

TuffCam™ High-Speed Swing Clamps

Frequently Asked Questions

Frequently Asked Questions

When do you recommend the use of TuffCam™ Swing Clamps over the standard product?

Sometimes there are applications where speed is essential, massive arms are required, or position sensing and feedback are necessary. These applications may result in premature failure not due to defects in standard clamps, but from excesses in speed, mass or other requirements.

When speed is essential, standard swing clamps (which last millions of cycles in ordinary applications) may not live up to life cycle expectations. When a standard swing clamp is damaged early in its life due to speed abuse, replacement with a TuffCam™ High-Speed Swing Clamp may be a way to maintain speed requirements and lengthen device life in the application.

Where arm mass damages the swing mechanism of standard swing clamps, the tri-cam uni-directional design of the TuffCam™ High-Speed Swing Clamp strengthens the ball and cam link. The beefier design, capacity and reinforced rotation mechanism of the TuffCam™ High-Speed Swing Clamp could be your best solution.

Can I run the TuffCam™ High-Speed Swing Clamp at any speed I want?

No, there are restrictions. TuffCam High-Speed Swing Clamps are capable of approximately two times the speed of standard swing clamps in prolonged use without damage. In the event that you need faster speeds or larger arms, please understand that the life of even TuffCam™

High-Speed Swing Clamps is reduced. Consult the **Clamp Time and Flow Rate** chart on page C-2 to determine the speed for your application.

What makes the cam follower ball seat so special in these units?

The three uni-directional cams and three cam balls guide the rotation of the plunger and provide greater guide, support and directional stability. The patented cam follower design is unique in the industry and uses solid carbide balls and composite ball seats. The ball seat design assures that the ball rolls in the cam rather than jamming and scraping resulting in wear on both the cam track and ball.

The demands on my fixture have changed and I am considering your TuffCam™ High-Speed Swing Clamps. Can I switch out High-Speed for your standard product?

Yes, the TuffCam™ High-Speed Swing Clamps have the same mounting envelope as standard swing clamp counterpart. However, if you are using our standard Bottom Flange 2600 lb capacity unit with the optional in-port flow control valve, you will be unable to use the valve in the TuffCam™ version of this Swing Clamp.

I want to use work supports with TuffCam™ High-Speed Swing Clamps. Will the work supports cycle fast enough to keep up with the part change outs?

There will be some lag between the unclamp of swing clamps and the full release of pressure in any work support circuit. This is critical with fluid advance supports, as the circuit must have time to evacuate under low pressure to allow the plungers to retract for reloading the fixture. If speed is the issue in support retraction to coordinate with TuffCam™ High-Speed Swing Clamps, an air advance support must be used with the air circuit released prior to hydraulic circuit release. When the hydraulic circuit is released, the support will begin to immediately retract pushing only the air from the line rather than the higher viscosity hydraulic fluid.

I'm using a high volume pump and it is "blowing out" my swing clamps. Will TuffCam™ High-Speed Swing Clamps take care of this problem?

High volume pumps often incorporate high volume accumulators. An accumulator will yield excessive flow, approaching instantaneous infinite flow, and is intended for dynamic loads. Hydraulic clamps are used to hold static loads. Excessive flow may continue to damage clamps, even TuffCam™ clamps, and we recommend changing to a pump designed for clamping applications or appropriate flow restriction.

It is important to hit my part in the exact place every time in my application, should I use your TuffCam™ Swing Clamps?

TuffCam™ High-Speed Swing Clamps will be more precise in their point of contact. Keep in mind that any draft angle or side forces will ultimately damage the cam tracks of any swing clamp and result in loss of precision. In the case of precision positioning, guide pins are recommended and may be implemented with a single-ended or double-ended arm.

What defines a TuffCam™ High-Speed Swing Clamp? How can I measure the clamp speed?

The maximum speed of a swing clamp is applicable to both clamp and unclamp function, as the momentum on the cam track and cam follower apply to both movements. To approximate the speed of your application:

- * Look down the centerline of the swing clamp, perpendicular to the arm.
- * Actuate your clamping system while watching the arm "swing" into position.
- * The eye can track speed of movement at roughly 1/16 second. If while looking directly into the end of the swing clamp, you can observe the arm move through it's swing, the positioning time should be somewhere around 1/2 second or longer. See flow rates and clamping time in the front of the TuffCam™ High-Speed Swing Clamp section of our catalog.
- * If, while looking directly into the end of the swing clamp, you cannot observe the arm move, or it is unclamped and the next thing you can see is that it is in the clamped position, the positioning time is something substantially less than 1/2 second. Your standard model clamp is at risk of premature failure. However, the TuffCam™ High-Speed Swing Clamps can actuate at a faster speed. See flow rates and clamping time in the front of the TuffCam™ High-Speed Swing Clamp section of our catalog.
- * It is possible to approximate the clamp time by adding the total active volume of devices in the specific control branch of your system, and dividing that volume (cubic inches) by your pump's output volume (cubic inches per minute) and then multiplying that number by 60 (60 seconds per minute). This will give you the theoretical calculated time to move a device through its stroke, but does not account for flow loss due to flow restrictions in the system.

TuffCam™ High-Speed Swing Clamps

Features

TuffCam™ High-Speed Swing Clamp

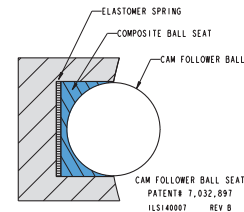
TuffCam™ High-Speed Swing Clamps were developed to meet your demand for high-speed, precise positioning and/or heavy arm applications. These tri-cam design clamps can position and clamp in less than one second and handle larger arms than standard swing clamps. One of the keys to this innovation is the patented Cam Follower Ball Seat that was developed to improve strength and wear. Using the patented Vektek V-Groove, a composite ball seat, and an elastomer spring, these clamps have reduced static friction for improved clamp breakaway and reduced dynamic friction for improved life.

- Available in these body styles:
 - Threaded Body
 - Top Flange
 - Bottom Flange
 - Cartridge Mount
 - Rod Position Sensing
 - Magnetic Position Sensing
- Single and double acting (position sensing are double acting only).
- Three cams for more accurate arm positioning, smoother rotation, and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Vektek again changes the “state of the art” in ball and cam swing clamps making them work better at reasonable prices.
- BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.
- Standard fluorocarbon wipers for improved coolant compatibility.
- Arm clamping feature uses standard Vektek arms.
- Same mounting envelope as Standard VektorFlo® Swing Clamps.



U. S. Patent Nos.
7,032,897
5,820,118

TuffCam™

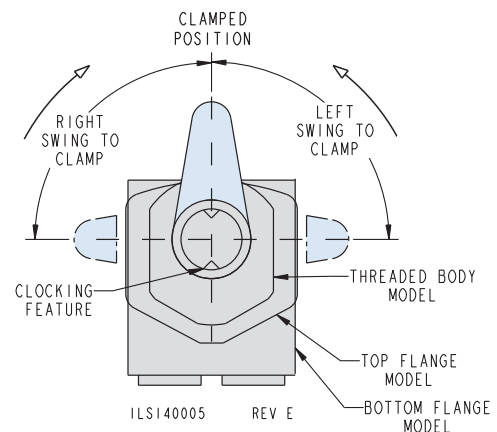


Clamp Time and Fluid Flow Rates for TuffCam™ High-Speed Swing Clamps

Swing Clamp Capacity (lb)	Standard Arm		Extended Arm	
	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cm ³ /min)	Fastest Allowable Clamp Time (sec.)	Maximum Permissible Flow Rate (cm ³ /min)
450	0.2	14	0.5	7
1100	0.3	45	0.7	20
2600	0.4	126	0.8	57

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- For upreach and double arms, use extended arm flows and times.
- When using custom arms the extended arm flows and times are to be considered the limiting factor.
- The actual time to position the clamp will vary by custom arm configuration and may require customer testing in specific application to establish limits.



TuffCam™ Arm Clamping Feature

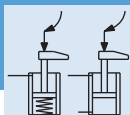
Drill points shown in the clamped position.
Second Clamping feature 180 from the first clamping feature.

NOTE: Arm Length and Pressure Limitation Graphs on page O-3

*TuffCam™ is a trademark of Vektek, Inc.

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VEKTEK, INC.
1-800-992-0236

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TuffCam™ High-Speed Swing Clamps

TuffCam™ High-Speed, Threaded Body Swing Clamp

Single And Double Acting

- Available in three capacities 450, 1100 and 2,600 lb. with standard arm at 5,000 psi.
- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- High-Speed clocking feature (page C-2) uses standard Vekttek arm.
- Arms sold separately — see section O.



U. S. Patent Nos.
7,032,897
5,820,118

C-3

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length **	Effective Piston Area (sq. in.)	Oil Capacity (cu. in.)****	
							Retract	Extend	
Single Acting (S/A)		Cylinders, actuated hydraulically 1 direction, spring returned.							
14-0105-01-R	Right	450	0.22	0.57	1 1/16-16	1.06	0.098	N/A	0.056
14-0105-01-L	Left								
14-0109-01-R	Right	1100	0.31	0.79	1 1/2-16	1.50	0.295	N/A	0.233
14-0109-01-L	Left								
14-0113-01-R	Right	2600	0.50	1.16	1 7/8-16	2.00	0.626	N/A	0.726
14-0113-01-L	Left								
Double Acting (D/A)		Cylinders, actuated hydraulically both directions.							
14-0205-01-R	Right	450	0.22	0.57	1 1/16-16	1.06	0.098	0.142	0.056
14-0205-01-L	Left								
14-0209-01-R	Right	1100	0.31	0.79	1 1/2-16	1.50	0.295	0.475	0.233
14-0209-01-L	Left								
14-0213-01-R	Right	2600	0.50	1.16	1 7/8-16	2.00	0.626	1.423	0.726
14-0213-01-L	Left								

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the Resultant Number X Your System Operating Pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for piece part height variations, it is recommended that the vertical travel be set at about 50% of the vertical stroke.

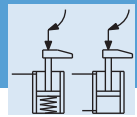
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

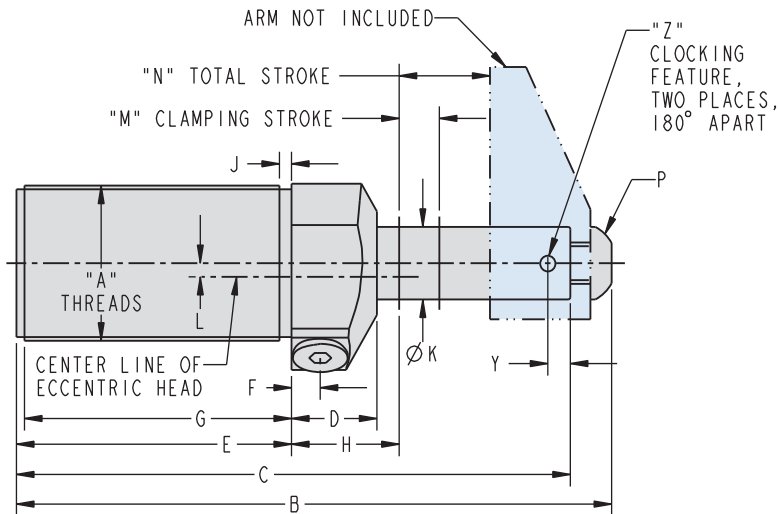
Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L
Single Acting (S/A)												
14-0105-01-L	450	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437	0.19
14-0109-01-L	1100	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15	0.625	0.16
14-0113-01-L	2600	1 7/8-16	7.33	6.81	1.06	3.35	0.36	3.21	1.30	0.15	0.875	0.16
Double Acting (D/A)												
14-0205-01-L	450	1 1/16-16	4.28	4.02	0.75	2.02	0.27	1.94	0.94	0.15	0.437	0.19
14-0209-01-L	1100	1 1/2-16	5.68	5.32	1.09	2.54	0.38	2.40	1.27	0.15	0.625	0.16
14-0213-01-L	2600	1 7/8-16	7.33	6.81	1.06	3.35	0.36	3.21	1.30	0.15	0.875	0.16

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TuffCam™ High-Speed Swing Clamps

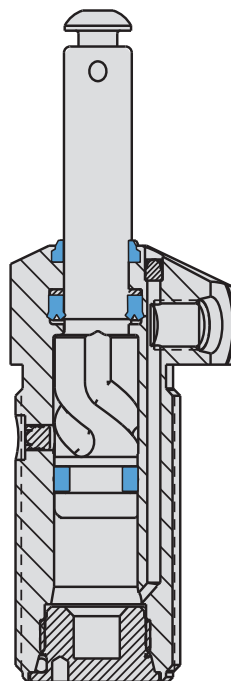
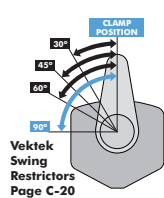
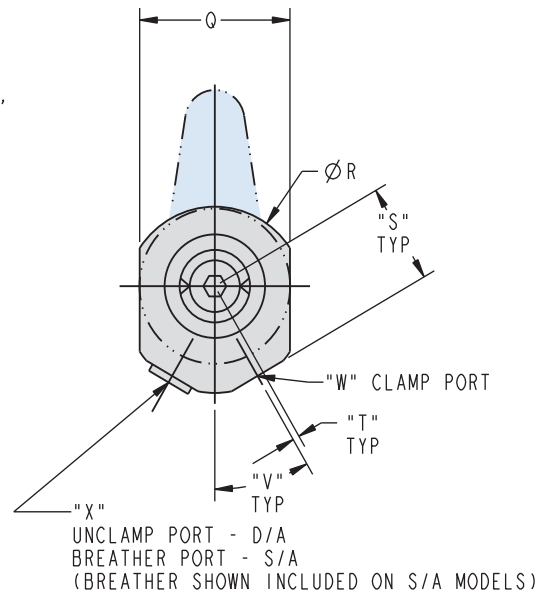


TuffCam™ High-Speed, Threaded Body Swing Clamp



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Features

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

SAE porting is all on the top of the cylinder body for easy access (bottom unclamp porting is available).

Vent port with bronze filter gives single acting swing clamps a place to "breathe" and helps keep out contamination.

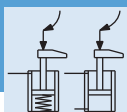


M	N	P	Q	R	S	T	V	W	X	Y±0.005	Z	Model No. Right Swing
Cylinders, actuated hydraulically 1 direction, spring returned.												
0.22	0.57	1/4-28 X 0.38	1.13	1.50	0.81	N/A	25°	SAE 2	SAE 2	0.156	Ø 0.13 x 90°	14-0105-01-R
0.31	0.79	3/8-24 X 0.63	1.50	1.88	1.03	0.09	35°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0109-01-R
0.50	1.16	1/2-20 X 0.75	1.88	2.25	1.20	0.08	30°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0113-01-R
Cylinders, actuated hydraulically both directions.												
0.22	0.57	1/4-28 X 0.38	1.13	1.50	0.81	N/A	25°	SAE 2	SAE 2	0.156	Ø 0.13 x 90°	14-0205-01-R
0.31	0.79	3/8-24 X 0.63	1.50	1.88	1.03	0.09	35°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0209-01-R
0.50	1.16	1/2-20 X 0.75	1.88	2.25	1.20	0.08	30°	SAE 4	SAE 4	0.156	Ø 0.19 x 90°	14-0213-01-R

Order arms separately

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TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed, Top Flange Swing Clamp

Single And Double Acting

- Available in three capacities 450, 1,100 and 2,600 lb. with standard arm at 5,000 psi.
- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- Fitting 30-8711-20, adapter assembly, included and shipped with the clamp, drawing on page H-5. Plugs are also included and shipped.
- High-Speed clocking feature (page C-2) uses standard Vekttek arm.
- Arms sold separately — see section O.
- Can be either manifold mounted or standard plumbed using standard SAE fittings.



U. S. Patent Nos.
7,032,897
5,820,118

TuffCam™

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Diameter	Standard Arm Length **	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend Retract	Optional Flow Control Model No.
Single Acting (S/A)			Cylinders, actuated hydraulically 1 direction, spring returned.						
14-6105-01-R	Right	450	0.22	0.57	1.00	1.06	0.098	N/A 0.056	70-2037-70
14-6105-01-L	Left								
14-6109-01-R	Right	1100	0.31	0.79	1.44	1.50	0.295	N/A 0.233	70-2037-71
14-6109-01-L	Left								
14-6113-01-R	Right	2600	0.50	1.16	1.75	2.00	0.626	N/A 0.726	70-2037-71
14-6113-01-L	Left								
Double Acting (D/A)			Cylinders, actuated hydraulically both directions.						
14-6205-01-R	Right	450	0.22	0.57	1.00	1.06	0.098	0.142 0.056	70-2037-70
14-6205-01-L	Left								
14-6209-01-R	Right	1100	0.31	0.79	1.44	1.50	0.295	0.475 0.233	70-2037-71
14-6209-01-L	Left								
14-6213-01-R	Right	2600	0.50	1.16	1.75	2.00	0.626	1.423 0.726	70-2037-71
14-6213-01-L	Left								

Warning! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide the cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

*** To allow for work piece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

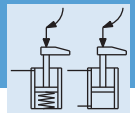
**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

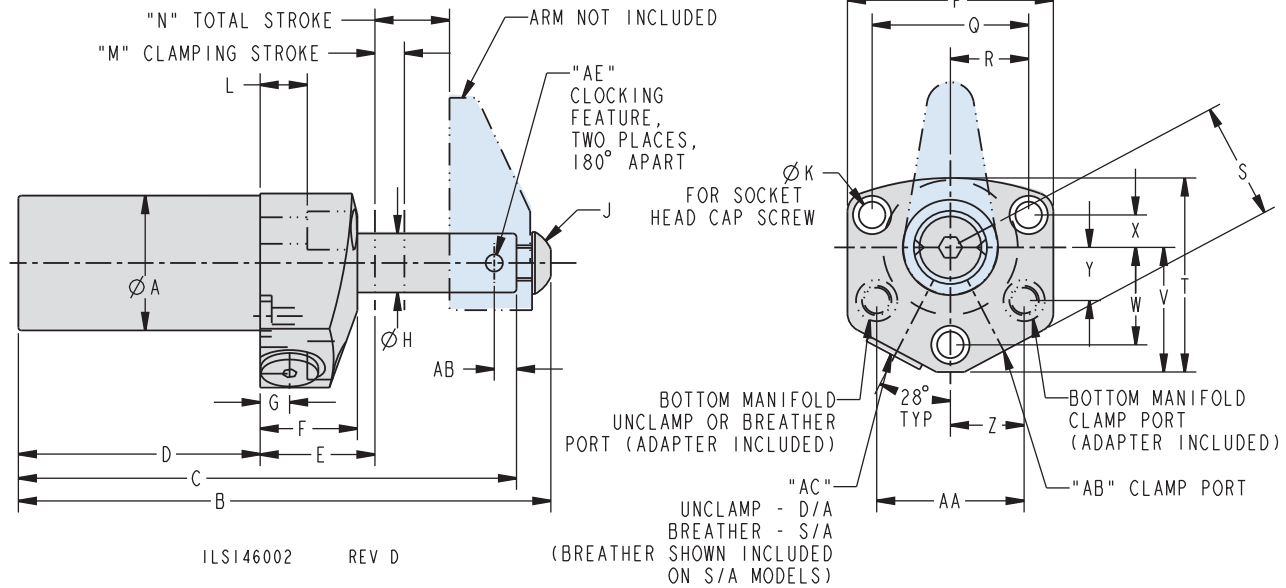
Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A)														
14-6105-01-L	450	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22	0.31	0.22	0.57
14-6109-01-L	1100	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.63	0.28	0.50	0.31	0.79
14-6113-01-L	2600	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41	0.50	1.16
Double Acting (D/A)														
14-6205-01-L	450	0.99	4.28	4.02	2.02	0.94	0.75	0.31	0.437	1/4 - 28 x 0.38	0.22	0.31	0.22	0.57
14-6209-01-L	1100	1.43	5.68	5.32	2.60	1.21	1.03	0.38	0.625	3/8 - 24 x 0.63	0.28	0.50	0.31	0.79
14-6213-01-L	2600	1.74	7.34	6.82	3.35	1.30	1.06	0.41	0.875	1/2 - 20 x 0.75	0.34	0.41	0.50	1.16

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TuffCam™ High-Speed Swing Clamp



TuffCam™ High-Speed, Top Flange Swing Clamp

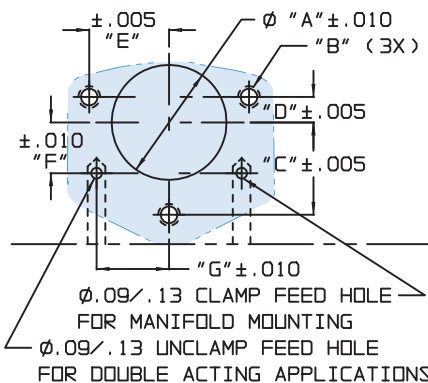


Features

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

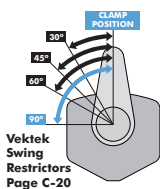
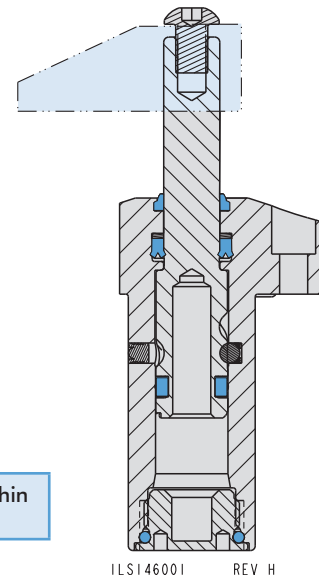
SAE porting is all on the top of the cylinder body for easy access, no need to modify fixtures or reroute tubing to access cylinder end to unclamp. (Optional bottom porting available)

Vent port with bronze filter gives single acting swing clamps a place to "breathe" and helps keep contamination from entering breather port.



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For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 µin R_a surface finish.



Mounting Dimensions

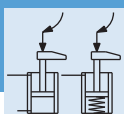
Model No.	Capacity	A	B	C	D	E	F	G
14-6X05-01-L/R	450	1.015	10-32	0.795	0.219	0.687	0.438	0.625
14-6X09-01-L/R	1100	1.453	1/4-20	1.032	0.344	0.875	0.562	0.844
14-6X13-01-L/R	2600	1.765	5/16-18	1.250	0.438	1.000	0.531	1.047

P	Q	R	S	T	V	W	X	Y	Z	AA	AB	AC	AD±0.005	AE	Model No. Right Swing
Cylinders, actuated hydraulically 1 direction, spring returned.															
1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.156	Ø.13 X 90°	14-6105-01-R
2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6109-01-R
2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6113-01-R
Cylinders, actuated hydraulically both directions.															
1.88	1.38	0.69	0.96	1.58	1.02	0.80	0.22	0.44	0.63	1.25	SAE 2	SAE 2	0.156	Ø.13 X 90°	14-6205-01-R
2.31	1.75	0.88	1.24	2.06	1.32	1.03	0.34	0.56	0.84	1.69	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6209-01-R
2.69	2.00	1.00	1.53	2.53	1.63	1.25	0.44	0.53	1.05	2.09	SAE 4	SAE 4	0.156	Ø.19 X 90°	14-6213-01-R

Order arms separately

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TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed, Bottom Flange Swing Clamp

Single And Double Acting

- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- High-Speed clamping feature (page C-2) uses standard Vektek arm.
- Arms sold separately — see section O.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

SAE porting from three directions on larger models gives you five alternatives for plumbing. You can use standard fittings in any of the three sets of ports or manifold by bolting up or down.

Vent port with bronze filter gives single acting swing clamps a place to “breathe” and helps keep contamination from entering breather port.



U. S. Patent Nos.
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Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Standard Arm Length	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)****		Optional Flow Control Model No.
							Extend	Retract	
Single Acting (S/A)									

Warning! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application, divide cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

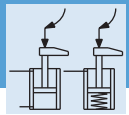
*** To allow for work piece height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

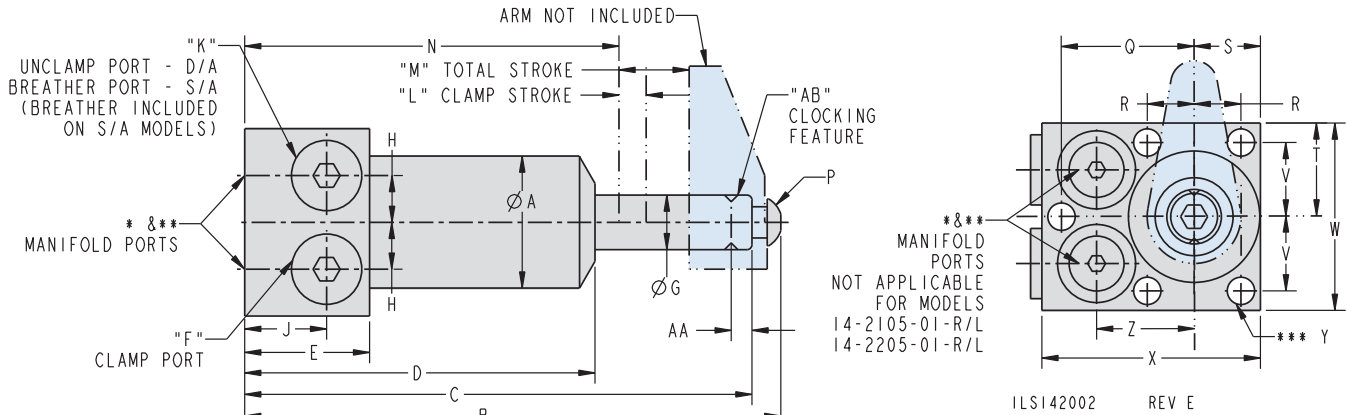
Dimensions

Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K	L	M	N
Single Acting (S/A)														
14-2105-01-L	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22	0.57	2.99
14-2109-01-L	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31	0.79	3.83
14-2113-01-L	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50	1.16	4.67
Double Acting (D/A)														
14-2205-01-L	450	1.05	4.32	4.06	2.80	1.00	SAE 4	0.438	0.38	0.66	SAE 4	0.22	0.57	2.99
14-2209-01-L	1100	1.49	5.70	5.33	3.65	1.25	SAE 4	0.625	0.56	0.63	SAE 4	0.31	0.79	3.83
14-2213-01-L	2600	1.79	7.35	6.83	4.43	1.25	SAE 4	0.875	0.75	0.63	SAE 4	0.50	1.16	4.67

TuffCam™ High-Speed Swing Clamp



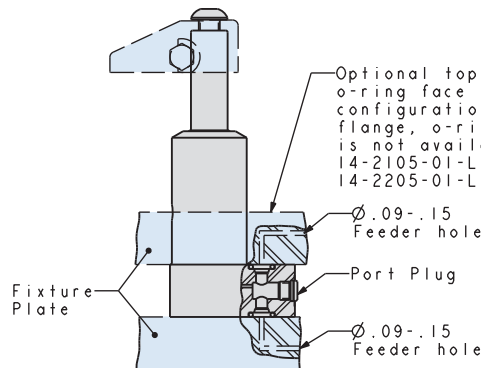
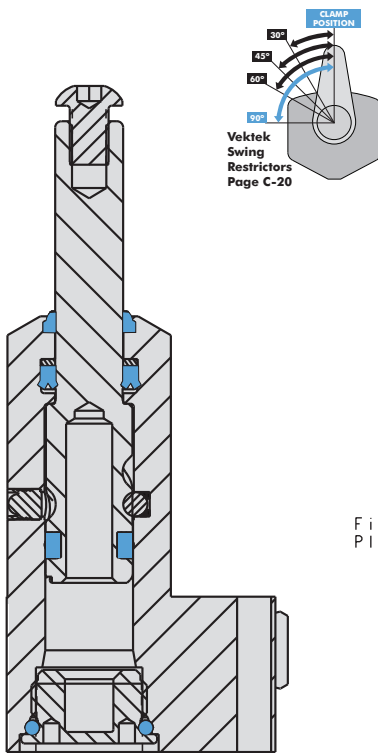
TuffCam™ High-Speed, Bottom Flange Swing Clamp



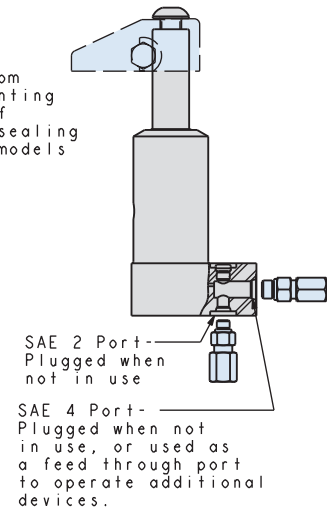
For Proper sealing, mating surface must be flat within 0.003 in. with a maximum 63 μ m R_a surface finish.

DRAWING NOTES:

- * All ports (except breather) are shipped with removable steel plugs installed.
- ** Counter bores for 5/8" diameter o-ring face seals provided. (SAE 2 ports)
- *** When used as manifold mounted, all 5 mounting bolts must be used to assure proper O-ring face sealing.



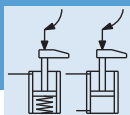
ILSI42005 REV A



ILSI42001 REV H

Order arms separately

P	Q	R	S	T	V	W	X	Y	Z	AA±0.005	AB	Model No. Right Swing
Cylinders, actuated hydraulically 1 direction, spring returned.												
1/4-28 X 0.38	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.156	Ø 0.13 X 90°	14-2105-01-R
3/8-24 X 0.63	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.156	Ø 0.19 X 90°	14-2109-01-R
1/2-20 X 0.75	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25	0.156	Ø 0.19 X 90°	14-2113-01-R
Cylinders, actuated hydraulically both directions.												
1/4-28 X 0.38	1.06	0.38	0.53	0.75	0.59	1.50	1.75	0.22	0.78	0.156	Ø 0.13 X 90°	14-2205-01-R
3/8-24 X 0.63	0.99	0.56	0.75	1.00	0.81	2.00	2.50	0.28	1.13	0.156	Ø 0.19 X 90°	14-2209-01-R
1/2-20 X 0.75	1.21	0.69	0.94	1.25	1.00	2.50	3.00	0.34	1.25	0.156	Ø 0.19 X 90°	14-2213-01-R



TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed Cartridge Mount

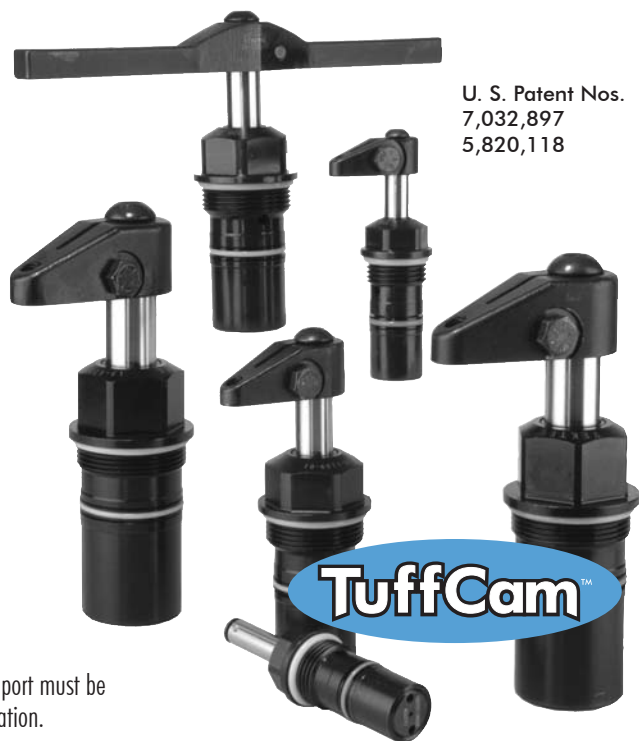
Single And Double Acting

- Three cams for accurate arm positioning, smoother rotation and lower per cam surface contact pressure.
- Patented ball seat for improved rotary function, cam follower contact, and reduced dynamic and static friction.
- Fluorocarbon wipers are standard for improved coolant compatibility.
- Tungsten-Carbide cam followers for strength and wear.
- Same mounting envelope as standard VektorFlo® Swing Clamps.
- High-Speed clamping feature (page C-2) uses standard Vekttek arm.
- Arms sold separately — see section O.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

Simplified pocket design with O-ring face seal on top allows use of some standard port tooling.

Only one O-ring must pass cross porting during installation, and only one (not two) port must be passed (but should not touch), reducing the chance of O-ring damage during installation.



TuffCam™

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)**	Vertical Clamping Stroke (in.)***	Total Stroke (Swing + Vertical)	Body Thread	Standard Arm Length	Effective Piston Area (sq. in.) Retract	Oil Capacity (cu. in.)**** Extend	Retract
Single Acting (S/A)					Cylinders, actuated hydraulically 1 direction, spring returned.				
14-1105-01-R	Right	450	0.22	0.57	1 1/16-12	1.06	0.098	N/A	0.056
14-1105-01-L	Left								
14-1109-01-R	Right	1100	0.31	0.79	1 5/8-12	1.50	0.295	N/A	0.233
14-1109-01-L	Left								
14-1113-01-R	Right	2600	0.50	1.16	1 7/8-12	2.00	0.626	N/A	0.726
14-1113-01-L	Left								
Double Acting (D/A)					Cylinders, actuated hydraulically both directions.				
14-1205-01-R	Right	450	0.22	0.57	1 1/16-12	1.06	0.098	0.142	0.056
14-1205-01-L	Left								
14-1209-01-R	Right	1100	0.31	0.79	1 5/8-12	1.50	0.295	0.475	0.233
14-1209-01-L	Left								
14-1213-01-R	Right	2600	0.50	1.16	1 7/8-12	2.00	0.626	1.423	0.726
14-1213-01-L	Left								

WARNING! Never allow swing arm to contact workpiece or fixture during arm rotation.

** Cylinder capacities are listed at 5,000 psi maximum operating pressure, with a standard length VektorFlo® arm installed. Minimum operating pressure is 750 psi for single acting, 500 psi for double acting. The clamping force is adjustable by varying the hydraulic system pressure. To determine the approximate output force for your application divide the cylinder capacity shown above by 5,000, and multiply the resultant number X your system operating pressure to obtain the approximate clamping force for your application. (Actual force will vary slightly due to internal cantilever loading, friction loss and/or return springs.)

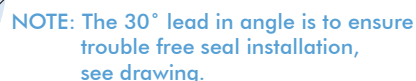
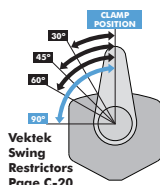
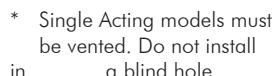
*** To allow for piece part height variations, it is recommended that the vertical travel be set to about 50% of the vertical stroke.

**** To ensure maximum service life and trouble-free operation, restrict fluid flow per table on page C-2.

Dimensions

Model No. Left Swing	Capacity	A	B	C	D	E	F	G	H	J	K
Single Acting (S/A)											
14-1105-01-L	450	2.13	2.13	1.32	1.88	0.13	0.63	0.49	0.83	0.438	0.92
14-1109-01-L	1100	2.70	2.98	1.50	2.63	0.13	0.94	0.65	1.13	0.625	1.34
14-1113-01-L	2600	3.17	4.17	1.50	3.65	0.16	1.25	0.55	1.49	0.875	1.72
Double Acting (D/A)											
14-1205-01-L	450	2.13	2.13	1.32	1.88	0.13	0.63	0.49	0.83	0.438	0.92
14-1209-01-L	1100	2.70	2.98	1.50	2.63	0.13	0.94	0.65	1.13	0.625	1.34
14-1213-01-L	2600	3.17	4.17	1.50	3.65	0.16	1.25	0.55	1.49	0.875	1.72

C-10



Basic Cavity can be formed with a standard (SAE J126/1 Port Detail) O-ring Port Contour Cutter

11S141100 RFV A

L	M	N	P	Q	R	S	T	V±0.005	W	Model No. Right wing
Cylinders, actuated hydraulically 1 direction, spring returned.										
0.935	1 1/16-12	1.25	1.00	1/4-28 X 3/8	0.22	0.57	Breather	0.156	Ø 0.13 x 90°	14-1105-01-R
1.372	1 5/8-12	1.88	1.50	3/8-24 X 5/8	0.31	0.79	Breather	0.156	Ø 0.19 x 90°	14-1109-01-R
1.747	1 7/8-12	2.13	1.63	1/2-20 X 3/4	0.50	1.16	Breather	0.156	Ø 0.19 x 90°	14-1113-01-R
Cylinders, actuated hydraulically both directions.										
0.935	1 1/16-12	1.25	1.00	1/4-28 X 3/8	0.22	0.57	SAE 2	0.156	Ø 0.13 x 90°	14-1205-01-R
1.372	1 5/8-12	1.88	1.50	3/8-24 X 5/8	0.31	0.79	SAE 4	0.156	Ø 0.19 x 90°	14-1209-01-R
1.747	1 7/8-12	2.13	1.63	1/2-20 X 3/4	0.50	1.16	SAE 4	0.156	Ø 0.19 x 90°	14-1213-01-R

TuffCam™ High-Speed Swing Clamp

TuffCam™ Position Sensing High-Speed Swing Clamps

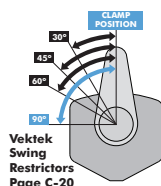
TuffCam™

Rod Position Sensing Swing Clamps

- For use with Double Acting clamps only.
- Available for use on TuffCam™ High-Speed Swing Clamp with capacities of 1,100 lbs. and 2,600 lbs.
- Actuator Rod Position System can be used with a mechanical switch or air logic system to detect when clamp is in position.
- Actuator rod is concentric to plunger shaft.
- Actuator rod moves with the same rotary and linear motion as the plunger.
- All TuffCam™ high-speed features apply to these units.
- TuffCam™ High-Speed Clocking feature (page C-2) uses standard Vektek arm.

BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

All TuffCam™ features apply to these units.

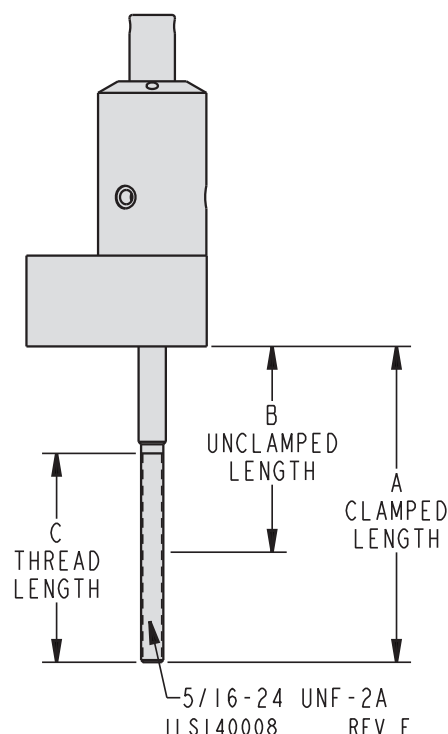


U. S. Patent Nos.
7,032,897
5,820,118

Rod Position Sensing System

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)	A (in.)	B (in.)	C (in.)	Optional Flow Control Model No.
TuffCam Threaded Body (D/A) clamps, hydraulic retract and extend.						
14-0209-01-R-PR	Right	1100	3.97	3.18	2.88	N/A
14-0209-01-L-PR	Left	1100	3.97	3.18	2.88	N/A
14-0213-01-R-PR	Right	2600	5.10	3.94	3.63	N/A
14-0213-01-L-PR	Left	2600	5.10	3.94	3.63	N/A
TuffCam Top Flange (D/A) clamps, hydraulic retract and extend.						
14-6209-01-R-PR	Right	1100	3.97	3.18	2.88	70-2037-71
14-6209-01-L-PR	Left	1100	3.97	3.18	2.88	70-2037-71
14-6213-01-R-PR	Right	2600	5.10	3.94	3.63	70-2037-71
14-6213-01-L-PR	Left	2600	5.10	3.94	3.63	70-2037-71
TuffCam Bottom Flange (D/A) clamps, hydraulic retract and extend.						
14-2209-01-R-PR	Right	1100	3.92	3.13	2.88	70-2037-71
14-2209-01-L-PR	Left	1100	3.92	3.13	2.88	70-2037-71
14-2213-01-R-PR	Right	2600	5.04	3.88	3.63	N/A
14-2213-01-L-PR	Left	2600	5.04	3.88	3.63	N/A

These systems available as Double Acting TuffCam™ Swing Clamps only.



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1-800-992-0236

TuffCam™ High-Speed Swing Clamp

TuffCam™ High-Speed Swing Clamps, Position Sensing

Magnetic Position Sensing Swing Clamps

- Sensors sold separately.
- Sensor mounting housing is concentric to plunger shaft.
- For use with Double Acting clamps only.
- Available for TuffCam High-Speed Swing Clamps only.
- TuffCam™ Clamping feature uses standard Vektex arm (page C-2).

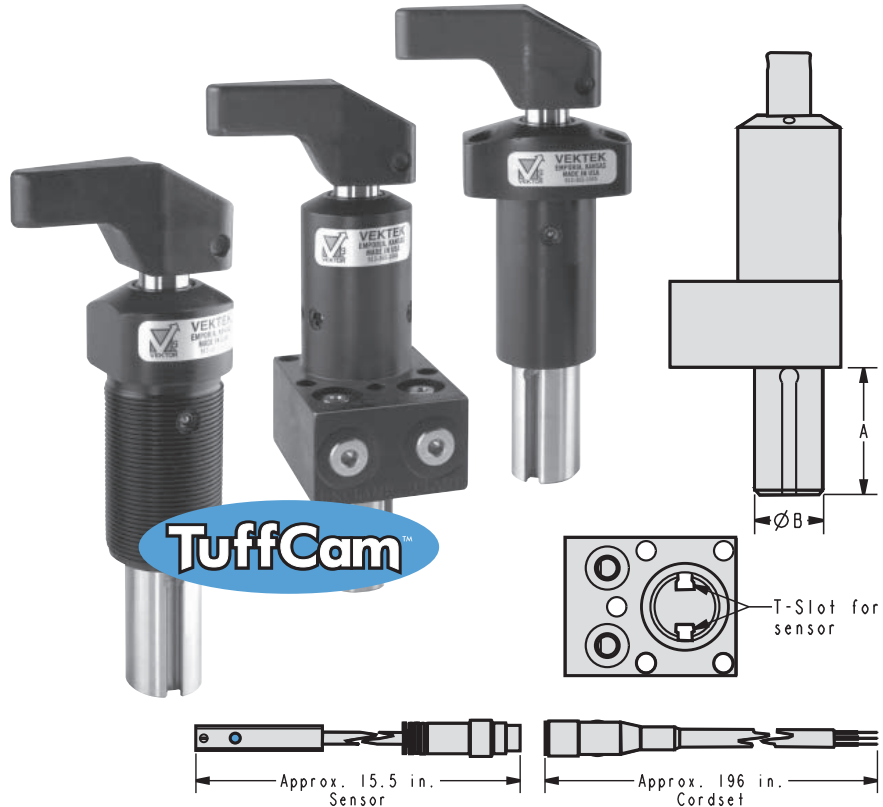
BHC™ (Black Hard Coating) on the cylinder bodies helps prevent scoring and scratching.

Sensor Kits Ordered Separately

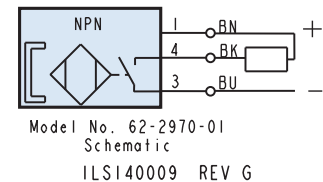
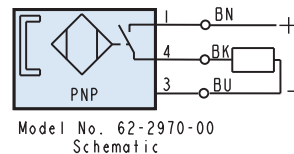
62-2970-00 PNP Position Sensing Kit includes:
a 29-7001-00 Sensor and a 27-6424-00 Cordset

62-2970-01 NPN Position Sensing Kit includes:
a 29-7001-01 Sensor and a 27-6424-00 Cordset

The use of NPN or PNP is determined by the device to which the sensor is connected. One Sensor is required for each sensing position.



C-12



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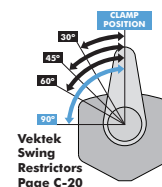
U. S. Patent Nos.
7,032,897
5,820,118

Magnetic Position Sensing System

Model No.	Clamp Swing Direction	Cylinder Capacity (lb.)	A (in.)	B (in)	Optional Flow Control Model No.
TuffCam™ Threaded Body (D/A) clamps, hydraulic retract and extend.					
14-0205-01-R-PS	Right	450	1.72	1.00	N/A
14-0205-01-L-PS	Left				
14-0209-01-R-PS	Right	1100	1.89	1.00	N/A
14-0209-01-L-PS	Left				
14-0213-01-R-PS	Right	2600	2.27	1.00	N/A
14-0213-01-L-PS	Left				
TuffCam™ Top Flange (D/A) clamps, hydraulic retract and extend.					
14-6205-01-R-PS	Right	450	1.72	1.00	70-2037-70
14-6205-01-L-PS	Left				
14-6209-01-R-PS	Right	1100	1.89	1.00	70-2037-71
14-6209-01-L-PS	Left				
14-6213-01-R-PS	Right	2600	2.27	1.00	70-2037-71
14-6213-01-L-PS	Left				
TuffCam™ Bottom Flange (D/A) clamps, hydraulic retract and extend.					
14-2205-01-R-PS	Right	450	1.66	1.00	70-2037-71
14-2205-01-L-PS	Left				
14-2209-01-R-PS	Right	1100	1.84	1.00	70-2037-73
14-2209-01-L-PS	Left				
14-2213-01-R-PS	Right	2600	2.21	1.00	N/A
14-2213-01-L-PS	Left				

Sensor Feature:

- Normally Open Contact
- LED Indicator Light
- 10 to 30 VDC operating range
- 3 Watt Maximum Contact Rating
- ≤ 0.8 ms Switch-off time
- ≤ 1.0 ms Switch-on time



These systems available for Double Acting TuffCam™ Swing Clamps only.

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1-800-992-0236

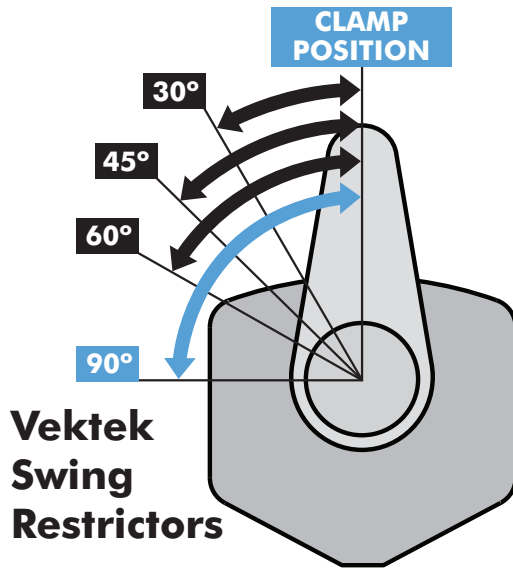
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Standard Swing Clamp

Swing Restrictors and Clocking

Swing Clamp Restrictors

Swing Restrictors add just one more element of flexibility when using Vektek Swing Clamps. Normally shipped with the swing angle set to 90°, you can have swing restrictors added to your clamps to limit the the arm swing to 30°, 45° or 60° of rotation. Restrictors that are factory installed on new clamps will have the clamp specially marked to avoid intermingling clamps with varying swing angles in your shop. Contact your Vektek Customer Service specialist should you need swing angles greater than 90°.



Swing Clamp Swing Restrictors

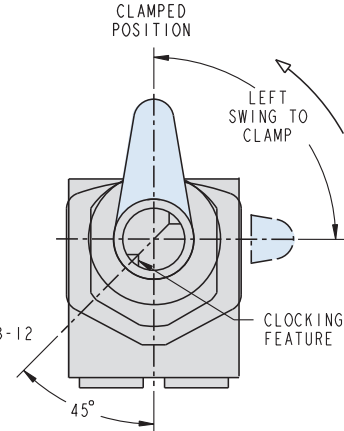
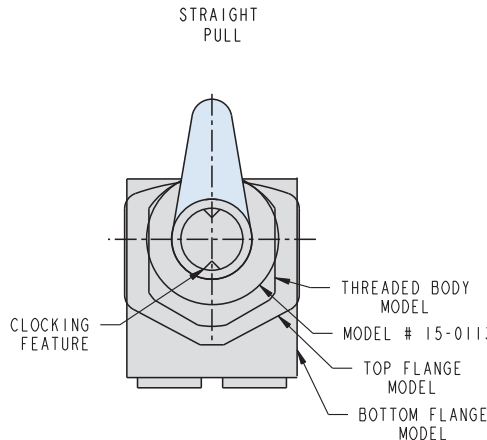
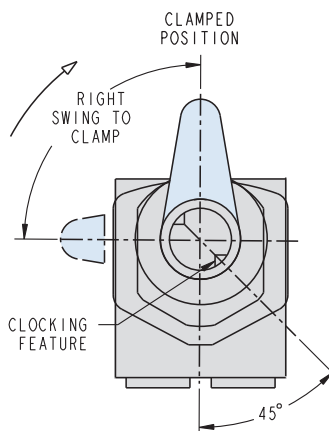
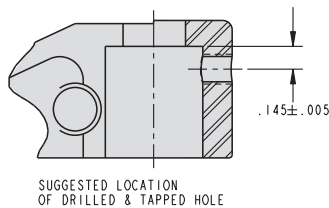
Model No	Clamp Capacity	Swing Restriction
81-5505-30	450/2kN	30°
81-5505-45	450/2kN	45°
81-5505-60	450/2kN	60°
81-5509-30	1100/4.9kN	30°
81-5509-45	1100/4.9kN	45°
81-5509-60	1100/4.9kN	60°
81-5513-30	2600/11.6kN	30°
81-5513-45	2600/11.6kN	45°
81-5513-60	2600/11.6kN	60°
81-5518-30	5000/22kN	30°
81-5518-31	LP SC 5000/22kN	30°
81-5518-45	5000/22kN	45°
81-5518-46	LP SC, 5000/22kN	45°
81-5518-60	5000/22kN	60°
81-5518-61	LP SC, 5000/22kN	60°
81-5521-30	LP SC 7500/33kN	30°
81-5521-45	LP SC 7500/33kN	45°
81-5521-60	LP SC 7500/33kN	60°

C-20

Clocking

Machined on most Vektek swing clamps, the Arm Clocking feature will dramatically reduce the time it takes to change arms for maintenance, replacement or design set up. This innovation eliminates the need for expensive special swing clamps and moves cost effective user modifications to the clamp arms.

A drill point on each clamp standardizes arm location at a particular position. A second orientation drill point resides 180° out from that position. Access to the positioning feature is through the back or side of the arm, making modification a snap for users. Each arm position can have its own specification.



Swing Clamp Arm Clocking Feature

Drill points shown in the clamped position.
Second Clocking feature 180 from the first clocking feature.

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