

D-M-E VectorForm Lifter Systems

A TAKAO INJECTION MOLD ENGINEERING INNOVATION

Taking lifter systems
to the next level



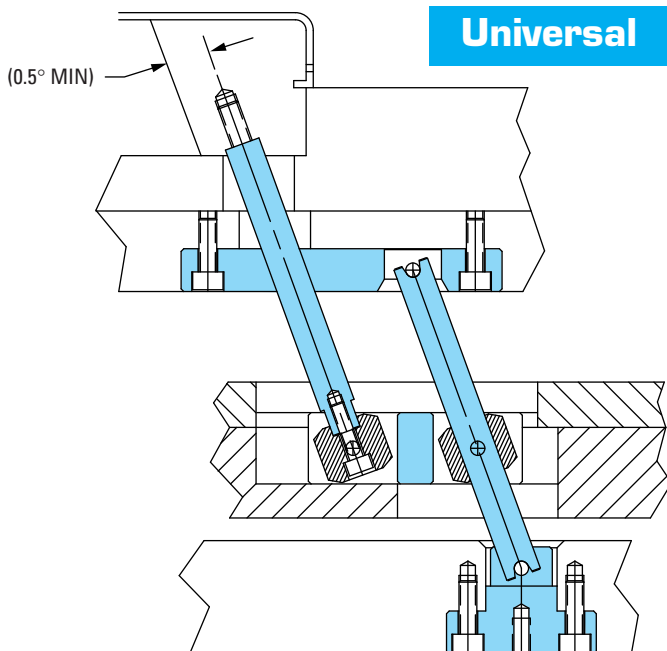
D-M-E

VectorForm Overview

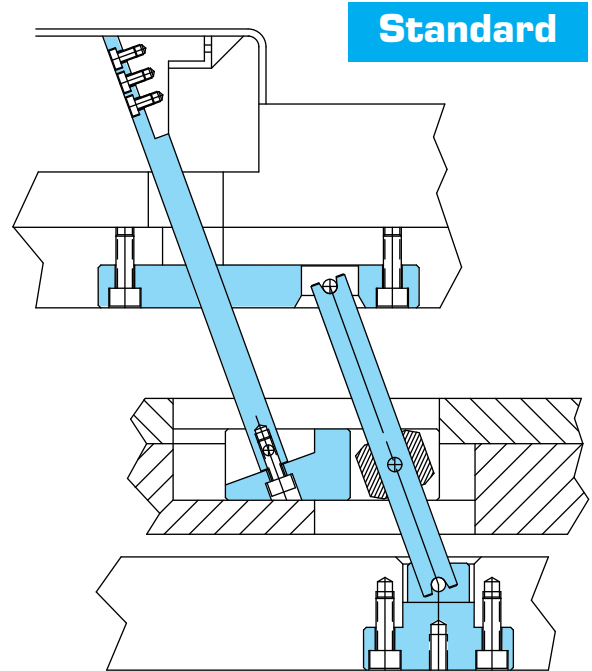
VectorForm Lifter Advantages

- 30°+ Angle – Half the stroke for the same undercut
- Simple plate machining
- Easy installation
- May be ganged
 - Multiple systems may be “ganged” to lift a large lifter core
 - A single system can lift multiple lifter cores
- Accelerate or decelerate the motion of the lifter core relative to the ejector plate
- Cooling may be added
- Design flexibility is improved

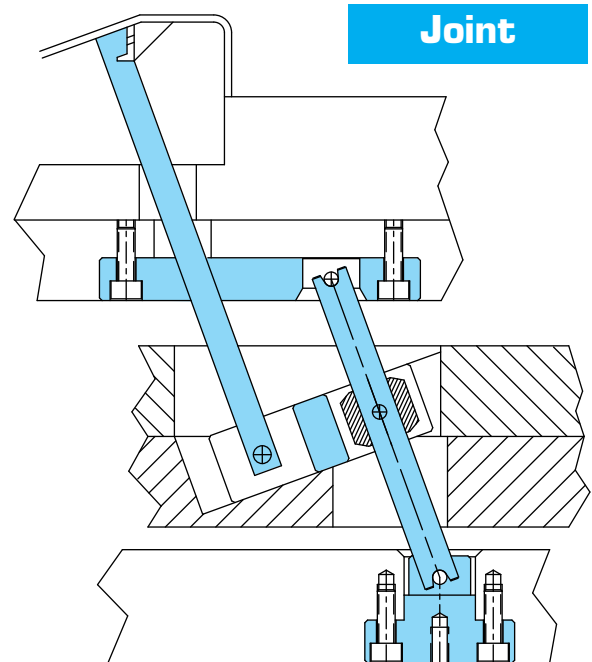
VectorForm Lifter Systems Design and Assembly Guide available upon request or at www.dme.net/vectorform



Universal Slide Base shown in typical ejector plate installation.



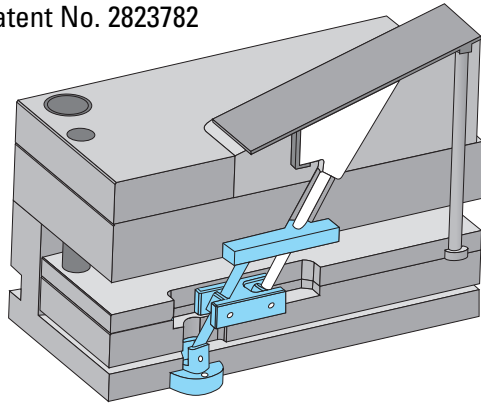
General installation. Standard Slide Base in typical ejector plate installation shown.



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

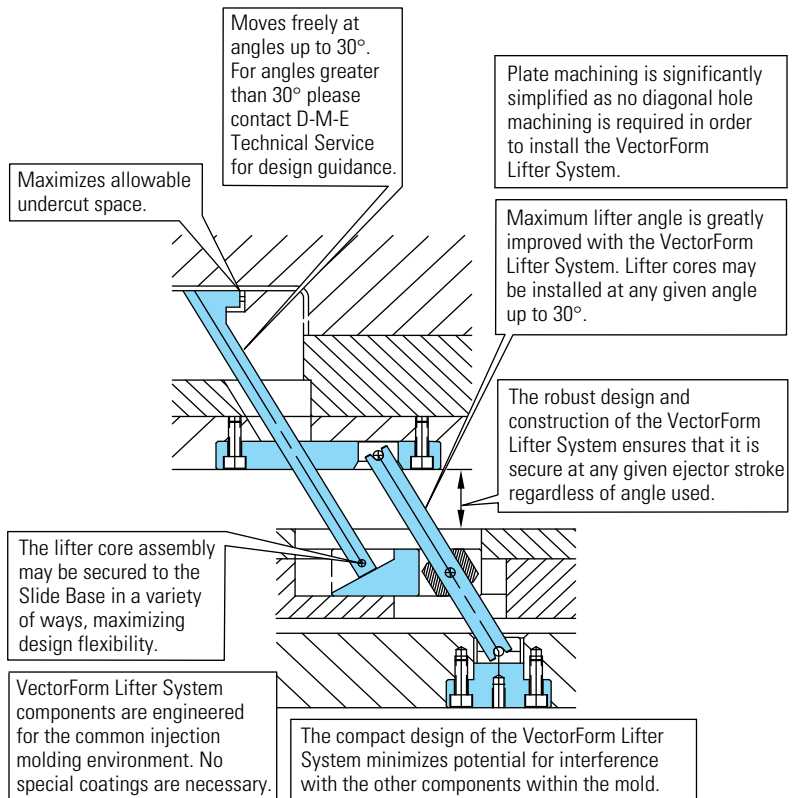
VectorForm Lifter System Features & Benefits

Patent No. 2823782



■ D-M-E Supplied Customer Supplied

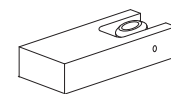
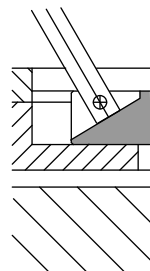
VectorForm Lifter Systems maximize design flexibility and offer off-the-shelf installation into most lifter applications.



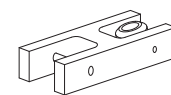
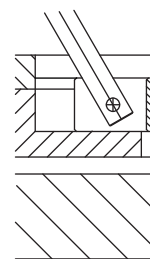
VectorForm Slide Bases

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

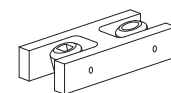
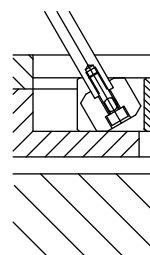
- The **Standard Slide Base (SB)** is the most flexible and the most economical slide base. The Standard Slide Base can be custom machined by the mold builder to meet specialized application requirements. The Standard Slide Base is also the most robust slide base with respect to loads and forces.
- The **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.



Standard Slide Base (SB)



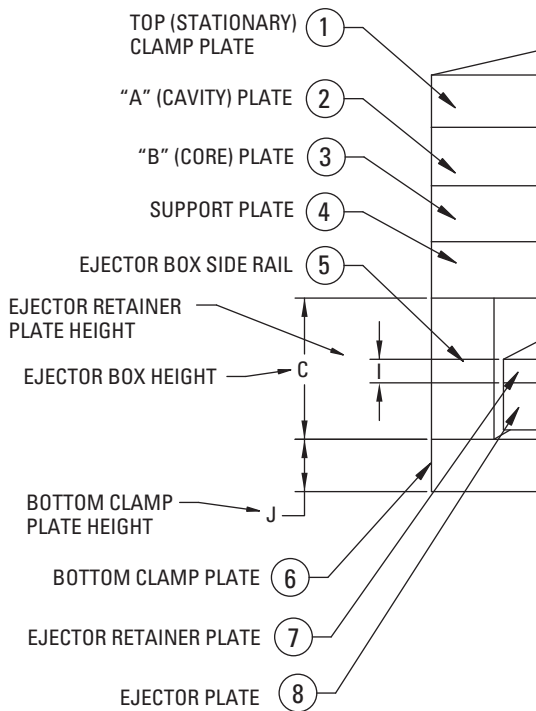
Joint Slide Base (JB)



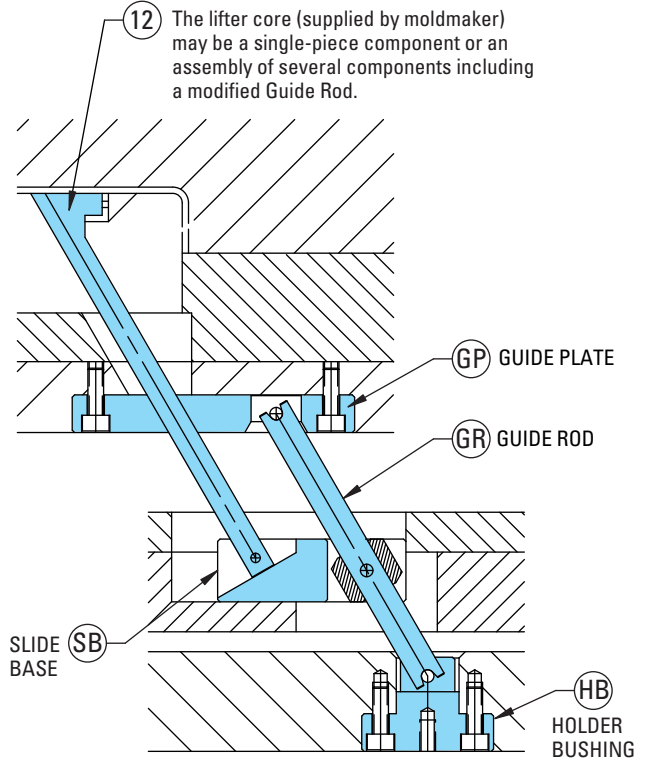
Universal Slide Base (UB)

VectorForm Overview

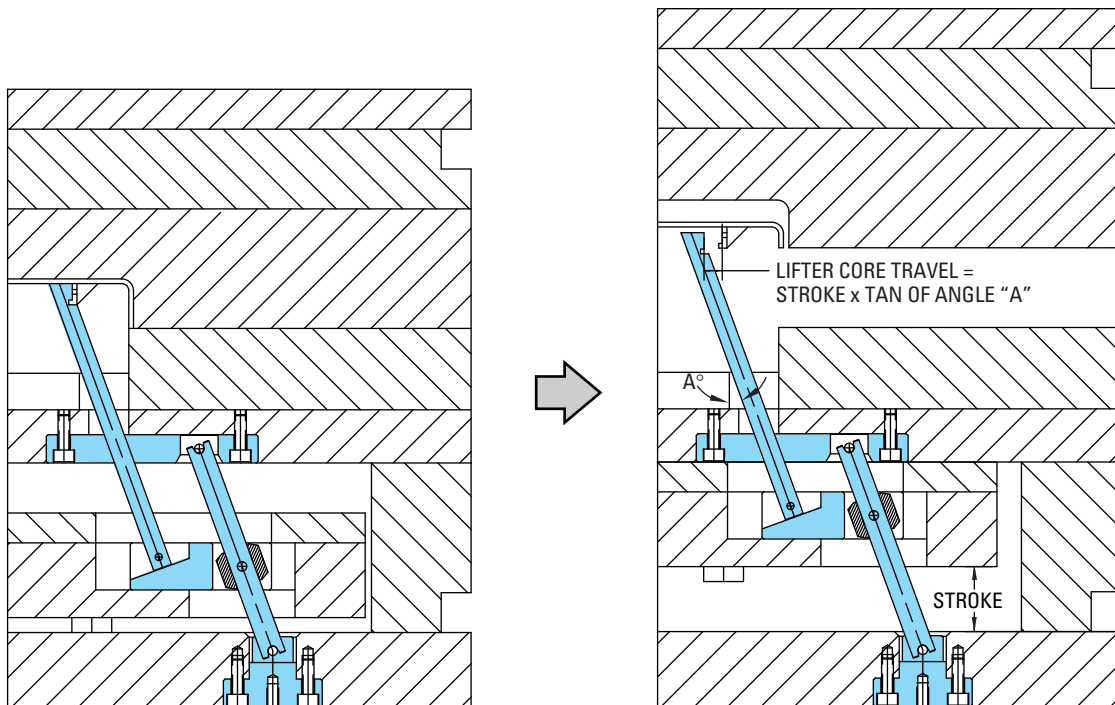
Mold Base Overview



VectorForm Lifter Overview

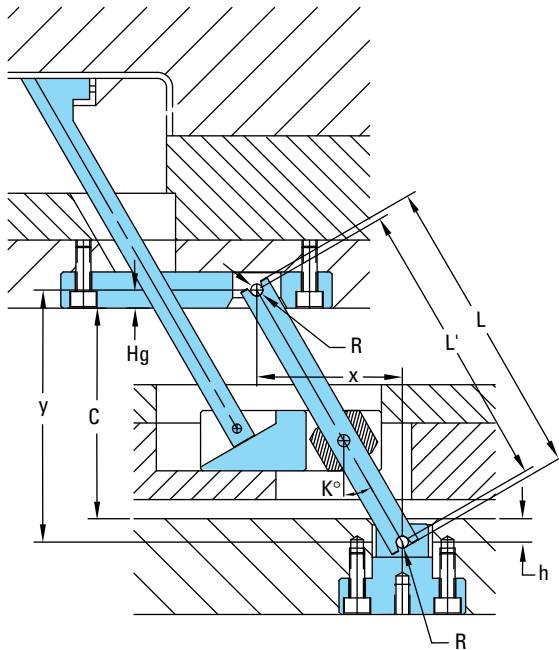


VectorForm Lifter Operating Sequence

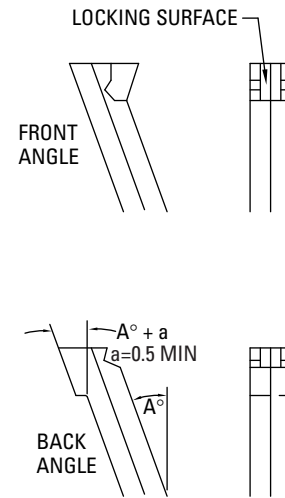


Design Guidelines

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



Locking Angles



1. 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.

2. 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.

3. 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.

4. Guided Ejection

- Guided ejection is recommended for all designs.

5. Fit and Finish

- Standard component dimensions and Rockwell hardness are provided in the component specifications section of this

brochure. 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.
- Lubrication is not generally required nor recommended. If lubrication is used, it should be low-viscosity.

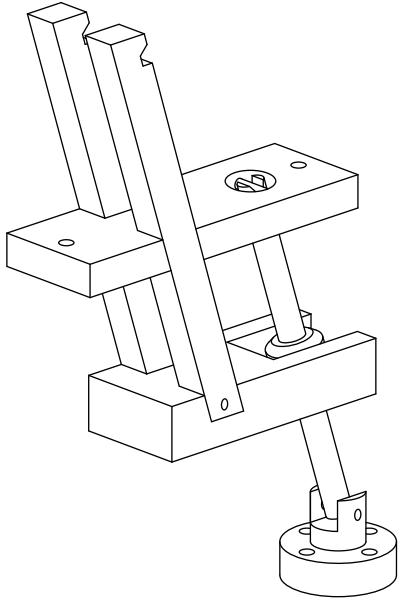
6. Locking Angles/Component Back-Up

- 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.

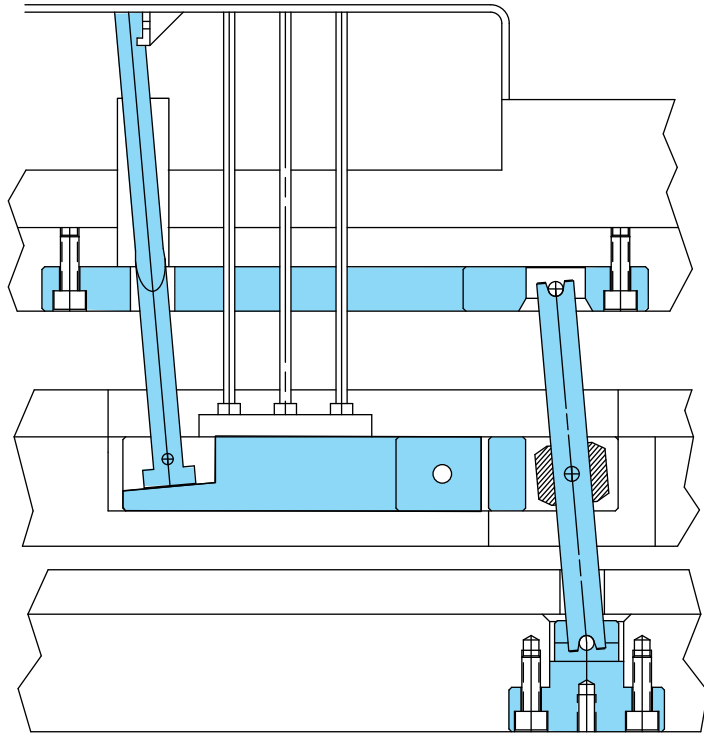
7. Non-Standard Shapes/Materials

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

Advanced Applications

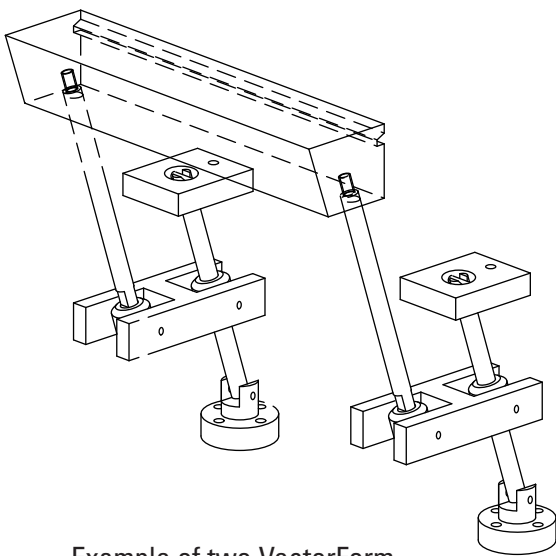


Example of multiple lifter cores being actuated in parallel by a Standard Slide Base (SB).

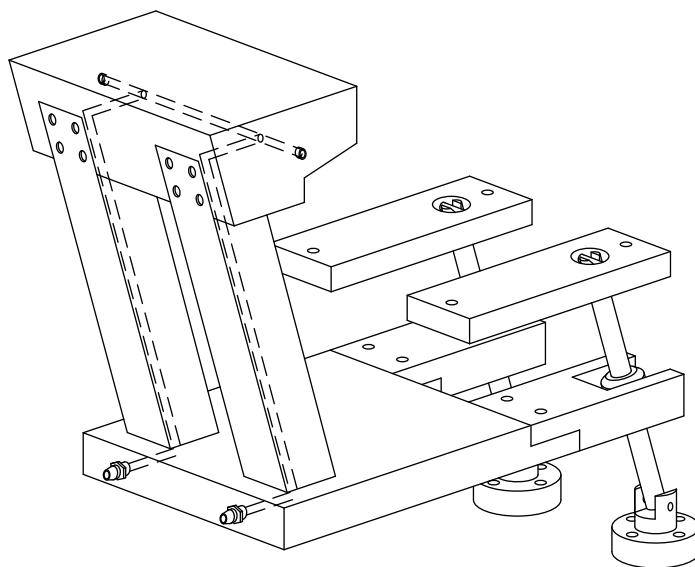


VectorForm Lifter System example with tandem ejector pins in close proximity to slide base. Joint Slide Base (JB) shown.

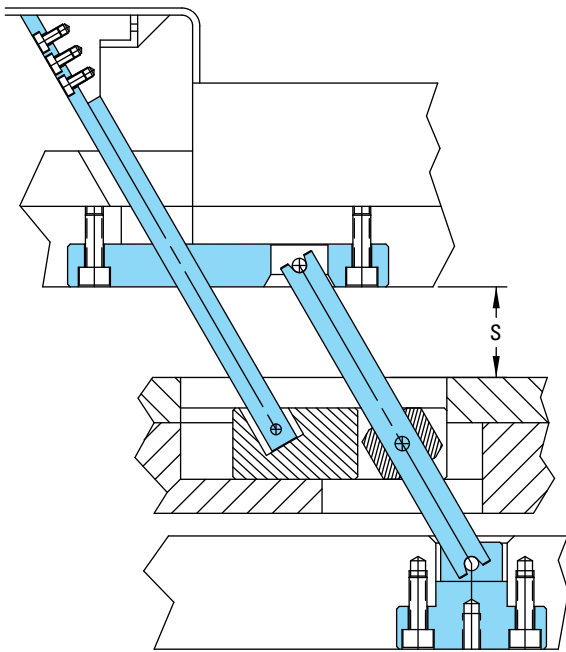
NOTE: Ejector pins are secured to, and move with, the ejector plate assembly, not the VectorForm System Slide Base.



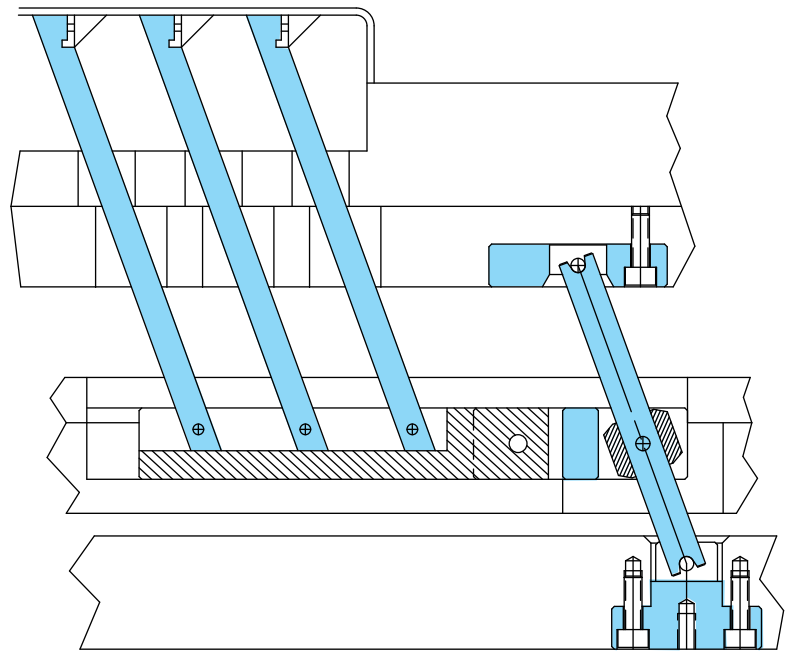
Example of two VectorForm Lifter System assemblies being used in parallel to lift a large lifter core assembly (UB shown).



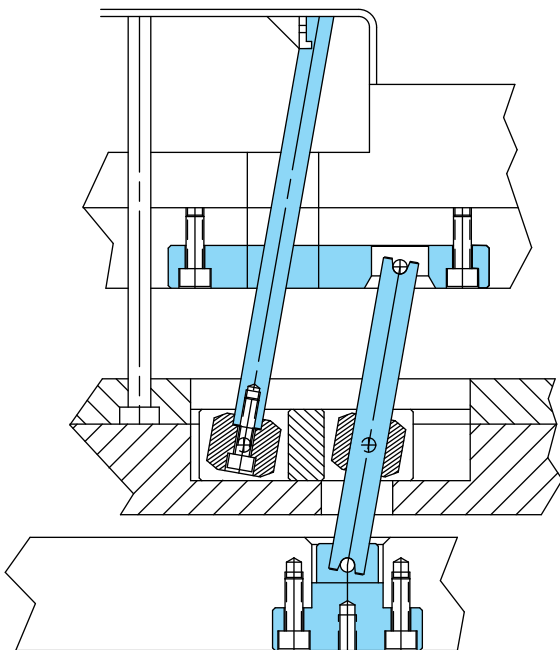
Multiple VectorForm Lifter Systems shown in parallel, actuating a large water-cooled lifter core through an extended Standard Slide Base.



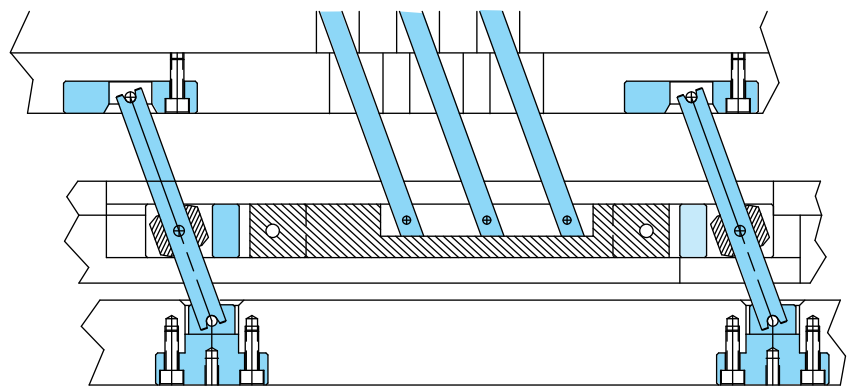
Deep undercut attained by increasing the shift angle and by having sufficient stroke "S". Standard Slide Base (SB) shown.



Multiple VectorForm Lifter Systems can be operated in tandem by a single Guide Rod assembly with the use of a simple extension coupled with a standard slide plate. Joint Slide Base (JB) shown.



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

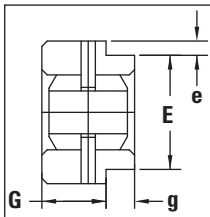


In cases of high ejection resistance, serial tandem guidance can be aided by using two or more Guide Rod assemblies. Joint Slide Base (JB) shown.

Component Specifications

Standard Slide Base – SB

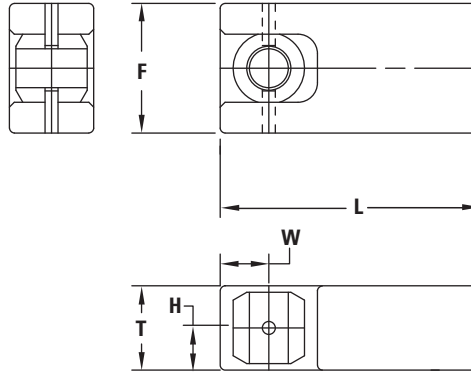
Material: SCM 440 / DIN 1.7225 / AISI 4140
Hardness: HRc 29-34



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:

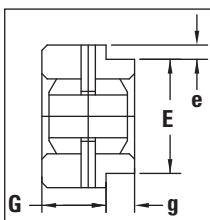
- Retaining bolt installation on lifter core rod or assembly
- Grooves as shown to far left of figure (for alignment) if required

Heat Treatment:

- Gas nitriding is permissible after additional machining has been performed

Joint Slide Base – JB

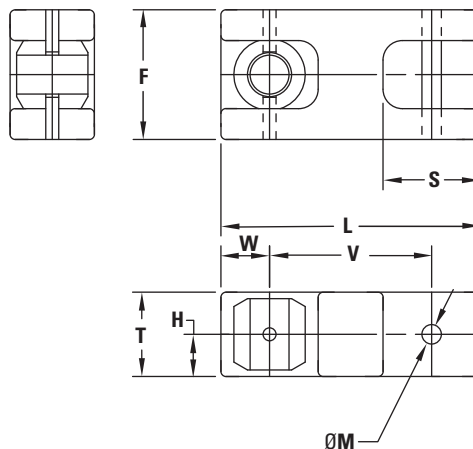
Material: SCM 440 / DIN 1.7225 / AISI 4140
Hardness: HRc 29-34



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
- During nitriding, use a pin finer (-0.01) than the attached joint pin
- Joint Pin material: SKH 51 / DIN 1.1213 / AISI 1050
- Hardness: HRc 60-66
- Tempering temperature: 600°C

Universal Slide Base – UB

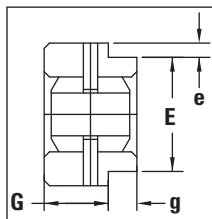
Material: SCM 440 / DIN 1.7225 / AISI 4140
Hardness: HRC 29-34



Additional Machining:
None

Attachment: None

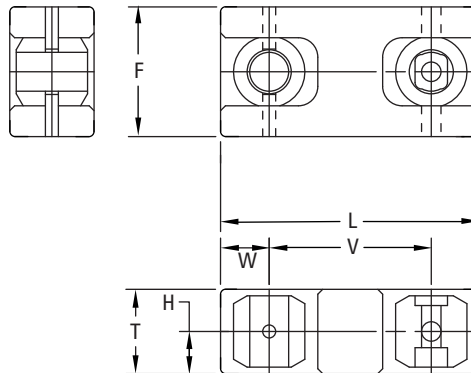
Heat Treatment:
Nitriding is permissible



**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

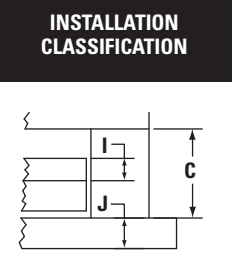
NOTE: Dimensions for retaining step to be machined by moldmaker as necessary.



Slide Base Ordering Information

SIZES	ITEM NUMBER					
	06	08	10	13	16	20
SB – STANDARD SLIDE BASE	VF 06 SB	VF 08 SB	VF 10 SB	VF 13 SB	VF 16 SB	VF 20 SB
JB – JOINT SLIDE BASE	VF 06 JB	VF 08 JB	VF 10 JB	VF 13 JB	VF 16 JB	VF 20 JB
UB – UNIVERSAL SLIDE BASE	VF 06 UB	VF 08 UB	VF 10 UB	VF 13 UB	VF 16 UB	VF 20 UB

SYMBOL	SIZES	DIMENSIONS					
		06	08	10	13	16	20
I		163	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}
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		40	50	60	80	100	130
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
N		Ø2	Ø3	Ø4	Ø5	Ø6	Ø7
V*		25	30	35	50	60	80
M*		Ø3	Ø4	Ø5	Ø6	Ø8	Ø10

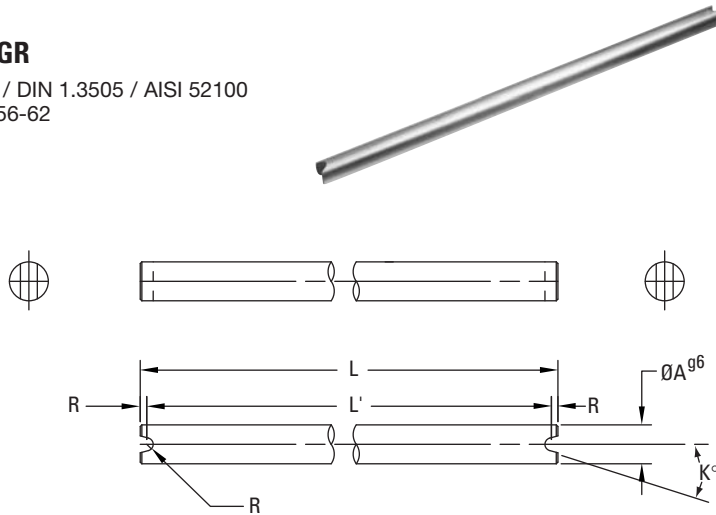


*Applies to JB and UB only.

Component Specifications

Guide Rod – GR

Material: S UJ 2 / DIN 1.3505 / AISI 52100
Hardness: HRc 56-62



NOTE: Moldmaker to add grooves and chamfers per specifications shown.

Additional Machining:

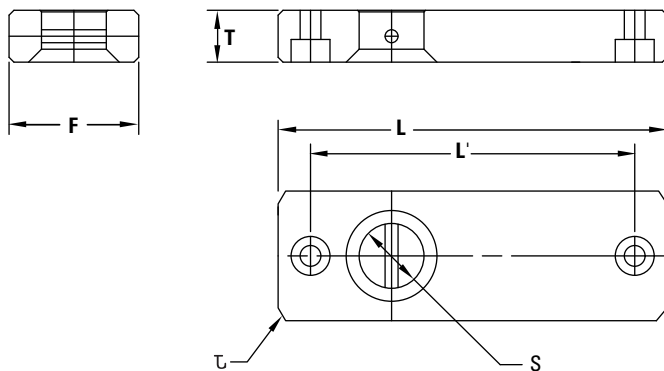
- Center distance:
 $L' = L - 2R$
- All dimensions shown are to be held after any additional machining has been performed
- Non-designated tolerance: ± 0.1
- Non-designated chamfer "C" tolerance: $0.5 \sim 1.0$

Heat Treatment:

- Induction hardening completed
- Heat treat is not required

Guide Plate – GP

Material: S 50 C / DIN 1.1213 / AISI 1050
Hardness: HRc 21-26



Additional Machining:

- Lifter core hole or slot
- As required to accommodate the lifter core assembly

Heat Treatment:

- Gas nitriding is permissible after additional machining has been performed

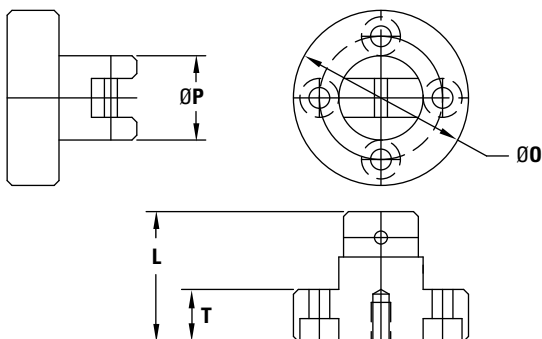
Holder Bushing – HB

Material: S 50 C / DIN 1.1213 / AISI 1050
 Hardness: HRc 13-22



Additional Machining:
None

Heat Treatment:
Not required



Guide Rod, Guide Plate, Holder Bushing Ordering Information

SYMBOL	SIZES	DIMENSIONS PER LIFTER SIZE						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	
GR – GUIDE ROD		VF 06 GR	VF 08 GR	VF 10 GR	VF 13 GR	VF 16 GR	VF 20 GR	
A ^{g6}		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}	
L		150	190	250	310	370	500	
L'		L'	L'	L'	L'	L'	L'	
K°		Same as the shift angle of the lifter core (30° MAX)						
R		Ø6 ^{+0.02} ₀	Ø8 ^{+0.02} ₀	Ø10 ^{+0.03} ₀	Ø13 ^{+0.03} ₀	Ø16 ^{+0.05} ₀	Ø20 ^{+0.05} ₀	
GP – GUIDE PLATE		VF 06 GP	VF 08 GP	VF 10 GP	VF 13 GP	VF 16 GP	VF 20 GP	
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}	
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}	
L'		50	60	75	105	130	155	
S		Ø10	Ø13	Ø16	Ø20	Ø25	Ø30	
HB – HOLDER BUSHING		VF 06 HB	VF 08 HB	VF 10 HB	VF 13 HB	VF 16 HB	VF 20 HB	
P		Ø13 ⁰ _{-0.05}	Ø16 ⁰ _{-0.05}	Ø20 ⁰ _{-0.07}	Ø25 ⁰ _{-0.07}	Ø30 ⁰ _{-0.1}	Ø40 ⁰ _{-0.1}	
L		20	25	32	40	50	60	
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}	

VectorForm Lifter Set Ordering Information

SIZES	06	08	10	13	16	20
SS – STANDARD SET	VF 06 SS	VF 08 SS	VF 10 SS	VF 13 SS	VF 16 SS	VF 20 SS
JS – JOINT SET	VF 06 JS	VF 08 JS	VF 10 JS	VF 13 JS	VF 16 JS	VF 20 JS
US – UNIVERSAL SET	VF 06 US	VF 08 US	VF 10 US	VF 13 US	VF 16 US	VF 20 US

VectorForm Lifter Sets include:

- (1) Holder Bushing – HB
- (1) Guide Rod – GR
- (1) Guide Plate – GP
- (1) Slide Base (Standard – SB, Joint – JB, or Universal – UB)

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ISO 9001



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Mold Technologies