.

Way covers

Polyurethane way covers with attaching plates are available for protection against dust and grit. They extend over and above the UniSlide Assembly as follows:

	Projection above slider mounting surface	Width
MB2500	¾ "	4 ½"
MA & MB4000	1 "	7 "
MA & MB6000	1¼"	8 ¼"
MB9000	1"	11 ½"

Since the collapsed or compressed bellows requires additional base length, please add 1/3 of free travel length to the nominal base length of the assembly. For example, the free travel of the MB4021P10J-S4 with the standard slider length of 4" and without way covers is 17 ". If way covers are desired, the dovetail base must be increased by 17 "/ 3, which, to the nearest 3" length increment, is 6". Therefore, Model MB4027P10J, having a 27 " nominal length base will accommodate the compressed bellows and is the correct choice. This option is specified by appending the Part Number with the letters "**WC**", i.e., MB4021P10J-S4-**WC**. The price for each unit with way covers is given in the price list.

Outboard limit switches

When the standard internal adjustable limit switches are not available or adequate for an application, outboard limit switches may be useful. For example, when it is necessary to over travel a stop point or to provide more stops than the normal two, these switches may be used. Adjacent photo shows a movable switch in a track mounted lengthwise along the side of the UniSlide Assembly base. A 1/4" plate with cam is mounted on the slider and activates the switch when it passes over it. The maximum number of limit switches is only limited by the nominal base length. These switches can be wired to stop travel until restarted, change speed or be active in only one direction. Consult the accompanying price list, Catalog No. 3-8515, for cost.

Fixed, end-of-travel, limit switches, Cat. No. 3-934, are also available at lower cost. See drawings on page 48.

Parallel Coupled UniSlide Assemblies with optional black anodized finish

Parallel Coupled
UniSlide Assemblies

For large cantilevered loads and extensive slides, timing-belt-connected, parallel-coupled UniSlide Assemblies are suggested.

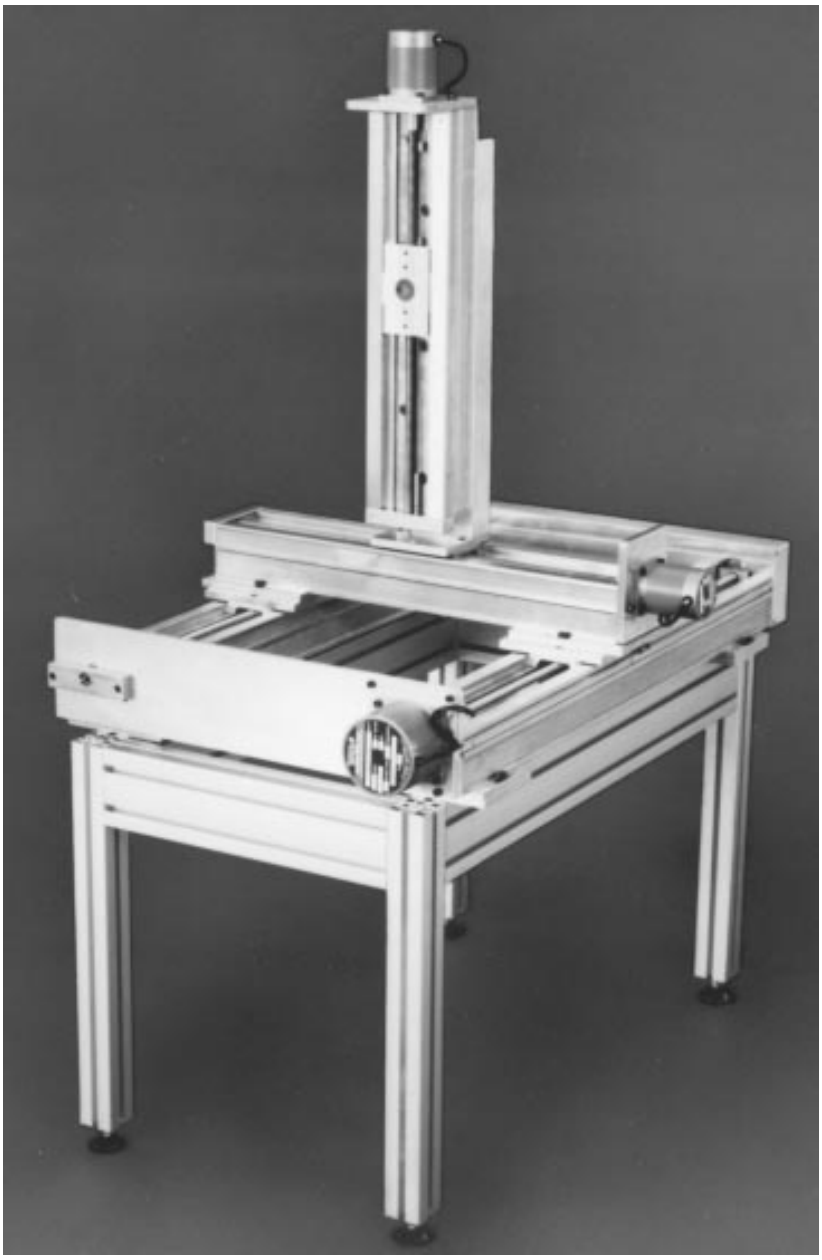
Figure 8, UniSlide Motorized Parallel Coupled XYZ Coordinate System Assembly shown positioning a probe for immersion into a liquid.

X two MB4015Q1J UniSlides with Slo-Syn Step Motor M091.

Z two MB4012Q1J UniSlides with Bodine 541 Shunt Wound Gear Motor.

Y one MB2515BJ UniSlide with Bodine 747 High Slip Induction Gear Motor.

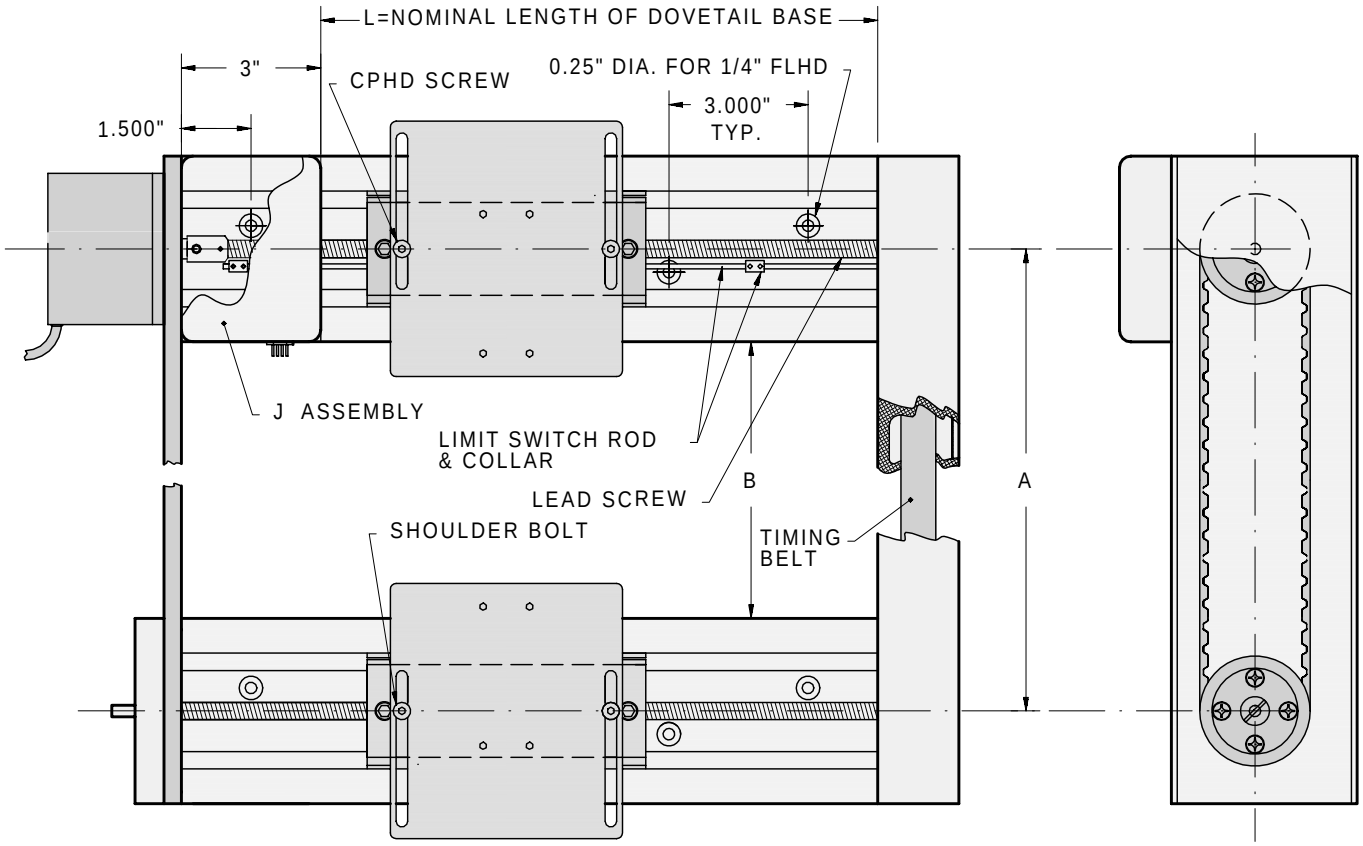
To order add **"PC xx"** to the part number as a suffix. XX represents the center-to-center separation distance as listed in row A in the table below.

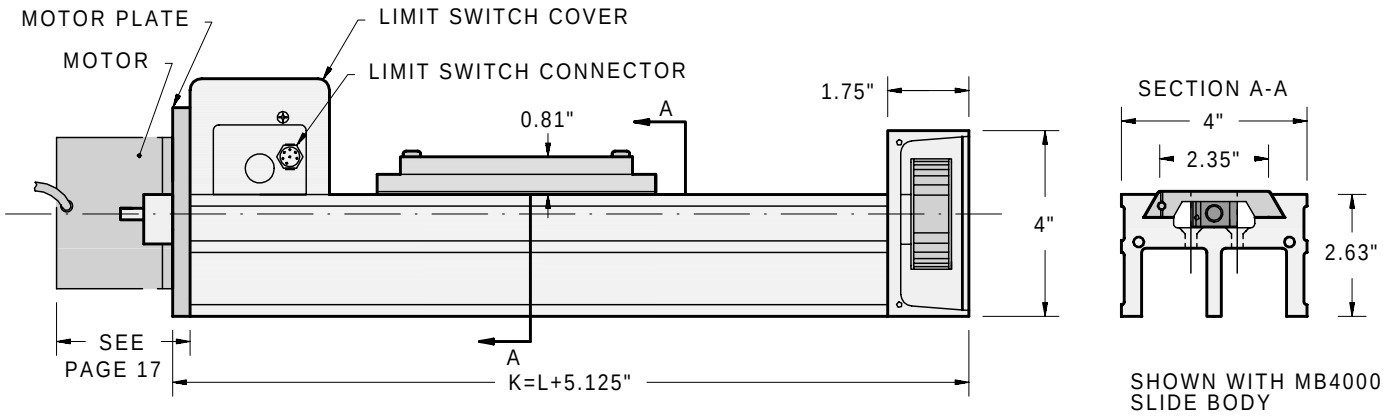


Parallel Coupled UniSlide Assemblies mounted on table constructed from the MiniTec Profile System. See page 55.

Series MB4000 Parallel Coupled Unislide

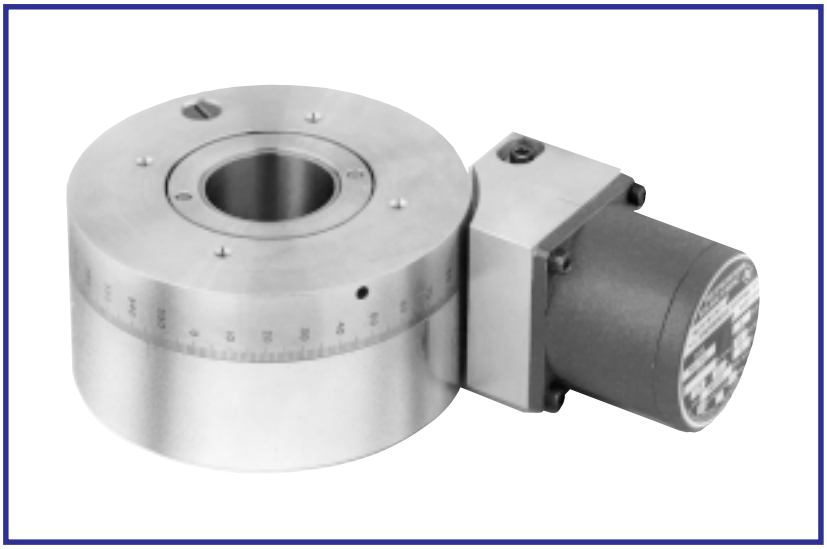
Also available in Series MB2500 and MB6000





TRAVEL (T) =L- 6"

Separation of Parallel Coupled UniSlide Assemblies in inches																							
A Center-to-Center All Series	8.5	13	14.5	16	17.5	19	20.5	22	23.5	25	26.5	28	29.5	31.5	34	36.5	39	41.5	46.5	51.5	59	66.5	81.5
B MB2500 Series Base separation	6	10.5	12	13.5	15	16.5	18	19.5	21	22.5	24	25.5	27	29	31.5	34	36.5	39	44	49	56.5	64	79
B MB4000 Series Base separation	4.5	9	10.5	12	13.5	15	16.5	18	19.5	21	22.5	24	25.5	27.5	30	32.5	35	37.5	42.5	47.5	55	62.5	77.5
B MB6000 Series Base separation	2.5	7	8.5	10	11.5	13	14.5	16	17.5	19	20.5	22	23.5	25.5	28	30.5	33	35.5	40.5	45.5	53	60.5	75.5



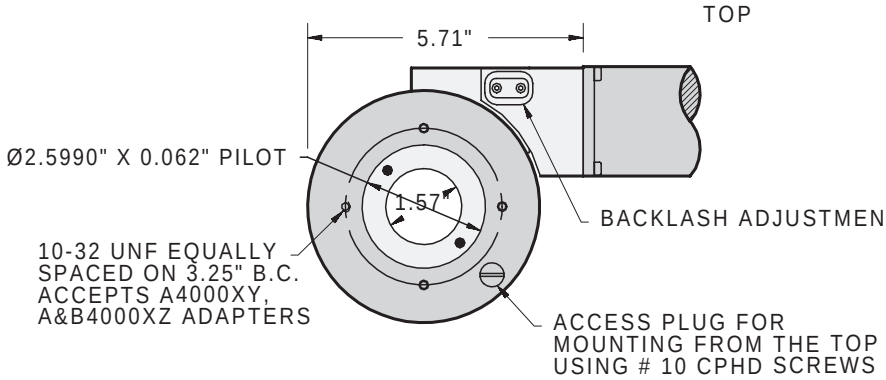
Model B4836TS Rotary Table

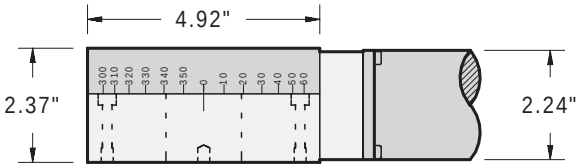
UniSlide Rotary Tables

Velmex offers two designs of rotary tables, the Series B4800TS and Model B5990TS. Series B4800 Rotary Tables use a worm and gear drive design with a central rotating ball bearing. There are three models, each with a different gear ratio. The tables can be driven by frame size 23 stepper motors or instrument case-type motors (Bodine Type K). They can be attached to the slider of the 4000 and the 6000 Series assemblies via the B6000TX adapter plate. Plate is 6" x 6" x ¼". All tables have a hollow spindle for optical applications, an engraved 360° scale and an adjustment to minimize gear backlash. See page 6 of Price List for pricing.

Model B5990TS Rotary Table is shown on the next page. It is smaller, has a 90:1 gear ratio, and is lower in cost. The table price includes a NEMA 17 stepper.

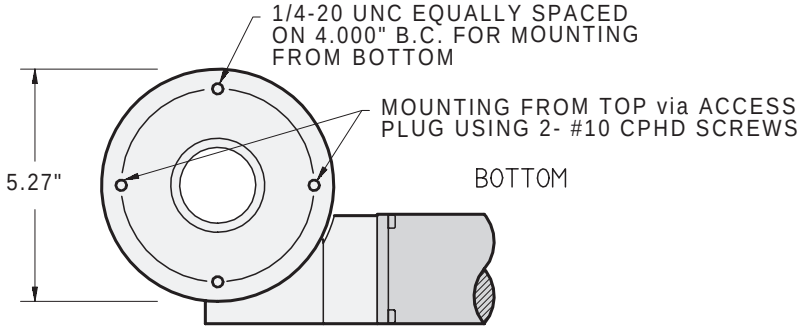
Series B4800 Rotary Tables





Dimensions for all B4800 Rotary Tables

Item	Inches	mm
Overall length	5.72	145
Threaded holes for payload	3.25 BC	83
Clear Aperture	1.57	40
Diameter	4.92	125
Width	5.27	134
Height	2.37	60
Pilot ring diameter (does not rotate)	2.5590	65 mm



B4800TS Mounting holes

Table Top: Four mounting holes 10 - 32 UNF - 2 x ½" on 3 ¼" diameter bolt circle.

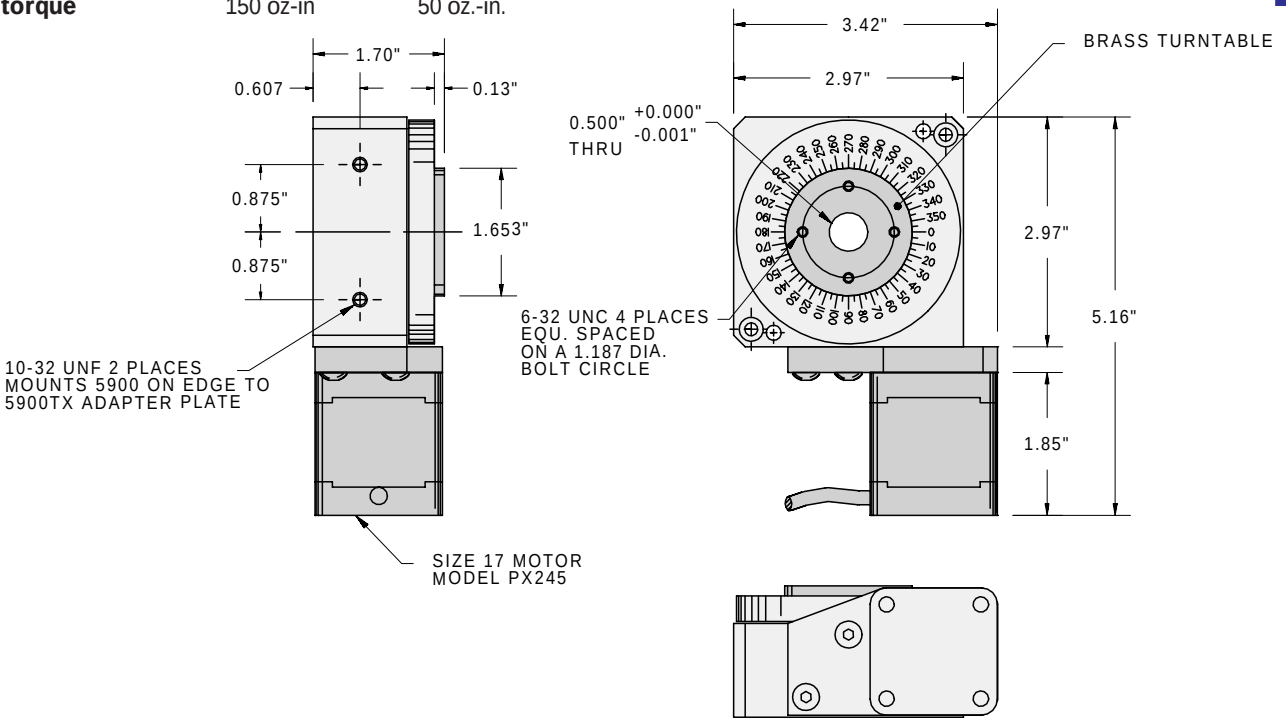
Table Bottom: There are two approaches to securing the base of the table. First, there are two clearance holes for 10-32 UNF cap screws for attachment from above through the top access hole. Alternatively, to attach with screws from below, there are four threaded holes. They are ¼" - 20 UNC - x ½" on a 4" diameter bolt circle.

Gear ratios and performance with stepper motors

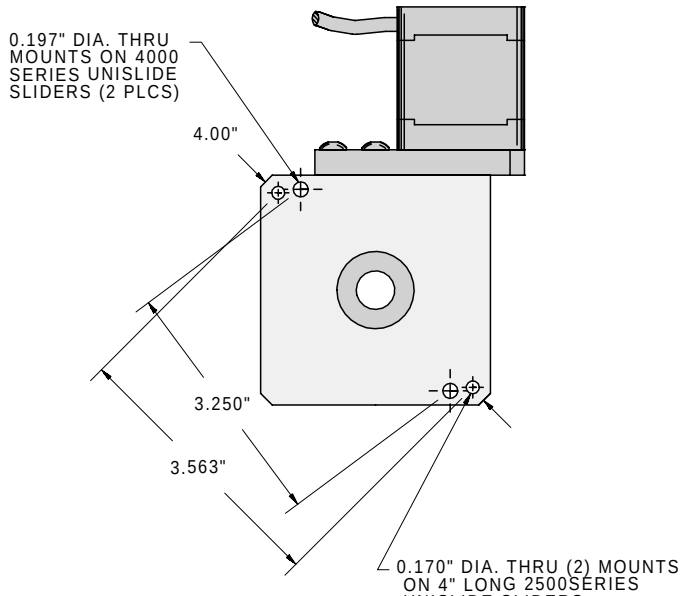
Model Number	Gear Ratio	RPM[5]	Time per Revolution[5]	Speed[5]	Degrees per Step	Typical Backlash
B4818TS18:1	8.33	7.2 sec.	50°/sec.	0.050	600 arc - second	
B4836TS36:1	4.16	14.4 sec.	25°/sec.	0.025	400 arc - second	
B4872TS72:1	2.08	28.8 sec.	12.5°/sec.	0.0125	200 arc - second	
B5990TS90:1	1.66	36 sec.	10°/sec.	0.010	160 arc - second	

[5] All values are with 1.8° stepper motor operating at 1000 steps/second in the half step (400 steps/rev.) mode.

Load Capacity when table is...	Series B4800TS	Model B5990TS
Horizontal	200 lbs.	50 lbs.
Vertical	25 lbs.	5 lbs.
Cantilever Load (Horiz.)	500 in-lb.	20 in-lb.
Table top axial runout	0.00025" TIR	0.00011" TIR
Table top radial runout	0.0005" TIR	0.00008" TIR
Accuracy	100 arc - second	100 arc - second
Repeatability	1 arc - second	1 arc - second
Table weight	5.5 lbs. / 2.5 kg.	2.7 lbs. with motor
Max. input shaft torque	150 oz-in	50 oz.-in.



Model B5990TS Rotary Tables



Part 2 Motors and Controls

Functional Classifications

The choice of the correct motor and control for a UniSlide Assembly should be based on the function you wish to accomplish. Broadly speaking, there are two functions: *scanning* and *positioning.*

Functional classification 1: **Scanning**. In this category, the objective or work to be accomplished occurs while the UniSlide Slider is in *motion*. Scanning functions can be further subdivided into two types, scanning at a single, fixed speed or at one of a range of user-selectable speeds.

Functional classification 1A—Scanning or feeding at a single*, fixed speed.*

A probe, sensor, cutter, dispenser, transducer or some other object is moved at a single, constant speed. An AC synchronous motor or gear motor achieves this function within 0.1% or less speed variation. The slider speed is a function of the motor and lead screw pitch selected. Available motors and the resultant translation speeds with each lead screw pitch are listed in the Tables IX–XIV.

Functional classification 1B—Scanning or feeding at a selected speed*.*

The objective is similar to class 1A. However, an added advantage is the ability to select one scanning speed from a range of motor speeds via a motor control. There are two possible configurations of speed control: open loop and closed loop.

Open loop speed *control* - Motor-control combinations include

- A DC stepper motor and control.
- A high slip AC induction motor and Velmex 311 Speed Control. Speed accuracy will fluctuate due to varying loads and voltages.

Closed loop speed control - In this system, the control senses the motor speed and makes the necessary adjustments. Two possible systems are:

- A permanent magnet DC motor and Minarik Speed Control. Speed regulation is achieved by sensing back-EMF; accuracy is the 1-2% range.
- A DC permanent magnet motor, such as the Moto-matic, with a tachometer and a feedback circuit in the control. Speed variation ranges from 0 to 2%.

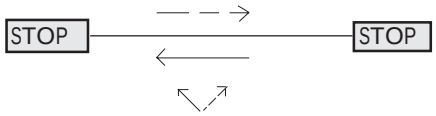
See page 31 for motor control information. In some instances, an optional circuit can be added to return to the "home" position at maximum motor speed. See page 32, *Auxiliary Circuitry*.

Functional classification 2: **Positioning.** The objective is to move to a target position. This is commonly achieved by using a stepper motor and an accurate lead screw. The motor is incremented a predetermined number of steps to achieve the desired position. Consult the section on stepper motors and controls for choice of available equipment.

Some Typical Operating Modes

SCANNING

Fig. A, Running between adjustable limit switches.



Go left or go right

Fig. B, Automatic reversing circuit for continuous motion. Returns at the same or different speed.

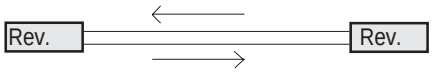
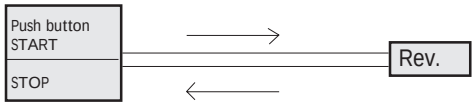


Fig. C, Auto reverse with stop—at—home end.



Catalog Nos. 3-732 and 3-8516 on the accompanying price list.

POSITIONING

Fig. D, Incremental motion on one axis, scan on return.

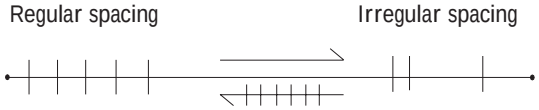


Fig. E, Continuous scan on one axis; incrementing on another.

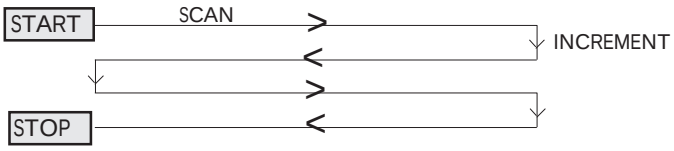
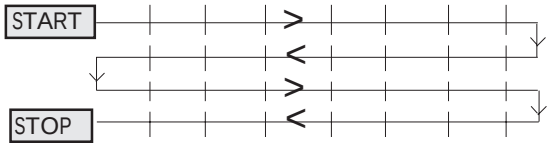


Fig. F, 2 Axes. Stop at each indicated point. Restart with input signal or after time delay.



Speed Controls for UniSlide Assemblies

For stepper motor controls, see pages 37-47.

Velmex Model 311 Speed Control – This control is designed for use with a high slip induction instrument gear motor, i.e., Bodine Type K. For a particular gear motor, the speed control range is from the rated speed down to 5% to 20% of this speed, depending on load conditions. The Model 311 circuit is housed in an all aluminum box with input cord and plug for 115 VAC and output cord and receptacle for attachment to the Internal Limit Switch Assembly of the motorized slide.

Velmex Model 311 Speed Control

Minarik[7] **SL-15** – This unit is designed for speed control of $^1/_{50}$ HP DC shunt wound motors and small 130V DC permanent magnet motors. Speed range is approximately 25X with internal regulation to maintain speed within 2% under varying load conditions. Dynamic braking and forward-reverse switch are standard. The SL-15 is supplied in a case 3.5" x 5.25" x 2.25" with 115V AC input cord and plug. Output is wired for plug-in to the UniSlide Motorized Assembly.

Minarik MM25251C - This control is similar to the SL-15 but is for larger motors up to $^1/_4$ HP. The enclosure measures 4.75" x 8.8" x 2.5"

Minarik SL-15

Minarik MM25251C

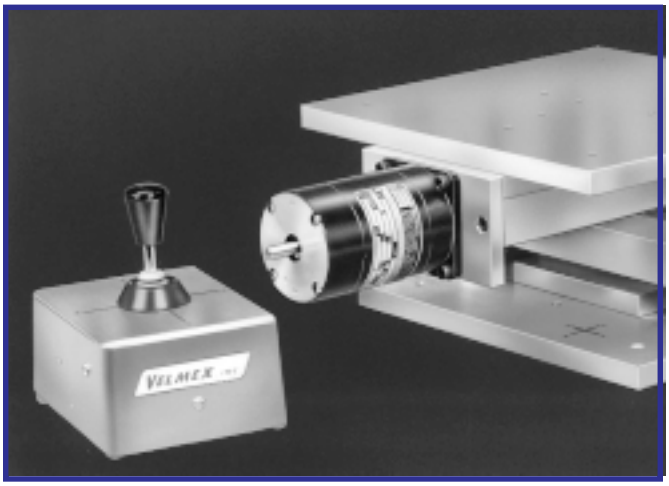
Motomatic II – This unit controls the Electro-Craft E284 and E652 motor-generator tachometer for direct drive of UniSlide Assemblies. The gear reduction version of the E284 motor is also controlled by Motomatic II. This is a closed loop speed control; see Functional Classification 1B, page 33. It serves as an electrical substitute for an infinitely variable gear train. It provides a smooth, stepless speed in a range from 10 to 5000 RPM. (Maximum speed with a E652M is 2000 RPM.) Speed accuracy is approximately 1% above 50 RPM and 3% at the slow end of the range. Front panel controls include forward/reverse, fine/coarse speed adjustment and torque adjustment. Speed or motor torque are displayed on a LED. For further information, consult a current Electro-Craft catalog.[8]

Motomatic II Speed Control

UniSlide 2 Axis Joystick Control and 72 RPM Synchronous Motors

This simple, inexpensive scanning system can provide either simultaneous or one-at-a-time axial movement of an XY table – depending upon user's preference. It is ideal for applications requiring smooth, bidirectional motion at a constant speed (Functional Class 1A) together with an uncomplicated human interface. Possible uses include feeding, dispensing, welding or moving transducers.

The brushless AC Synchronous motors operate at 72 RPM and feature very low RFI and instant Start/Stop. Selection of the lead screw pitch determines the translation speed (17.75" to 3.6"/minute.) See Tables X, XII and XIV. Specify either a *non-gated joystick* for both simultaneous and one-at-a-time control; a *gated joystick* for one-at-a-time movement only.



Velmex joystick control

7. Minarik Electric Company, 901 East Thomson Avenue, Glendale, CA 91201-2011
8. Reliance Electric/ Electro-Craft Inc.; 6950 Washington Ave. So., Eden Prairie, MN 55344

Position Indication Systems

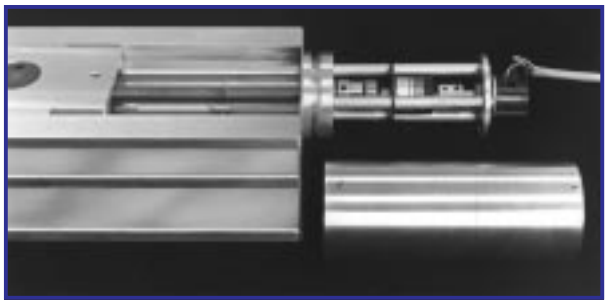
Analog types - A small gear train and potentiometer may be attached to the lead screw. Application of a stable voltage source across the potentiometer provides a voltage output proportional to the slider position. This voltage may be applied as an input to an X-Y recorder, to an A/D converter for computer control, or to a comparator circuit for analog position control. In many cases, a direct resistance measurement as a position indicator is adequate. For most applications, a precision 10-turn potentiometer produces the required voltage signal. The gear train reduction ratio is selected to yield an output of close to, but less than, 10 revolutions. Accuracy is within 1% of travel. See page 8, Item 3-734, of Price List and page 49 for a drawing.

Alternatively, for short units, a linear strip variable resistor can be installed paralleling the ways of the UniSlide Assembly. These resistor strips are available in lengths from 2" to 10" and are normally 1.5K ohms/inch. Accuracy is within 0.25%. See page 8, Item 3-816 of the Price List.

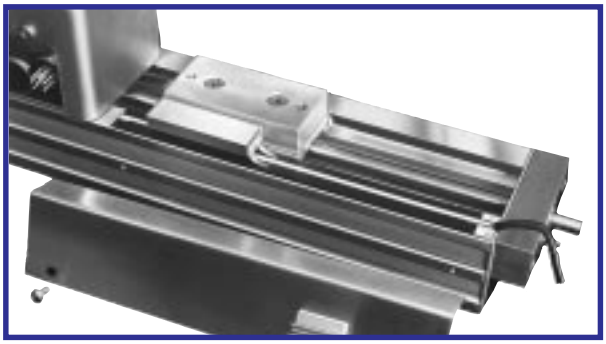
Digital systems

Linear encoder - A digital readout system, the ACU-RITE Linear Encoders[9], can be attached to the UniSlide Assemblies by Velmex. The reader head is mounted to the slider, as shown, providing a true measurement of slider position. Resolutions available are 0.0005", 0.0001" or 0.00005". Scales can be provided from 2" to 90" long. A number of displays are available, some with RS-232 ports. A cross section of the scale unit is shown on page 49. Please consult our Technical Sales Department for current prices.

Rotary encoder - These encoders have quadrature output using 5 V logic and are stocked in the following resolutions: 100, 200, 400, and 500 counts per revolution (CPR). When combined with a LCD readout, the encoder counts are converted to inches for the English thread or centimeters for the metric thread lead screws. For rotary tables, the encoder can be mounted on a motor shaft extension. It will read degrees on the LCD. The LCD display can be mounted in its own enclosure or, in some instances, incorporated into the stepper motor control enclosure. See page 1 for a photograph and page 49 for a drawing. Also, see item 3-918 on page 5 of the Price List.



Potentiometer and gear train assembly shown with cover removed



Resistive strip shown with cover removed

UniSlide Assembly and ACU-RITE linear encoder with a two axis DRO display

Auxiliary Circuitry

Model 32 Automatic Reversing Circuit - For those applications which require continuous back and forth linear motion between limit stops, an auxiliary relay and switch box can be provided. In all applications the circuit between the UniSlide Assembly and the various control housings require extra conductors. Consequently, if automatic reversing will be required at any future time, it is recommended that the motorized UniSlide Assembly be ordered initially with this feature. Full cycle times using this option should be 10 sec. or greater.

Model 32 Automatic Reversing Circuit

9. ACU-RITE Inc.; One Precision Way, Mason I.P., Jamestown, NY 14701

General Motor Characteristics

Functional Class	Motor Type	Examples	Advantages	Disadvantages
1A & 1B	AC induction (instrument type)	Bodine type K	No controls needed with fixed speed models Synchronous (constant) speeds No brushes; no RFI Least expensive	Limited power Limited speed control range Will coast.
1B	DC shunt or Permanent magnet	Bodine N-1 Bodine 043 Hurst	Wide speed control range Easily braked Moderate speed accuracy (5%)	Has brushes; moderate RFI
1B	DC motor with Tachometer-Generator	Electro-Craft E284	Wide speed range Accurate speed regulation (1-2%) Senses torque output	Expensive control Acoustically noisy gearheads
1A	High Torque AC synchronous 72 or 200 RPM	Slo-Syn AC Synch SS91L	Fast start/stop/reverse Simplified control Good torque without gearhead Synchronous speed No brushes	Fixed speed 60 Hz vibration
All	DC stepper	Superior M062	Accurate positioning Well suited to computer control Accurate speeds, No brushes Fast reversing and acceleration Widest speed range, High torque for size	Requires special controller Vibration at low speed

Typical Motor Type vs. UniSlide Series Compatibility

Specifications for individual motors are found throughout the catalog. Other motors can be installed on special order at the user's request.

	UniSlide Assembly Series									
	1500	2500		4000		6000		9000	Rotary Tables	
Motor Type[10]	**MA**	**MA**	**MB**	**MA**	**MB**	**MA**	**MB**	**MB**	**B5990TS**	**B4800TS**
Motors for Constant Speed Scanning										
Bodine Type K Low-slip, Synchronous			X		X	X				X
Bodine Type 30R-D Gear Motor					X		X	X		
Bodine Type 30R-F Gear Motor					X		X	X		
Slo-Syn Synchronous type 23D		X	X	X	X	X	X			X
Slo-Syn Synchronous type 34D				X	X	X	X	X		
Motors for Variable Speed Scanning										
Pittman Type GM8700, (GM9400)	X	X	X	(X)	(X)					
Bodine Type K High Slip			X		X	X				X
Bodine Type 24A, Model 0043		X	X	X	X					X
Motomatic Type E284 w/Gear Head			X		X		X	X		
Motomatic Type E284 Direct drive		X	X	X	X					
Motomatic Type E652 Direct drive					X		X	X		
Bodine Type 24A-D Gear Motor					X		X	X		
Bodine Type 24A-3F Gear Motor					X		X	X		
Bodine Type 32A-W Gear Motor							X	X		
Bodine Type 42A, Model 4035							X	X		
Stepper Motor - NEMA 17	X	X	X						X	
Stepper Motor - NEMA 23		X	X	X	X	X	X			X
Stepper Motor - NEMA 34					X	X	X	X		

10. Specific motor model numbers for each frame type may be found in the accompanying price list.

Translation Speed Tables

The following charts will allow you to select a motor for your application based upon a desired scanning speed. For information on lead screws and designations, see page 6 of this catalog. Rated torque of motors is included to give a relative measure of torque output between motors. Note also maximum thrust load specifications included with each chart. Although a specific motor may be used with multiple UniSlide bases, it may be listed only once, usually for the smallest usable Series. See Page 33, Table VIII for a summary of motors compatible with each UniSlide Series .

To use these charts, first determine the required motor RPM based upon desired scan rate per Table IX below. Next, if constant speed scanning is desired, select a motor from table X, XII, or XIV depending on UniSlide series to be used. If variable speed scanning is desired, select a motor from table XI, XIII, or XV.

For constant speed tables, synchronous motor speeds are accurate provided sufficient torque is generated to move a given load. Non-synchronous motor speed will fluctuate with varying loads and voltages.

For the variable scanning speed tables, a DC motor with appropriate torque should be selected to operate within the desired range of scanning speed. Note that actual scan speed in inches per minute is the product of motor RPM and Lead Screw Advance per Turn in inches. Using the Minarik or Velmex 311 speed controls, the extreme ends of the speed range may not be attainable due to reduced and/or irregular torque output. The amount of the speed range affected is also related to the load. To verify the appropriateness of your anticipated motor selection please contact our Technical Sales Department.

For stepper motors and controls, see page 37.

AC and DC Motor System Linear Translation Speed Chart

Inches/Minute
Centimeter/Minute

Leadscrew Designation	WF	W4 & P2.5	W2 & P5	W1 & P10	B & P20	C & P40	K1 & Q1	K2 & Q2
Advance per Revolution	1.0 in.	0.4 in.	0.200 in.	0.100 in.	0.050 in.	0.025 in.	1.0 mm	2.0 mm
Lead Screw RPM								
1	1.00	0.40	0.20	0.10	0.05	0.025	0.039	0.08
	2.54	1.02	0.51	0.25	0.13	0.063	0.10	0.20
10.0	10.00	4.00	2.00	1.00	0.50	0.25	0.394	0.79
	25.40	10.16	5.08	2.54	1.27	0.64	1.00	2.00
25.0	25.00	10.00	5.00	2.50	1.25	0.63	0.984	1.97
	63.50	25.40	12.70	6.35	3.18	1.59	2.50	5.00
50.0	50.00	20.00	10.00	5.00	2.50	1.25	1.969	3.94
	127.00	50.80	25.40	12.70	6.35	3.18	5.00	10.00
100.0	100.00	40.00	20.00	10.00	5.00	2.50	3.937	7.87
	254.00	101.60	50.80	25.40	12.70	6.35	10.00	20.00
200.0	200.00	80.00	40.00	20.00	10.00	5.00	7.874	15.75
	508.00	203.20	101.60	50.80	25.40	12.70	20.00	40.00
400.0	400.0	160.00	80.00	40.00	20.00	10.00	15.75	31.50
	1016.00	406.40	203.20	101.60	50.80	25.40	40.00	80.00
600.0	600.0	240.00	120.00	60.00	30.00	15.00	23.62	47.24
	1524.00	609.60	304.80	152.40	76.20	38.10	60.00	120.00
800.0	800.0	320.00	160.00	80.00	40.00	20.00	31.5	62.99
	2032.00	812.80	406.40	203.20	101.60	50.80	80.00	160.00
1,000.0	1000.0	400.00	200.00	100.00	50.00	25.00	39.37	78.74
	2540.00	1016.00	508.00	254.00	127.00	63.50	100.00	200.00

AC and DC MOTORS FOR MB2500 and MA2500 SERIES UNISLIDES

See Table VIII for Motor/UniSlide Compatibility

Constant scanning speed

Functional Classification 1A

Motor Type	Motor Model Number	Gear Ratio to 1	Motor Speed RPM	Rated Torque oz-in[12]
Bodine Type K Low Slip Induction Non-Synch 115V 60 Hz	727	1,800	0.9	120.0
	726	900	1.9	100.0
	724	300	5.6	95.0
	723	180	9.0	95.0
	722	120	13.0	95.0
	732	60	26.0	80.0
	731	30	52.0	59.0
	730	18	86.0	35.0
	729	12	130.0	24.0
	728	6	260.0	12.0
Bodine Type K Induction Synch 115v 60 Hz	767	1,800	1.0	120.0
	765	600	3.0	88.0
	776	180	10.0	72.0
	775	120	15.0	48.0
	774	72	25.0	29.0
	772	30	60.0	15.0
	771	18	100.0	8.9
Slo-Syn 23D	SS-25	1	72.0	30

Variable scanning speed

Functional Classification 1B

Motor Type	Motor Model No.	Gear Ratio to 1	Approx Speed Range RPM [11] Min.	Max.	Rated Torque oz-in[12]
Bodine Type K High Slip Induction 115V 60Hz w/Velmex 311 Control	744	600	0.5	2.3	95.0
	743	300	1.0	4.9	95.0
	741	120	2.0	10.0	88.0
	750	60	4.0	20.0	80.0
	749	30	8.0	40.0	44.0
	748	18	13.4	67.0	27.0
	747	6	40.0	200.0	8.9
Bod. Type 24A 130V PMDC[16]	0043	1	100.0	2500.0	24.00
Electro-Craft 284 DC Motor Tachometer-Generator[14]	116	180	1.4	28.0	>500
	113	100	2.5	50.0	>500
	109	50	5.0	100.0	440.0
	103	12.5	20.0	400.0	120.0
	102	6	41.7	833.0	56.0
	015	1	250.0	5,000	16.0
Pittman Type 9000 PM DC 24V with Dart Speed Control	S032	218	1.0	21.0	300
	S029	128	2.0	36.0	150
	S023	38	5.0	110.0	100
	S020	20	10.0	215.0	100
	S017	12	17.0	350.0	50.0

11. High slip induction motor speed range is affected by load.
12. MB2500 & MA2500 limited to 50lb. maximum thrust load on ball bearings
14. With Motomatic II Speed Control (See P7 - “Maximum RPM for lead screws”)
16. With Minarik SL-15 Speed Control or Equivalent

AC and DC MOTORS FOR MB4000 and MA4000 SERIES UNISLIDES

See Table VIII for Motor/UniSlide Compatibility

TABLE XII Constant scanning speed Functional Classification 1A

Motor Type	Motor Model Number	Gear Ratio to 1	Motor Speed RPM	Rated Torque oz-in[17]
Bodine	5463	450	3.8	640.0
Type 30R-D	5462	180	9.4	640.0
(In Line)[18]	5461	90	19.0	640.0
Non-Synch	5474	60	28.0	640.0
115V 60 Hz	5473	30	57.0	432.0
	5472	18	94.0	256.0
	5471	12	140.0	176.0
	5470	6	285.0	80.0
Bodine	0492	60	28.0	592.0
Type 34R-3F	0491	40	43.0	352.0
(Rt. Angle)	0487	30	58.0	368.0
Non-Synch	0490	20	86.0	336.0
115V 60 Hz	0489	15	113.0	320.0
	0488	10	173.0	272.0
Slo-Syn 23D	SS-91L	1	72.0	100.0
Slo-Syn 34D	SS-80	1	72.0	80.0

TABLE XIII Variable scanning speed Functional Classification 1B

Motor Type	Motor Model Number	Gear Ratio to 1	Approx Speed Range RPM Min	Max	Rated Torque oz-in[17]
Bodine	0199	450	0.2	5.6	640.0
Type 24A-D	0198	300	0.3	8.3	640.0
130V PMDC	0197	180	0.6	14.0	640.0
Gear Motors	0196	90	1.1	28.0	640.0
(In Line)[16,18]	0190	60	1.7	42.0	640.0
	0189	30	3.3	83.0	464.0
	0188	18	5.6	139.0	272.0
	0187	12	8.3	208.0	192.0
	0186	6	16.7	417.0	86.4
Bodine	0099	60	1.7	42.0	352.0
Type 24A-3F	0098	40	2.5	63.0	304.0
130V PMDC	0096	20	5.0	125.0	256.0
Gear Motors	0094	10	10.0	250.0	160.0
(Rt Angle)	0093	5	20.0	500.0	83.2
(16)					

AC and DC MOTORS FOR MB6000, MA6000 and MB9000 SERIES UNISLIDES

See Table VIII for Motor/UniSlide Compatibility

TABLE XIV Constant scanning speed Functional Classification 1A

Motor Type	Motor Model Number	Gear Ratio to 1	Motor Speed RPM	Rated Torque oz-in[17]
Bodine	5463	450	3.8	640.0
Type 30R-D	5462	180	9.4	640.0
(In Line)[18]	5461	90	19.0	640.0
Non-Synch	5474	60	28.0	640.0
115V 60 Hz	5473	30	57.0	432.0
	5472	18	94.0	256.0
	5471	12	140.0	176.0
	5470	6	285.0	80.0
Bodine	0492	60	28.0	592.0
Type 34R-3F	0491	40	43.0	352.0
(Rt. Angle)	0487	30	58.0	368.0
Non-Synch	0490	20	86.0	336.0
115V 60 Hz	0489	15	113.0	320.0
	0488	10	173.0	272.0
Sup. Elec 23D	SS-91L	1	72.0	100
Sup. Elec 34D	SS-241L	1	72.0	240

TABLE XV Variable scanning speed Functional Classification 1B

Motor Type Number	Motor Model	Gear Ratio to 1	Approx Speed Range RPM Min	Max	Rated Torque oz-in[17]
Bodine					
Type 32A-W	4152	20.40	4.9	123.0	736.0
130V PMDC	4151	13.80	7.2	181.0	496.0
Gear Motors	4150	9.40	10.6	266.0	336.0
(In Line)[15,18]	4149	5.48	18.2	456.0	192.0
	4148	3.79	26.4	660.0	96.0
Bodine					
Type 42A[19]	4035	1.00	100.0	2500	101.0

15. With Minarik 21251C Speed Control or Equiv.
16. With Minarik SL-15 Speed Control or Equiv.
17. MB4000 & MA4000 limited to 50 lb. maximum thrust load & MB6000, MA6000 and MB9000 limited to 100 lb. maximum thrust load on ball bearings.
18. Axis of output shaft of 30R-D, 24A-D, N1-D and 32A-W motors must be operated in horizontal plane. (Types N1-R, 24A-3F or 34R-3F Motor are suggested for vertical applications)
19. See Page 6 - “Maximum RPM for leadscrews”

Stepper Motor System Linear Translation Speed Chart (1.8° per step motors)

Inches/Minute

Centimeters/minute

Lead screw designation Leadscrew Designation			WF	W4 &P2.5	W2 & P5	W1 & P10	B & P20	C & P40	K1 & Q1	K2 & Q2
Travel per Revolution			1.00"	0.400"	0.200"	0.100"	0.050"	0.025"	1 mm	2 mm
1/2 Steps/Sec.(0.9")	RPM	RPS								
100	15	0.25	15.00	6.00	3.00	1.50	0.75	0.38	0.59	1.18
			38.10	15.24	7.62	3.81	1.91	0.95	1.50	3.00
500	75	1.25	75.00	30.00	15.00	7.50	3.75	1.88	2.95	5.91
			190.50	76.20	38.10	19.05	9.53	4.76	7.50	15.00
1000	150	2.50	150.00	60.00	30.00	15.00	7.50	3.75	5.91	11.81
			381.00	152.40	76.20	38.10	19.05	9.53	15.00	30.00
1500	225	3.75	225.00	90.00	45.00	22.50	11.25	5.63	8.86	17.72
			571.50	228.60	114.30	57.15	28.58	14.29	22.50	45.00
2000	300	5.00	300.00	120.00	60.00	30.00	15.00	7.50	11.81	23.62
			762.00	304.80	152.40	76.20	38.10	19.05	30.00	60.00
3000	450	7.50	450.00	180.00	90.00	45.00	22.50	11.25	17.72	35.43
			1143.00	457.20	228.60	114.30	57.15	28.58	45.00	90.00
4000	600	10.00	600.00	240.00	120.00	60.00	30.00	15.00	23.62	47.24
			1524.00	609.60	304.80	152.40	76.20	38.10	60.00	120.00
6000	900	15.00	900.00	360.00	180.00	90.00	45.00	22.50	35.43	70.87
			2286.00	914.40	457.20	228.60	114.30	57.15	90.00	180.00
8000	1200	20.00	1200.00	480.00	240.00	120.00	60.00	30.00	47.24	94.49
			3048.00	1219.20	609.60	304.80	152.40	76.20	120.00	240.00
Theoretical step resolution @ 400 1/2 steps/rev. See footnote 20 @400 1/2 steps/rev.										
Inches per Step			0.0025	0.001	0.0005	0.00025	0.00013	0.00006	0.0001	0.0002
Millimeters per Step			0.0635	0.0254	0.0127	0.00635	0.003175	0.00158	0.0025	0.0050
Microns per Step			63.5	25.4	12.7	6.35	3.175	1.5875	2.5	5.0

20. Actual incremental step resolution is dependent on system orientation, rigidity, friction and applied load.

UniSlide Programmable Control & Driver Models

NF90 Series

NF90-1 Operates 1 motor
NF90-2 Operates 2 motors, 1 at a time
NF90-3 Operates 3 motors, 1 at a time

VP9000 Series

VP9001 Operates 1 motor
VP9002 Operates 2 motors, 1 at a time
VP9003 Operates 3 motors, 1 at a time
VP9004 Operates 4 motors, 1 at a time

Selection guide for UniSlide Stepper Motor Controls

	UniSlide NF90	UniSlide VP9000
Type	Programmable control & driver	
Number of axes	1, 2 or 3[21.]	1, 2, 3 or 4[21]
Simultaneous motors	No[21.]	No[21]
Max. motor current	2A	5A
Step/Rev.	400	400
No. of Programs	1	31 or 62
Interface	RS-232[22.]	RS-232[22]
Aux.inputs/outputs	1/1	4/2
User RAM:		
Total bytes	101bytes	8K or 16K[23.]
Battery-backed	0	8K or 16K[23]
Program language	Special Single letter	Special Single letter
Stand alone operation	No	Yes
Manual Jog Inputs	Yes	Yes
Front panel position readout	No	Yes
Optional Encoder Interface	No	Yes

[21.] For additional motors, controls can be daisy chained together.
[22.] To interface a RS-232 controller with IEEE, see Serial/IEEE converter, page 39.
[23.] Optional

Understanding step motors and their controllers

Since 1980, Velmex has been noted for offering the best value in step motor controllers, and has been the pioneer of step motor controllers featuring two, three, and four axes of microprocessor-based indexer/drivers in a single enclosure.

Originally, step motor controllers/drivers were the resistance limited type (L/R) with large power supplies and current limiting resistors. These L/R step drives are noted for being simple and reliable, but very inefficient when the motor is energized and not stepping. To eliminate this wasted energy, Velmex step motor controllers utilize automatic motor power-down resulting in no power consumption when the motor(s) is at rest.

Another potential problem with step motor translator/drivers is position errors due to electrical noise coupling onto pulse inputs. A step motor translator can not discriminate between a valid step pulse and a extraneous electrical spike on its pulse input. When an electrical spike gets to the pulse input, the motor will make a step, putting it out of intended position. The opposite problem can occur when a legitimate step pulse is too weak or its duration too short for the translator to count. However, Velmex step motor controllers by design do not have translators. Instead of a translator (which converts a pulse to a phase change of voltage levels on each motor drive), the Controller's microcomputer is in total control of the voltage level on each phase of each motor drive.

Recent technological advancements have dramatically improved modern step motor controllers. The Velmex VP9000 series step motor controller/drivers is an example of modern electronics - controlled by a single chip microcomputer; alpha/numeric display; high power/efficient bi-level motor drives; front panel and computer programmable; encoder interface option; nonvolatile memory for program storage; remote jog/slew control; four axes in one compact enclosure.

The NF90 controller is low cost with desirable features like: RS-232 computer programmable; three axes in a small enclosure; jog/slew inputs; user input/output.

Answers to commonly asked questions about step motors

1. ***When should I use a step motor with a UniSlide Assembly?***

Step motors are preferred for incremental positioning or scanning when computer controlled motion is desired, complex motion requirements of more than one distance interval and/or speed, very fast or slow starts/stops, and fast reversing, for accurate speeds, for speed range requirements as high as 1 to 8000; and also, when a brushless motor is required.

2. ***Will the motor "lose" steps occasionally?***

Step motors do not "lose" steps. Step motors run synchronously to their phase switching speed. When an external motor load exceeds the running torque of the motor, then the motor will stall, and lose position much greater than one step. Poor wiring practice and full-stepping translators of 25 years ago were the contributors to this "losing step" phenomenon. Velmex step motor controllers eliminate the problems of low speed motor resonance by utilizing half-stepping and current control. The NF90, and VP9000 switch the motor drives directly, eliminating the sensitive pulse-to-motor translator link.

3. ***How do I insure the motor will not stall?***

Size the motor for the load and run the motor at a speed that provides 50% more torque than needed. By applying the load and increasing motor speed until a stall occurs will determine the actual torque required. By using the motor speed/torque curves for the particular Controller, maximum reliable operating speed can be determined.

4. ***When the motor stalls, is it damaging the motor?***

When the motor stalls (loses synchronism) the motor output torque drops very low, and the motor current drops slightly. There are not any mechanical parts that are slipping, only magnetic slippage occurs. The step motor is an ideal motor for torque limiting applications.

5. ***Why do you sell so many step motors and not servo motors for your UniSlide Assemblies?***

Closed loop servo systems have more complexity and cost without significant benefits when used with UniSlide assemblies. Servo motors have more torque at RPMs over 1000. However, the UniSlide lead screw/drive nut assembly has limited life at speeds over 1000 RPM, making high RPMs impractical. Ministep/microstep controllers provide smoothness typical of servos, but at less cost.

6. ***I cannot risk the chance of being out of position because the motor might stall. Shouldn't I use a closed loop servo system?***

You can use the VP9000 step motor controller with the encoder interface option. This option allows input from rotary encoders for redundant position checking. This type of position verification is more reliable than a servo with just an encoder for feedback. The VP9000 will index a motor in a preset manner while simultaneously counting encoder pulses. After the index ends the VP9000 compares its commanded distance to encoder counts, a flag is set if a discrepancy is found.

7. ***Why do step motors work well on UniSlides and not as well on other types of devices?***

Step motors need some frictional load to dampen the stepping. UniSlides have adequate residual friction, and the polymer lead screw nut helps absorb step vibration. The relatively small diameter lead screws used on UniSlides make the primary inertia very low compared to motor inertia, making very fast accelerations and decelerations possible. Step motors reach full torque in just one step. Therefore, variable loads and friction have a negligible effect on positional accuracy.

Indexer LPT and HPGL Controller (Part Nos. 4-923 and 4-936)

One method of motor control uses an IBM compatible computer as the motor indexer. *Indexer LPT* by Ability Systems[24] converts an ordinary printer card into a powerful multi-axis step motor controller. This software is ideally suited for a broad range of motion control applications, simple or complex. Compatible with numerous motor translator-drivers, Indexer LPT is easy to use and inexpensive.

Indexer LPT uses an installable device driver; it loads into your computer and stays resident until called. This driver receives ASCII characters masquerading as a disk file. It is compatible with BASIC, C, Pascal or DOS batch files.

Each printer port supports two axes of motion with signals for step, direction, reduced current, all windings off, high limit switch, low limit switch and auxiliary input. Using three printer ports, Indexer LPT controls up to six motors simultaneously. Any two axes can be used to draw circles and arcs with circular and linear interpolation. For more information, please contact our sales department

Also available is Ability Systems HPGL Controller. The *HPGL Controller* uses the commands contained in HPGL plot files to control motors for milling, routing, engraving, water jet cutting, laser etching, glue deposition, flame cutting, large scale template plotting or other operations where the motion of a tool must be directed of a specified path.

HPGL Controller low cost CAM software provides a convenient operator interface and includes features especially useful in managing production operations. Pop-up menus and easy-to-use manual positioning options allow you to position the tool for each job setup.

The HPGL Controller does not replace Indexer LPT. Rather, it uses Indexer LPT for all the machine signal input and output. The HPGL Controller generates Indexer LPT commands from the plot file created by CAD or drawing software.

The program is available in DOS and Windows versions. The Windows versions features Step and Repeat for manufacturing multiple parts in rows or columns. There is also support for four Z axis stages or heads to automatically compensate for X-Y offset position of the heads. In addition there is a tool path preview. For more information, please contact our sales department

Serial/IEEE 488 Converter Part No. 4-922

Serial/488A is a transparent interface between an IEEE 488 device, typically a computer, and a RS-232-equipped stepper motor control. It has a built in 32K buffer. It is packaged in a rugged all metal case, convenient for bench top and rack mount applications.

Specifications Serial Interface
The following parameters are switch selectable:
Data Bits, Stop Bits, Parity, Baud Rate
Electrical Characteristics: Supports RS-232 and RS-422
Duplex: Full with echo/no-echo
Connector: Accepts 25-Pin Sub-D male: DCE configured

Specifications IEEE 488 Interface
Terminator: Software selectable CR, LF, CR-LF, LF-CR and/or EOI
Connector: Standard IEEE 488 connector with metric studs

General
Data Buffer: 32K characters
Indicator: LEDs for Talk, Listen, Serial, Receive and Power
Controls: Power Switch (rear panel)
Internal DIP switches for serial and IEEE parameters
Weight 1 kg. Dimensions: 7.5” x 5.4” x 2.7”
Power: 105-125V or 210-250V, 50, 60 HZ: 10 VA MAX

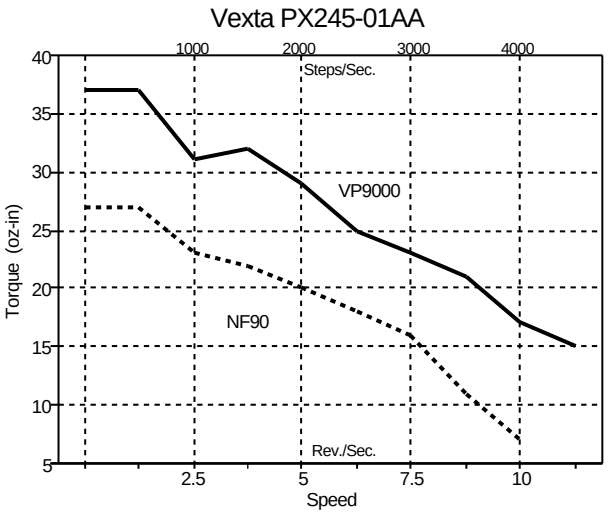
Serial/IEEE 488 Converter.

24. Ability Systems, Roslyn, PA 19001

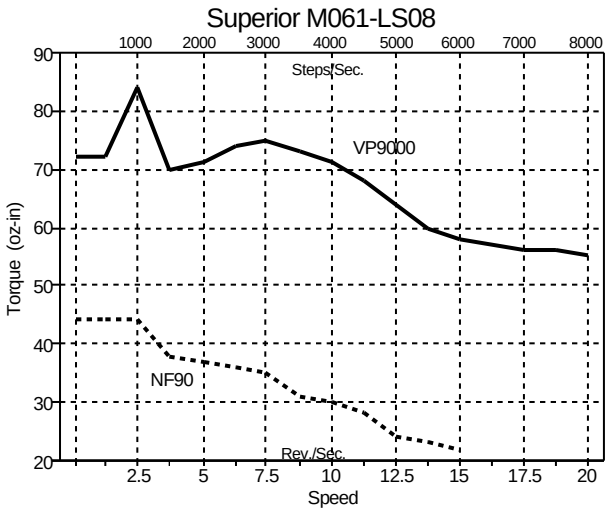
Torque/Speed Curves

These graphs display step motor torque vs. shaft speed for different motors used with NF90 and VP9000 Controllers. Please note “Steps/Sec.” are 1.8° motors in half-step mode (400 steps per revolution).

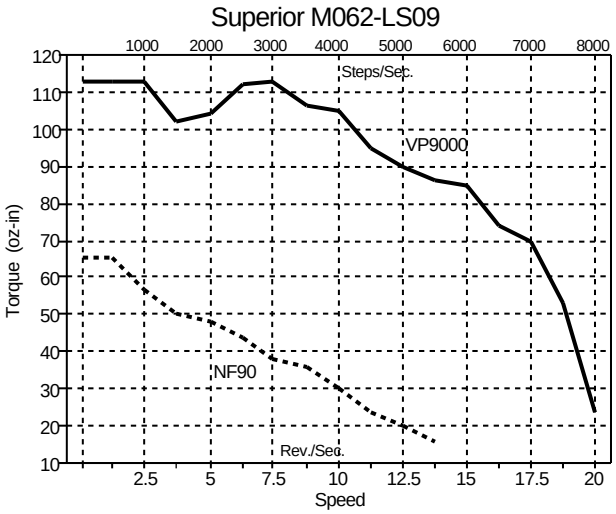
Please consult with our Technical Sales Department for curves on other motors.



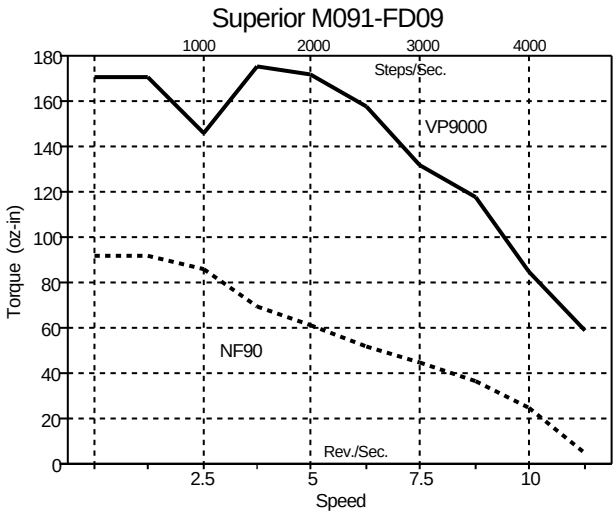
Vexta PX245-01AA motor.



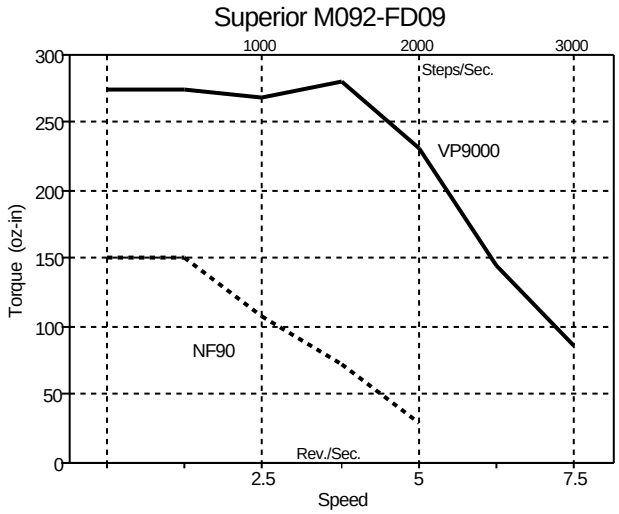
Superior Electric MO61-LS08



Superior Electric MO62-LS09



Superior Electric MO91-FD09



Superior Electric MO92-FD09

Model NF90 Controller

The NF90 is a low cost programmable stepping motor controller for running three motors, one-at-a-time. The Controller incorporates a single chip "Super Microprocessor" that has on-chip RAM. The RAM is available for temporary storage of a user-entered program and motion parameters.

Commands and data are entered through the RS-232 interface from a host computer, terminal, or programmable controller. Specialized Commands provide simple and efficient entry of a complex, yet compact, program.

Features

- ✓ A complete microprocessor-based Controller with motor drives for one, two, or three motors.
- ✓ Low cost and small size
- ✓ 400 steps per revolution (0.9° step angle) resolution
- ✓ Linear type motor and logic power supplies result in low Electromagnetic Interference (EMI).
- ✓ A Digitizing function can be utilized with a host terminal connected as a readout of motor position.
- ✓ A three wire RS-232 allows a host to enter Commands (ASCII characters) and Data, Poll for status, and Read Position information. A ten-foot serial cable with a 25 to 9 pin adapter for PCs comes standard.
- ✓ The NF90 will run in an interactive or stand-alone mode.
- ✓ Acceleration/Deceleration settable from 2,000 to 100,000 steps/sec^2 in 2,000 step/sec^2 increments.
- ✓ Speed programmable from 1 to 6000 steps/sec. in 1 step/sec increments. NOTE: Most motors have low torque above 2000 steps/sec.
- ✓ Incremental Index distance is programmable from ±1 to ±1,048,575 steps.
- ✓ Programmable Return-to-Zero position.
- ✓ Six powerful Loop Commands provide from one to continuous repeat operations, performing simple functions like auto-reverse, raster scans and other complex XY matrix patterns.
- ✓ Programmable pauses from 100 milliseconds to 13 minutes.
- ✓ A User Output can be programmed to turn On and Off an external solid state relay, or interface to other logic level devices.
- ✓ A User Input can be utilized in a program as a WAIT for external switch or relay closure.
- ✓ Backlash Compensation can be set to automatically finish every index approaching from the positive direction.
- ✓ Run, Limit switch, Remote Jog, Output, Input, RS-232 and Motor connections are accessible at unpluggable connectors on the front panel.
- ✓ Optional push-button jog controller available.
- ✓ RS-232 baud rate settings are switch settable to 300, 1200, 4800, or 9600.
- ✓ Terminal, Diagnostic, LabVIEW drivers, and BASIC, C, and Pascal Example Programs for PCs on diskette are included.

Features continued

- ✓ A User program can be put in EPROM by Velmex for a nominal fee.
- ✓ As many as 255 controllers can be "daisy-chained" together allowing the host to address each one from just one serial port.
- ✓ The NF90 can be set to signal the host when a limit switch has been encountered.
- ✓ Automatic Power Down reduces power consumption by de-energizing the motors when at a standstill.
- ✓ Single Step mode is provided for debugging a program or as a controlled interrupt.
- ✓ Completely wired and tested for direct connection to UniSlide Motors /Assemblies.
- ✓ The NF90 can be polled for its status at any time; additionally a prompt ("^") is automatically sent to the host when a program has finished.
- ✓ The NF90 can be programmed to send a pulse or character at preset distances without stopping or slowing the motor.
- ✓ Motor position can be read while motor is in motion.
- ✓ Limit Switches for CW and CCW directions are provided with plug-in connection to UniSlide limit switch assemblies. Limits can be used for "homing."
- ✓ Two year Limited Warranty.

SPECIFICATIONS

Functional

Packaged Controller/Driver, using Microcomputer control of stepping motors. Unipolar series resistance (L/R) driver. Operates one to three (dependent on model) motors, one-at-a-time.
Interactive limit switch inputs (TTL), (CW and CCW for each axis).
One User Input (0V to +3V min., -25V to +25V max.), and one User Output (0 or +5V, 10 mA sinking and 3 mA sourcing capability).
Programming through full-duplex RS-232-C; 300,1200,4800,9600 Baud (switch settable), 7 Data bits, Even parity, 2 Stop bits, ASCII; special configurations with 8 data bits, odd or no parity, are available.
User available RAM can store up to 33 different moves per Run.
Remote Run and Jog Inputs (TTL).
Eight foot motor and limit switch cables with connectors.

Motor Compatibility

1.8° PM 6 or 8 lead stepping motors, 4.7 Amp/phase max. Factory matched for a particular motor current, motors on each axis to be the same Amp/phase value.

Physical

Weight: 7.2 lbs. (3.2 kg)
Height: 5.0 inches (12.7 cm)
Width: 10.8 inches (27.4 cm)
Depth: 7.8 inches (19.8 cm)

Electrical Requirements

90 to 130 VAC 50/60Hz, 150 watts
210-250V 50 Hz. available on request

Environmental

35° to 95° F (2° to 35° C) Convection cooled

Models

Model # NF90-1 One motor version
Model # NF90-2 Two motor version
Model # NF90-3 Three motor version

Options

Remote Manual Push-button Control
19" Rack Mount Kit
Mouse control for NF90-1& NF90-2 on next page

Command Summary

Command	Function
I*m***M***x*	Set steps to **I**ndex a motor CW (positive), *m*= motor# (1,2,3), *x*=1 to 1048575
I*m***M-***x*	Set steps to **I**ndex a motor CCW (negative), *m*= motor# (1,2,3), *x*=1 to 1048575
I*m***M0**	**I**ndex a motor to absolute zero position, *m* =motor# (1,2,3)
S*m***M***x*	Set **S**peed of a motor, *m* = motor# (1,2,3), *x*=1 to 6000 steps/sec.
A*m***M***x*	**A**cceleration/deceleration, *m* = motor# (1,2,3), *x* =1 to 50
L0	Loop continually from the beginning
L-0	Sets the **L**oop-to-marker at the current location in the program
L*x*	**L**oop from beginning or Loop-to-marker *x*-1 times (*x* =2 to 255)
L-*x*	**L**oop from beginning or Loop-to-marker *x*-1 times, alternating direction of motor 1
LM-2	**L**oop once from beginning or Loop-to-marker reversing index direction of motor 2
LM-3	**L**oop once from beginning or Loop-to-marker reversing index direction of motor 1 and motor 2
P*x*	**P**ause *x* tenths of a second and output if output enabled (*x* =0 to 8191, 10 µsec pause when *x* =0)
U0	Wait for a "high" on the user input
U1	Wait for a high on the user input, holding the user output high while waiting
U2	Disable user output when pausing
U3	Enable output when pausing (reset state)
U4	User output "low"
U5	User output high
U6	Send "W" to host and wait for a "G" to continue

Command	Function
U7	Start of Continuous Index with pulse output
U8	Start of Continuous Index sending "@" to the host
U9	End of Continuous Index
B*x*	**B**acklash compensation, compensation on when *x* =1, off when *x* =0
O*x*	Indicate limit switch **O**ver-travel to host, off when *x* =0, NF90 sends "O" when *x* =1 and a limit switch is encountered
Q	**Q**uit On-Line mode (return to Jog/Slew mode)
R	**R**un program
N	**N**ull (zero) motors 1,2,3 absolute position registers
K	**K**ill operation in progress
V	**V**erify Controller's status, NF90 sends "B" to host if busy, or "R" if ready
C	**C**lear program from memory
D	**D**ecelerate to a stop (interrupts current index in progress)
E	**E**nable On-Line mode with echo on
F	Enable On-Line mode with echo o**FF**
G	**G**o after waiting or holding
H	Put Controller on **H**old (single step mode)
X	Send position of motor 1 to host
Y	Send position of motor 2 to host
Z	Send position of motor 3 to host

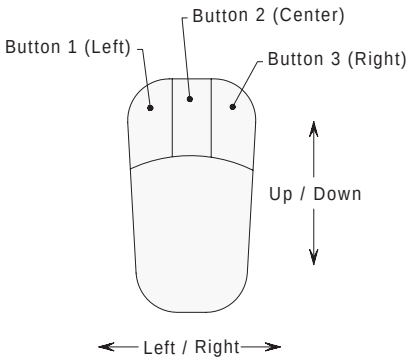
The following are for NF90s that are daisy-chained together:

[*x***]**	Send commands to the next NF90 in the "chain", *x* are any of the above commands
&	Enable multiple NF90s that are daisy-chained

Mouse Control for NF90 Series Controllers

The NF90 Proportional Speed/Distance Mouse provides a precise efficient one, two, three, or four axis variable speed positioning system when used with one or two modified NF90 Stepping Motor Controllers. The Mouse is a three button electromechanical encoder type with special modifications for use with Velmex NF90 Controllers. To achieve simultaneous motion two NF90 Controllers are required for this system. The NF90s can be either one or two axis versions. The mouse works in two modes, proportional speed or proportional distance, that are button/switch (user option) selectable. In the speed mode, motor speed and direction are proportional to how far the mouse is moved; the further the mouse is moved the faster the motor will slew. In the distance mode, the motor moves a distance and direction proportional to the mouse position; every mouse pulse will step the motor a step.

The center and right mouse buttons enable the motors to move. Motor speed and distance is determined by moving the mouse when the button(s) are depressed. The motor(s) will only move when both the mouse button(s) and the mouse is moved from the position where the button(s) was pressed. Releasing the button(s) anytime a motor is moving will cause a rapid controlled deceleration of the motor(s) to a stop.



VP9000 Programmable Stepping Motor Controller

The VP9000 is a complete, powerful stepping motor controller/driver, capable of running up to four motors, in one compact package. The VP9000 is fully front panel and RS-232 programmable. Commands and data are entered either through the RS-232 interface or selected with the front panel keyboard. Motor position(s), setup parameters, and menus are viewed on the front panel display. 31 programs (over 1900 moves) can be entered into nonvolatile memory. An optional encoder interface is available for automatic motor stall detection.

Features

- Completely wired and tested for direct connection to UniSlide motors/Assemblies.
- Linear type motor and logic power supplies provide low Electromagnetic Interference (EMI).
- Motor position can be read while motor is in motion.
- Automatic Power Down reduces power consumption by de-energizing the motors when at a standstill. Motor 1 can be set to stay energized when at a standstill.
- A Digitizing function can be utilized with the front panel display, or with a host computer or terminal.
- A Jog Controller (included) allows motors to be jogged manually one step or slewed up to full speed.
- Front Panel Readouts can be set to display motor position in "real" units for various Lead Screw pitches and Rotary Table gear ratios.
- "Friendly" error messages displayed on front panel simplify troubleshooting.
- Terminal/Editor, Diagnostic and BASIC, C, and PASCAL Example Programs for DOS PCs on diskette are included.
- The VP9000 can run in an interactive or stand-alone mode.
- Acceleration/Deceleration is programmable from 1,000 to 127,000 steps/sec^2 in 1,000 step/sec^2 increments.

- Speed is programmable from 1 step/ 2 sec to 8000 steps/sec in 1 step/sec increments.
- Incremental and Absolute Index distances are programmable from ±1 to ±16,777,215 steps.
- Programmable Home to Limit and Zero Position commands.
- The VP9000 stores thirty-one different programs (total of 1984 different moves), or an optional sixty-two program version.
- Jump-to a different program and Jump-to-and-return commands allow programs to be extensions and subroutines to other programs.
- Nine powerful Loop Commands provide from one to continuous repeat operations, performing simple functions like auto-reverse to raster scans and other complex X,Y matrix patterns.
- Programmable pauses from 100 milliseconds to 109 minutes in 100 millisecond intervals, and 0.1 milliseconds to 6.5535 seconds in 0.1 millisecond intervals.
- Two User Outputs can be programmed to turn On and Off an external solid state relay, or interface to other logic level devices.
- Two User Inputs can be utilized in a program as WAITs for an external logic "low" level, external switch, or relay closure.
- Special Inputs provide interruption of WAIT or motion commands. An interrupt will decelerate a running motor to a stop, or terminate a WAIT command and transfer control to a user specific program.
- A user programmable counter can totalize over four billion counts and display total on the front panel.
- The VP9000 can be programmed to send a pulse or character at preset distances without stopping or slowing the motor. Up to 6 speeds can be preset to change "on the fly".
- Backlash Compensation can be set to automatically finish every index approaching from the positive direction.
- Single Step mode is provided for debugging a program or as a controlled interrupt.
- The VP9000 can be polled for its status at any time; additionally a prompt ("^") is automatically sent to the host when a program has finished.
- Multiple controllers can be "daisy-chained" together, allowing the host to address each one from just one serial port.
- Limit Switches for CW and CCW directions are provided with plug-in connection to UniSlide limit switch assemblies. Limits can be used for "homing"; unused limit switch inputs can be software disabled.
- The VP9000 can be set to signal the host when a limit switch has been encountered.
- Extensive self testing built in.
- Compact Enclosure, rack mountable, with no fans or vent openings.
- A twelve-foot serial communication cable, and 25 to 9 pin adapter for PCs comes standard.
- 2 year Limited Warranty.

Specifications

Functional

Packaged Controller/Driver, 400 steps per revolution (0.9° step angle) resolution. Operates one to four (dependent on model) motors, one-at-a-time. Bi-level motor drives, settable holding torque for motor one. Interactive limit switch inputs (TTL), (CW and CCW for each axis).

User input 1 active high (0V to +3V min., -25V to +25V max.), Input 2 is TTL active low, and two user outputs (0 or +5V, 10 mA sinking and 3 mA sourcing capability).

Wide viewing angle, 2 line x 24 character, backlit, supertwist LCD readout for motor position display and data selection.

Six key calculator quality keyboard for cursor control, display selection, and 0 entry.

Front panel programmable or through a full-duplex three wire RS-232-C; 300,1200,4800,9600 Baud (settable), 7 Data bits, Even parity, 2 Stop bits, ASCII.

User available NVRAM for program storage is 7936 bytes.

Remote Run, Reset, Two Interrupt input.

Inputs to count quadrature converted pulses from multiplexed encoder.

Ten-foot motor and limit switch cables with connectors.

Electrical Requirements

90-130 VAC, 50/60 Hz operation standard.
190-260 VAC, 50/60 Hz operation is optional.

Motor Compatibility

American Precision: 23D-6108A, 23D-6209A, 23D-6309A, 34D-9109A, 34D-9209A, 34D-9311A
Bodine Electric: 2430, 2530, 2431, 2531, 2411, 2511, 2433, 2533, 2434, 2534, 2435, 2535
Superior Electric: MO61-LS08, MO62-LS09, MO63-LS09, MO91-FD09, MO92-FD09, MO93-FD11
Vexta: PX245-01, PX245M-01, PX245-02, PX245M-02, PK245-01, PK245M-01
Other motors on request

Physical

- Weight: 22 lbs. (10 kg)
- Height: 5.2 inches (13.2 cm)
- Width (without handles): 8.5 inches (21.6 cm)
- Depth (without handles): 14.3 inches (36.3 cm)

Environmental

- 35° to 95° F (2° to 35° C) Convection cooled

Models

Cat #	Model #	Version
4-911	VP9001	One motor
4-912	VP9002	Two motor, one-at-a-time.
4-913	VP9003	Three motor, one-at-a-time.
4-914	VP9004	Four motor, one-at-a-time.

Options

Cat. # 4-918, 19" Rack Mount Extension Plates
Cat. # 4-919, Encoder Interface Module for 1-4 motors

VP9000 Command Summary

Motion Commands

I*m***M***x* Set steps to incremental **I**ndex motor CW (positive), *m*= motor# (1,2,3,4), *x*=1 to 16,777,215

I*m***M-***x* Set steps to incremental **I**ndex motor CCW (negative), *m*= motor# (1,2,3,4), *x*=1 to 16,777,215

IA*m***M**x Set **A**bsolute **I**ndex distance, m=motor# (1,2,3,4), x= ±1 to ±16,777,215 steps

IA*m***M0** **I**ndex motor to **A**bsolute zero position, *m*=motor# (1,2,3,4)

IA*m***M-0** Zero motor position for motor# *m*, *m*= 1,2,3,4

I*m***M0** **I**ndex motor until positive limit is encountered, *m*=motor# (1,2,3,4)

I*m***M-0** **I**ndex motor until negative limit is encountered, *m*=motor# (1,2,3,4)

S*m***M***x* Set **S**peed of motor (70% of power applied to motor), *m*= motor# (1,2,3,4), *x*=0 to 8000 steps/sec. 0 being 1 step/ 2 sec.

SA*m***M***x* Set **S**peed of motor and **A**scend to 100% power, *m*= motor# (1,2,3,4), *x*=0 to 8000 steps/sec. 0 being 1 step/ 2 sec.

A*m***M***x* **A**cceleration/deceleration, *m*= motor# (1,2,3,4), *x*=1 to 127; 1 is 1000 steps/sec^2, 2 is 2000 steps/sec^2, 127 is 127000 steps/sec^2, etc.

Looping Commands

L0 **L**oop continually from the beginning or Loop-to-marker of the current program

LM0 Sets the **L**oop-to-marker at the current location in the program

LM-0 Resets the **L**oop-to-marker to the beginning of the current program

L*x* **L**oop from beginning or Loop-to-marker *x*-1 times (*x*=2 to 65,535), when the loop reaches its last count the non-loop command directly preceding will be ignored

L-*x* **L**oop from beginning or Loop-to-marker *x*-1 times, alternating direction of motor 1, when the loop reaches its last count the non-loop command directly preceding will be ignored

LA*x* **L**oop **A**lways from beginning or Loop-to-marker *x*-1 times (*x*=2 to 65,535)

LA-*x* **L**oop **A**lways from beginning or Loop-to-marker *x*-1 times, alternating direction of motor 1

LM-2 **L**oop once from beginning or Loop-to-marker reversing index direction of motor 2

LM-3 **L**oop once from beginning or Loop-to-marker reversing index direction of motor 1 and motor 2

Miscellaneous Commands

P*x* **P**ause *x* tenths of a second (*x*=0 to 65,535, 10 msec pause when *x*=0)

PAx **P**ause x tenths of a second **A**ltering output 1 high for duration of the pause (x=0 to 65,535, 10 msec pause when x=0)

P-*x* **P**ause *x* tenths of a millisecond (*x*=0 to 65,535)

PA-x **P**ause x tenths of a millisecond **A**ltering output 1 high for duration of the pause (x=0 to 65,535)

B*x* **B**acklash compensation, compensation on when *x*=1, off when *x*=0

O*x* Indicate limit switch **O**ver-travel to host, off when *x*=0, VP9000 sends "O" when *x*=1 and a limit switch is encountered

PM*x* Select **P**rogra**m** number *x*, *x*= 0 to 30

PM-*x* Select and clear all commands from **P**rogra**m** number *x*, *x*= 0 to 30

PM Request the number of the current **P**rogra**m**

J*x* Jump to the beginning of program number *x*, *x*= 0 to 30

JM*x* Jump to the beginning of program number *x* and come back for **M**ore after program *x* ends, *x*= 0 to 30

User I/O Commands

U0 Wait for a "high" on user input 1

U1 Wait for a high on user input 1, holding user output 1 high while waiting

U2 Enable Jog mode while waiting for an input

U3 Disable Jog mode while waiting for an input

U4 User output 1 "low" (reset state)

U5 User output 1 high

U6 Send "W" to host and wait for a "G" to continue

U7 Start of Continuous Index with pulse on output 2

U8 Start of Continuous Index sending "@" to the host

U9 End of Continuous Index

U10 Wait for a low on input 2

U11 Wait for a low on input 2, holding user output 2 high while waiting

U12 Wait for a keyboard key to jump to a program or continue: ← key to jump to program #21, → key to jump to program #22, ↓ key to jump to program #23, ↑ key to jump to program #24, 0 or SEL key to proceed in current program

U13 Wait for a button on Remote Control to jump to a program or continue: 1- key to jump to program #25, 1+ key to jump to program #26, 2- key to jump to program #27, 2+ key to jump to program #28, ▭ key to proceed in current program

U14 **U**ser output 2 low (reset state)

U15 **U**ser output 2 high

U16 Wait for ← key to be pressed on front panel keyboard

U17 Wait for → key to be pressed on front panel keyboard

U22 Wait for a keyboard key to jump to a program and come back, or continue: ← key to jump to program #21 and come back, key → to jump to program #22 and come back, key ↓ to jump to program #23 and come back, key ↑ to jump to program #24 and come back, 0 or SEL key to proceed in current program

U23 Wait for a button on Remote Control to jump to a program and come back, or continue: 1- key to jump to program #25 and come back, 1+ key to jump to program #26 and come back, 2- key to jump to program #27 and come back, 2+ key to jump to program #28 and come back, ▭ key to proceed in current program

U30 Wait for a high to low transition on user input 1

U31 Wait for a high to low transition on user input 1, holding user output 1 high while waiting

U32 Wait for 1- button to be pressed on Remote Control

U33 Wait for 1+ button to be pressed on Remote Control

U40 Wait for a low to high transition on input 2

U41 Wait for a low to high transition on input 2, holding user output 2 high while waiting

U50 Wait for a high and low on user input 1 with debouncing for a mechanical push-button switch

U51 Wait for a high and low on user input 1 with debouncing for a mechanical push-button switch, holding user output 1 high while waiting

U60 Wait for a low and high on user input 2 with debouncing for a mechanical push-button switch

U61 Wait for a low and high on user input 2 with debouncing for a mechanical push-button switch, holding user output 2 high while waiting

U70 Zero counts in user programmable counter

U71 Display user programmable counts "on"

U72 Display user programmable counts "off"

U73 Increment user programmable counter by one

U90 Wait for Run input

Single Character Commands

Q **Q**uit On-Line mode (return to Jog/slew mode)

R **R**un currently selected program

N **N**ull (zero) motors 1,2,3,4 absolute position registers

K **K**ill operation in progress and reset user outputs

V **V**erify Controller's status, VP9000 sends "B" to host if busy, "R" if ready, or "J" if in the Jog/slew mode

C **C**lear all commands from currently selected program

D **D**ecelerate to a stop (interrupts current index in progress)

E **E**nable On-Line mode with echo "on"

F Enable On-Line mode with echo "o**FF**"

G Same as "F" except <Cr> is added as termination character

H Put Controller on **H**old (single step mode)

X Send position of motor 1 to host

Y Send position of motor 2 to host

Z Send position of motor 3 to host

T Send position of motor 4 to host

M Request **M**emory available for currently selected program

Request the **number** of the currently selected motor

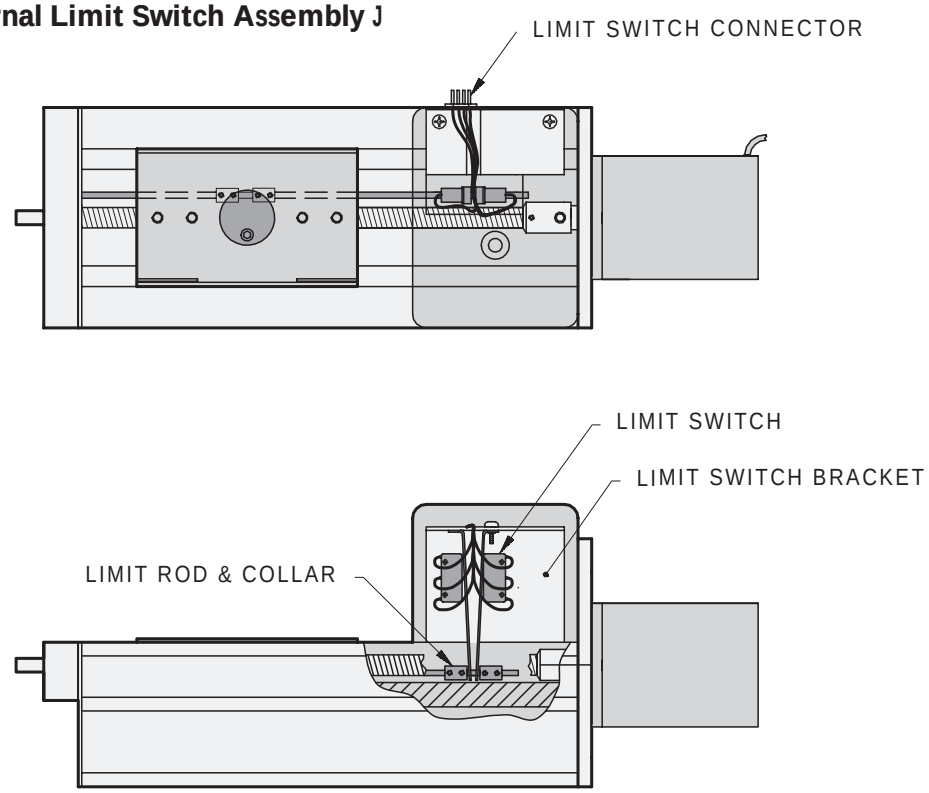
% Requests encoder/motor status from last index, VP9000 sends: **=** when motor counts and encoder counts are **equal**, **<** when encoder counts are **less** than motor counts (motor stall), **>** when encoder counts are **greater** than motor counts (motor overshoot)

{*x***}** Send commands to the next VP9000 in the "chain", *x* are any of the previous commands

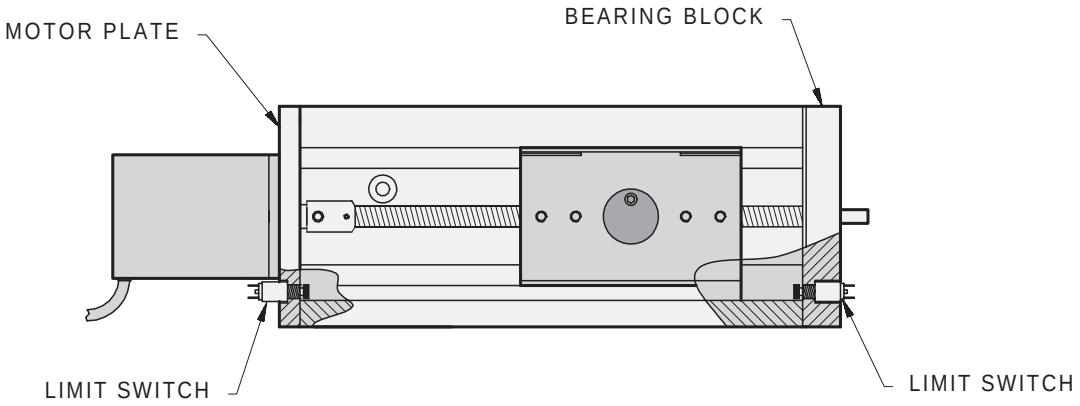
& Enable multiple VP9000s that are daisy chained

***** Request position when last motor was interrupted with a "D" command or user Input 4

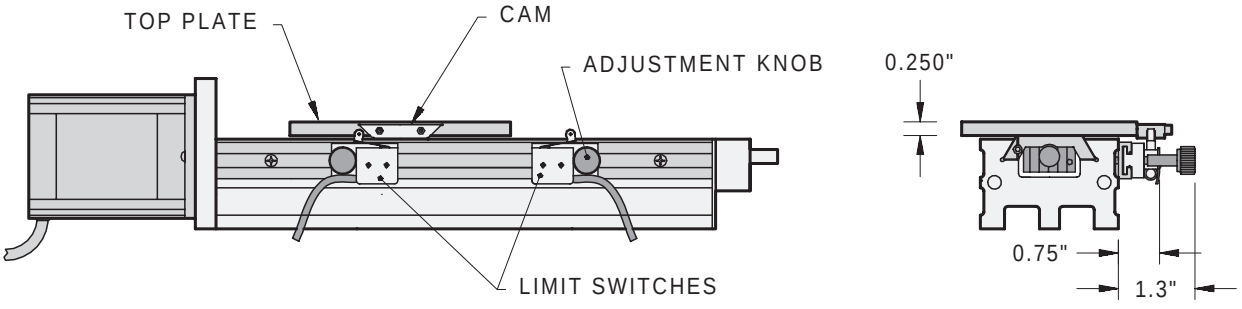
Internal Limit Switch Assembly J



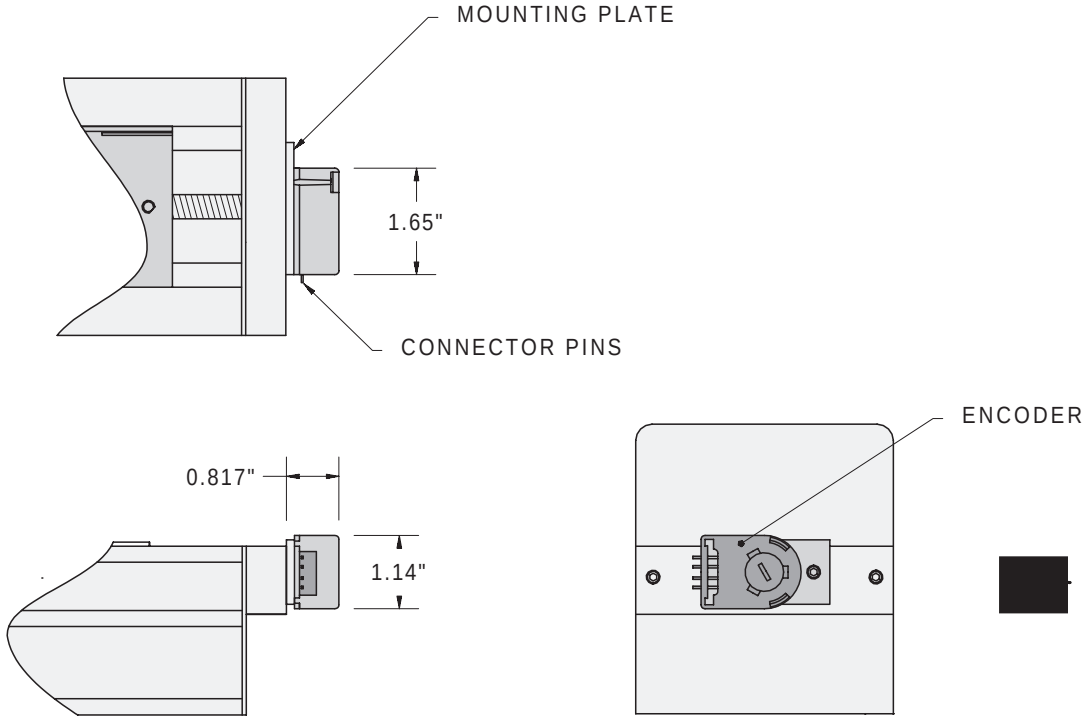
Fixed End-of-Travel Limit Switch Assembly (Part No. 3-934)



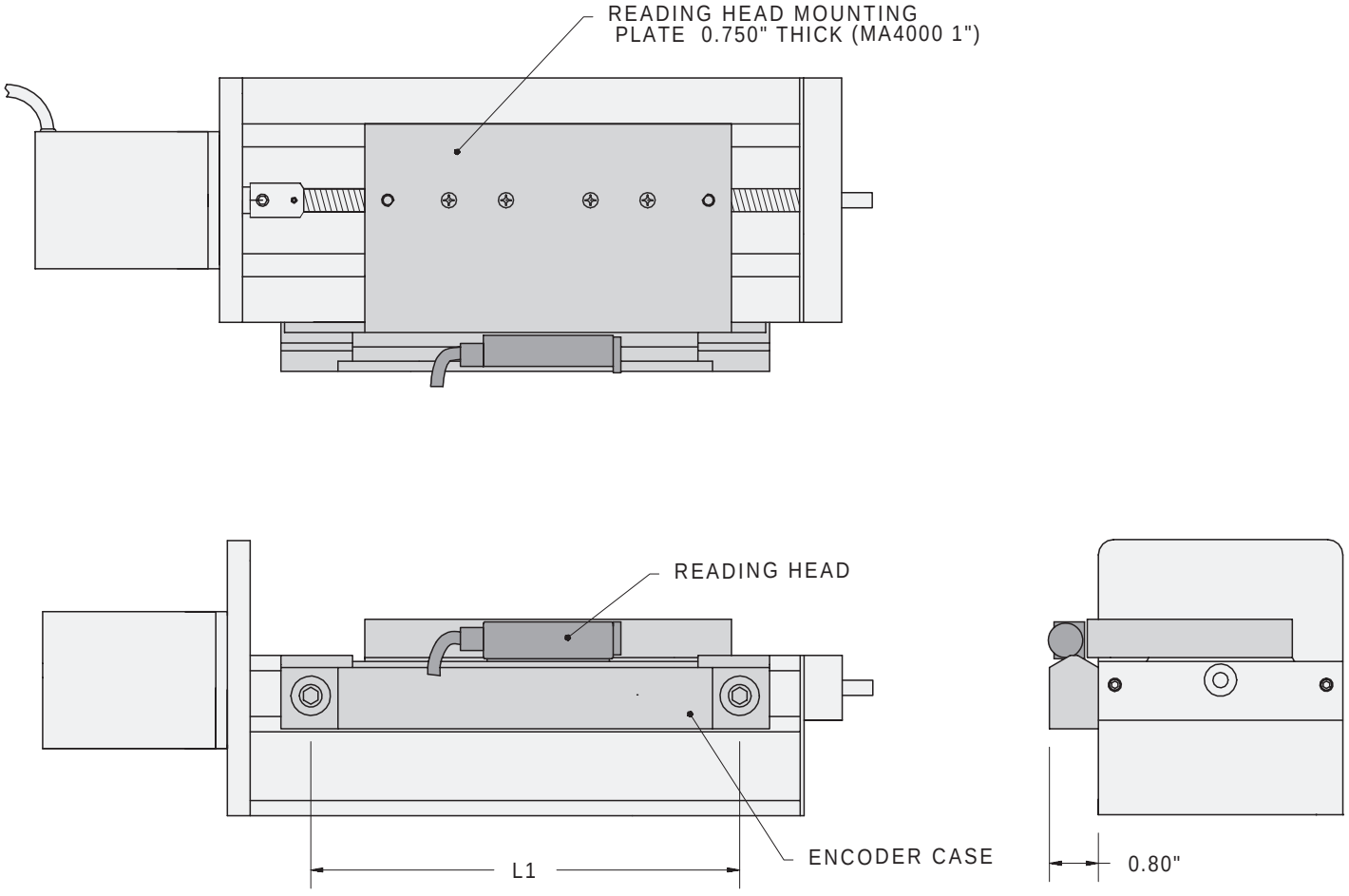
Outboard Limit Switch Assembly (Part No. 3-8515)



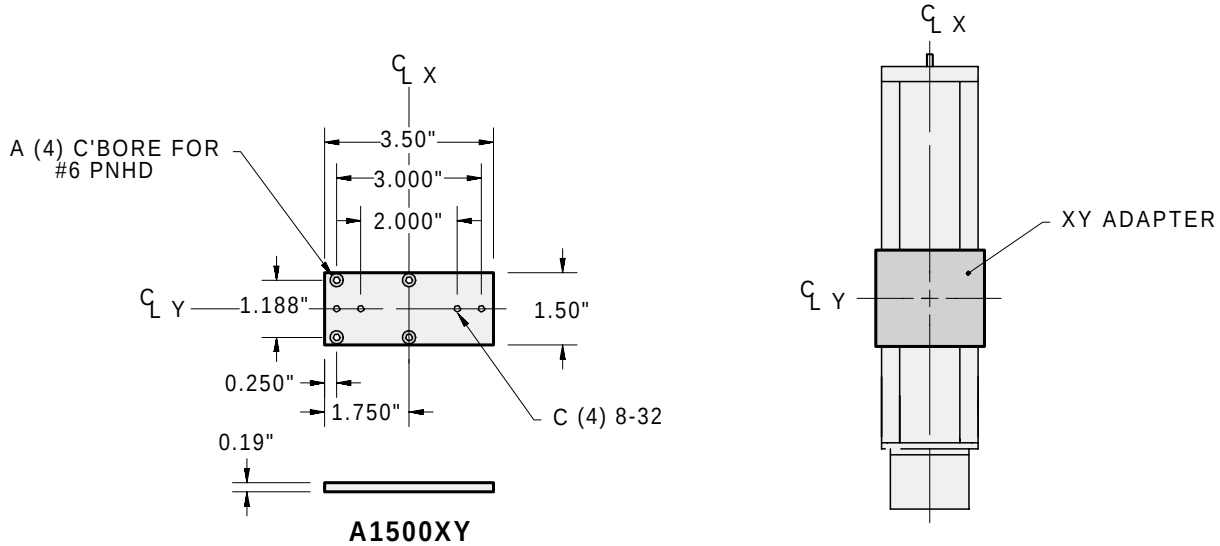
Rotary Encoders (Part No. 3-918E Encoder only or No. 3-918 Encoder with LCD Readout)



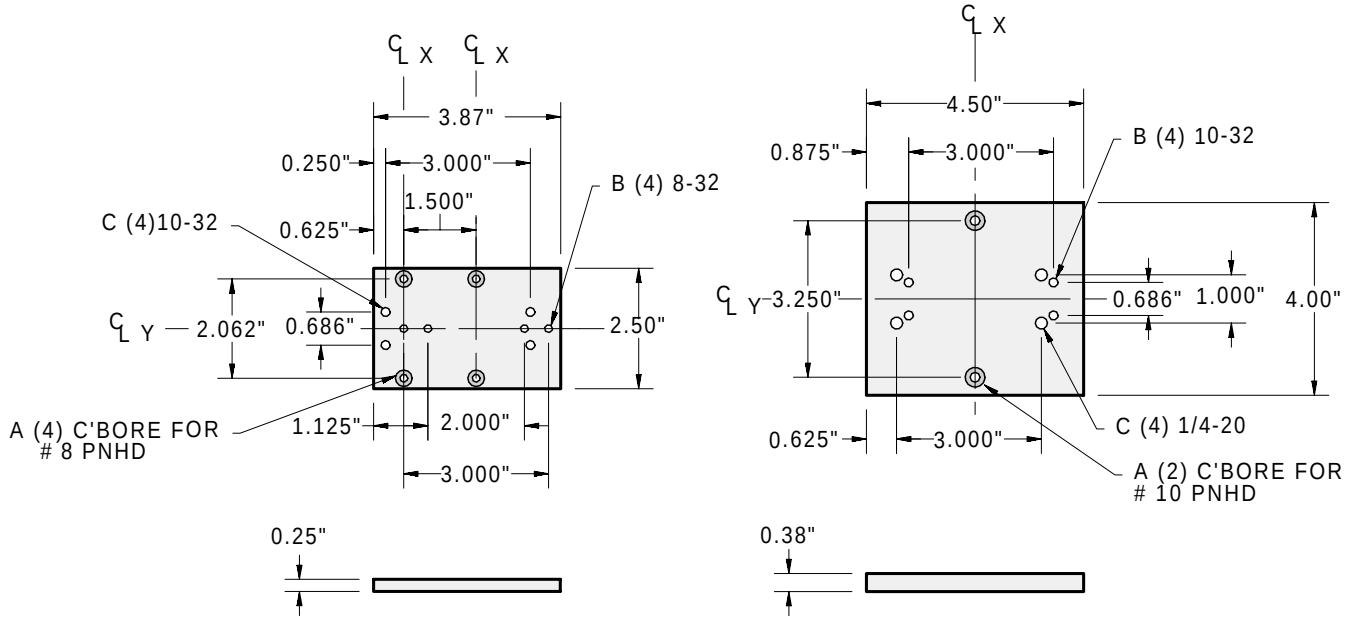
ACU-RITE Linear Encoder Consult factory for Part No. and Pricing)



XY Adaper Plates



A1500XY
Part No. 3-7308



A2500XY
Part No. 3-7310

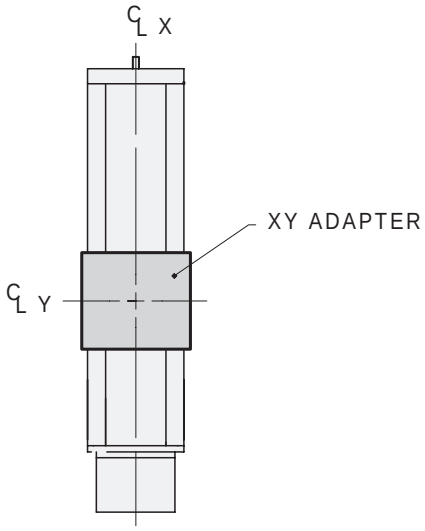
A4000XY
Part No. 3-7311

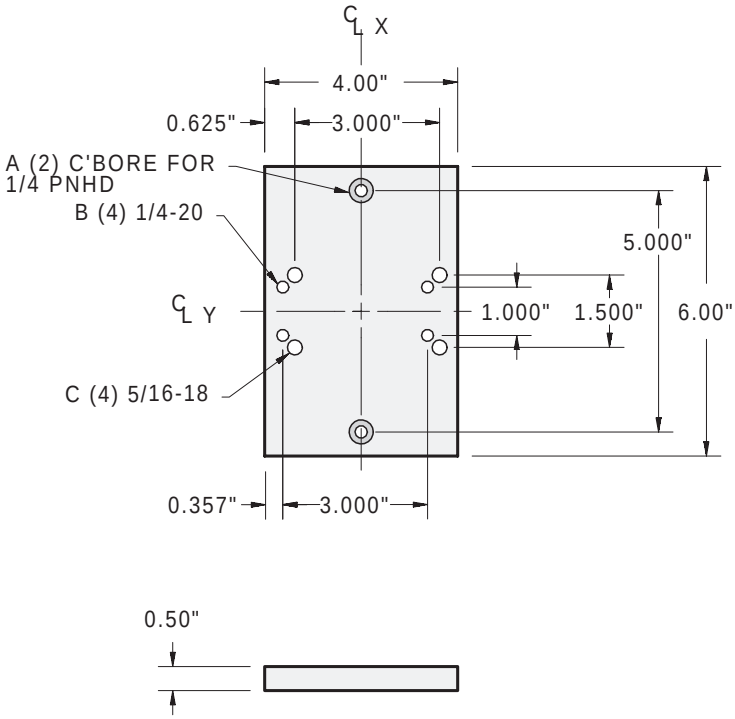
A = FOR MOUNTING TO LOWER "X" UNISLIDE

B = FOR MOUNTING TO UPPER "Y" UNSLIDE OF NEXT SMALLER SERIES

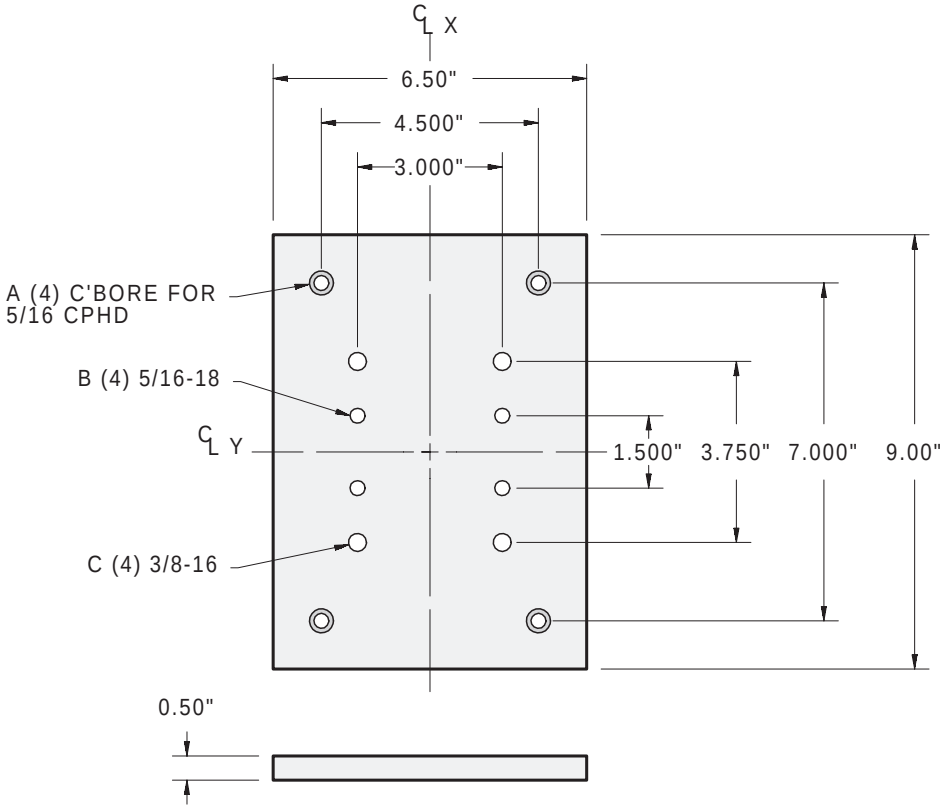
C = FOR MOUNTING TO UPPER "Y" UNISLIDE OF THE SAME SERIES

XY Adaper Plates





A6000XY
Part No. 3-761



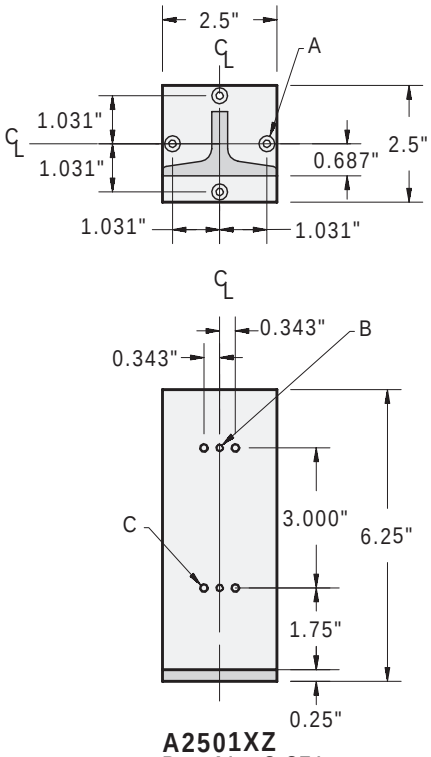
B9000XY
Part No. 3-854

A = FOR MOUNTING TO LOWER "X" UNISLIDE

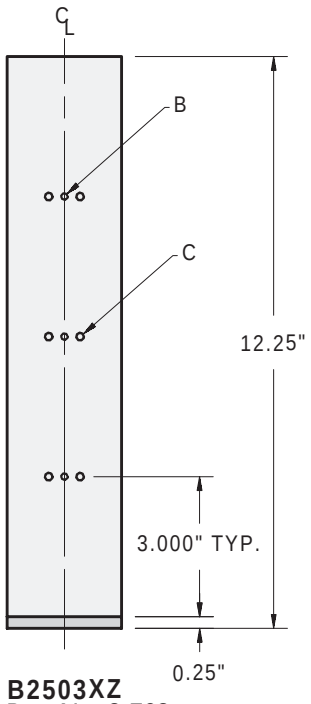
B = FOR MOUNTING TO UPPER "Y" UNSLIDE OF NEXT SMALLER SERIES

C = FOR MOUNTING TO UPPER "Y" UNISLIDE OF THE SAME SERIES

XZ Adapter Brackets for Series MB/MA2500 and MB/MA4000



A2501XZ
Part No. 3-851

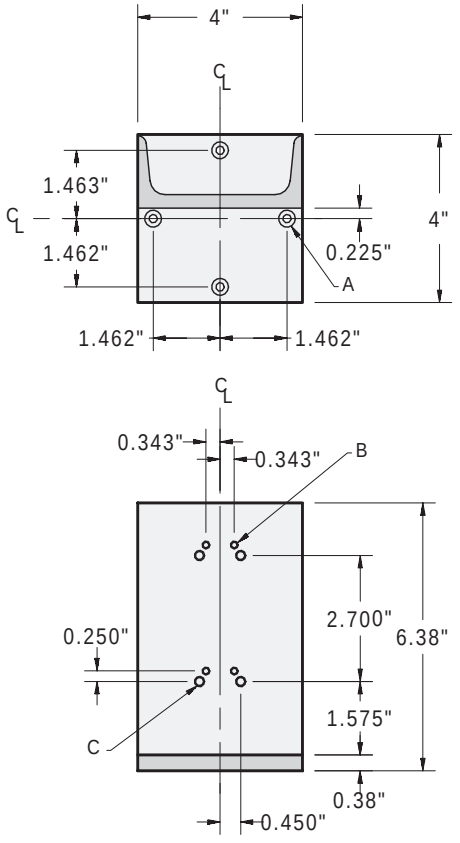


B2503XZ
Part No. 3-762

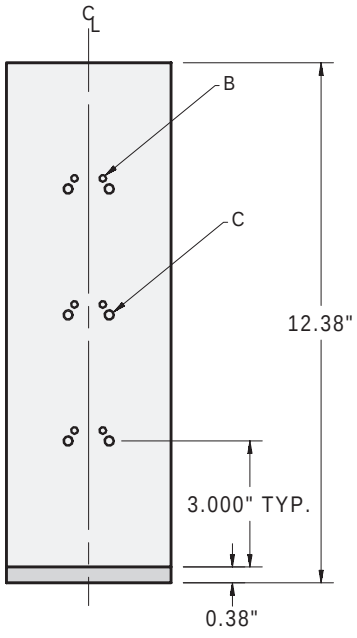
XZ2500

A =(4) COUNTERBORE FOR # 8 PANHEAD, FOR MOUNTING TO 2500 SERIES SLIDERS, A2505TS, A4007TS AND MAXY4000
B = 8-32 THREAD FOR MOUNTING 1500 SERIES UNISLIDE
C = 10-32 THREAD FOR MOUNTING 2500 SERIES UNISLIDE

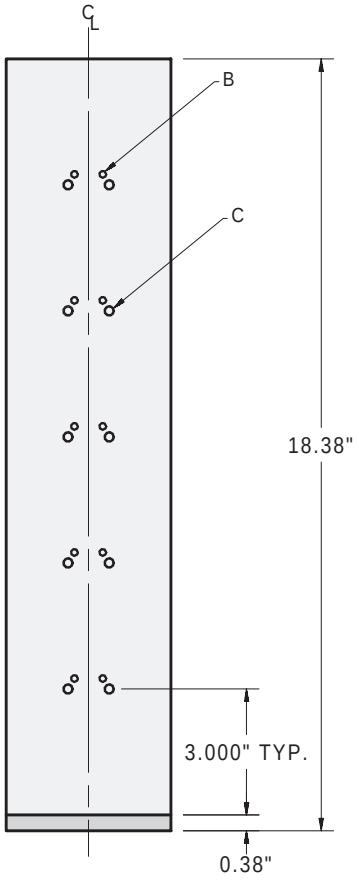
XZ4000



A4001XZ
Part No. 3-852



B4003XZ
Part No. 3-763

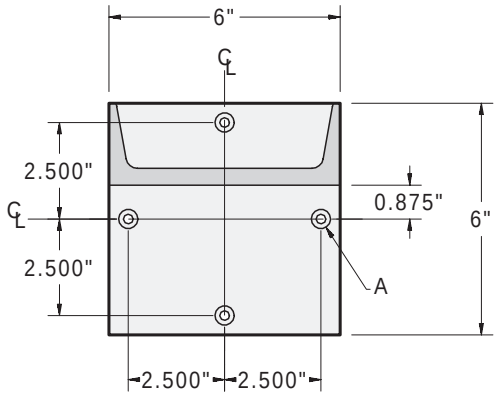


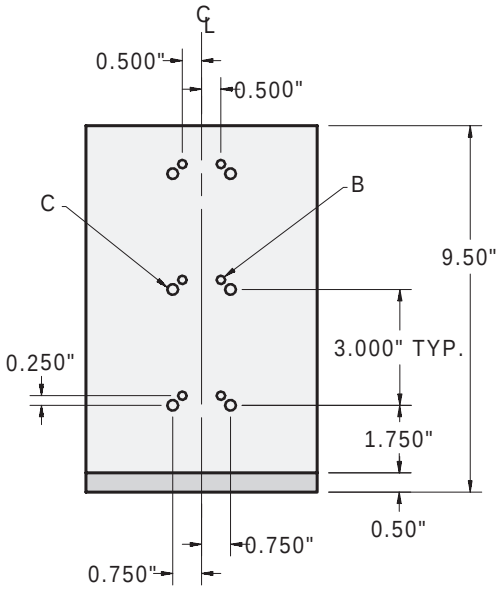
B4004XZ
Part No. 3-764

A =(4) COUNTERBORE FOR #10 PANHEAD, FOR MOUNTING TO 4000 SERIES SLIDERS, 6000 SERIES SLIDERS, A4007TS, B4800 ROTARY TABLE, MAXY4000 AND MAXY6000

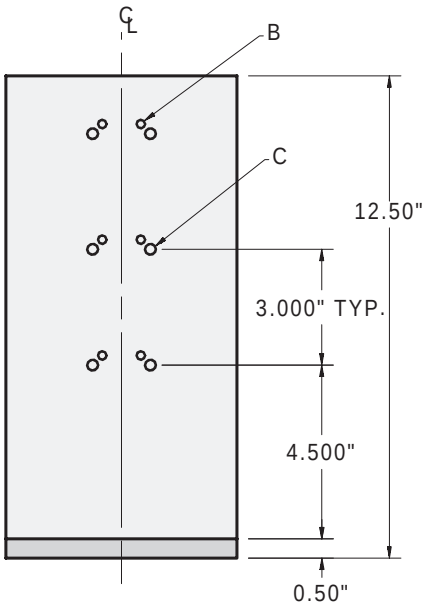
B = 10-32 THREAD FOR MOUNTING 2500 SERIES UNISLIDE
C = 1/4-20 THREAD FOR MOUNTING 4000 SERIES UNISLIDE

XZ Adapters for Series MB/MA6000

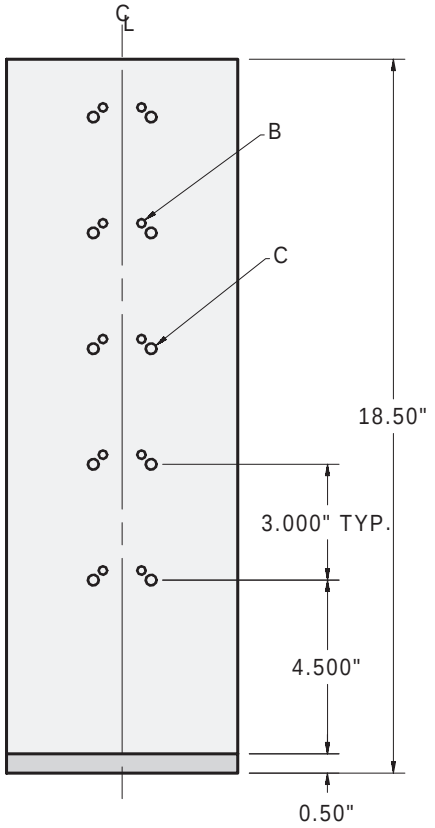




A6001XZ
Part No. 3-853



B6003XZ
Part No. 3-765



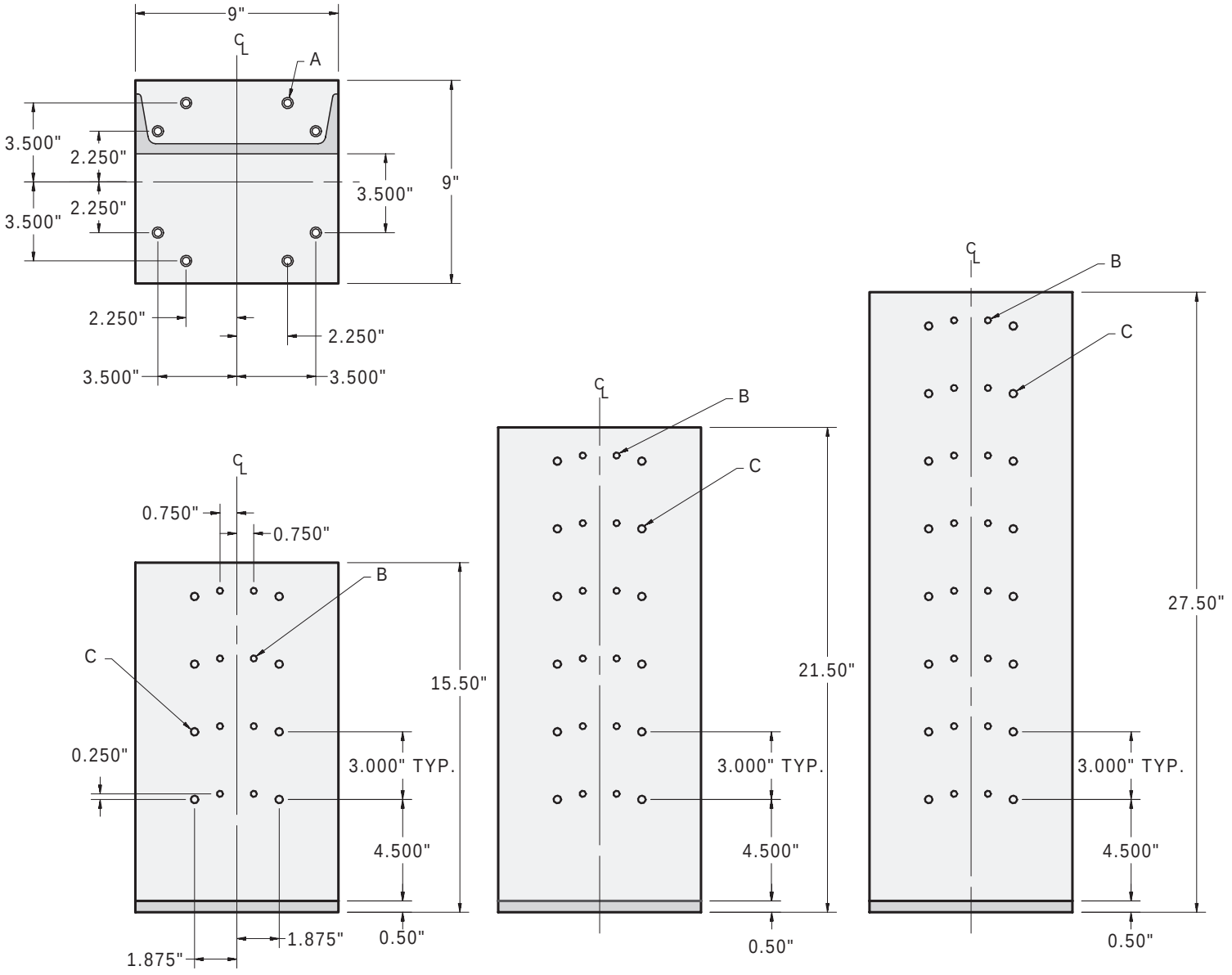
B6004XZ
Part No. 3-766

A =(4) COUNTERBORE FOR 1/4" PANHEAD, FOR MOUNTING TO 6000 SERIES SLIDERS, B9000 SERIES SLIDERS AND MAXY6000

B = 1/4-20 THREAD FOR MOUNTING 4000 SERIES UNISLIDE

C = 5/16-18 THREAD FOR MOUNTING 6000 SERIES UNISLIDE

XZ Adapters for Series MB9000



B9001XZ
Part No. 3-855

B9002XZ
Part No. 3-856

B9003XZ
Part No. 3-857

A =(8) COUNTERBORE FOR 5/16 CPHD , FOR MOUNTING TO 9000 SERIES SLIDERS

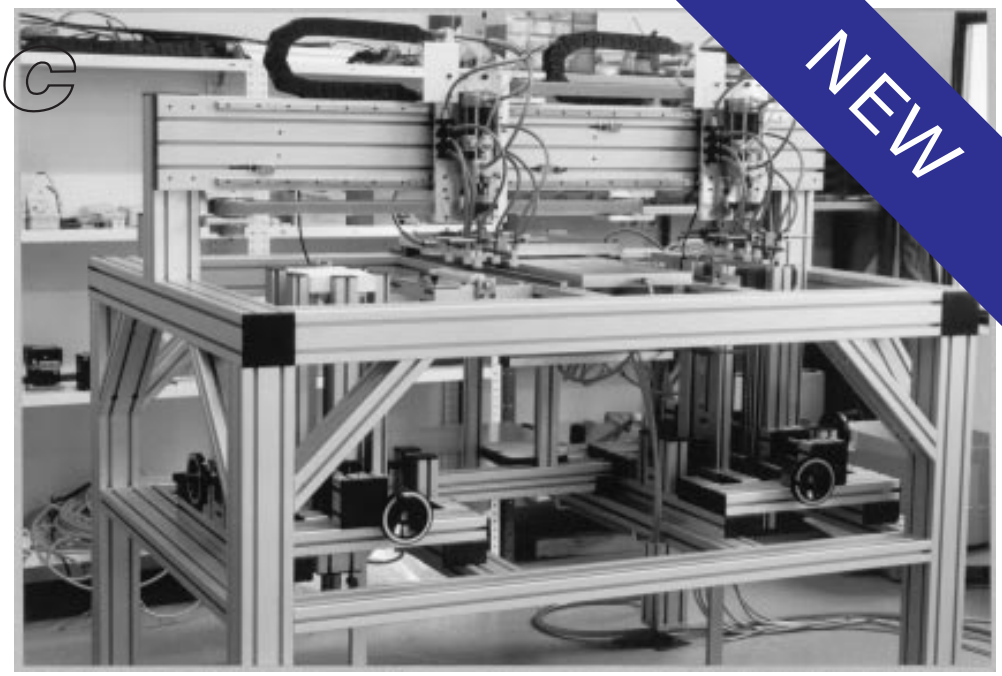
B = 5/16-18 THREAD FOR MOUNTING 6000 SERIES UNISLIDE

C = 3/8-16 THREAD FOR MOUNTING 9000 SERIES UNISLIDE

Also from Velmex,

MiniTec

Aluminum Profile System for Framing and Automation Construction



Custom Automation Solutions from existing components including framing, linear bearings, motors, and controls.

The MiniTec Concept:

Fast Construction

If you design or weld custom construction projects, here is a faster, less expensive solution, the new MiniTec Framing System. At the heart of the system are a series of aluminum profiles and revolutionary connector. These allow easy assembly of even the most complex design with only a drill, saw, and an hex wrench.

The MiniTec Application

With a comprehensive range of components, the MiniTec System builds into an limitless variety of items from simple fixtures, machine guards, and workbenches to complete production lines. You can purchase the MiniTec profiles and process your design or let MiniTec process your order and send it to you in kit form.

The MiniTec Design

MiniTec profiles are supplied in lengths up to 6 meters (19' 8") and can be cut square by a bed type power circular saw. Most profiles have internal channels which can be used as conduits for air or wires. T-slots make attachment and relocation of any added components fast, easy and secure.

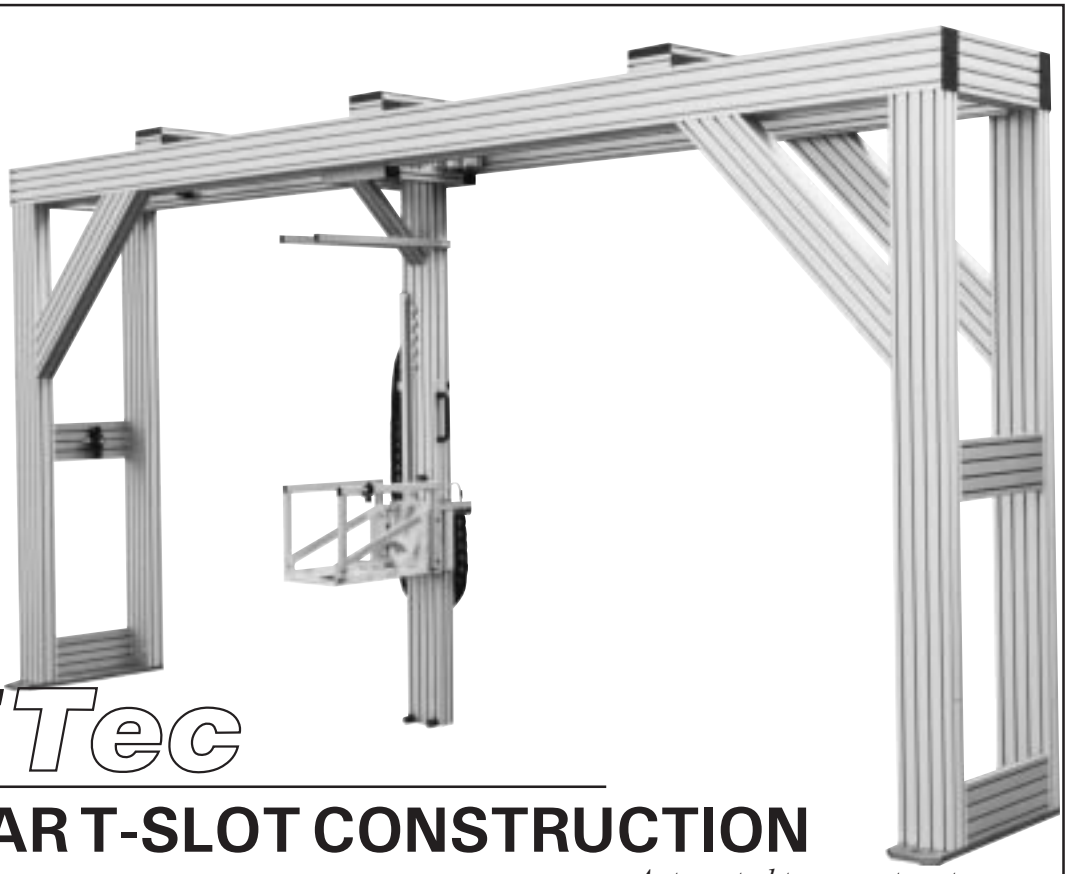
The MiniTec Benefits

One manufacturer of industrial conveyors of welded frame construction, increased his output from 20 units to 60 units per day, by switching to the MiniTec system. Its bolt-together design, anodized finish and unique fixturing method eliminated welding, extensive drilling, and finishing operations. Construction was carried out by existing employees without the need for additional investment in equipment or facilities.

A range of specially designed components such as doors, hinges, locking hinges and a variety of jointing brackets permits modules to be easily assembled on site to meet precise requirements.

Machine guards and bases

To order, call 1 800 642-6446 or 1 716 657-6151



MiniTec

MODULAR T-SLOT CONSTRUCTION SYSTEM CUTS OEM COSTS

Automated transport system.

Can your construction system do this? (Join four members at a common intersection?) —>

With the MiniTec PowerLock™ connector you save a substantial amount of time. You reduce you engineering time, simplify your design, eliminate the need for access holes, and assemble your project in record time. Contact us and we'll be happy to send you a sample so you can see for yourself.

The new G style extrusion (shown below) is for general engineered structures in the medical industry or anywhere strict hygiene standards must be maintained. Tear-open T-slots minimize the amount of open T-slot which can collect pathogens or harbor contaminants. The autoclavable profile has a smooth, streamlined surface and aesthetically pleasing. Also, the extrusion eliminates plastic or metal covers commonly used to seal standard T-slot extrusions.