

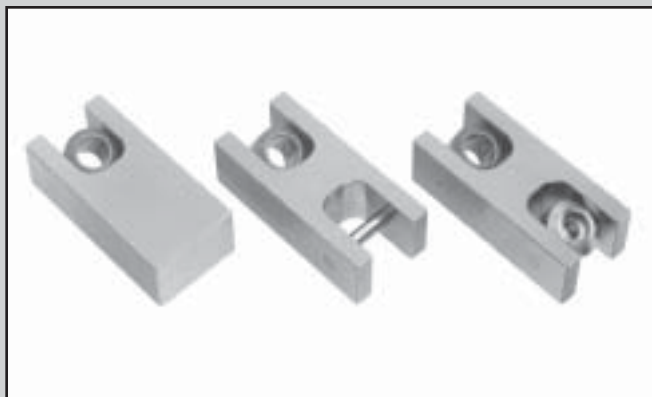
DME VectorForm Lifter System

A TAKAO INJECTION MOLD
ENGINEERING INNOVATION





A wide variety of sizes meets the needs of virtually any size application.



Three styles of Slide Bases:

- Standard
- Joint
- Universal



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Overview and Design Guidelines

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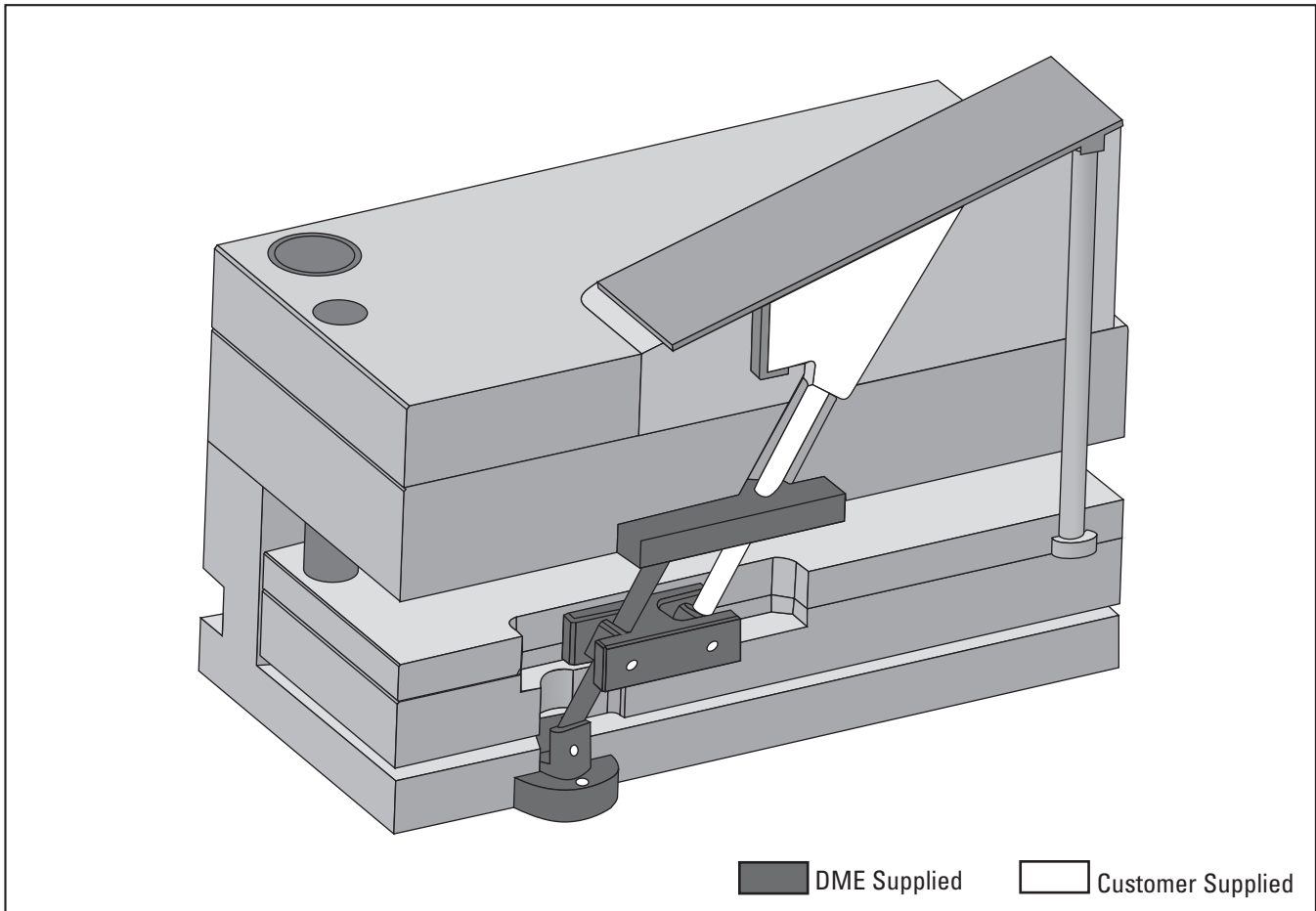
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Samples



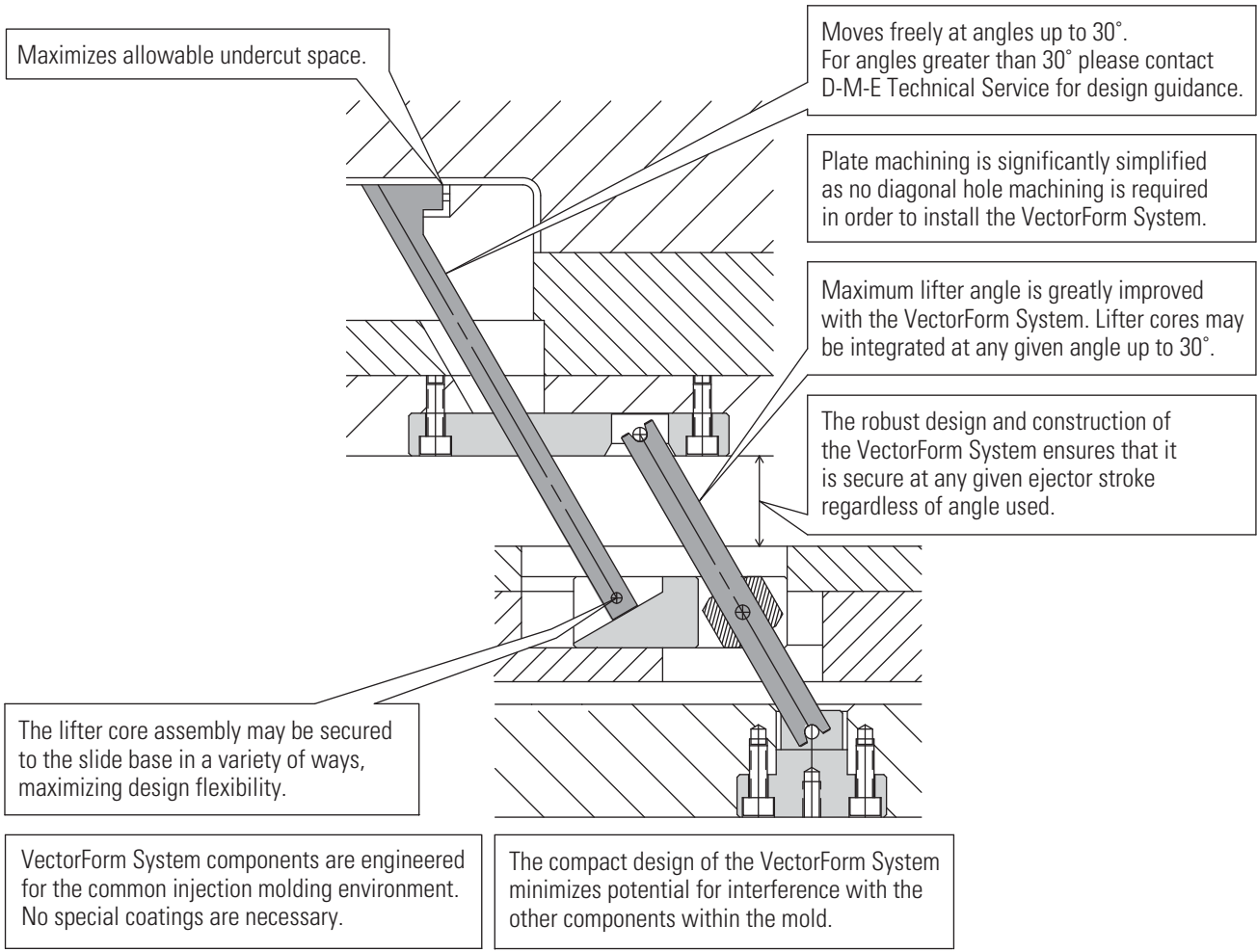
VectorForm Lifter Systems

- **Maximize design flexibility**
- **Multiple systems can be used on a single large lifter**
- **A single system can operate multiple lifter cores**
- **Minimize plate machining**
- **Off-the-shelf installation into most lifter applications**
- **Available in a wide variety of sizes**

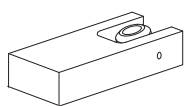
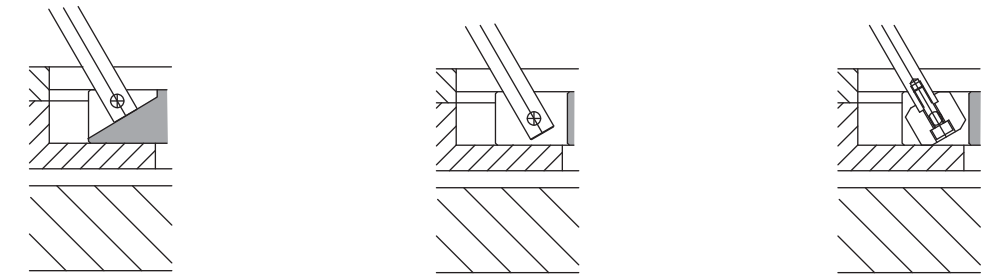
VectorForm Lifter Systems offer three types of slide bases to meet the needs of your applications.

- **The Standard Slide Base (SB)** is the most flexible and the most economical slide base. The Standard Slide Base can be custom machined by the mold builder to meet specialized application requirements. The Standard Slide Base is also the most robust slide base with respect to loads and forces.
- **The Joint Slide Base (JB)** permits the lifter core assembly to be retained with a single pin.
- **The Universal Slide Base (UB)** is similar to the Joint Slide Base, although the single pin is replaced by a universal joint which offers greater flexibility than the Joint Slide Base (JB) while still requiring only one screw to retain the lifter core assembly.

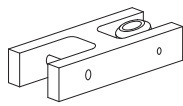
VectorForm Lifter System features and benefits



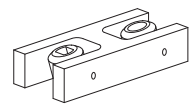
Three styles of slide bases



Standard Slide Base (SB)



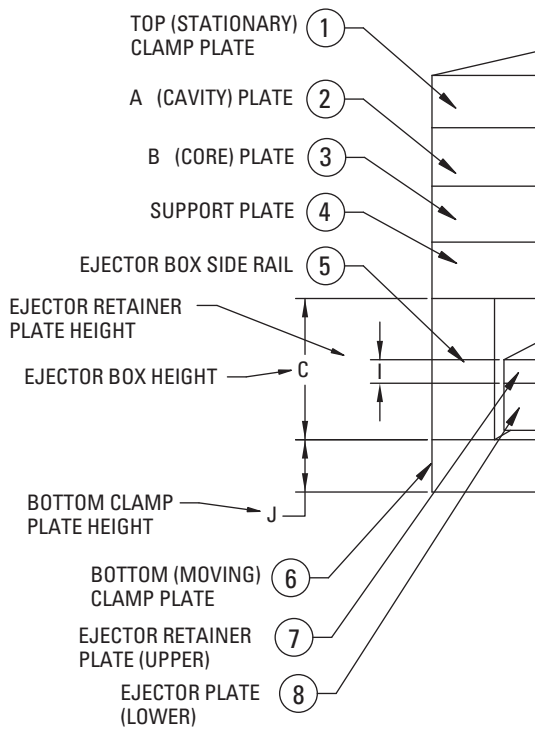
Joint Slide Base (JB)



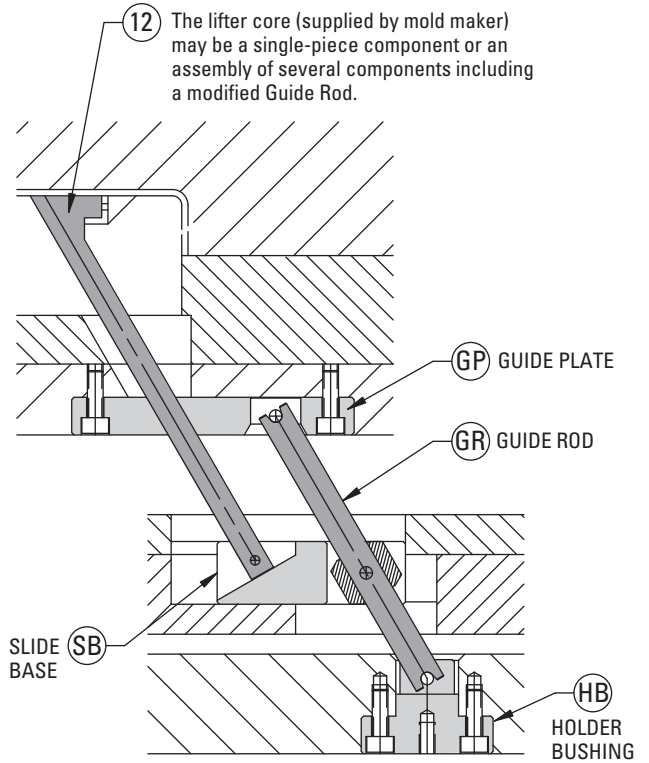
Universal Slide Base (UB)

VECTORFORM OVERVIEW

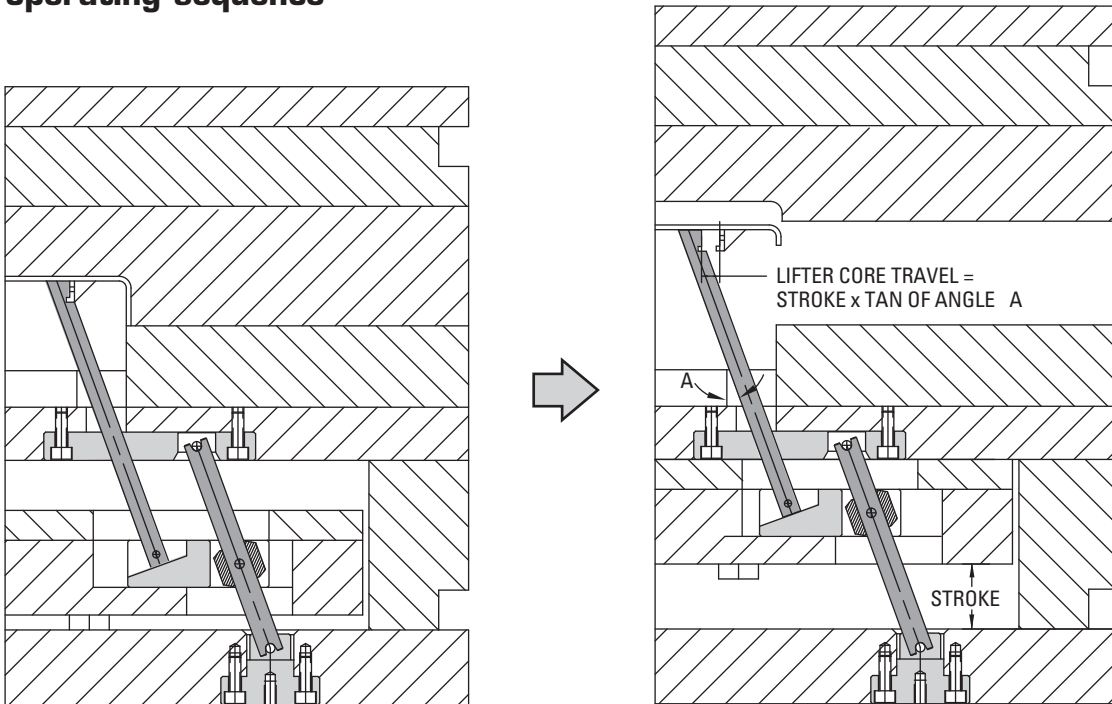
Mold base overview

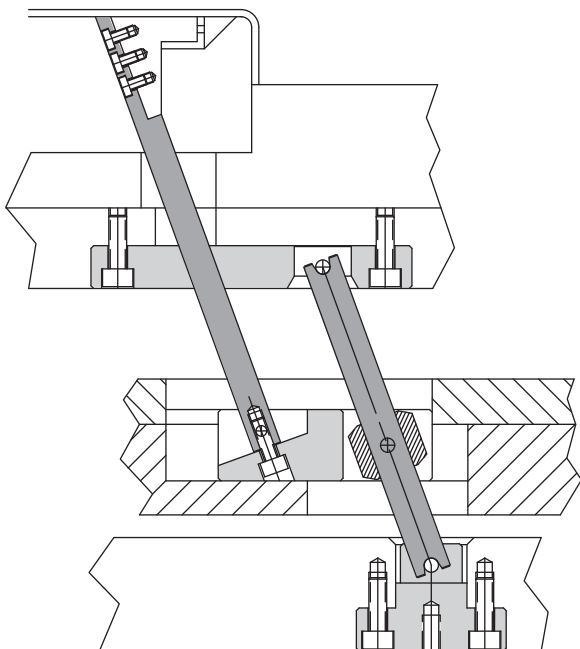


VectorForm Lifter overview

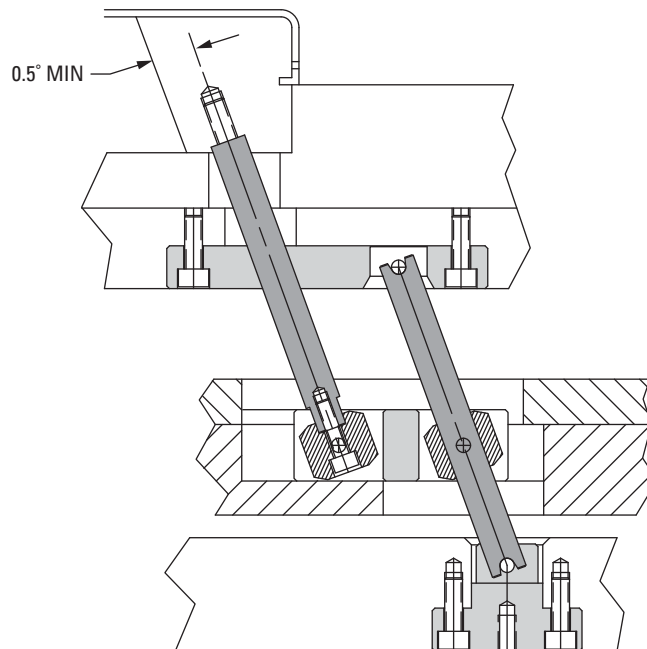


VectorForm Lifter System operating sequence

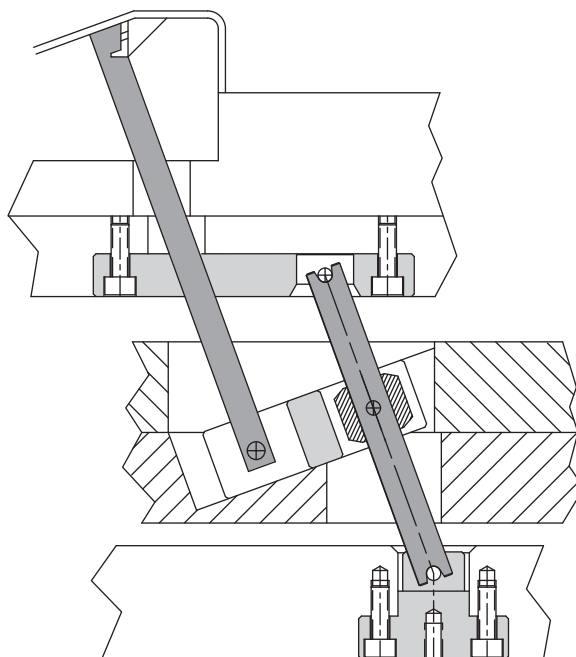




General integration. **Standard Slide Base** in typical ejector plate installation shown.



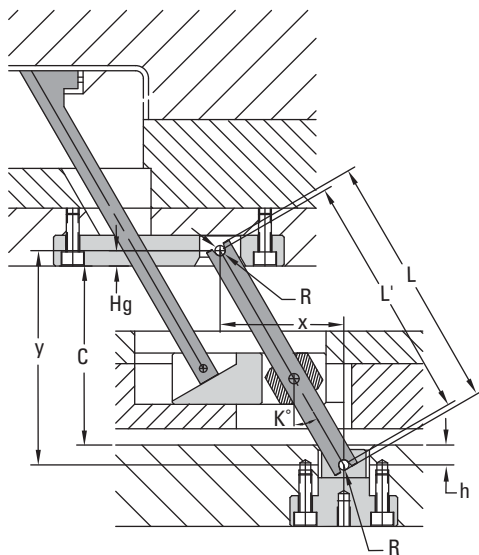
Universal Slide Base shown in typical ejector plate installation.



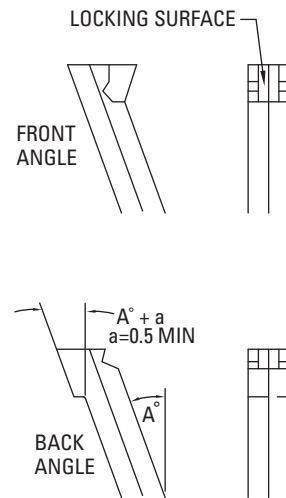
Joint Slide Base shown in inclined ejector plate installation. Angled Slide Base installation may be used to accelerate or decelerate the action of the VectorForm System. In this example, the VectorForm System movement is decelerated relative to the movement of the ejector plate.

VectorForm basic design

LENGTH OF GUIDE ROD:
 $y = C + H_g + h$
 $L' = y / \cos K$ $L = L' + 2R$



Locking Angles



General Installation

- It is recommended that the VectorForm Lifter System be installed as shown above.
- For each given VectorForm set, all components **MUST** be of the same size. However, separate sets of different sizes may be installed in the same mold.
- Actuation of VectorForm Lifter Systems can be accelerated or decelerated by an inclined sliding surface on the ejector plate and ejector retainer plate.
- Lubrication is not generally required nor recommended. If lubrication is used, it should be low-viscosity.

Angles

- The VectorForm Lifter System may be used with angles ranging from 5° (minimum) to 30° (maximum).
- Deep undercuts in the molded part can be obtained by using a larger angle in the lifter core and by increasing the ejector plate stroke.

Lifter Core Guidance

- The lifter core must have sufficient guidance in the tool. For multiple lifter cores installed in tandem in the tool, additional guidance in the core inserts is recommended.
- If resistance in actuation is great, an additional Guide Plate may be placed directly below the core insert.

Guided Ejection

- Guided ejection is recommended for all designs.

Fit and Finish

- Standard component dimensions and Rockwell hardness are provided in the component specifications section of this guide. Should the standard components need to be modified, additional performance can be obtained by treating after finish machining (TiN coating, flash-chrome, etc.). Component installations can be fitted to suit.
- Ensure a loose fit on the Holder Bushing and Guide Plate installation. Ensure a precise fit between the lifter core and the Guide Plate. The Holder Bushing will automatically align prior to bolting the bushing to the clamp plate.

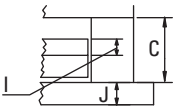
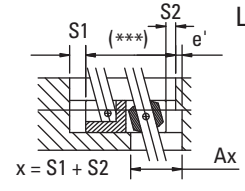

Locking Angles/Component Back-Up

- Locking angles may be designed to provide a locking surface to counter against molding pressure.
- A block construction using a square lifter core can also allow the resin pressure to be backed up by the core insert.
- If the axial load acting on the lifter core exceeds the limit allowed for the slide base pin (used in JB and UB Slide Bases), use a Standard (SB) Slide Base and back the lifter core on the slide by machining a ledge that is perpendicular to the axis of the lifter core. The lifter core must then seat firmly against the angled face of the slide base.

Non-Standard Shapes/Materials

- Lifter core blocks may be machined to any desired shape and size, provided the chosen number and size of the VectorForm core standard components will support the lifter core blocks. Lifter core are to be supplied by the moldmaker.

VECTORFORM MACHINING BASICS

Size	Dimensions						Installation Classification
	06	08	10	13	16	20	
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
T _g	8 ^{+0.03} ₀	10 ^{+0.03} ₀	12 ^{+0.05} ₀	15 ^{+0.05} ₀	20 ^{+0.1} ₀	25 ^{+0.1} ₀	 <p>Lg: The numerical values refer to the standard dimensions. They may be subject to change depending on the design situation.</p> <p>Ls: The numerical values in parentheses refer to the standard dimensions. They may be subject to change depending on the design situation.</p> <p>Ax: The interference relief with the Guide Rod when the ejector plate assembly is operating.</p> <p>Design the operating displacement space S1 and S2, Ax, and the other interference reliefs with sufficient margin of space.</p>
F _g	20 ^{+0.5} _{+0.3}	25 ^{+0.5} _{+0.3}	32 ⁺¹ _{+0.5}	40 ⁺¹ _{+0.5}	50 ⁺² ₊₁	60 ⁺² ₊₁	
L _g	60 ^{+0.5} _{+0.3}	70 ^{+0.5} _{+0.3}	90 ⁺¹ _{+0.5}	120 ⁺¹ _{+0.5}	150 ⁺² ₊₁	180 ⁺² ₊₁	
T _s	13 ^{+0.2} _{+0.1}	16 ^{+0.2} _{+0.1}	20 ^{+0.3} _{+0.2}	25 ^{+0.3} _{+0.2}	30 ^{+0.4} _{+0.3}	40 ^{+0.4} _{+0.3}	
F _s	20 ^{+0.3} _{+0.2}	25 ^{+0.3} _{+0.2}	32 ^{+0.5} _{+0.3}	40 ^{+0.5} _{+0.3}	50 ^{+1.0} _{+0.5}	60 ^{+1.0} _{+0.5}	
L _s	(40) +x	(50) +x	(60) +x	(80) +x	(100) +x	(130) +x	
A _s	8	10	13	16	20	25	
Ph	∅13 ^{+0.3} _{+0.1}	∅16 ^{+0.3} _{+0.1}	∅20 ^{+0.5} _{+0.2}	∅25 ^{+0.5} _{+0.2}	∅32 ^{+1.0} _{+0.5}	∅40 ^{+1.0} _{+0.5}	
Oh	∅27 ^{+0.5} _{+0.3}	∅34 ^{+0.5} _{+0.3}	∅42 ^{+1.0} _{+0.5}	∅51 ^{+1.0} _{+0.5}	∅65 ⁺² ₊₁	∅80 ⁺² ₊₁	
Th	8 ^{+0.05} ₀	10 ^{+0.05} ₀	12 ^{+0.1} ₀	15 ^{+0.1} ₀	18 ^{+0.2} ₀	22 ^{+0.2} ₀	
Ch	1	1	1.5	1.5	2	2	
E _s	16 ^{+0.3} _{+0.2}	20 ^{+0.3} _{+0.2}	26 ^{+0.5} _{+0.3}	33 ^{+0.5} _{+0.3}	42 ^{+1.0} _{+0.5}	50 ^{+1.0} _{+0.5}	
G _s	9 ^{+0.2} _{+0.1}	11 ^{+0.2} _{+0.1}	14 ^{+0.3} _{+0.2}	17 ^{+0.3} _{+0.2}	22 ^{+0.4} _{+0.3}	28 ^{+0.4} _{+0.3}	
(CB) M	3x10	4x12	5x15	6x20	8x25	10x30	

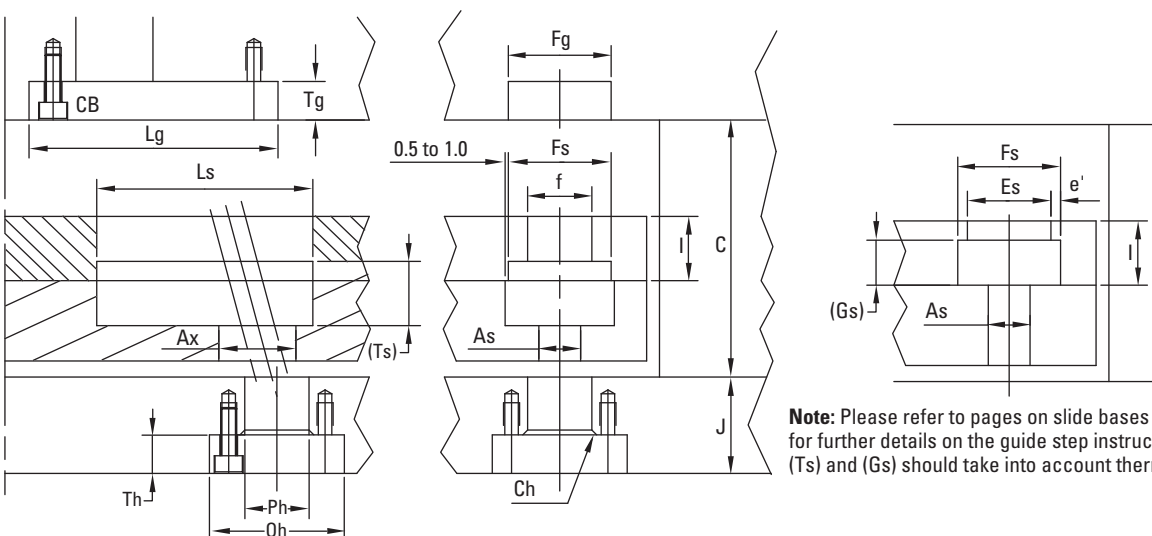
All dimensions are in mm

Information

- The above table describes the reference values that are to be used as a guide. Determine the actual values by taking into consideration the overall tolerances (accuracy) of the machined installations (in the mold plates) and of the components themselves.
- When the slide base is placed between the ejector retainer plate (upper) and the ejector plate (lower), it may be necessary to make the ejector plate thicker than normal to completely accommodate the slide base.

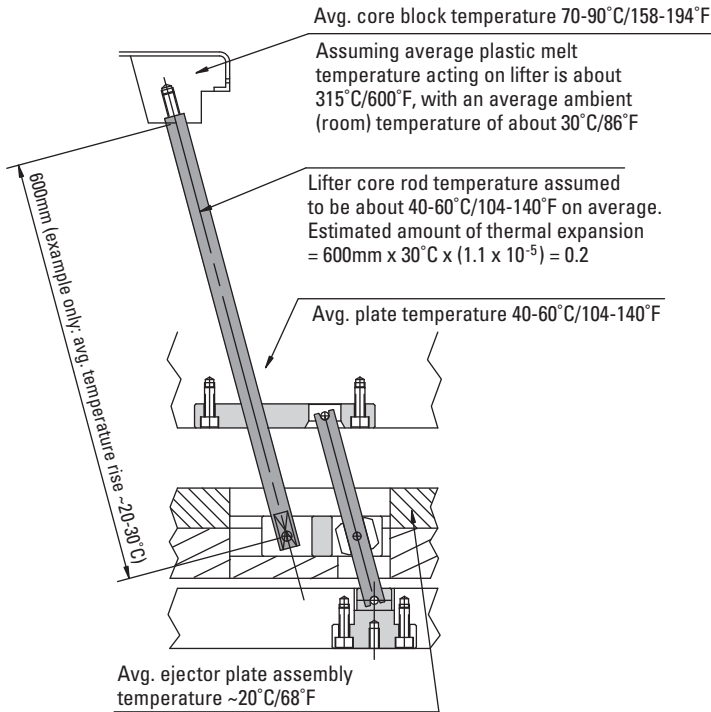
Note: In general, all the fits are designed with slack, arranged in a rather loose manner to allow for automatic centering of the assembly. (As a result, the integration of the assembly into a typical mold base is smoother. This facilitates assembly.)

f = clearance for lifter core f' = difference (to one side) between lifter core clearance hole and the slide base installation pocket in the ejector plate assembly



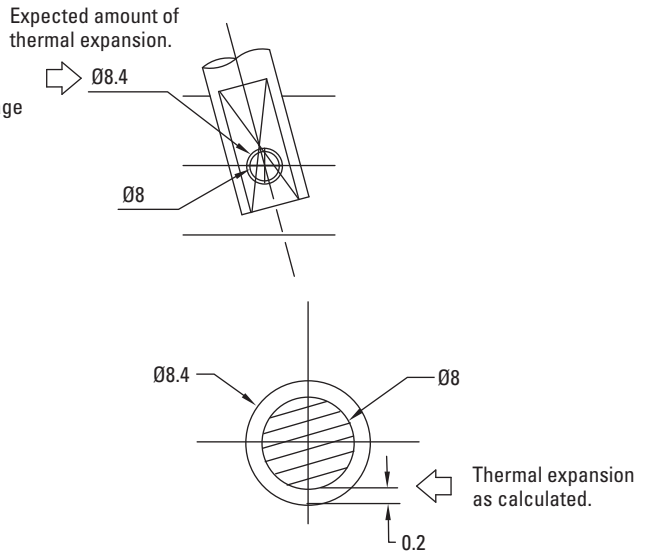
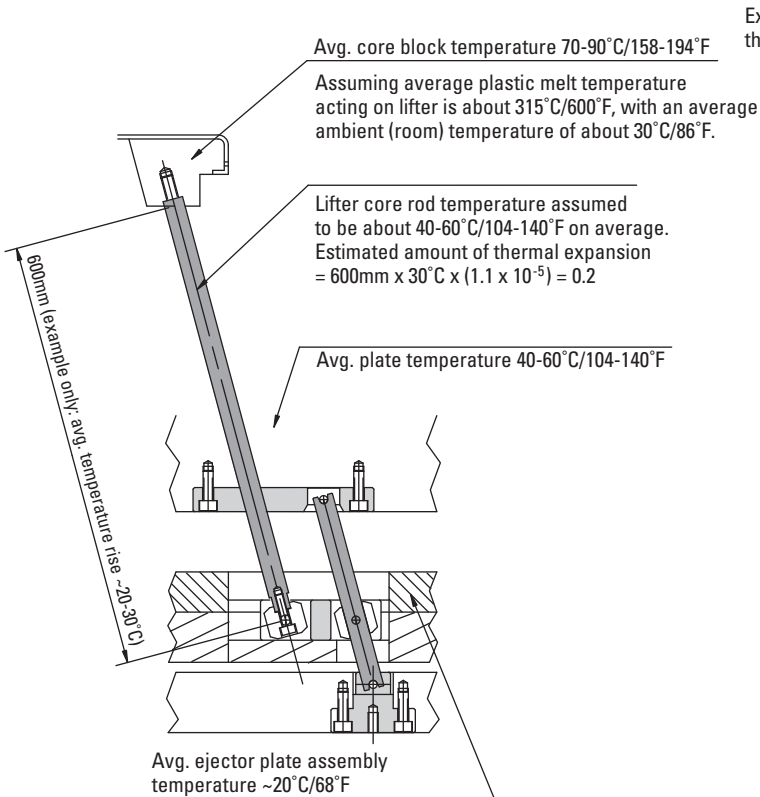
Note: Please refer to pages on slide bases for further details on the guide step instructions. (Ts) and (Gs) should take into account thermal expansion.

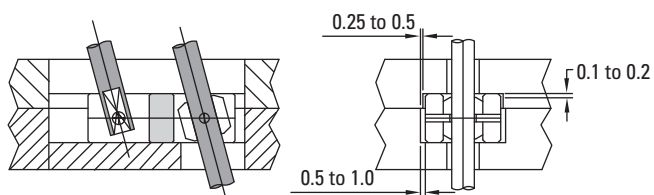
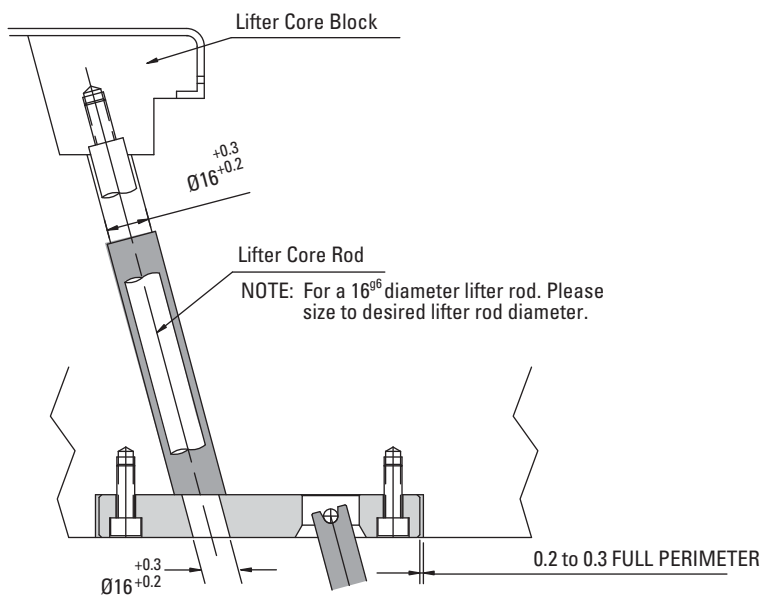
Thermal expansion – Joint Base



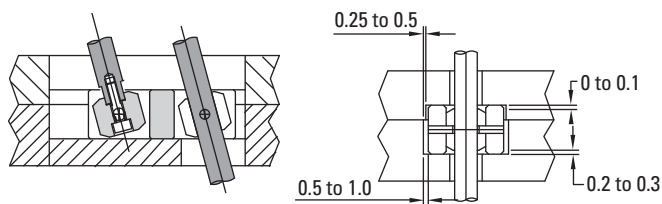
- It is not necessary to fit a special metal into the sliding hole of the lifter core rod.
- The lifter core sliding clearance allows for the misalignment between the lifter core and the lifter core rod.
- Center the Guide Plate in the lifter core rod, and ensure a loose fit for automatic centering; then, tighten the screws.

Thermal expansion – Universal Base

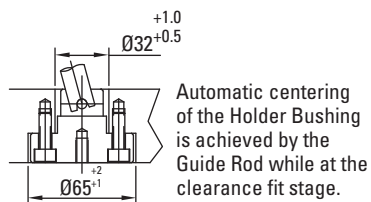




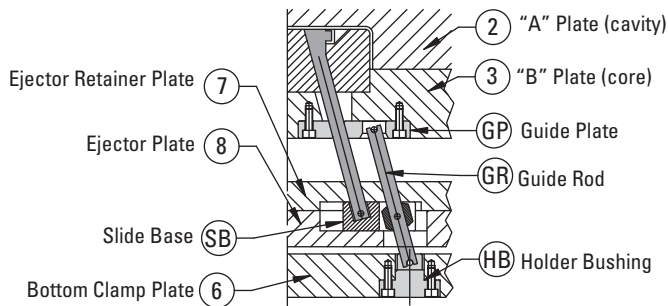
Do not design in contact on the Slide Base, except for the face closest to the stationary side of the tool.



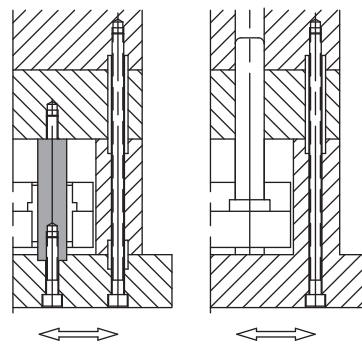
Expected amount of thermal expansion. At ambient (room) temperature, there is cold clearance between the Slide Base and the ejector plate assembly.



VECTORFORM DESIGN GUIDELINES



Examples of plate alignment:

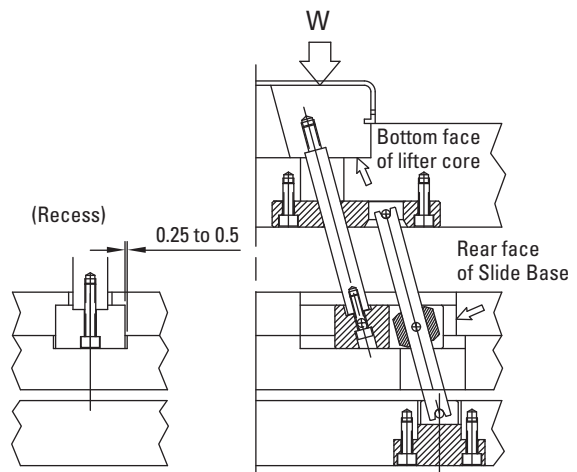


Guidelines

- The accumulated machining errors in stackup can negatively affect the accuracy in the integration of component parts, which can hinder the operation of the system. Try to maintain the accuracy in the "vertical" direction of each part and machined installation.
- Besides the machined accuracy in the vertical direction, the "horizontal" alignment and accuracy all the way to the moving clamp plate is required in a manner similar to the case of the sleeve ejector installation. It is recommended that the guided ejection pin be used and placed in conjunction with the alignment dowel pin. The use of some form of alignment dowel or alignment pin is particularly important if the ejector box is custom or built up from separate plates and side rails.
- If it is difficult to maintain the required alignment and accuracy, ensure a rather loose fit between the Guide Plate (GP) and the Holder Bushing (HB) so that automatic centering of the lifter core and Guide Rod (GR) can be performed during the installation of those components. Once the components have been installed and have self-aligned, tighten the screws for the Guide Plate and Holder Bushing.
- Whenever an operation performance check is performed, do not depend on oiling or nitriding to ensure smooth operation (such techniques can be used once good operation has been achieved). Machine the edges of the Guide Plate hole so that the edges take on a rounded shape. This will assist in sliding. Machine the other edges of the slide base so that the edges take on a rounded shape.
- Upon completion of the preliminary design, check the allowable load for the components chosen and compare them to the expected load in the desired application.

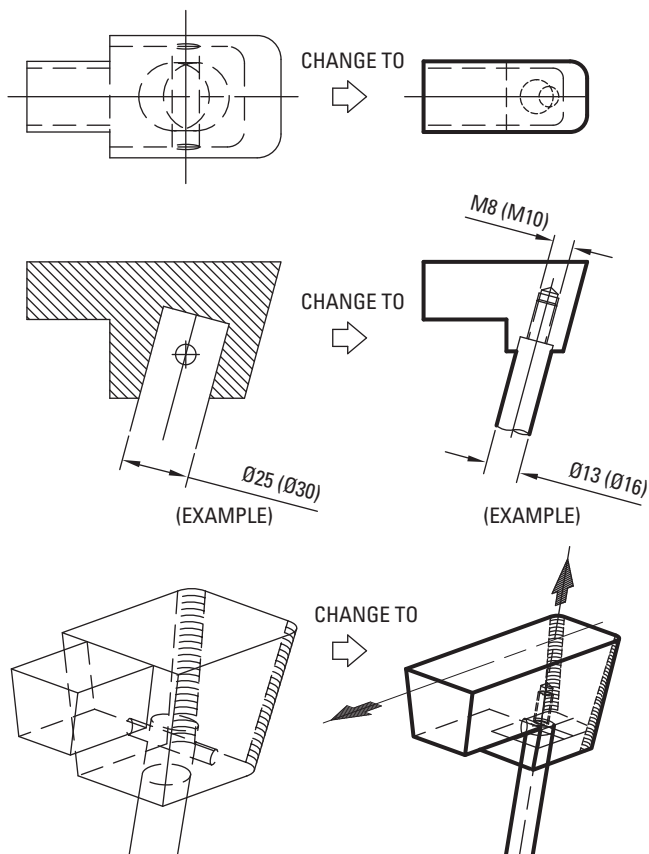
- Refer to the pages on the Guide Rod and slide bases for further details regarding the allowable load of the lifter core.
 - If the pressure receiving area of the lifter core exceeds the allowable value in terms of design, split the structure of the lifter core so that the bottom face of the core can receive the pressure.
- Back up the rear face of the slide base so that the load on the Guide Rod is reduced.
- Take into account the ejection resistance.
- If necessary, the Slide Base entirely within between lower ejector plate in the ejector plate assembly, it may be necessary to make the lower ejector plate thicker than standard to fully accommodate the Slide Base.
- Avoid the use of separation or a gap between the upper ejector retainer plate and the lower ejector plate when accommodating the slide base.
- Be sure to use sufficient bolt lengths when installing the lifter core components to ensure the components are firmly installed.
- Please refer to the pages regarding "Design Integration" for further details on the lifter core design.
- Please refer to "Determining Loads and Forces" for further details on the load analysis and strength simulation for the desired system.

- Notes:**
1. If the edges indicated on the Guide Plate and the slide base are not radiused, poor operation may result.
 2. The application of anaerobic adhesive for easy screw locking plus the use of TPE tape are also effective when performing automatic alignment of the Guide Plate and the Holder Bushing.



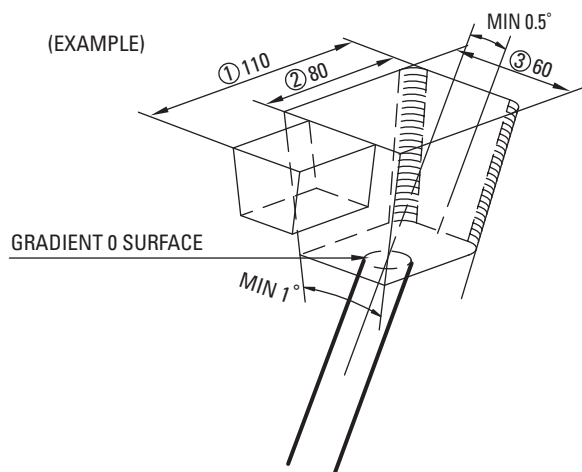
Be careful to avoid any contact interference on the Slide Base if a space or gap between the upper ejector retainer plate and lower ejector plate is necessary.

Design concept for reducing the size of the lifter core block when the lifter core block is connected to a round lifter core rod.



- Allow the design of the lifter core to be shallow in depth and slim, thereby reducing the required space for the assembly while maintaining strength and safety in operation.
- Pinning to the heavy shaft results in no force being exerted in the axial direction.
- The use of a screw thread that is machined directly onto the end of the slim shaft will enable a strong joint without the risk of loosening.
- As a simple measure to prevent the screw from loosening, the infiltration of anaerobic adhesive and the friction force strengthened by the use of TPE seal tape, etc, are effective as well.
- By reducing the size of the lifter core, smaller lifter components such as the lifter core rod, slide base, Guide Plate, Guide Rod and Holder Bushing may be used. This will reduce the space requirement of the overall lifter assembly. The reduced lifter core size increases the ease of avoiding interference with other mold components, improves the ejector plate layout, and provides room for cooling channels.
- The lifter core should be designed to enable the center of gravity for the core and the ejector drive center to coincide. This will prevent or reduce torque that would otherwise be applied to the ejector plate assembly during ejection.

Design concept describing thermal expansion in the lifter core block.



For a lifter core that does not have a water cooling circuit, the temperature is expected to be on average about 50°C higher than the surrounding core block during steady state molding. This value may vary depending on the core material used, the resin being molded, and processing conditions.

Below are examples of thermal expansion for the lifter core in a Pressure-Receiver Configuration (see next page):

1. 110mm x 50°C x 0.000011(CTE) = 0.06mm
2. 80mm x 50°C x 0.000011(CTE) = 0.044mm
3. 60mm x 50°C x 0.000011(CTE) = 0.033mm

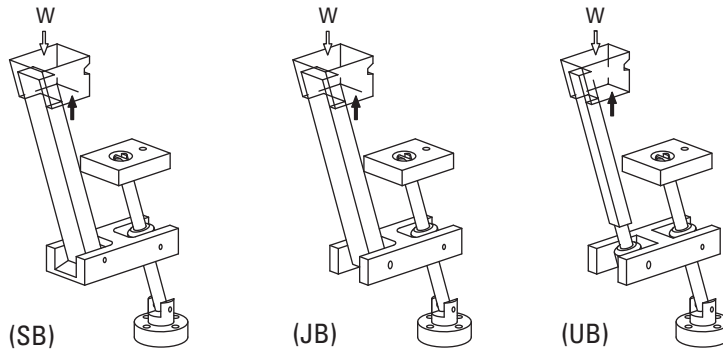
When it comes to the interference of a fit, the thermal expansion acts as a powerful ejector resistance, which becomes a factor contributing to hindered operation.

In design, a safe operation is dramatically improved by considering a gradient of the parallel sliding part besides simply reducing the lifter core dimensions by the calculated amounts of thermal expansion.

The VectorForm System assures that the streamlining and the safe operation of the lifter core can go hand-in-hand.

DETERMINING VECTORFORM LOADS & FORCES

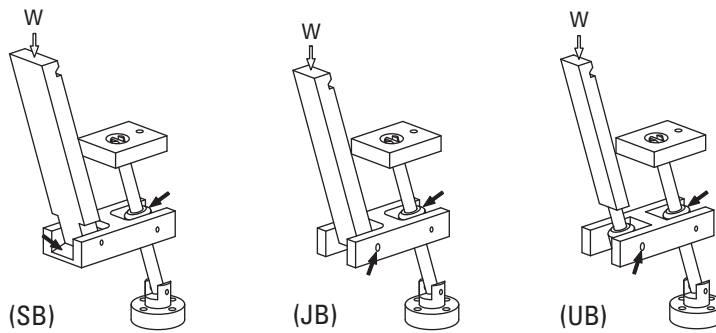
Pressure-Receiver Configuration



→ Designates molding load/force from injection pressure.

← Designates generated reaction forces.

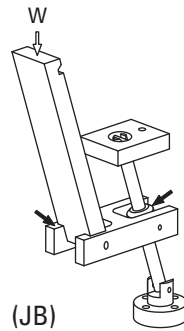
Straight-Pressure Configuration



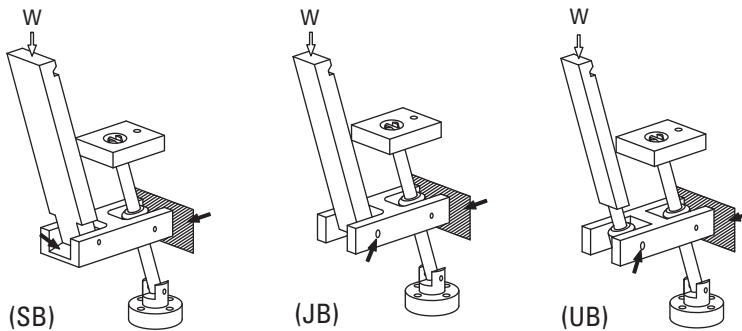
Guidelines


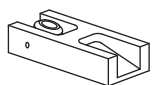
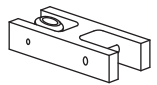
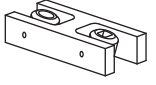
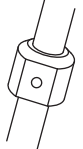
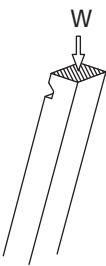
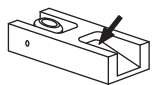
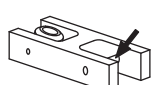
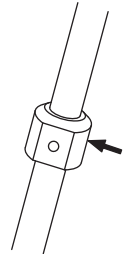
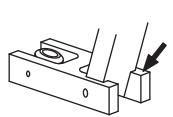
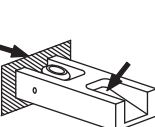
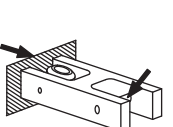
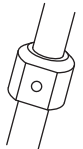
- No bending moment is generated during ejection.
- Use a thin and slim lifter core design with fewer pressure-receiving areas.
- When possible, try to reduce the set size as this will allow for a more compact design.
- Check the strength between different set sizes through comparison with a list of allowable values. If the smaller set size does not have sufficient strength, a larger set size is required.

Straight-Pressure Configuration



Straight-Pressure Configuration



		Slide Base			Guide Rod
		SB: Standard Slide Base	JB: Joint Slide Base	UB: Universal Slide Base	
Type of Lifter Core Pressure-Receiver Type 	1				
		G1	G1	G1	
Straight-Pressure Type 	4		5		 G3
		G2	G2	G2	
				7	
	8		9		
		G5	G5	G5	
				10	







Limits to allowable load:
 YES / NO

W → Place where molding load is generated.
 ← Place where reactionary forces are generated.

(Refer to notes below for guidelines related to above configurations.)

Guidelines

- For the pressure-receiver style of lifter core, there is no reaction force (caused by mold loading) that is applied to the SB, JB and UB Slide Bases or Guide Rod.
- For the straight-pressure style of lifter core, the SB Slide Base will receive a reaction force that is caused by mold loading. There is no limit in the slide base for the allowable load. For JB and UB Slide Bases, the joint pin in the slide base receives the reaction force caused by mold loading, and there is a limit to the allowable load.
- For the straight-pressure style of lifter core, there is a limit to the allowable load that may be placed on the Guide Rod, regardless of the mounting method of the Guide Rod onto each of the three types of Slide Base (SB, JB and UB).
- For the straight-pressure style of lifter core, when mounting Slide Bases (SB, JB and UB styles), there is no limit to the allowable load on the Guide Rod if the load is received on the rear face of the base.
- For the joint pin of the JB and UB Slide Bases there is a limit to the amount of allowable ejection load.
- No Guide Rod force in configurations 8, 9 and 10.

	Pressure-receiver style lifter block
	Straight-receiver style lifter block
	Standard Slide Base (SB)
	Joint Slide Base (JB)
	Universal Slide Base (UB)
	Guide Rod (GR)



When designing the lifter core, be sure to include allowances for thermal expansion on the vertical and horizontal length of the lifter core.

DETERMINING VECTORFORM LOADS & FORCES

PAGE 1 OF 2 – Complete both pages of this form, then fax to DME at 1-248-544-5707.

Company Name _____

Contact Name _____

Phone _____ Fax _____ Email Address _____

Select the pattern



and enter β° .

Fill in the structure selection



and the number of

combinations:



Select the Size Rank of the VectorForm Lifter System

(please circle one)



Ascending

06

08

10

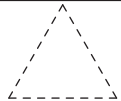
13

16

20

$\beta^\circ =$
(please specify angle)

$\beta^\circ =$
(please specify angle)

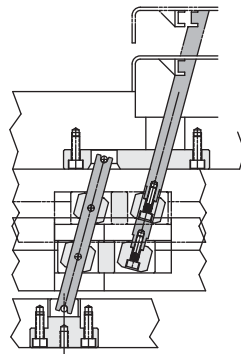
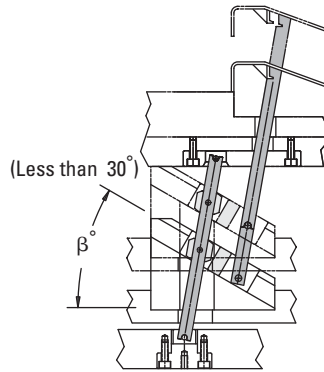
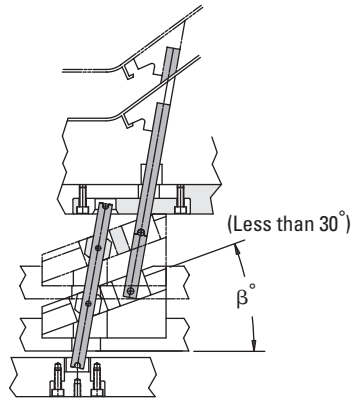


Descending



Horizontal

$\beta^\circ = 0$

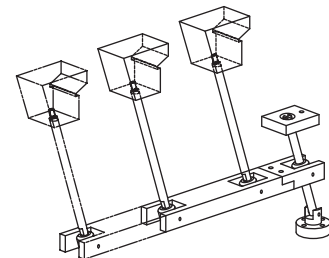
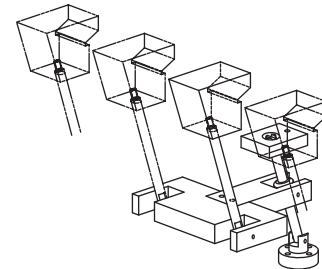
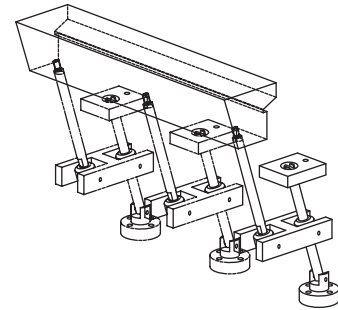
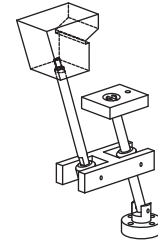


Single Row

Parallel Combinations

Double Row Combinations

Series Combinations



Refer to pages regarding Guide Rod and Slide Base specifications for the strength check concerning "molding pressure load" and "ejection load".

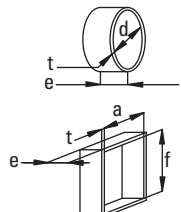
Company Name _____
 Contact Name _____
 Phone _____ Fax _____ Email Address _____

Enter the dimensions in the applicable shape/structural section.

Outline shape and dimensions of part to be molded.

Customer to supply Resin Type: _____

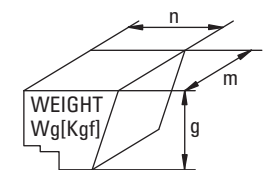
$d =$ _____ mm
 $t =$ _____ mm
 $e =$ _____ mm
 $f =$ _____ mm
 $d =$ _____ mm
 $t =$ _____ mm
 $e =$ _____ mm



Outline shape and dimensions of large mass lifter core.

Customer to supply

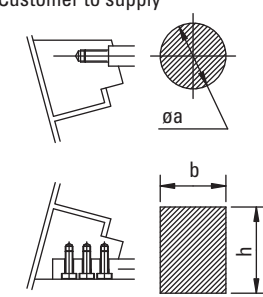
$n =$ _____ mm
 $m =$ _____ mm
 $g =$ _____ mm
 WEIGHT Wg [Kgf] _____ Kgf



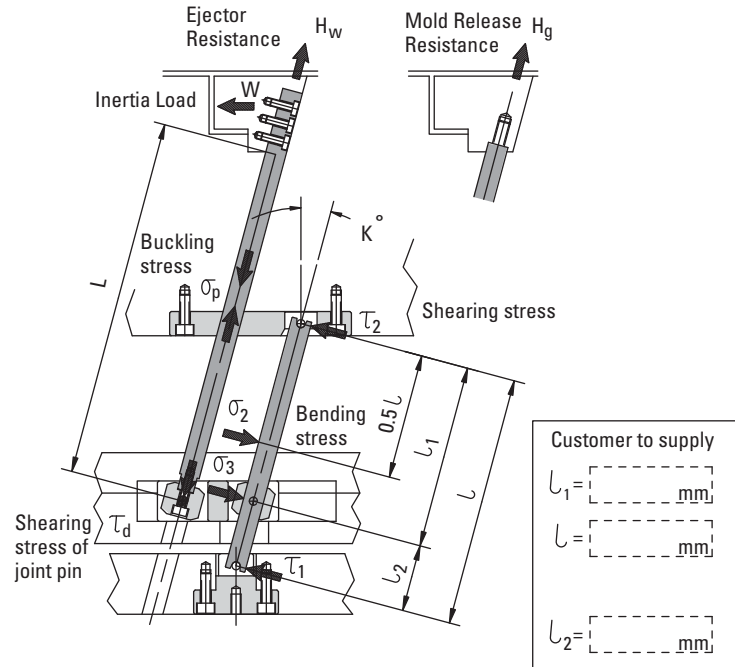
Outline shape and dimensions of lifter core rod and/or bar.

Customer to supply

$a =$ _____ mm
 $b =$ _____ mm
 $h =$ _____ mm



Required Design Parameters for Analysis



Load Analysis and Strength Simulation – Provided by D-M-E			
W	Kgf	σ_2	Kgf/mm ²
H_w or H_g	Kgf	σ_3	Kgf/mm ²
σ_p	Kgf/mm ²	τ_1	Kgf/mm ²
τ_d	Kgf/mm ²	τ_2	Kgf/mm ²

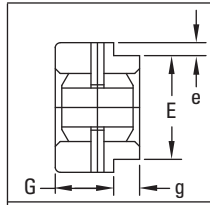
Information

1. A simulation will be performed to analyze the stress of each section by predicting the “mold release resistance” and the “internal load”.
2. Circle the applicable item, and fill in the rough value of each figure.
3. No estimations of “buckling stress of core rod and bar”, “shearing stress of joint pin”, and “bending/shearing stress of Guide Rod” are available. As an alternative, make a comparison with the specified allowable stress for each component during the evaluation phase.
4. Upon completion of this 2-page form, please fax both pages to DME at 248-544-5707. The results of the analysis will be returned to you via fax.

VECTORFORM COMPONENT SPECIFICATIONS STANDARD SLIDE BASE – SB

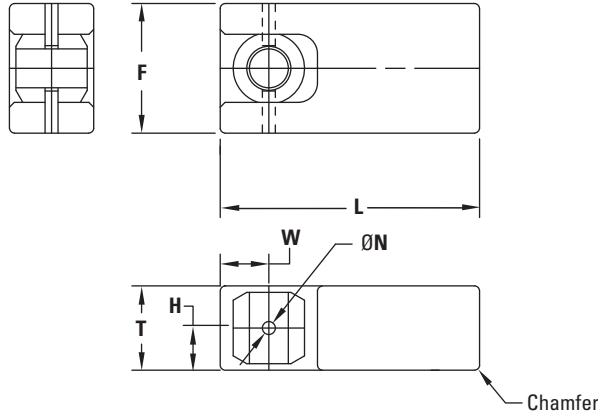
Standard Slide Base – SB

Material: SCM 440 / DIN 42 CrMo4 / AISI 4140
Hardness: HRC 30-33



Standard Size of Guide Step			
	E	e	g
06	16	2.0	9
08	20	2.5	11
10	26	3.0	14
13	33	3.5	17
16	42	4.0	22
20	50	5.0	28

Note:
Dimensions for retaining step to be machined by moldmaker as necessary.



Additional Machining:

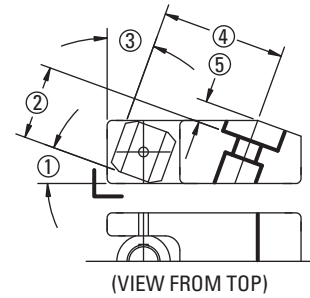
- Retaining bolt installation on lifter core rod or assembly.
- Grooves as shown to far left of figure (for alignment) if required.
- Any additional machining in slide base for retaining lifter core rod or assembly.

Heat Treatment:

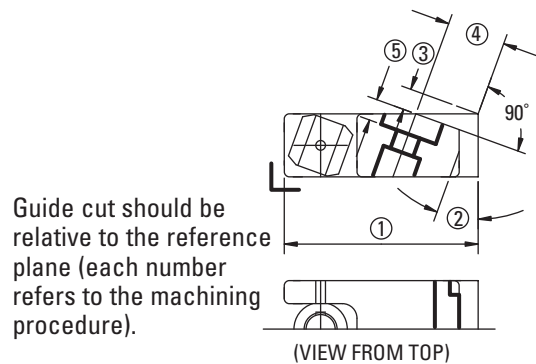
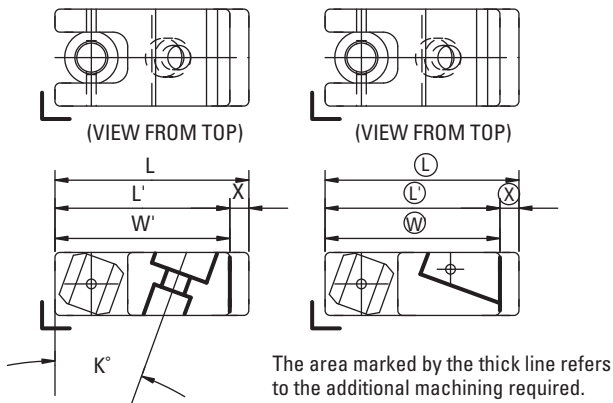
Gas nitriding is permissible after additional machining has been performed.

Standard Slide Base Guidelines

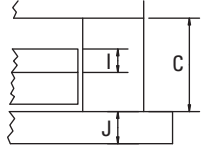
- Modify the length of the slide base to suit requirements of the desired ejection application. The customer is required to add the lifter core hole, bolt hole and chamfers as marked by the thick line in the figure shown below.
- When modifying the Guide Plate, dimensions are to be modified relative to the reference planes marked by L as shown below.
- Since the slide base is a sliding part, be sure to chamfer or round corners as much as possible to aid in the sliding action.
- Do not attempt to remove or disassembly the joint pin from the slide base.
- For heat treatment, gas nitriding is permissible after the additional customer machining has been completed. Do not quench or harden the slide base or joint pin.
- A precise fit into the bearing surface of the mold plate is an important factor in positioning the lifter core assembly. This is particularly important when the Guide Plate is reduced in size or simplified (i.e., only one bolt hole is used).



Guide cut from the reference plane (each number refers to the machining procedure).

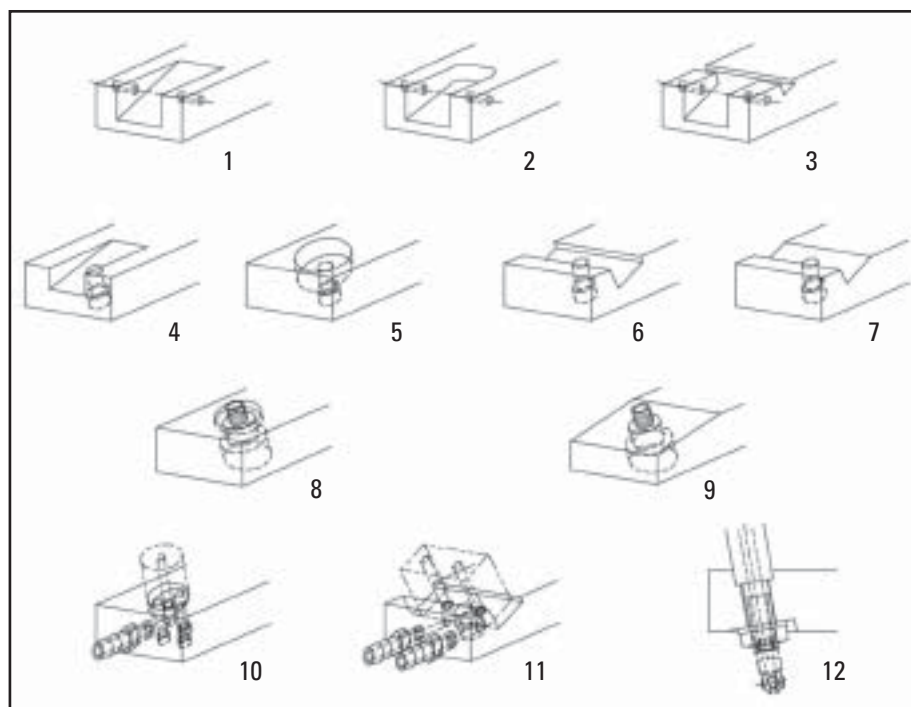



We recommend that you use pinning for easy machining performance and to maintain a flexible assembly.

Size	Dimensions						Installation Classification
Standard Base (SB)	VF06SB	VF08SB	VF10SB	VF13SB	VF16SB	VF20SB	
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
T	13 ⁰ _{-0.02}	15 ⁰ _{-0.02}	20 ⁰ _{-0.03}	25 ⁰ _{-0.03}	30 ⁰ _{-0.05}	40 ⁰ _{-0.05}	Additional machining and remarks
F	20 ⁰ _{-0.02}	25 ⁰ _{-0.02}	32 ⁰ _{-0.03}	40 ⁰ _{-0.03}	50 ⁰ _{-0.05}	60 ⁰ _{-0.05}	Additional Machining: <ul style="list-style-type: none"> ■ Lifter core holt (bolt hole) ■ Groove ■ Full-length machining Heat Treatment: Gas nitriding is permissible after additional machining has been performed.
L	40 ⁰ _{-0.1}	50 ⁰ _{-0.1}	60 ⁰ _{-0.2}	80 ⁰ _{-0.2}	100 ⁰ _{-0.3}	130 ⁰ _{-0.3}	
H	6.5	7.5	10	12.5	15	20	
W	7.5	10	12.5	15	20	25	
N	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	
CHAMFER	0.5	0.5	1.0	1.0	2.0	2.0	

Examples of lifter core mounting installations

1. We recommend options 1, 2 and 3 (shown below) since those configurations will enable easy automatic centering.
2. For the joint pin hole, ensure the concentricity with an H7 fit, relative to the hole facing the joint pin hole.
3. An optional joint pin is easily replaced.
4. By providing backup to the lifter core via the slide base the total limitations of the lifter core are reduced.



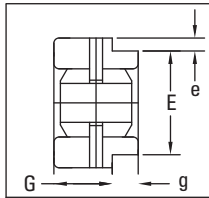
 The mutual machining accuracy in the mounting between the lifter core and the Slide Base is important.

VECTORFORM COMPONENT SPECIFICATIONS

JOINT SLIDE BASE – JB

Joint Slide Base – JB

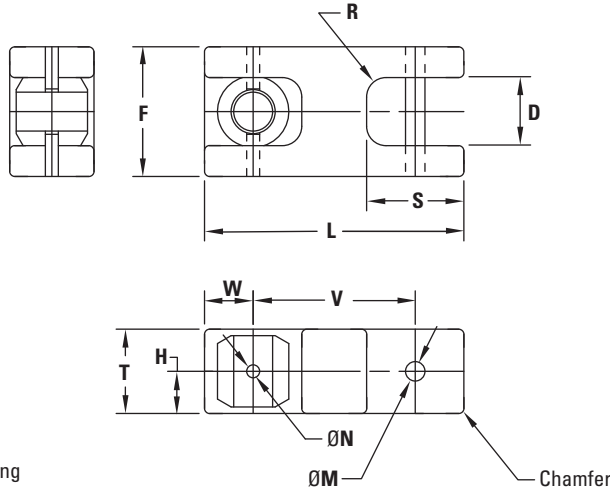
Material: SCM 440 / DIN 42 CrMo4 / AISI 4140
 Hardness: HRC 30-33



Standard Size of Guide Step

	E	e	G	g
06	16	2.0	9	4
08	20	2.5	11	4
10	26	3.0	14	6
13	33	3.5	17	8
16	42	4.0	22	8
20	50	5.0	28	12

Note:
 Dimensions for retaining step to be machined by moldmaker as necessary.



Additional Machining: None

Attachment: Joint pin

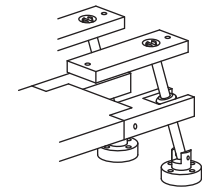
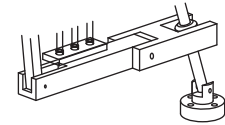
Heat Treatment:

Gas nitriding is permissible after additional machining has been performed. During nitriding, use a pin finer (-0.01) than the attached joint pin.

- Joint pin material: SKH51 / DIN S6-5-2 / AISI M2
- Hardness: HRC 60-63
- Tempering temperature: 600°C

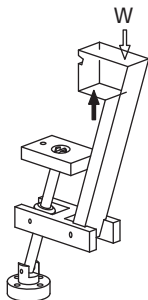
Joint Slide Base Guidelines

- No additional machining is required.
- Since the slide base is a sliding part, be sure to chamfer or round corners as much as possible to aid in the sliding action.
- Do not attempt to remove or disassemble the joint pin from the slide base.
- The joint pin is detachable.
- For heat treatment, gas nitriding is permissible after customer machining has been completed. Do not quench or harden the slide base or joint pin.
- Add the additional machining operation to the guide step as needed. There is no limit to modifications that can be made.
- Make sure to take into consideration the presence (or absence) of load acting on the joint pin and the allowable load limit of the joint pin.
- The accuracy of the lifter core is important.
- We recommend that you use as large a joint pin as possible with the lifter core.



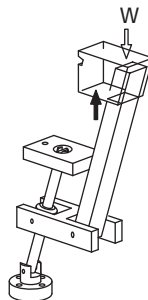
The joint base can be used with custom broad base extension plates.

Pressure Receiver Style



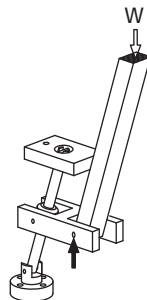
There is no limit to the load that acts on the joint pin when this configuration is used.

Pressure Receiver Style

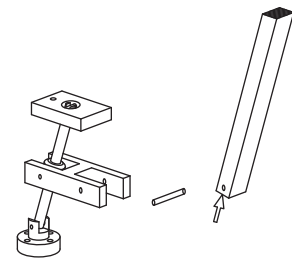


The only limit on the load acting on the joint pin is defined by the ejection force.

Straight Pressure Style



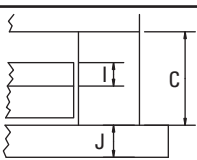
There is a limit to the allowable load that acts on the joint pin when this configuration is used.



Establish a rather loose fit for the pin hole at ϕ , allowing for an error in angle, position, and thermal displacement.



- Maintain parallel sliding surfaces on the ejector plate and ejector retainer plate (upper and lower) to ensure safe operation.
- The clearance in the joint pin hole automatically centers the angle and the position of the lifter core even if there is error in the machining.

Size	Dimensions						Installation Classification
Joint Base (JB)	VF06JB	VF08JB	VF10JB	VF13JB	VF16JB	VF20JB	
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
T	13 ⁰ _{-0.02}	15 ⁰ _{-0.02}	20 ⁰ _{-0.03}	25 ⁰ _{-0.03}	30 ⁰ _{-0.05}	40 ⁰ _{-0.05}	Additional machining and remarks
F	20 ⁰ _{-0.02}	25 ⁰ _{-0.02}	32 ⁰ _{-0.03}	40 ⁰ _{-0.03}	50 ⁰ _{-0.05}	60 ⁰ _{-0.05}	Additional Machining: NO Attachment: Joint pin Heat Treatment: Gas nitriding is permissible after additional machining has been performed. During nitriding, use a pin finer (-0.01) than the attached joint pin. ■ Joint pin material: SKH 51 ■ Hardness: HRC 60-66 ■ Tempering temperature: 600°C
L	40 ⁰ _{-0.1}	50 ⁰ _{-0.1}	60 ⁰ _{-0.2}	80 ⁰ _{-0.2}	100 ⁰ _{-0.3}	130 ⁰ _{-0.3}	
D	10.5	13.5	17	22	27	33	
S	15	20	25	30	40	50	
H	6.5	7.5	10	12.5	15	20	
W	7.5	10	12.5	15	20	25	
V	25	30	35	50	60	80	
N	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	
M	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	
R	R3	R5.5	R6	R7	R11	R12	
CHAMFER	0.5	0.5	1.0	1.0	2.0	2.0	

Allowable Load: Ejection pressure P = 5 [Kgf/mm ²]		Shift Angle	Joint Pin diameter and allowable load limit						Factor of Safety = 5
Load during molding	Multiplying factor of ejection		VF06JB	VF08JB	VF10JB	VF13JB	VF16JB	VF20JB	
			Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	
Full Load W [N]	0.98	5°	5608	9961	15569	22422	39853	62275	
	0.95	10°	5745	10206	15951	22971	40824	63795	
	0.93	15°	5931	10549	16481	23726	42187	65912	
	0.90	20°	6186	10990	17177	24735	43971	68706	
	0.88	25°	6510	11569	18088	26039	46294	72334	
	0.85	30°	6931	12314	19245	27716	49265	76981	
Pressure Receiving Area: A [mm ²]	A=W/P	5°	114	203	318	457	813	1270	
		10°	117	208	325	469	833	1301	
		15°	121	215	336	484	861	1345	
		20°	126	224	350	505	897	1402	
		25°	133	236	369	531	944	1476	
		30°	141	251	393	565	1005	1570	
Square Root: B [mm]	B=√A	5°	10.7	14.2	17.8	21.4	28.5	35.6	
		10°	10.8	14.4	18.0	21.7	28.9	36.1	
		15°	11.0	14.7	18.3	22.0	29.3	36.7	
		20°	11.2	15.0	18.7	22.5	29.9	37.4	
		25°	11.5	15.4	19.2	23.0	30.7	38.4	
		30°	11.9	15.8	19.8	23.8	31.7	39.6	

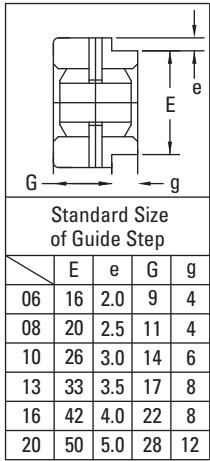
Note: The allowable value of ejection resistance can be obtained by multiplying the full load W by the multiplying factor of ejection.

VECTORFORM COMPONENT SPECIFICATIONS

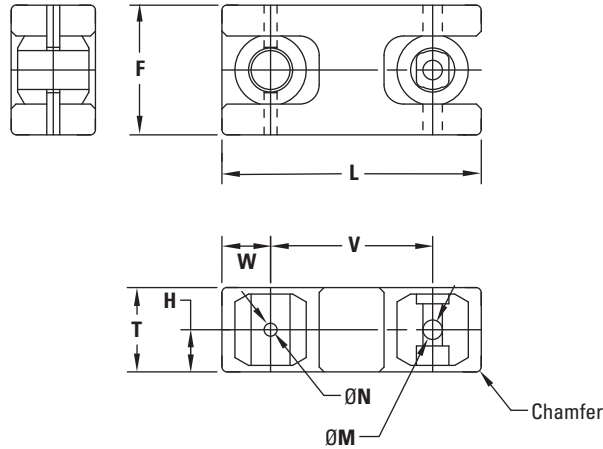
UNIVERSAL SLIDE BASE – UB

Universal Slide Base – UB

Material: SCM 440 / DIN 42 CrMo4 / AISI 4140
 Hardness: HRC 30-33



Note:
 Dimensions for retaining step to be machined by moldmaker as necessary.



Additional Machining:
 None

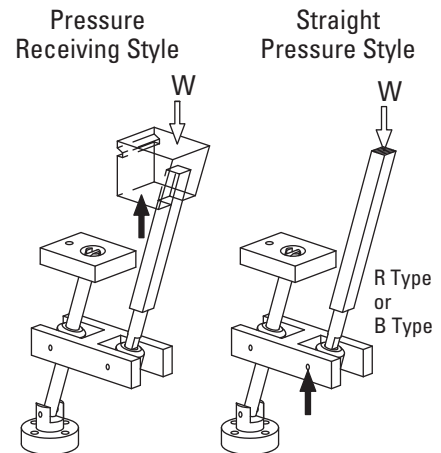
Attachment: None

Heat Treatment:
 Gas nitriding is permissible after additional machining has been performed.

Size	Joint Housing Dimensions						Mounting Eye Geometries
	VF06UB	VF08UB	VF10UB	VF13UB	VF16UB	VF20UB	
Universal Base (UB)							
a	6 ^{+0.15} / _{-0.05}	8 ^{+0.15} / _{+0.05}	10 ^{+0.2} / _{+0.1}	13 ^{+0.2} / _{+0.1}	16 ^{+0.3} / _{+0.15}	20 ^{+0.3} / _{+0.15}	R type
b	5 ^{+0.15} / _{+0.05}	6.5 ^{+0.15} / _{+0.05}	8 ^{+0.2} / _{+0.1}	10 ^{+0.2} / _{+0.1}	13 ^{+0.3} / _{+0.15}	17 ^{+0.3} / _{+0.15}	
e	3.3	4.6	6.0	8.4	9.3	11	B type
f	5.3	7.1	9.0	12.4	13.3	17	
r.c.	1.0	1.25	1.5	2.0	2.0	3.0	
v	(1.2)	(2.2)	(2.7)	(4.7)	(4.2)	(5.0)	
h	3.5 ^{±0.05}	3.5 ^{±0.05}	5 ^{±0.08}	5 ^{±0.08}	7.5 ^{±0.10}	10 ^{±0.10}	
(CB)M	3x10	4x12	5x15	6x20	8x25	10x35	

Universal Slide Base Guidelines

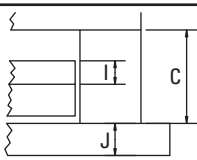
1. No additional machining is required.
2. Since the slide base is a sliding part, be sure to chamfer or round corners as much as possible to aid in the sliding action.
3. Do not attempt to remove or disassemble the bushing hinge pin from the slide base.
4. For heat treatment, gas nitriding is permissible after customer machining has been completed. Do not quench or harden the slide base or joint pin.
5. Add the additional machining operation to the guide step as needed. However, any modifications that are made to the Universal Slide Base are the customer's responsibility. Be careful not to compromise the strength of the slide base when adding modifications.
6. Make sure to consider the presence (or absence) of load acting on the bushing hinge and the allowable load limit of the bushing hinge pin.
7. The accuracy in the length of the lifter core is important.
8. For the lifter core set screw, use one with the specified length, and lock it.



The only limit to the load that can be applied to the joint pin is the ejection force.



- Some slack in angle and position will be centered automatically.
- Maintain parallel sliding surfaces on the ejector plate and ejector retainer plate (upper and lower) to ensure safe operation.

Size	Dimensions						Installation Classification
Universal Base (UB)	VF06UB	VF08UB	VF10UB	VF13UB	VF16UB	VF20UB	
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
T	13 ⁰ _{-0.02}	15 ⁰ _{-0.02}	20 ⁰ _{-0.03}	25 ⁰ _{-0.03}	30 ⁰ _{-0.05}	40 ⁰ _{-0.05}	Additional machining and remarks
F	20 ⁰ _{-0.02}	25 ⁰ _{-0.02}	32 ⁰ _{-0.03}	40 ⁰ _{-0.03}	50 ⁰ _{-0.05}	60 ⁰ _{-0.05}	Additional Machining: NO Attachment: NO Heat Treatment: Gas nitriding is permissible after additional machining has been performed.
L	40 ⁰ _{-0.1}	50 ⁰ _{-0.1}	60 ⁰ _{-0.2}	80 ⁰ _{-0.2}	100 ⁰ _{-0.3}	130 ⁰ _{-0.3}	
H	6.5	7.5	10	12.5	15	20	
W	7.5	10	12.5	15	20	25	
V	25	30	35	50	60	80	
N	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	
M	Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	
CHAMFER	0.5	0.5	1.0	1.0	2.0	2.0	

Allowable Load: Ejection pressure P = 5 [Kgf/mm ²]		Shift Angle	Universal Pin diameter and allowable load limit						Factor of Safety = 5
Load during molding	Multiplying factor of ejection		VF 06 UB	VF 08 UB	VF 10 UB	VF 13 UB	VF 16 UB	VF 20 UB	
			Ø3	Ø4	Ø5	Ø6	Ø8	Ø10	
Full Load W [N]	0.98	5°	4490	7971	12451	17941	31883	49824	
	0.95	10°	4598	8167	12765	18373	32657	51040	
	0.93	15°	4745	8441	13186	18981	33745	52726	
	0.90	20°	4951	8794	13745	19784	35177	54961	
	0.88	25°	5206	9255	14471	20834	37040	57863	
	0.85	30°	5549	9853	15392	22177	39412	61589	
Pressure Receiving Area: A [mm ²]	A=W/P	5°	92	163	254	366	650	1016	
		10°	94	167	260	375	666	1041	
		15°	97	172	269	387	688	1076	
		20°	101	179	280	404	718	1121	
		25°	106	189	295	425	756	1181	
		30°	113	201	314	452	804	1256	
Square Root: B [mm]	B=√A	5°	9.6	12.8	15.9	19.1	25.5	31.9	
		10°	9.7	12.9	16.1	19.4	25.8	32.3	
		15°	9.8	13.1	16.4	19.7	26.2	32.8	
		20°	10.0	13.4	16.7	20.1	26.8	33.5	
		25°	10.3	13.7	17.2	20.6	27.5	34.4	
		30°	10.6	14.2	17.7	21.3	28.4	35.4	

Note: The allowable value of ejection resistance can be obtained by multiplying the full load W by the multiplying factor of ejection.

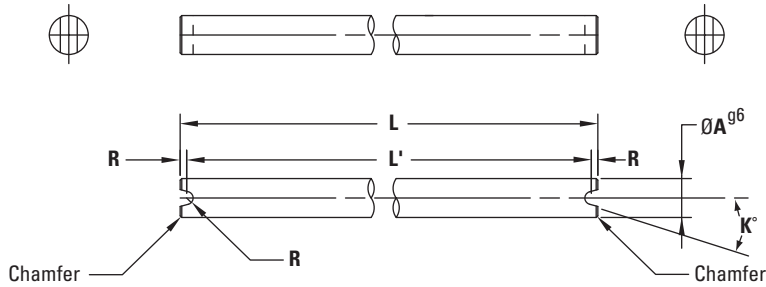


- Some slack in angle and position will be centered automatically.
- Maintain parallel sliding surfaces on the ejector plate and ejector retainer plate (upper and lower) to ensure safe operation.

VECTORFORM COMPONENT SPECIFICATIONS GUIDE ROD – GR

Guide Rod – GR

Material: S UJ 2 / DIN 100 Cr6 / AISI 52100
Hardness: HRC 58-60



Additional Machining:

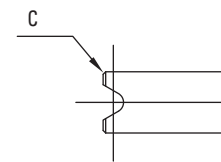
- All dimensions shown are to be held after any additional machining has been performed. Non-designated tolerance: ± 0.1 . Non-designated chamfer "C" tolerance: 0.5 to 1.0.
- Moldmaker to add grooves and chamfers per specifications shown.

Center Distance: $L' = L - 2R$

Heat Treatment: Induction hardening completed; heat treat is not required.

Guide Rod Guidelines

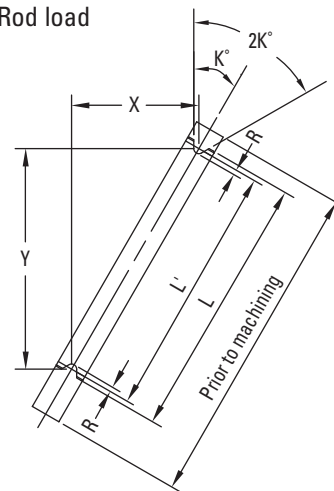
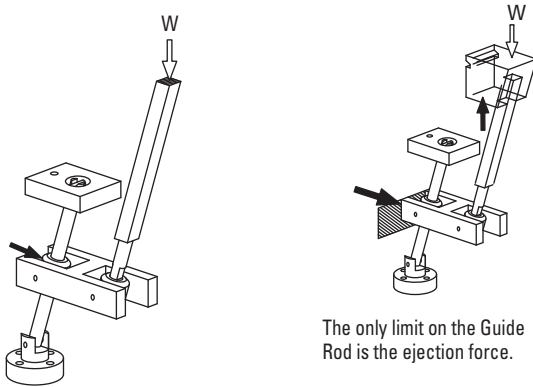
1. Add the machining detail shown to the right. The final length, the U groove and the chamfer "C" detail designated by the thick line are to be machined by the customer.
2. Machining is wire EDM. The final length and "U" groove are to be machined simultaneously.
3. Heat treatment of the Guide Rod is not required.
4. The full length is $L' = y / \cos K^\circ$ and $L = L' + 2R$ (after the Guide Rod has been cut to length and the U grooves have been machined into the Guide Rod).
5. The actual L' dimension must also take into consideration the component tolerances.
6. Refer to the page regarding the Holder Bushing component specifications for further details on the method of calculating "y".
7. At the maximum allowable full flank length L, the chamfer height C shown is the maximum allowable value, allowing for a shift angle (the "shift" angle refers to the angle of the Guide Rod to the leader pin axis in the mold plates) of $K = 30^\circ$ maximum (however, this case is limited where the thickness of the mounting plate is the standard thickness).
8. Make sure to take into consideration the presence (or absence) of Guide Rod load and the allowable load limit of the Guide Rod.



$$L' = y / \cos K^\circ$$

$$L = L' + 2R$$

(Dimensions of final length after machining)

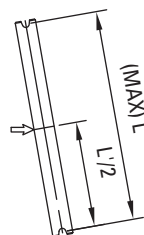


You do not have to increase the ejector stroke for the purposes of reducing the shift angle. Make an ejector stroke smaller, and tilt the lifter core assembly down to the desired angle.

Size	Dimensions						Installation Classification
Guide Rod (GR)	VF06GR	VF08GR	VF10GR	VF13GR	VF16GR	VF20GR	
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
A	Ø6 ^{-0.004} _{-0.012}	Ø8 ^{-0.005} _{-0.014}	Ø10 ^{-0.005} _{-0.014}	Ø13 ^{-0.006} _{-0.017}	Ø16 ^{-0.006} _{-0.017}	Ø20 ^{-0.007} _{-0.020}	Additional machining and remarks
L	150	190	250	310	370	500	(Flank full length dimensions)
L'	L' ^{-0.1} _{-0.2}	L' ^{-0.1} _{-0.2}	L' ^{-0.1} _{-0.2}	L' ^{-0.2} _{-0.4}	L' ^{-0.2} _{-0.4}	L' ^{-0.2} _{-0.4}	Additional Machining: U groove Center Distance: L' = L - 2R Heat Treatment: Induction hardening completed; heat treat is not required.
K°	Same as the shift angle of the lifter core (30° MAX)						
R	1.0 ^{+0.02} ₀	1.5 ^{+0.02} ₀	2.0 ^{+0.03} ₀	2.5 ^{+0.03} ₀	3.0 ^{+0.05} ₀	3.5 ^{+0.05} ₀	
CHAMFER	0.5	0.5	0.5	1	1	1	

Allowable Load: Ejection pressure P = 5 [Kgf/mm ²]		Shift Angle	Guide Rod diameter "A" [mm] x rod length "L" [mm] and allowable load value.						Factor of Safety = 5
Load during molding	Multiplying factor of ejection		VF06GR	VF08GR	VF10GR	VF13GR	VF16GR	VF20GR	
			Ø6x148	Ø8x187	Ø10x246	Ø13x305	Ø16x364	Ø20x493	
Full Load W [N]	0.06	9°	19873	37294	55402	98011	153138	220933	
	0.11	10°	10167	19079	28334	50128	78324	112991	
	0.29	15°	3098	5804	8628	15265	23853	34412	
	0.40	20°	1951	3657	5431	9608	15010	21657	
	0.47	25°	1510	2843	4216	7461	11657	16824	
	0.52	30°	1314	2471	3667	6490	10137	14628	
Pressure Receiving Area: A [mm ²]	A=W/P	9°	405	761	1130	1999	3124	4507	
		10°	207	389	578	1023	1598	2305	
		15°	63	118	176	311	487	702	
		20°	40	75	111	196	306	442	
		25°	31	58	86	152	238	343	
		30°	27	50	75	132	207	298	
Square Root: B [mm]	B=√A	9°	20.1	27.6	33.6	44.7	55.9	67.1	
		10°	14.4	19.7	24.0	32.0	40.0	48.0	
		15°	7.9	10.9	13.3	17.6	22.1	26.5	
		20°	6.3	8.7	10.5	14.0	17.5	21.0	
		25°	5.6	7.6	9.3	12.3	15.4	18.5	
		30°	5.2	7.1	8.7	11.5	14.4	17.3	

- There is no load caused by the resin pressure when K is 8° or lower in angle. Only the ejection resistance exists.
- Multiply the full load W by the multiplying factor to find the allowable value of ejection resistance.
- The allowable full load (and the pressure-receiving area) are inversely proportional to the length of the Guide Rod.
 Example: VF 10 GR Ø10 mm x 246 mm, 30° shift angle,
 374 Kgf → Ø10 mm x 123 mm, 30°, 748 Kgf
 75 mm² → 150 mm²
- The allowable full load (and pressure-receiving area) apply to the case where the length L' in the shaft center of the Guide Rod is the central load when the maximum specified load is reached. Perform calculations in a manner inversely proportional to the actual design value length.



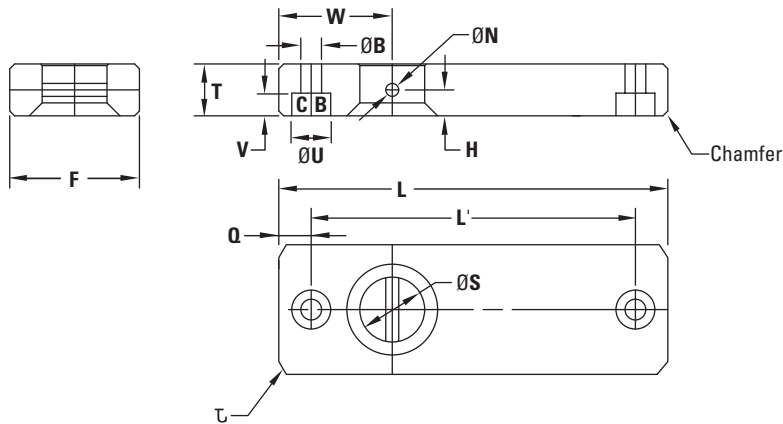
Determine an effective value by actual measurement of the spacer height C and the mounting plate thickness J.

VECTORFORM COMPONENT SPECIFICATIONS

GUIDE PLATE – GP

Guide Plate – GP

Material: S 50 C / DIN C50E / AISI 1049
 Hardness: HRC 15-20



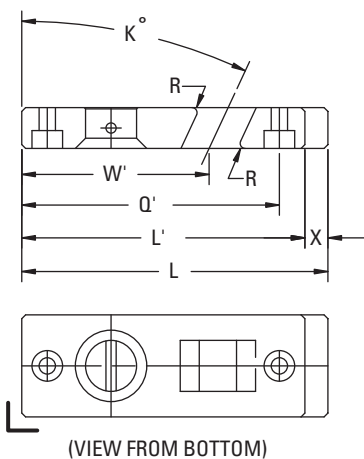
Additional Machining:

- Lifter core hole or slot
- Any additional machining that is required to accommodate the lifter core assembly.

Heat Treatment: Gas nitriding is permissible after additional machining has been performed.

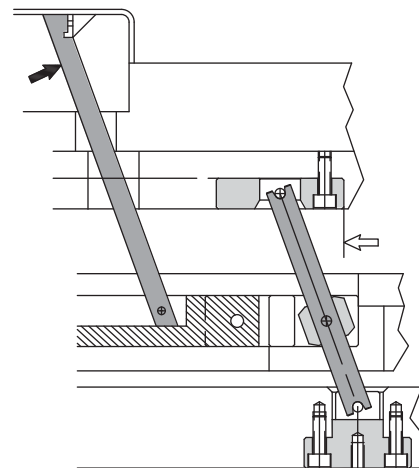
Guide Plate Guidelines

1. Modify the length of the Guide Plate to suit requirements of the desired ejection application. The customer is required to add the lifter core hole and necessary chamfers, as marked by the thick line below.
2. When modifying the Guide Plate, dimensions are to be modified relative to the reference planes marked by L as shown below.
3. Be sure to include the radius R (shown below) when adding the lifter core hole to the Guide Plate.
4. Do not remove the joint pin that comes installed in the Guide Plate.
5. For heat treatment, gas nitriding is permissible after the additional customer machining has been completed. Do not quench or harden the Guide Plate.
6. A precise fit into the bearing surface of the mold plate is an important factor in positioning the lifter core assembly. This is particularly important when the Guide Plate is reduced in size or simplified (ie. only one bolt hole is used).



When reducing the size of the Guide Plate to the point that it can no longer be used to guide the lifter core, be sure to guide the lifter core in the area marked X .

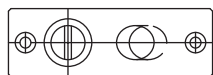
Position the Guide Plate securely on the mold plate reference plate (marked \leftarrow) when reducing the size of the Guide Plate.



If the lifter core block is used to guide the lifter core, the guide hole (or groove) in the Guide Plate can be omitted.

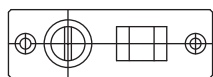
Symbol	Dimensions						Installation Classification
	VF 06 GP	VF 08 GP	VF 10 GP	VF 13 GP	VF 16 GP	VF 20 GP	
Guide Plate (GP)							
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
T	8 ⁰ _{-0.02}	10 ⁰ _{-0.02}	12 ⁰ _{-0.03}	15 ⁰ _{-0.03}	20 ⁰ _{-0.05}	25 ⁰ _{-0.05}	Additional machining and remarks
F	20 ⁰ _{-0.02}	25 ⁰ _{-0.02}	32 ⁰ _{-0.03}	40 ⁰ _{-0.03}	50 ⁰ _{-0.05}	60 ⁰ _{-0.05}	
L	60 ⁰ _{-0.04}	70 ⁰ _{-0.04}	90 ⁰ _{-0.06}	120 ⁰ _{-0.06}	150 ⁰ _{-0.1}	180 ⁰ _{-0.1}	Additional Machining: <ul style="list-style-type: none"> ■ Lifter Core holt (bolt hole) ■ Groove ■ Full-length machining Heat Treatment: Gas nitriding is permissible after additional machining has been performed.
L'	50	60	75	105	130	155	
H	4	5	6	7.5	10	12.5	
W	17.5	20	25	30	40	45	
N	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	
S	Ø10	Ø13	Ø16	Ø20	Ø25	Ø30	
B	Ø3.3	Ø4.3	Ø5.3	Ø6.7	Ø8.5	Ø10.6	
U	Ø6.0	Ø7.5	Ø9.0	Ø11.0	Ø14.0	Ø18.0	
V	3.5	4.5	5.5	7.0	9.0	11.0	
Q	5	5	7.5	7.5	10	12.5	
CHAMFER	0.5	0.5	0.5	1.0	1.0	1.0	
(CB) M	3x10	4x12	5x15	6x12	8x25	10x30	

Guide Plate Guidelines



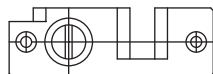
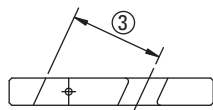
(VIEW FROM BOTTOM)

1. Machining for centering in a slanted position from the guide cut (each number refers to the machining procedure).



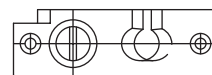
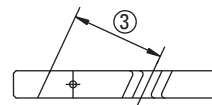
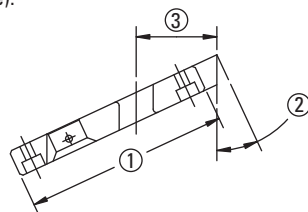
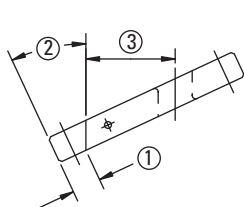
(VIEW FROM BOTTOM)

2. Machining for centering in a slanted position from the stay guide cut (each number refers to the machining procedure).



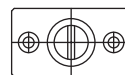
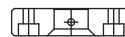
(VIEW FROM BOTTOM)

3. Machine the guide cut and the groove simultaneously from the reference plane.



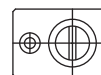
(VIEW FROM BOTTOM)

4. Upon completion of the simultaneous machining of the guide cut and the groove from the reference plane, machine the groove and the hole of the shaft.



(VIEW FROM BOTTOM)

5. No lifter core hole (1)



(VIEW FROM BOTTOM)

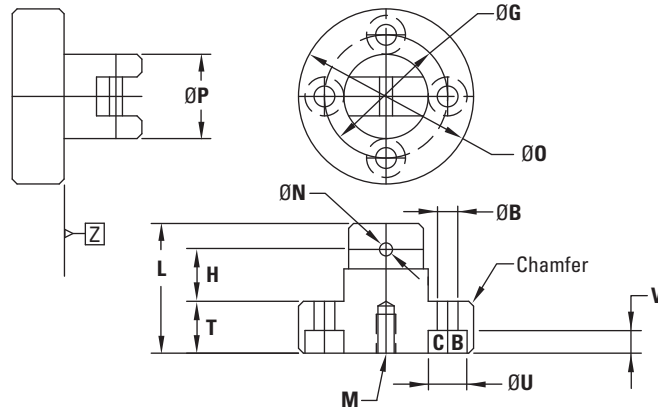
6. No lifter core hole (2)

VECTORFORM COMPONENT SPECIFICATIONS HOLDER BUSHING – HB

Holder Bushing – HB

Material: S 50 C / DIN C50E / AISI 1049

Hardness: HRc 15-20

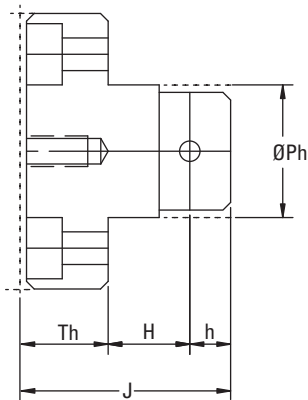


Additional Machining: None
Heat Treatment: Not required.

Holder Bushing Guidelines

1. No additional machining is required.
2. The reference point for this part is at the intersection of the center point of $\varnothing P$ and the reference plane $\square Z$
3. Do not attempt to remove or disassemble the bushing hinge pin from the Holder Bushing.
4. No heat treatment is required.
5. If interference occurs in the maximum diameter flange "O", the flange can be cut away down to $\varnothing P$.
6. In the case that portions of the flange is cut away, two mounting screws will be sufficient. At least two mounting screws are required.
7. "h" is a factor that determines the required Guide Rod length.
8. The bottom face of the Holder Bushing is concave below the bottom plate surface.
9. When machining the installation for the Holder Bushing, keep a loose tolerance on clearance hole for the "Ph" diameter. This will allow for automatic centering.
10. Tighten the socket head cap screws firmly after the Holder Bushing has automatically aligned.

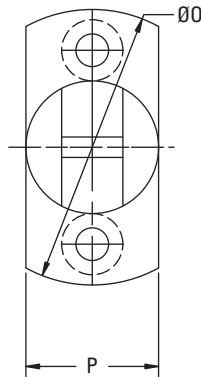
PLATE INSTALLATION



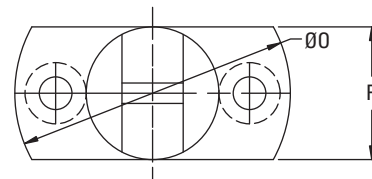
$$h = J - Th - H$$

ALTERNATE INSTALLATIONS

EXAMPLE OF 2 BOLT CONFIGURATIONS WITH HOLDER BASE CUT TO REDUCE SPACE REQUIREMENTS



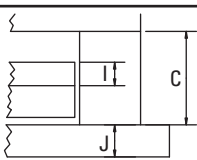
EXAMPLE OF PIN PERPENDICULAR TO CUTS



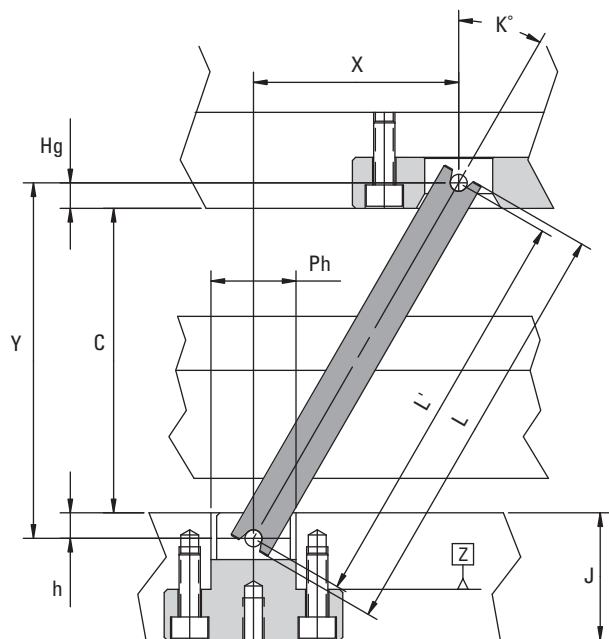
EXAMPLE OF PIN PARALLEL TO CUTS




Ensure the the hinge pin height "h" and the bearing surface depth "Th" dimensions by actual measurement of the bottom plate thickness "J".

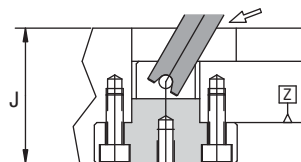
Size	Dimensions						Installation Classification
Holder Bushing (HB)	VF06HB	VF08HB	VF10HB	VF13HB	VF16HB	VF20HB	
I	13	15	20	25	30	35	
J	20	25	30	35	40	50	
C	50-120	50-150	70-200	100-250	120-300	120-400	
P	Ø13 ⁰ _{-0.05}	Ø16 ⁰ _{-0.05}	Ø20 ⁰ _{-0.07}	Ø25 ⁰ _{-0.07}	Ø32 ⁰ _{-0.1}	Ø40 ⁰ _{-0.1}	Additional machining and remarks
L	20 ^{-0.1} _{-0.2}	25 ^{-0.1} _{-0.2}	30 ^{-0.1} _{-0.3}	35 ^{-0.1} _{-0.3}	40 ^{-0.1} _{-0.5}	50 ^{-0.1} _{-0.5}	Additional Machining: NO Heat Treatment: Not required.
O	Ø27 ⁰ _{-0.2}	Ø34 ⁰ _{-0.2}	Ø42 ⁰ _{-0.3}	Ø51 ⁰ _{-0.3}	Ø65 ⁰ _{-0.5}	Ø80 ⁰ _{-0.5}	
T	8 ^{-0.1} _{-0.2}	10 ^{-0.1} _{-0.2}	12 ^{-0.1} _{-0.3}	15 ^{-0.1} _{-0.3}	18 ^{-0.1} _{-0.5}	22 ^{-0.1} _{-0.5}	
H	8	10	12	12.5	12	15.5	
N	Ø2	Ø3	Ø4	Ø5	Ø6	Ø7	
G	Ø19	Ø24	Ø30	Ø37	Ø47	Ø58	
B	Ø3.2	Ø4.3	Ø5.5	Ø6.5	Ø8.5	Ø11	
U	Ø6.0	Ø7.5	Ø9.0	Ø11.0	Ø14.0	Ø18.0	
V	3.5	4.5	5.5	7.0	9.0	11.0	
M	M3x6	M4x8	M5x10	M6x12	M8x15	M10x20	
CHAMFER	0.5	0.5	1.0	1.0	1.0	1.0	
(CB)M	3x10	4x12	5x15	6x20	8x25	10x30	

Note: The length of the Guide Rod is determined by the installation of the Holder Bushing.
 $y = C + Hg + h$ $L' = y / \cos K^\circ$ $L = L' + 2R$



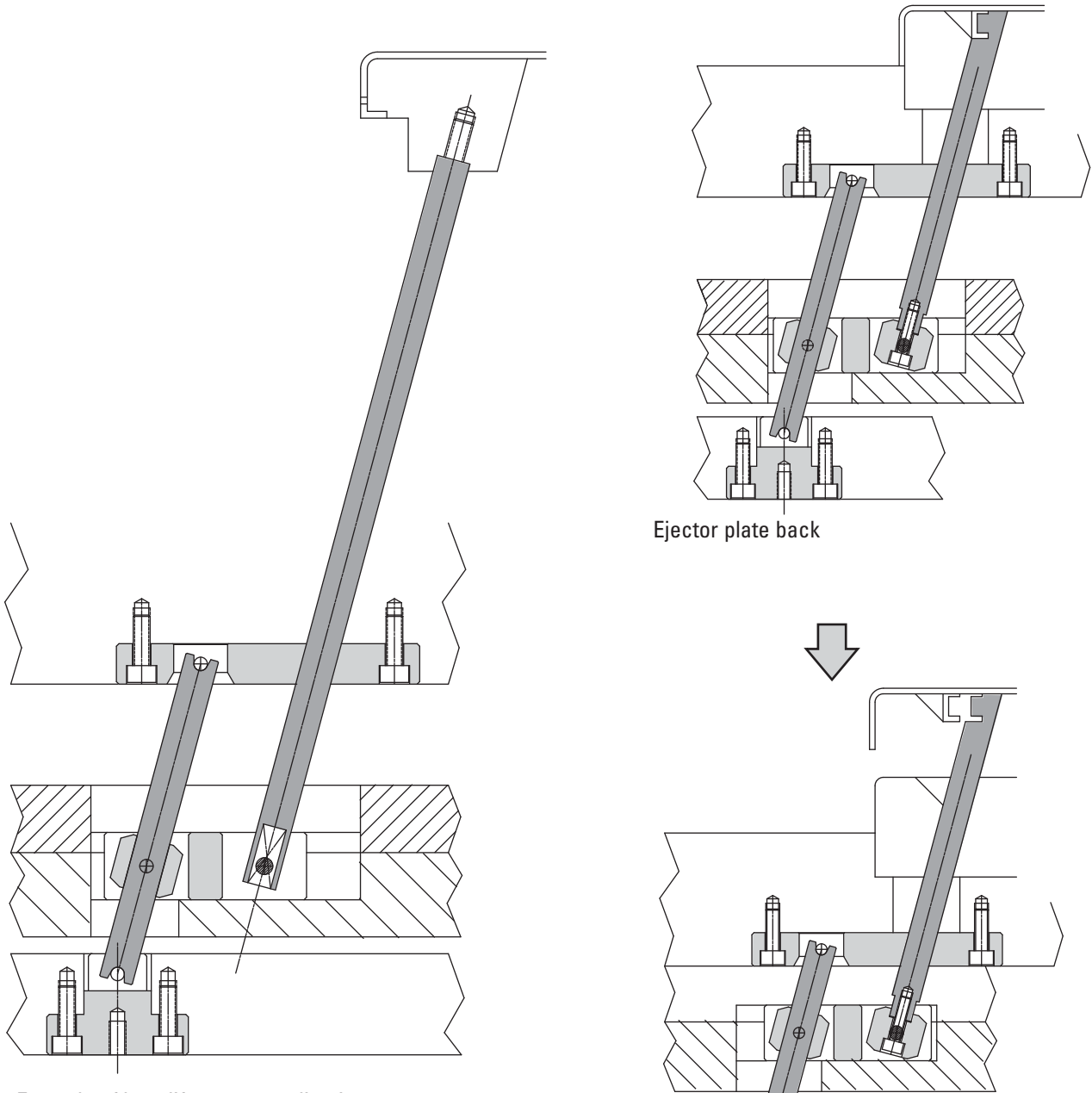
Holder Bushing Guidelines

1. Include sufficient clearance in the mold plate to avoid interference (as shown by ↙). The amount of clearance required will change depending on the shift angle (of the lifter core and Guide Rod) used, and on the thickness of the bottom clamp plate.
2. Avoid a "bump" against the bearing surface by maintaining a static fit when inserting the Guide Rod. 

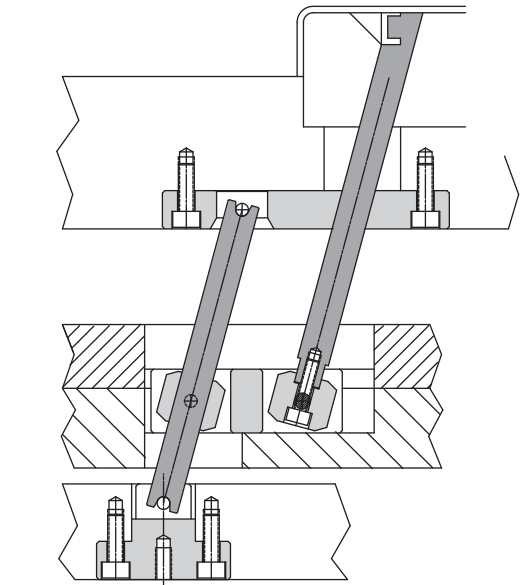


Keep the installation of the "Ph" diameter rather loose. This will allow for automatic centering.

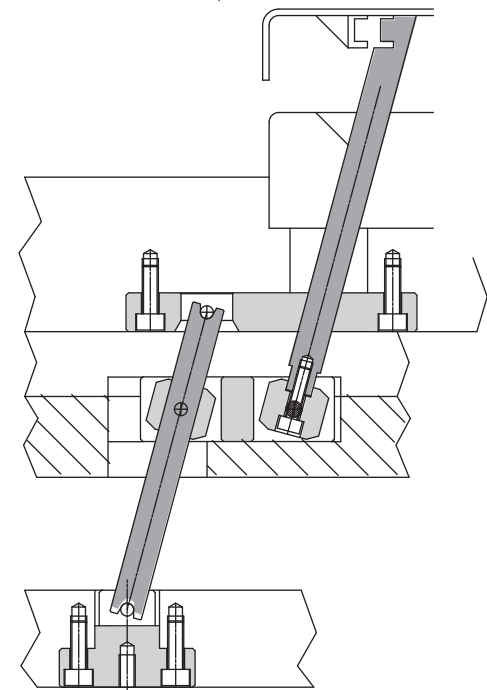
Standard Configuration



Example of long lifter core application.
Joint Slide Base (JB) shown.

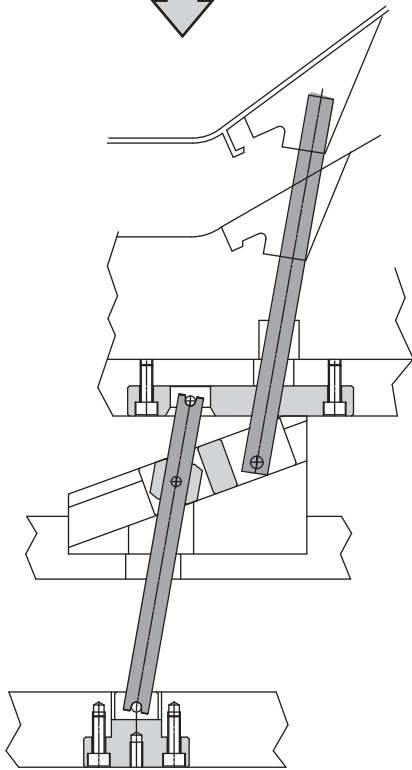
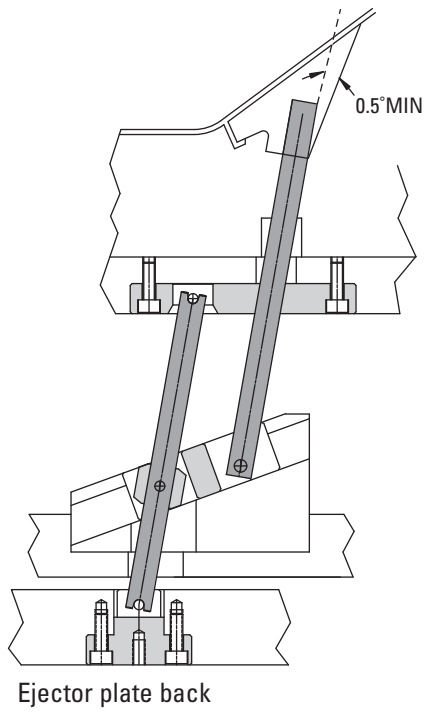


Ejector plate back

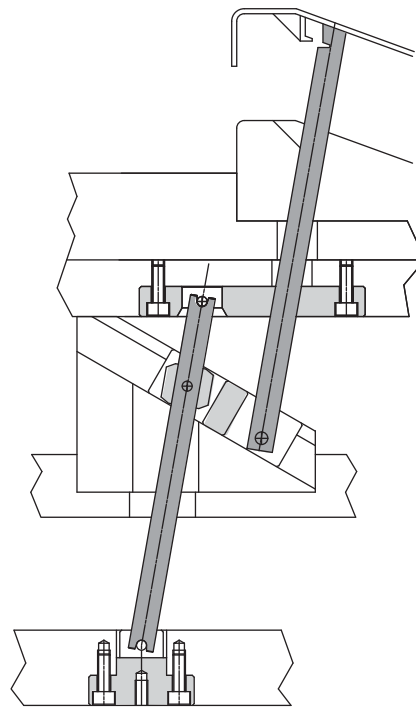
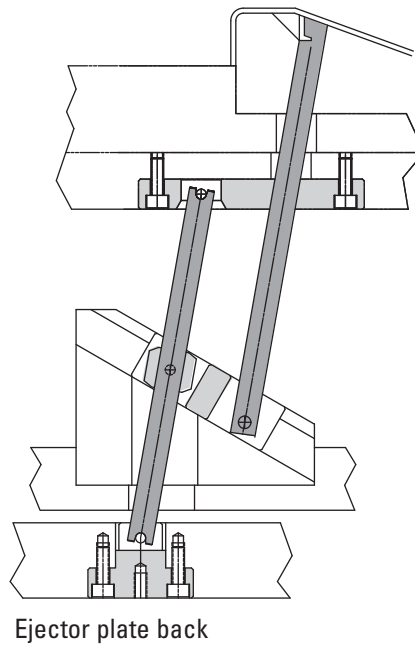


Ejector plate forward
Universal Slide Base (UB).

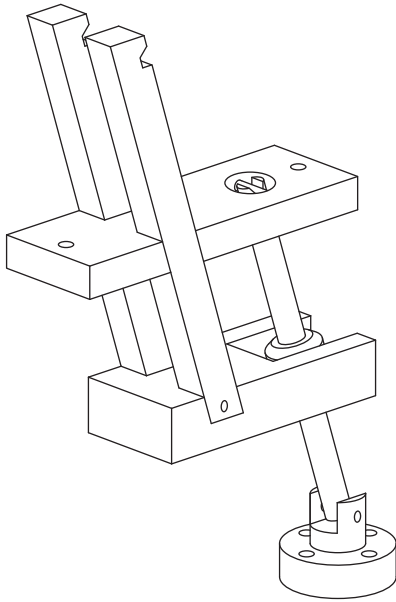
Accelerated Configuration



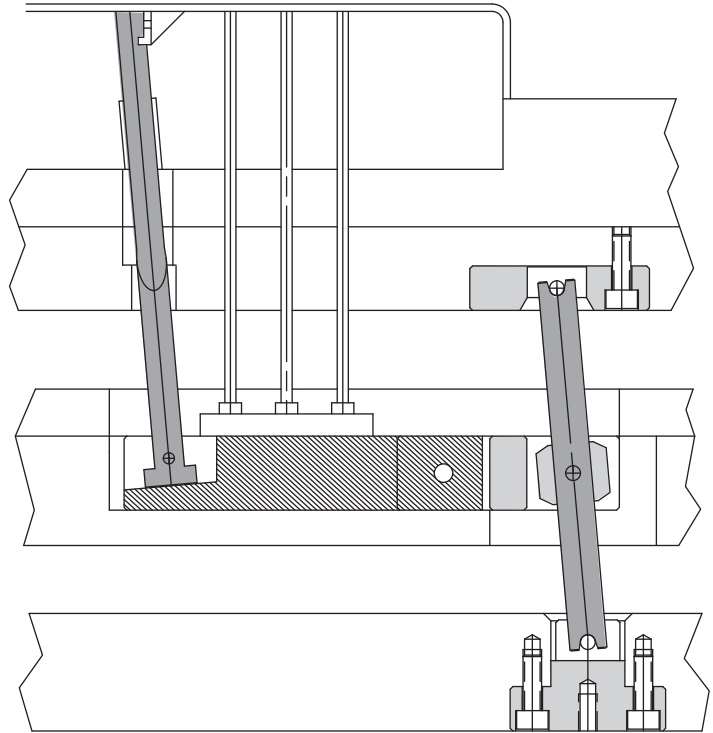
Decelerated Configuration



VECTORFORM SAMPLE APPLICATIONS

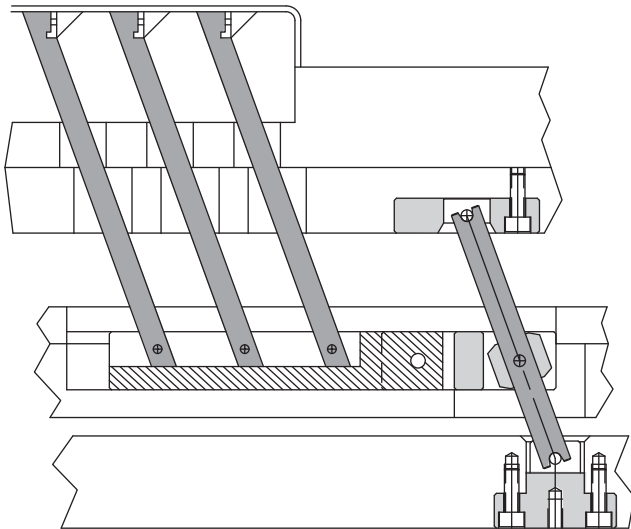


Example of multiple lifter cores being actuated in parallel by a Standard Slide Base (SB).

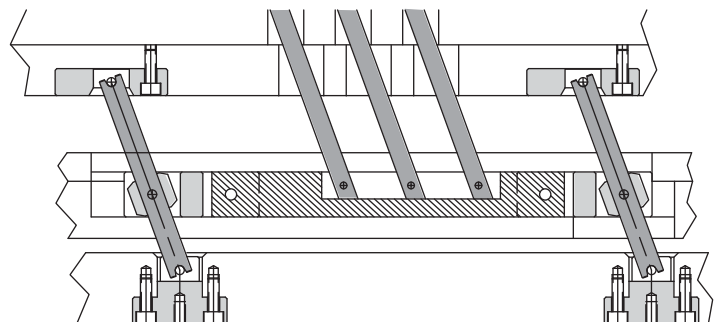


VectorForm Lifter System example with tandem ejector pins in close proximity to slide base. Joint Slide Base (JB) shown.

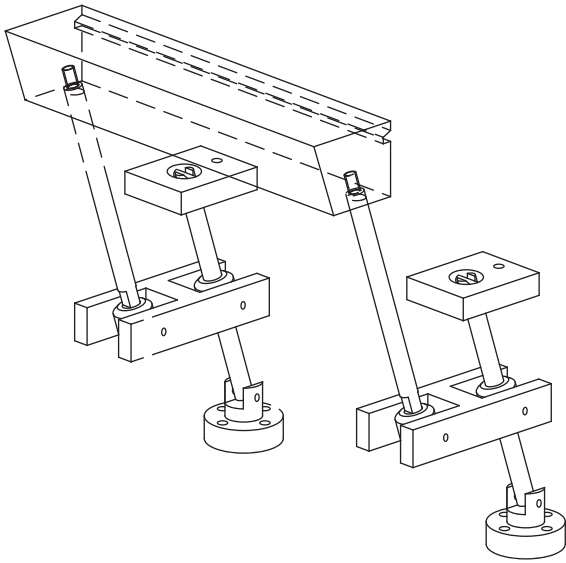
NOTE: Ejector pins are secured to, and move with, the ejector plate assembly, not the VectorForm Lifter System slide base.



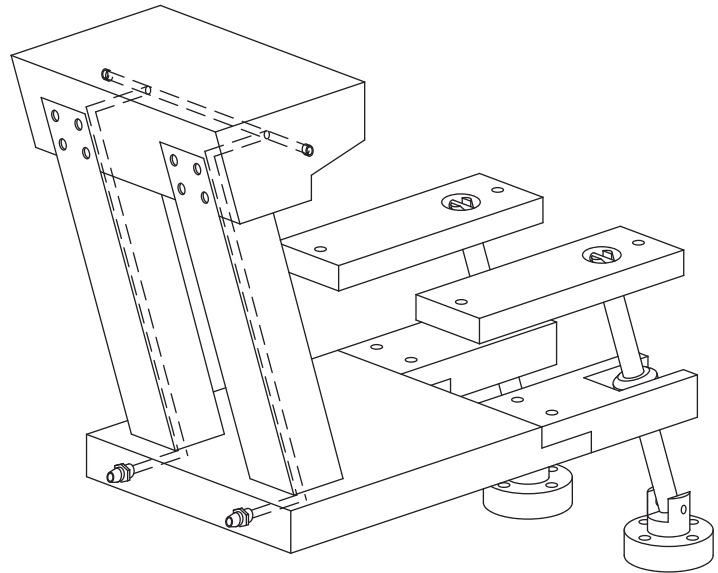
Avoid interference with the adjacent components by using a small section lifter core and by using reverse integration. Universal Slide Base (UB) shown.



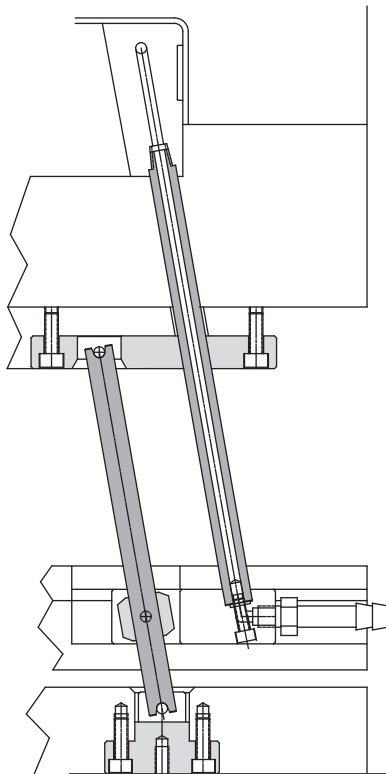
In cases of high ejection resistance, serial tandem guidance can be aided by using two or more Guide Rod assemblies as shown above. Joint Slide Base (JB) shown.



Example of two VectorForm Lifter Systems being used in parallel to lift a large lifter core. Universal Slide Base (UB) shown.

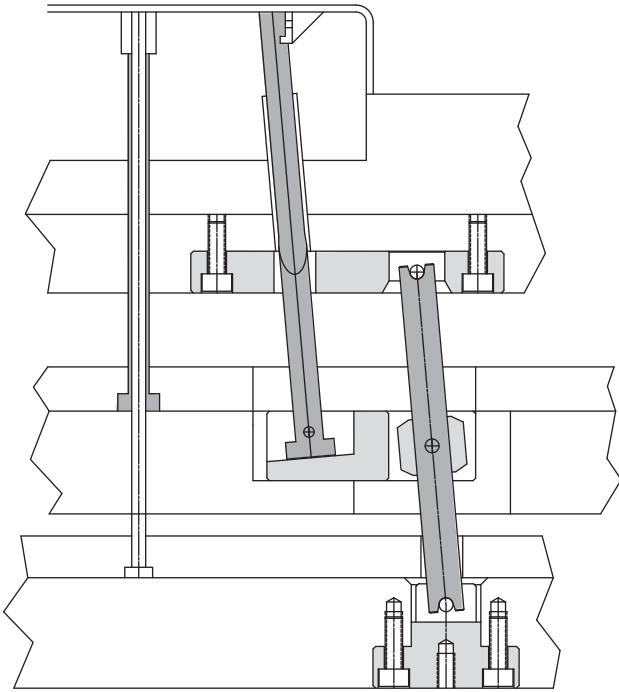


Multiple VectorForm Lifter Systems shown in parallel, actuating a large water-cooled lifter core through an extended Standard Slide Base (SB).

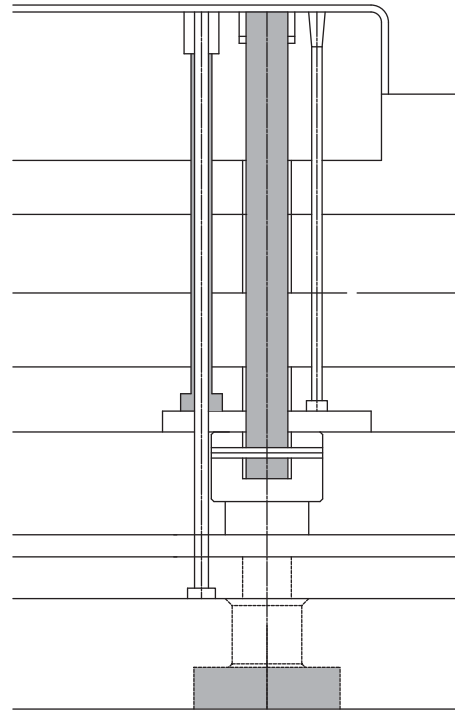


Example of coupling a lifter core with a junction tube for water cooling inside mold. Standard Slide Base (SB) shown.

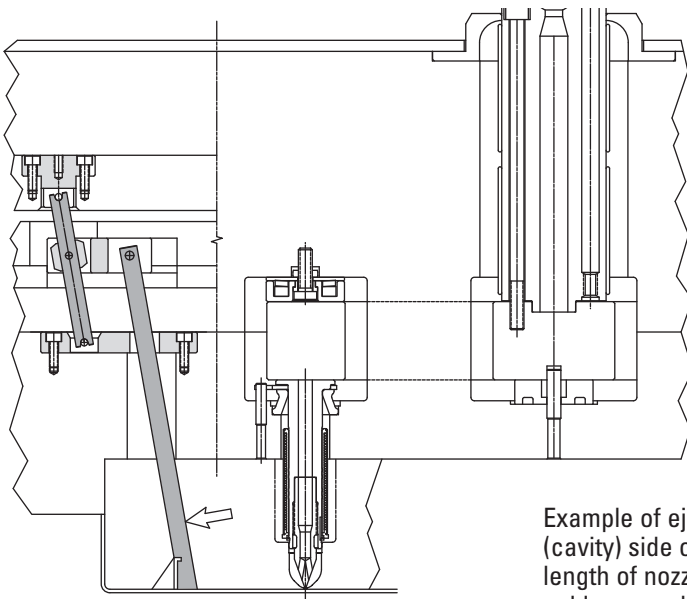
VECTORFORM SAMPLE APPLICATIONS



Example of ejector sleeve and lifter core integrated into same retainer plate. The lifter core shown is an example of a square ejector in application. Standard Slide Base (SB) shown.



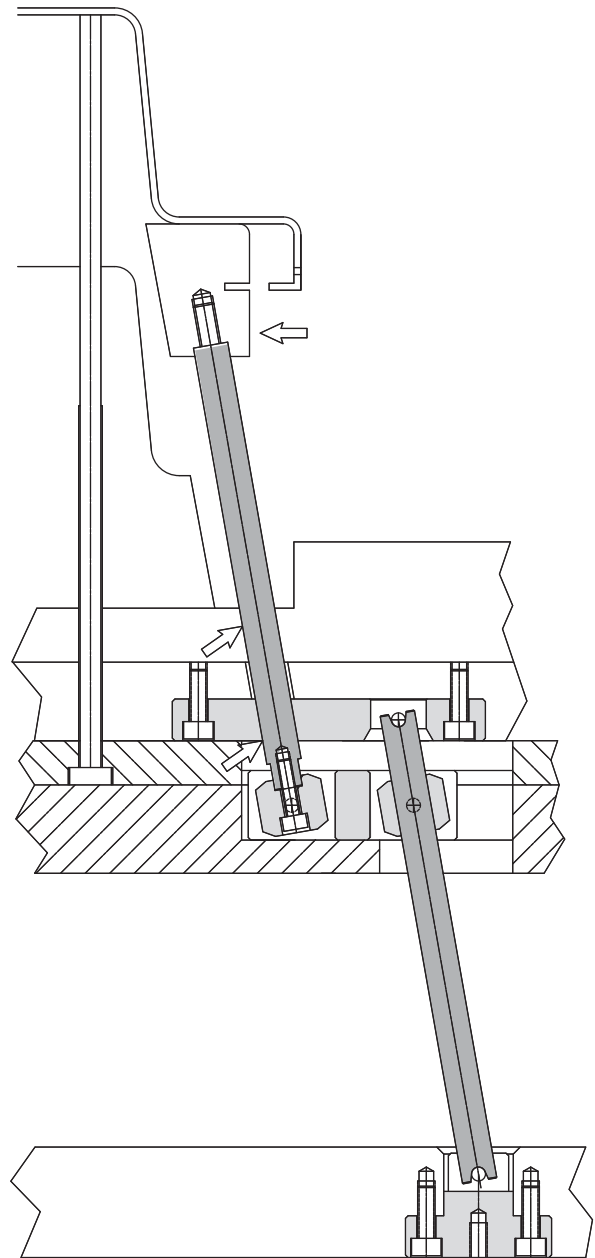
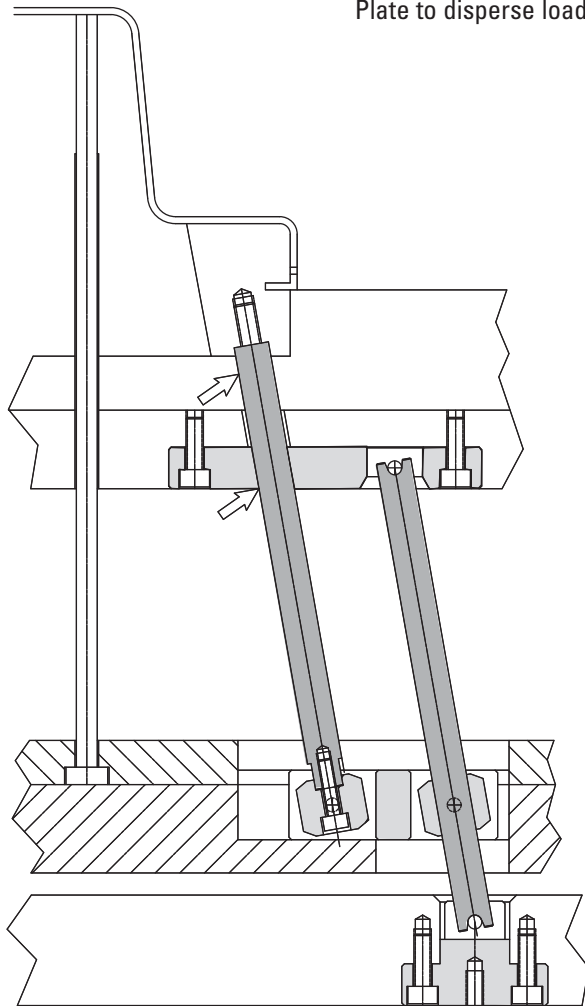
Example of ejector pin and ejector sleeve assemblies that are close to or adjacent to the lifter core. Fit the slide base into the ejector plate and use a smaller spacer plate to back-up the ejector pin and ejector sleeve as shown. Standard Slide Base (SB) shown; component view rotated 90 degrees.



Example of ejection installation in "A" (cavity) side of mold. To shorten the length of nozzle (or sprue if system is a cold runner design), set the ejection stroke to be smaller and the lifter core inclination to be greater. This will allow the design to become compact by selecting a smaller set. Joint Slide Base (JB) shown.

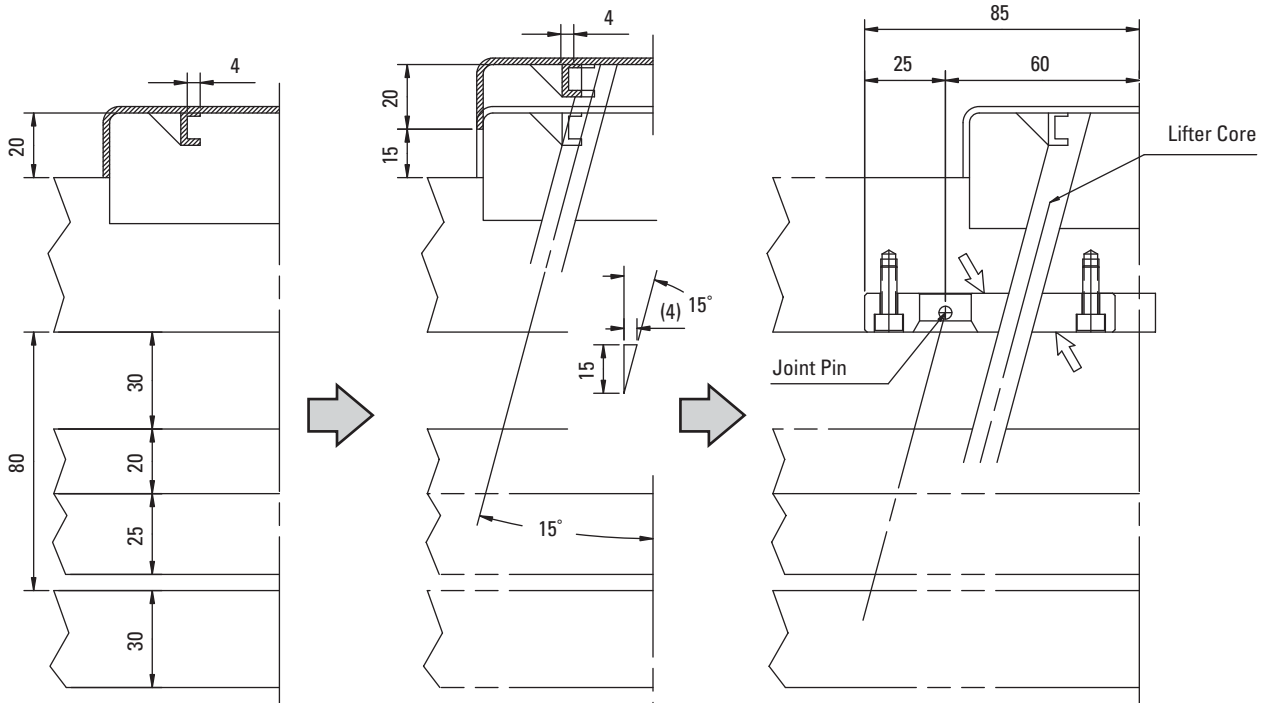
NOTES: If the ejector stroke is great or if the longitudinal mold release resistance is great, increase the size rank used for the lifter core and standard components.

Do not eliminate the Guide Plate to disperse load.

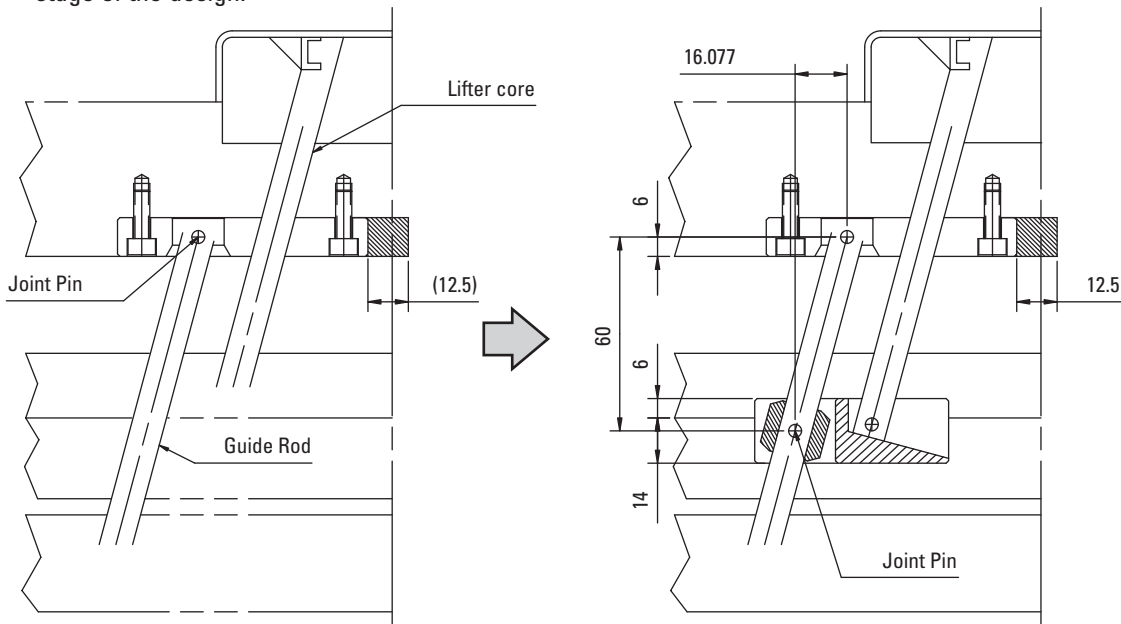


If the ejector stroke is great without a guide in the core, increase the effect of guidance by giving support at two points (see arrows). Universal Slide Base (UB) shown.

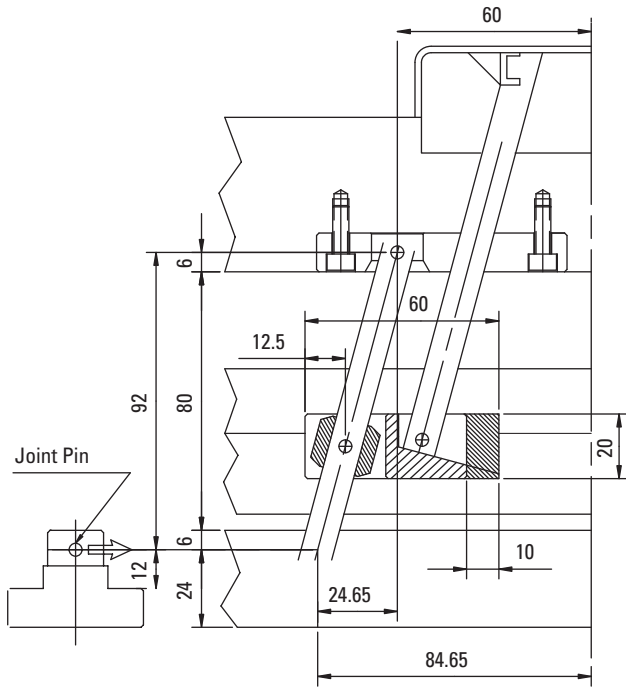
VECTORFORM SAMPLE DESIGN STANDARD BASE - SB



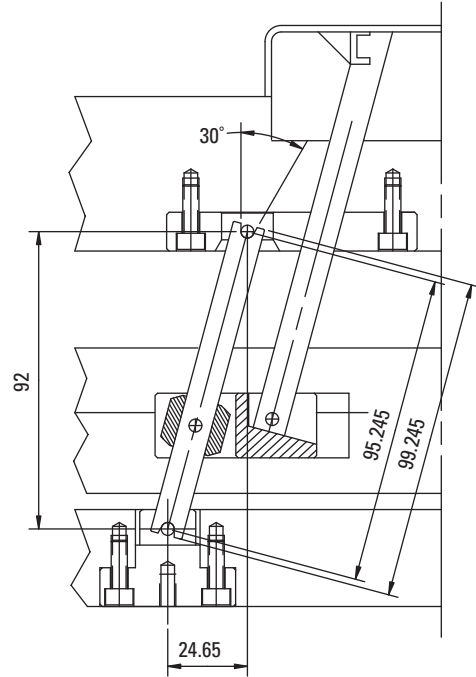
1. Design the cross section such as the ejector stroke and the plate thickness, etc, based on the depth and size of the lifter core. The undercut does not need to be considered during this stage of the design.
2. Determine the shift angle that releases the undercut by 4mm and that provides 15mm of ejection. The lifter core may be tentatively placed into position at this stage of the design.
3. Leave space (specified by in the drawing) before and after the lifter core hole, and place the Guide Plate as shown. Allow the Guide Rod to act as a guideline at a 15° angle from the joint pin center.



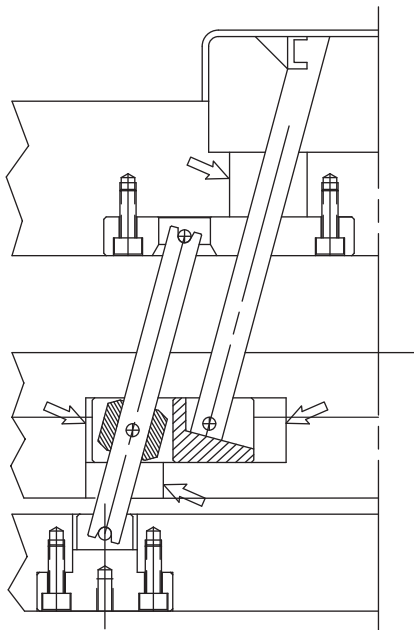
4. Cut the excess length of the Guide Plate as necessary. Align the groove center of the Guide Rod with the joint pin center of the Guide Plate, and place the Guide Rod (inclined at a 15° angle) onto the line on a tentative basis.
5. Align the joint pin center of the slide base with the Guide Rod center, and place them on the specified position of the ejector plate and ejector retainer plate. Pin down the lifter core.



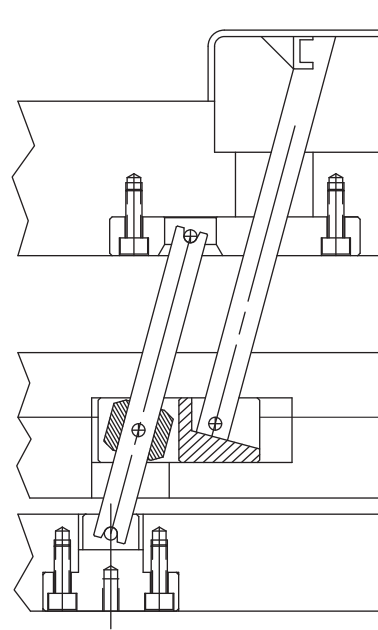
6. Cut the excess length of the slide base as necessary. Align the joint pin center of the Holder Bushing with the center of the Guide Rod, and place them as shown in the drawing above.



7. Modify the Guide Rod length to accommodate the position of the other components in the assembly.

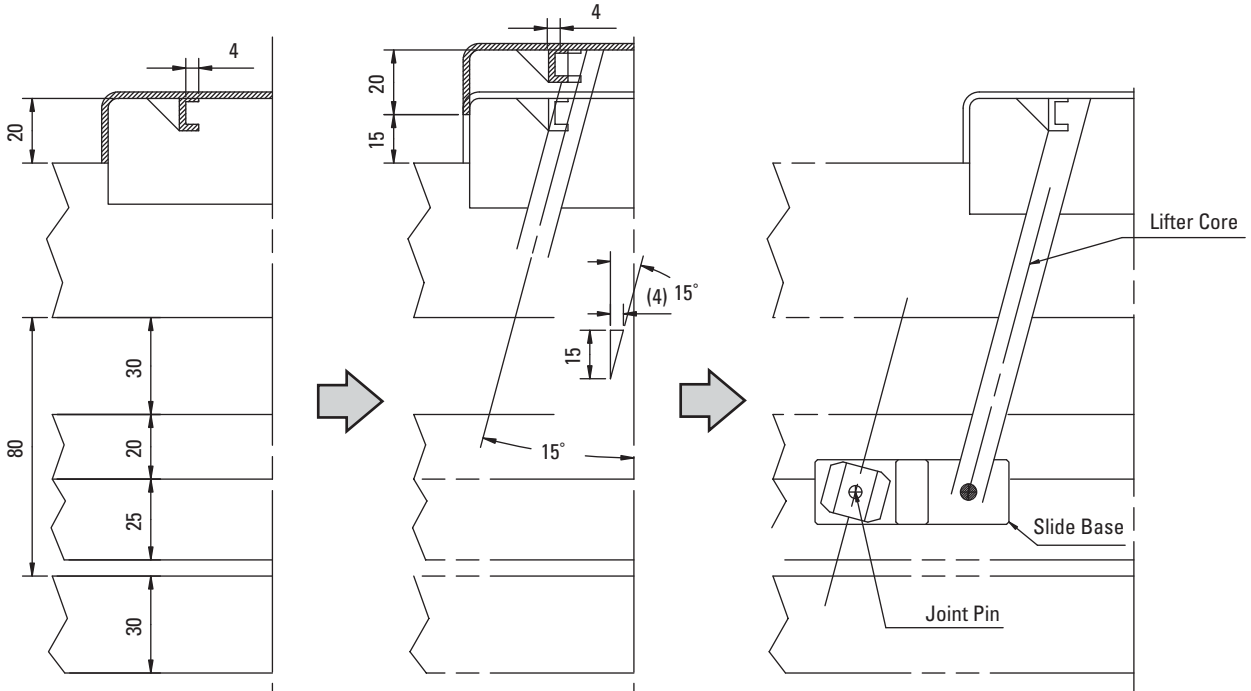


8. Determine the amount of clearance (specified as ϕ in the drawing above) needed in the ejector plate assembly that is required to accommodate the sliding action of the slide base and the position of the Guide Rod.

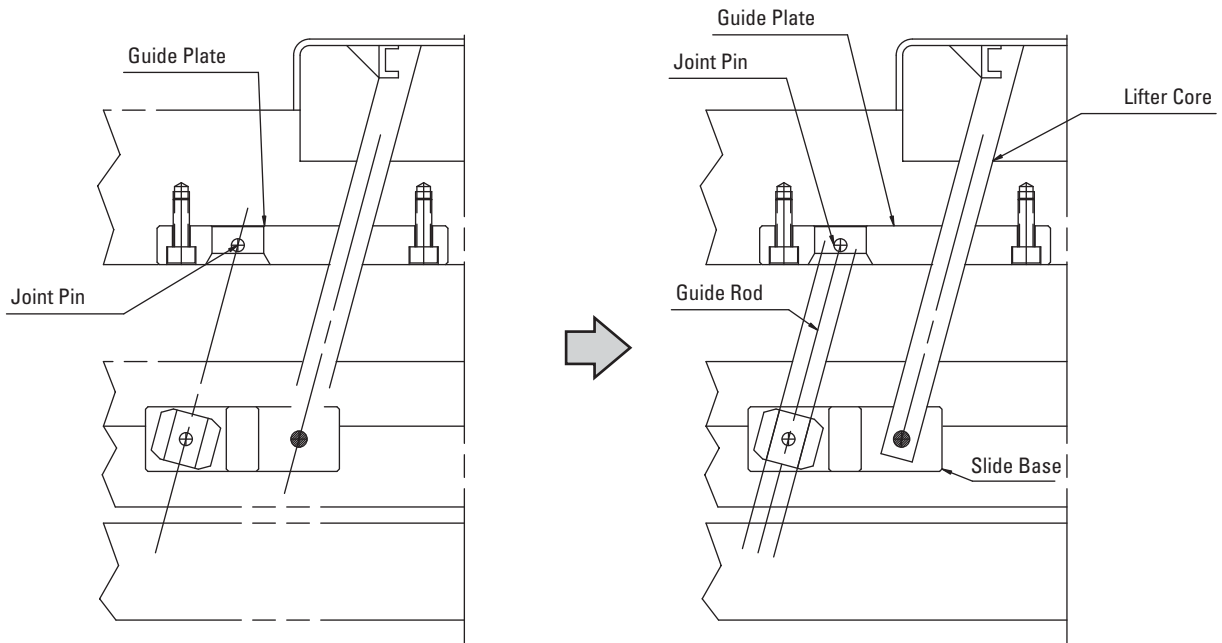


9. Now, the design is complete.

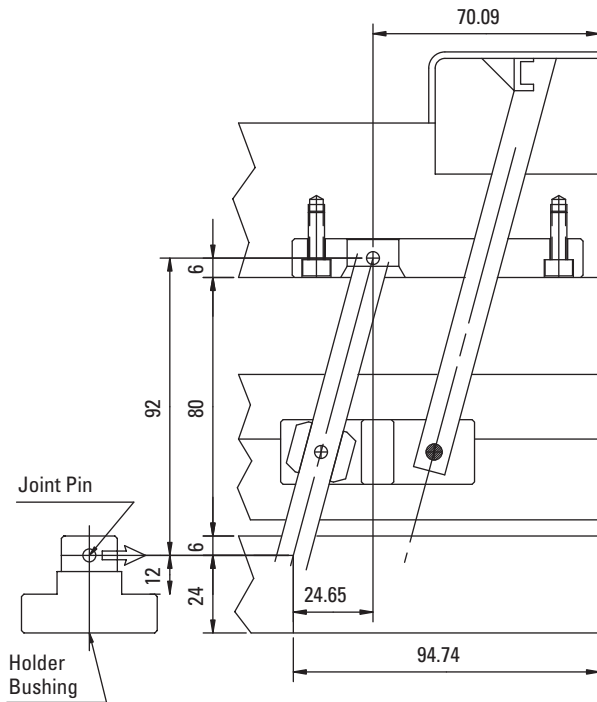
VECTORFORM SAMPLE DESIGN JOINT BASE – JB



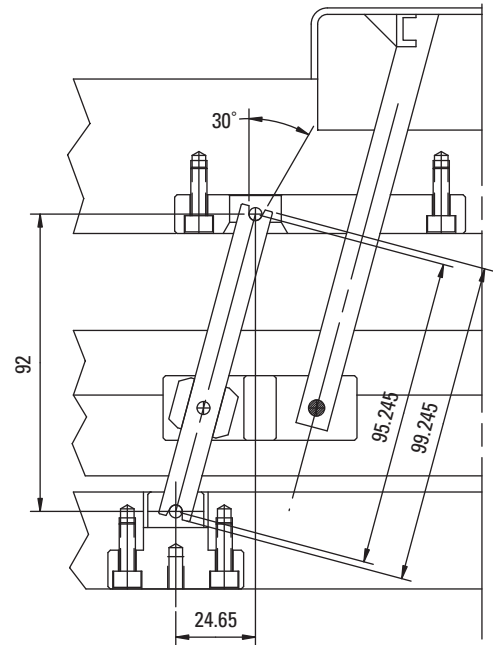
1. Design the cross section such as the ejector stroke and the plate thickness, etc, based on the depth and size of the lifter core. The undercut does not need to be considered during this stage of the design.
2. Determine the shift angle that releases the undercut by 4mm and that provides 15mm of ejection. The lifter core may be tentatively placed into position at this stage of the design.
3. While aligning the center line of the lifter core with the joint pin center, place the Slide Base into the ejector plate. Allow the Guide Rod center to act as a guideline at a 15° angle from the joint pin center of the guide bushing.



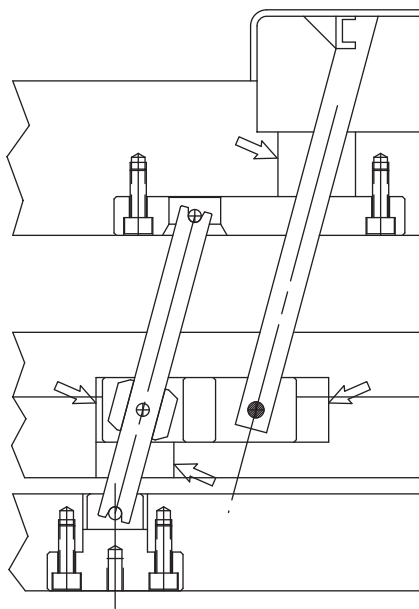
4. While aligning the joint pin center of the Guide Plate on the Guide Rod line, place the Guide Plate into the mold plate installation.
5. Align the center of the Guide Rod groove with the joint pin center of the Guide Plate, and place in the location of the Guide Rod inclined at a 15° angle. Determine the lifter core length.



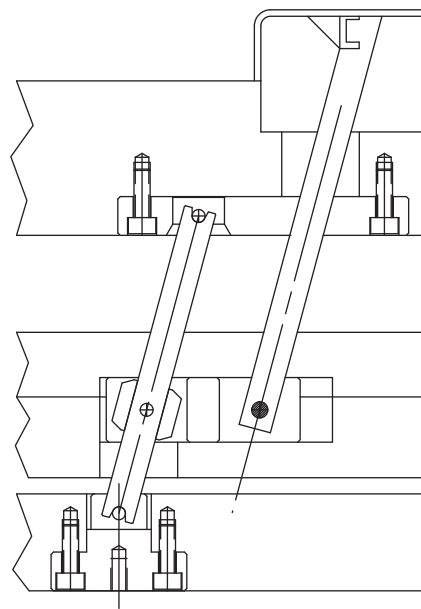
6. Align the joint pin center of the Holder Bushing with the Guide Rod center, and place it as shown in the drawing above.



7. Modify the Guide Rod length to accommodate the position of the other components in the assembly.

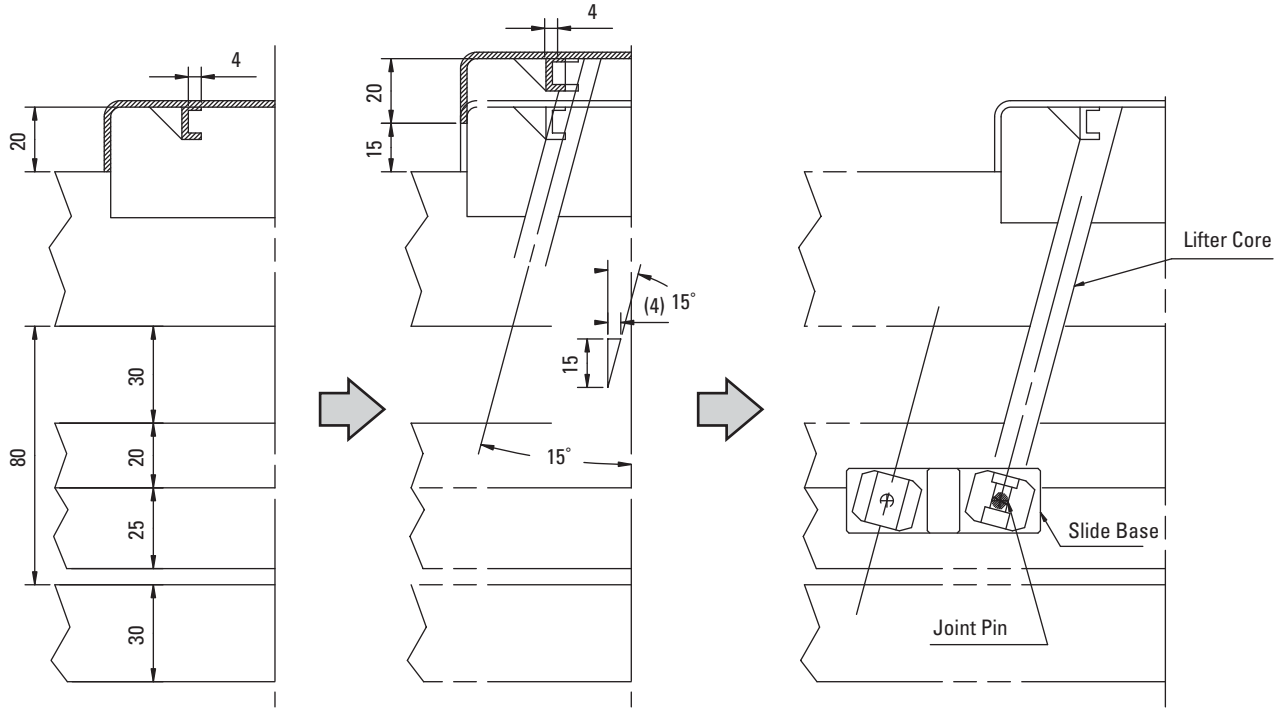


8. Determine the amount of clearance (specified as δ in the drawing above) needed in the ejector plate assembly that is required to accommodate the sliding action of the Slide Base and the position of the Guide Rod.

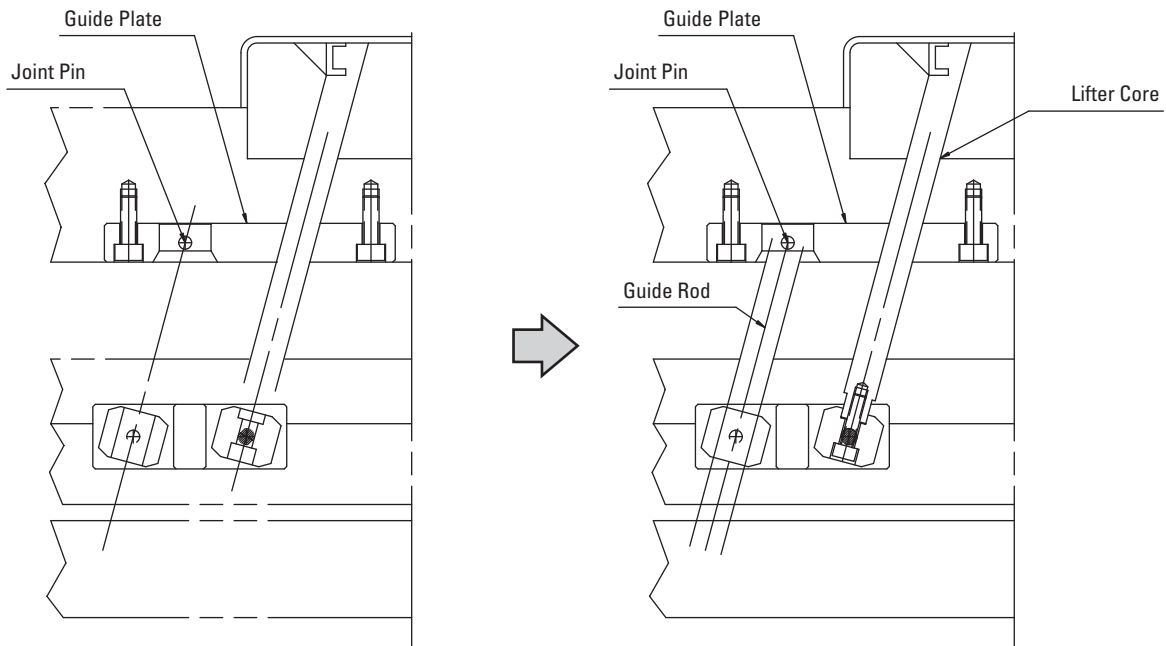


9. Now, the design is complete.

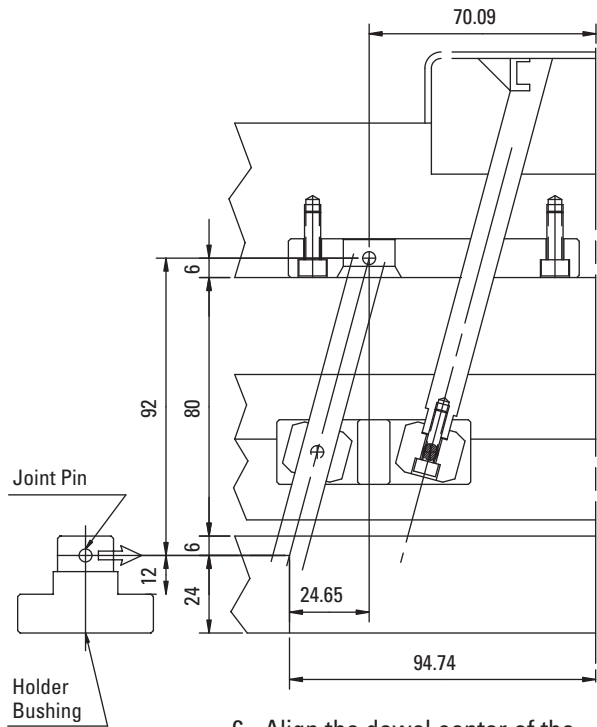
VECTORFORM SAMPLE DESIGN UNIVERSAL BASE - UB



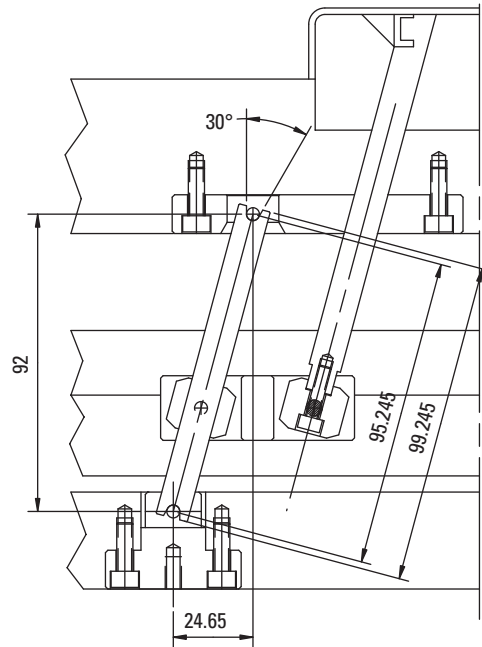
1. Design the cross section such as the ejector stroke and the plate thickness, etc, based on the depth and size of the lifter core. The undercut does not need to be considered during this stage of the design.
2. Determine the shift angle that releases the undercut by 4mm and that provides 15mm of ejection. The lifter core may be tentatively placed into position at this stage of the design.
3. While aligning the center line of the lifter core with the joint pin center, place the Slide Base into the ejector plate. Allow the Guide Rod center to act as a guideline at a 15° angle from the joint pin center of the guide bushing.



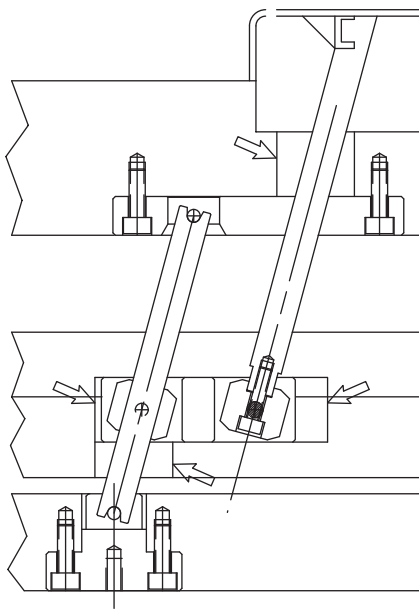
4. While aligning the joint pin center of the Guide Plate on the Guide Rod line, place the Guide Plate into the mold plate installation.
5. Align the center of the Guide Rod groove with the joint pin center of the Guide Plate, and place in the location of the Guide Rod inclined at a 15° angle. Determine the lifter core length and the required fit.



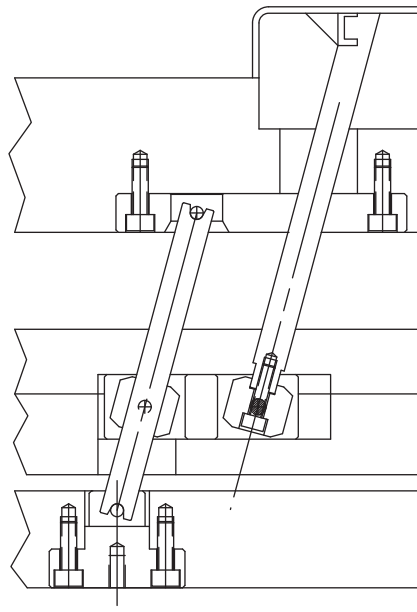
6. Align the dowel center of the Holder Bushing with the Guide Rod center, and place it as shown in the drawing above.



7. Modify the Guide Rod length to accommodate the position of the other components in the assembly.



8. Determine the amount of clearance (specified as δ in the drawing above) needed in the ejector plate assembly that is required to accommodate the sliding action of the Slide Base and the position of the Guide Rod.



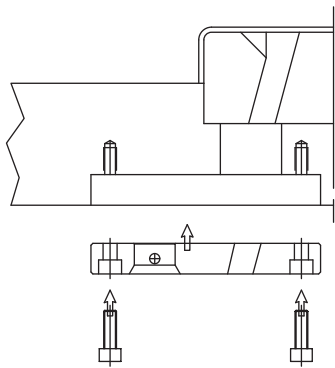
9. Now, the design is complete.

VECTORFORM SAMPLE INSTALLATION

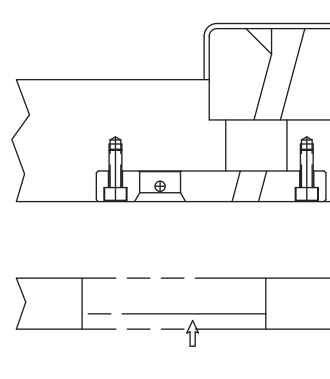


Be sure to use sufficient length bolts when installing the components.

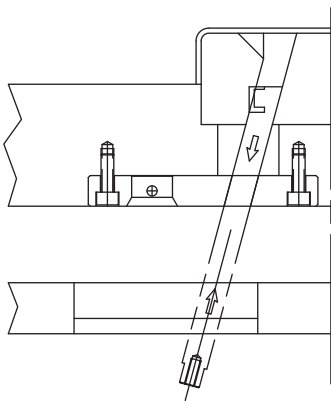
1. Allow the Holder Bushing to self-align prior to torquing retaining bolts. It is recommended that ejector plate movement be checked to ensure smooth operation. Holder Bushing alignment may be adjusted as necessary.
2. Check for alignment and smooth operation. Proper machining of installation will ensure good alignment, smooth operation and long life of components during operation.
3. Oil or greasing may be performed if desired, however, do not depend upon oiling or nitriding to ensure smooth operation.



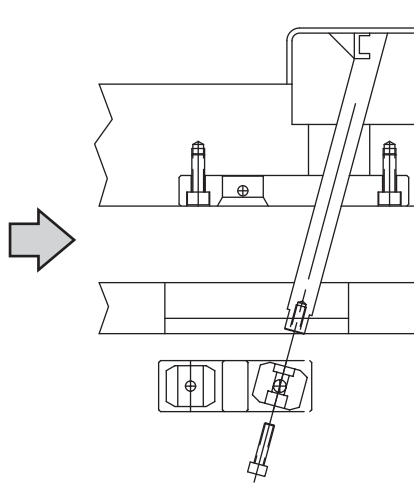
1. Place the Guide Plate into position.



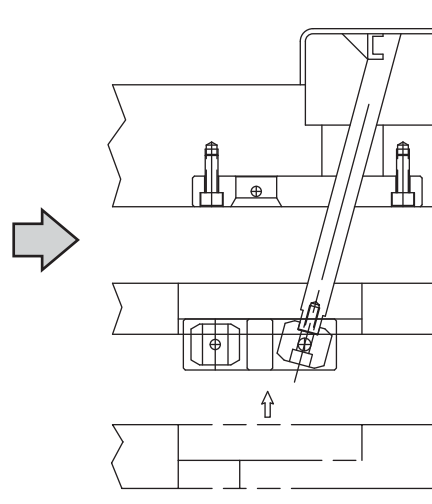
2. Place the upper ejector retainer plate into position.



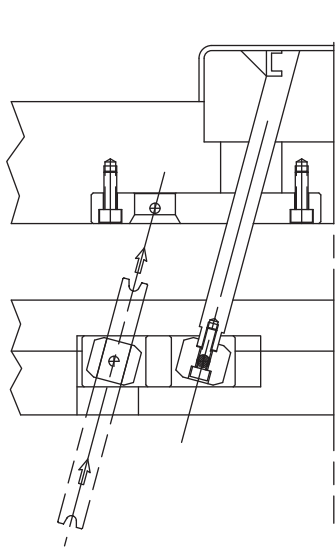
3. Insert the lifter core from below (or from above if desired).



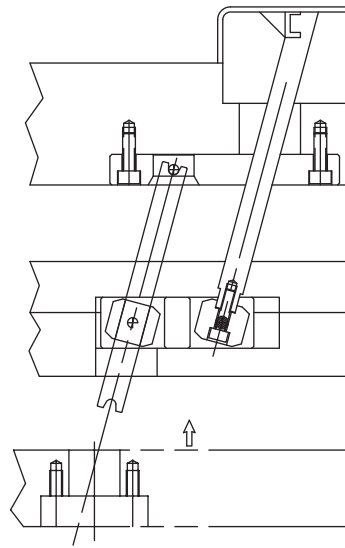
4. Install the slide base, and secure into the desired position by installing the screws.



5. Place the lower ejector plate into position.

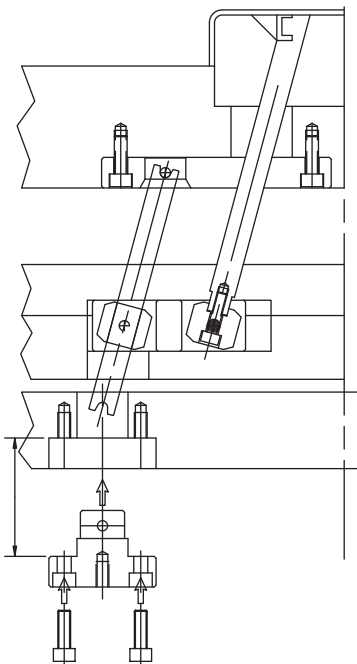


6. Insert the Guide Rod into the guide bushing of the slide base, and engage the end of the Guide Rod on the hinge pin in the Guide Plate.

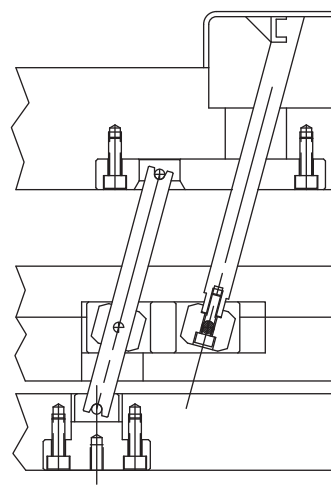


7. Place the moving (bottom) clamp plate into position. Install alignment dowels and bolt the clamp plate into place.

Ensure that the Holder Bushing flange is firmly seated against the bearing face in the installation.



8. Insert the Holder Bushing into the installation in the moving clamp plate so that the hinge pin in the Holder Bushing and the "U" groove in the Guide Rod engage with each other. Once the Holder Bushing self-aligns, tighten the retainer bolts.



9. Check the operation of the system. If required, please refer to Component Specifications – Holder Bushings for more detail regarding Holder Bushing backup if required.



- Be sure that the bolts are sufficiently torqued as to avoid loosening over time.
- Radii improve the smooth operation of the system.



World Headquarters

DME Company

29111 Stephenson Highway
Madison Heights, MI 48071
800-626-6653 *toll-free tel*
248-398-6000 *tel*
888-808-4363 *toll-free fax*
dme@dme.net *e-mail*

DME Company

6210 Northwest Drive
Mississauga, Ontario
Canada L4V 1J6
800-387-6600 *toll-free tel*
905-677-6370 *tel*
800-461-9965 *toll-free fax*
dme_canada@dme.net *e-mail*

DME Europe C.V.B.A.

Industriepark Noord
B-2800 Mechelen Belgium
32-15-215011 *tel*
32-15-218235 *fax*
sales@dmeeu.com *e-mail*

DME Europe C.V.B.A.

(Shenzhen) Co., Ltd.
C-108 Huahan Building
No. 16 Langshan Rd.
Northern Hi-Tech Industrial Zone
Nanshan District,
Shenzhen 518057, China
(86-755) 8601 9031 *tel*
(86-755) 8601 6583 *fax*
cs@dmechina.net *e-mail*