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Anchor Lamina has made a commitment to the metal stamping industry by manufacturing and distributing a comprehensive collection of high quality products.

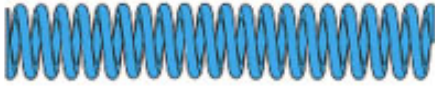
Lamina has long been known for expertise in producing precision products and has applied that knowledge into the design and production of cams with truly interchangeable parts. LamCams™ maintain consistency throughout standard lines available from bump cams to Aerial and Diemount cams to the Modular Styles.

Input from our customers has been and continues to be an important part of cam development and maintenance which assures Lamina's leadership position.

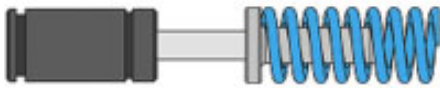
No other company surpasses our obligation to you, our customer, in supporting cams. We listen to your needs and respond when you require our assistance.

- **Ease of spring replacement from back of cam; the cam base incorporates a safety restraint system to retain the slide during spring removal**
- **High quality materials used throughout, including high-strength steel castings for major components**
- **All wear areas are double-plated with self-lubricated wear plates to reduce maintenance and accommodate high volume and long production life**
- **Three Return Spring Kit options; mechanical ISO spring, combination mechanical/nitrogen springs and nitrogen spring**
- **Pentahedron design ensures smooth and stable slide movement on 500 through 1200 Series Cams**
- **Urethane bumper cushion on slide return; Optional hydraulic shock absorber available**
- **Mounting/locating provisions include both square keys and dowel holes**
- **Meets or exceeds all of "NAAMS" cam requirements**
- **Lock-out kit installed; ready for cam installation and set up**
- **Safety back-up provisions for retaining keeper plates**
- ***Improved, super-duty* accelerator system standard on 0° through 50° angles**
- **Dual external positive return system**

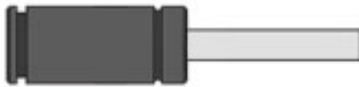
## SLIDE RETURN SYSTEM OPTIONS



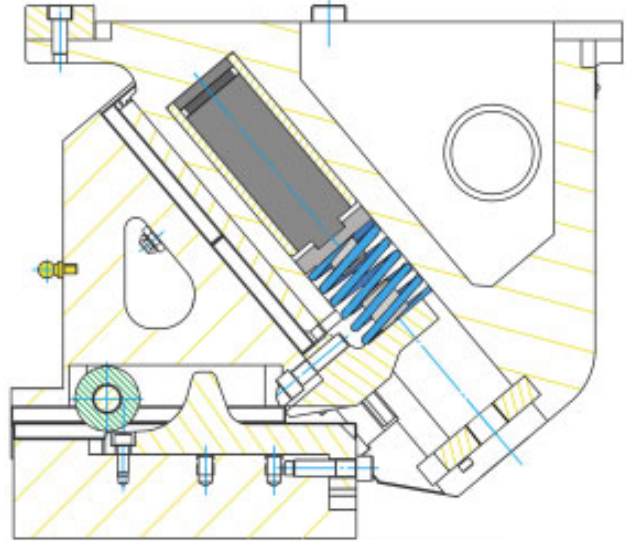
Mechanical Spring



Mechanical & Nitrogen Spring\*  
(Recommended)



Nitrogen Spring



Recognizing that different cam applications have different requirements, Lamina offers three Return Spring Kit Options.

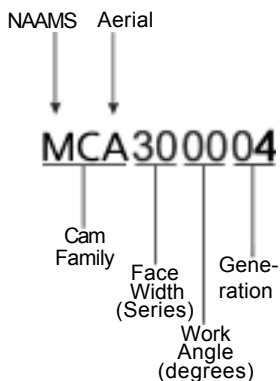
1. Mechanical – Employs a conventional ISO Die Spring, used in cam applications where additional stripping force is not required.
2. Combination Mechanical/Nitrogen – This unique Lamina design employs an ISO Die Spring in series combination with a Nitrogen Spring. This return system utilizes the mechanical spring for preload, keeping the forces low, while providing high final loads from the nitrogen spring for stripping.
3. Nitrogen – This return system provides high return spring forces for stripping. By nature of the nitrogen spring, it also has a higher initial contact force than other return spring options. This higher contact force may result in greater wear on the cam and its accelerator system (where applicable).

**\*Lamina strongly recommends the use of the Nitrogen Cylinder/Mechanical Spring Combination System for the slide return function of all Aerial and Diemount cam units.**

**The benefit of using the Combination System is two-fold:**

1. The force developed in the slide return system is low when the accelerator function is active (because only the mechanical spring is operative at that point), thus, wearing of the accelerator components is greatly reduced.
2. The total developed slide return force at the cam's shut height position is greater with the Combination System than it is with the Nitrogen-only option. The result is more on-board capability for part stripping.

### PART NUMBER KEY

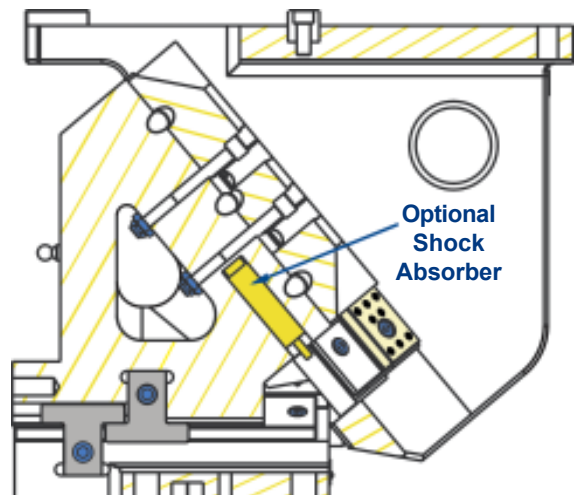


### OPTIONAL SHOCK ABSORBERS

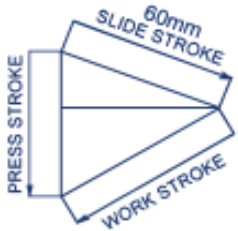
Optional shock absorbers are available and should be used in the absence of an accelerator system on low-angle cams (i.e., less than 35°) to ensure a gentle return of the slide to its home position.



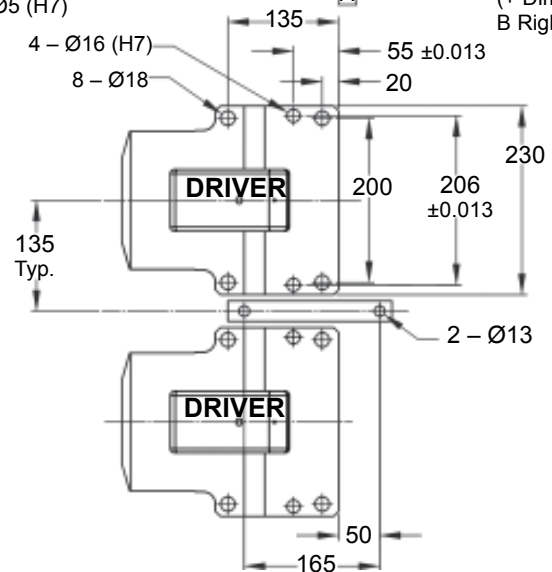
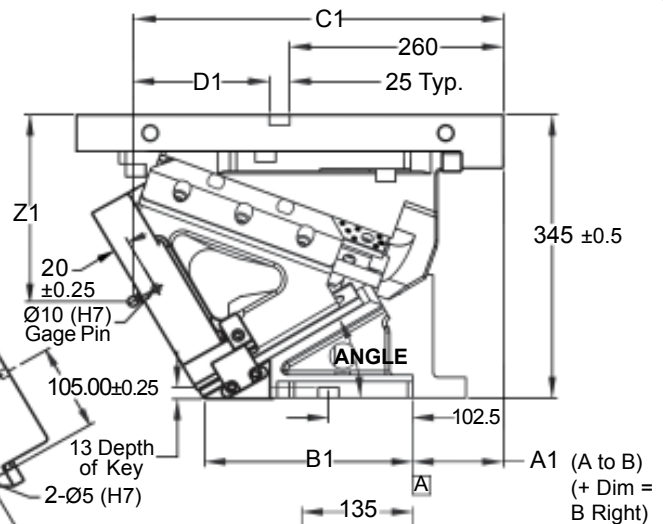
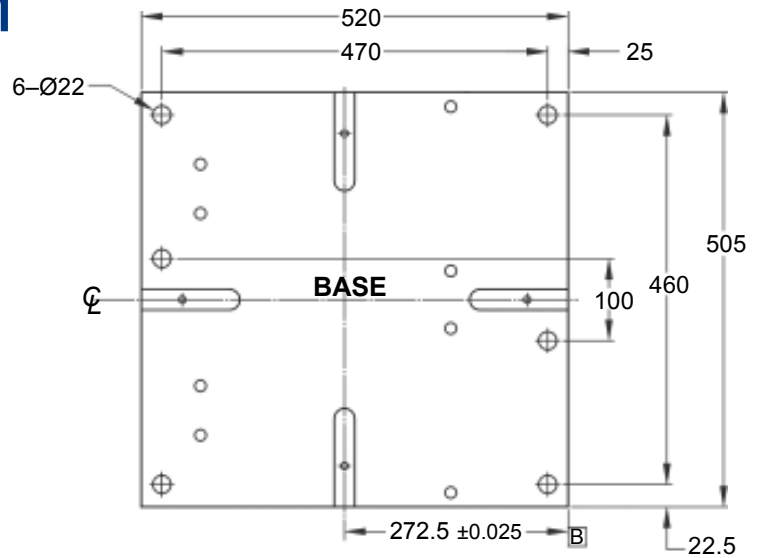
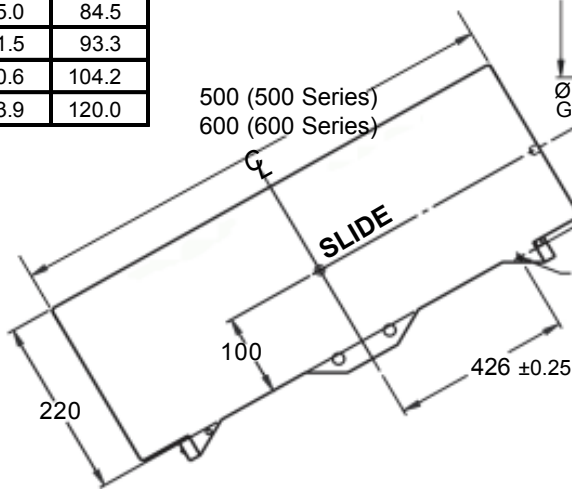
Shock Absorber and  
M6x12 set screw



# 500 – 600 Series AERIAL MODULAR CAM



ANGLE	PRESS STROKE	WORK STROKE
0	46.0	38.6
5	46.1	42.6
10	46.7	46.7
15	47.6	50.9
20	48.9	55.3
25	50.7	60.0
30	53.1	65.1
35	56.1	70.8
40	60.0	77.1
45	65.0	84.5
50	71.5	93.3
55	90.6	104.2
60	103.9	120.0

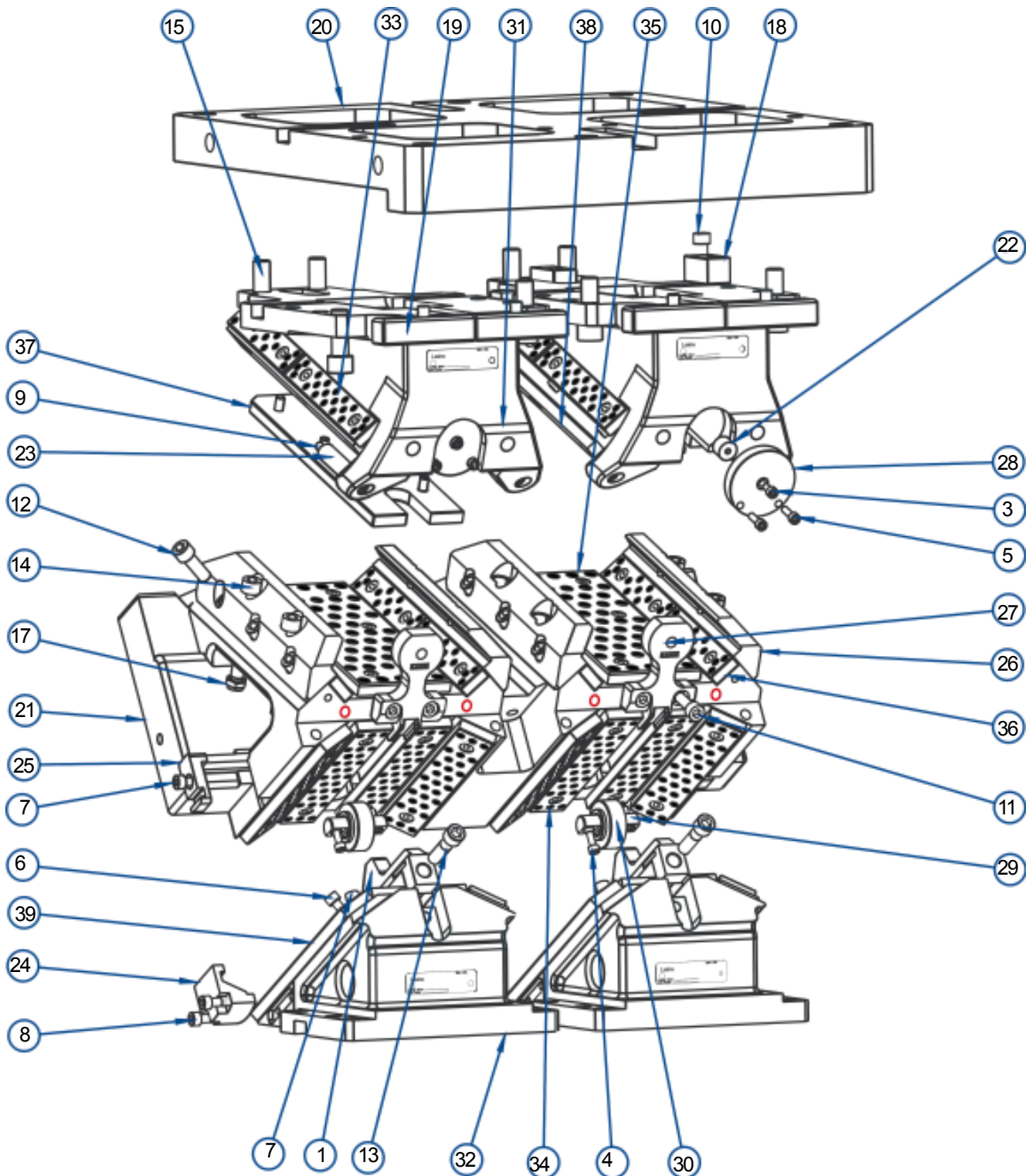


AERIAL MODULAR CAM PART NUMBERS & WEIGHTS										
500 SERIES					A N G L E	600 SERIES				
PART NUMBER			WEIGHT			PART NUMBER			WEIGHT	
With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs
MCA050004M	MCA050004K	MCA050004D	289	636	0	MCA060004M	MCA060004K	MCA060004D	297	654
MCA050504M	MCA050504K	MCA050504D	286	630	5	MCA060504M	MCA060504K	MCA060504D	294	648
MCA051004M	MCA051004K	MCA051004D	283	624	10	MCA061004M	MCA061004K	MCA061004D	291	642
MCA051504M	MCA051504K	MCA051504D	287	632	15	MCA061504M	MCA061504K	MCA061504D	295	650
MCA052004M	MCA052004K	MCA052004D	286	631	20	MCA062004M	MCA062004K	MCA062004D	294	649
MCA052504M	MCA052504K	MCA052504D	279	614	25	MCA062504M	MCA062504K	MCA062504D	287	632
MCA053004M	MCA053004K	MCA053004D	288	635	30	MCA063004M	MCA063004K	MCA063004D	296	653
MCA053504M	MCA053504K	MCA053504D	286	630	35	MCA063504M	MCA063504K	MCA063504D	294	648
MCA054004M	MCA054004K	MCA054004D	291	640	40	MCA064004M	MCA064004K	MCA064004D	298	658
MCA054504M	MCA054504K	MCA054504D	288	634	45	MCA064504M	MCA064504K	MCA064504D	296	652
MCA055004M	MCA055004K	MCA055004D	296	652	50	MCA065004M	MCA065004K	MCA065004D	304	670
MCA055504M	MCA055504K	MCA055504D	289	638	55	MCA065504M	MCA065504K	MCA065504D	298	656
MCA056004M	MCA056004K	MCA056004D	303	668	60	MCA066004M	MCA066004K	MCA066004D	311	686
With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs
MCA050004MK	MCA050004MD	MCA050044	289	636	0	MCA060004MK	MCA060004MD	MCA060044	297	654
MCA050504MK	MCA050504MD	MCA050544	286	630	5	MCA060504MK	MCA060504MD	MCA060544	294	648
MCA051004MK	MCA051004MD	MCA051044	283	624	10	MCA061004MK	MCA061004MD	MCA061044	291	642
MCA051504MK	MCA051504MD	MCA051544	287	632	15	MCA061504MK	MCA061504MD	MCA061544	295	650
MCA052004MK	MCA052004MD	MCA052044	286	631	20	MCA062004MK	MCA062004MD	MCA062044	294	649
MCA052504MK	MCA052504MD	MCA052544	279	614	25	MCA062504MK	MCA062504MD	MCA062544	287	632
MCA053004MK	MCA053004MD	MCA053044	288	635	30	MCA063004MK	MCA063004MD	MCA063044	296	653
MCA053504MK	MCA053504MD	MCA053544	286	630	35	MCA063504MK	MCA063504MD	MCA063544	294	648
MCA054004MK	MCA054004MD	MCA054044	291	640	40	MCA064004MK	MCA064004MD	MCA064044	298	658
MCA054504MK	MCA054504MD	MCA054544	288	634	45	MCA064504MK	MCA064504MD	MCA064544	296	652
MCA055004MK	MCA055004MD	MCA055044	296	652	50	MCA065004MK	MCA065004MD	MCA065044	304	670
MCA055504MK	MCA055504MD	MCA055544	289	638	55	MCA065504MK	MCA065504MD	MCA065544	298	656
MCA056004MK	MCA056004MD	MCA056044	303	668	60	MCA066004MK	MCA066004MD	MCA066044	311	686

AERIAL MODULAR CAM DIMENSIONS								
500-600 SERIES								
ANGLE	A1	B1	C1	D1	Z1	PRESS STROKE	WORK STROKE	EFFECTIVE WORK STROKE
0°	194.5	230.0	443.6	158.6	181.4	46.0	38.6	30.0
5°	185.1	232.1	446.9	161.9	191.0	46.1	42.6	35.0
10°	161.9	231.2	434.6	149.6	199.9	46.7	46.7	37.0
15°	159.7	230.9	443.4	158.4	206.7	47.6	50.9	43.0
20°	138.7	222.1	429.7	144.7	212.1	48.9	55.3	48.0
25°	109.2	226.3	414.0	129.0	219.6	50.7	60.0	52.0
30°	110.4	253.5	448.3	163.3	226.3	53.1	65.1	58.0
35°	107.4	228.9	432.7	147.7	234.7	56.1	70.8	63.0
40°	97.1	222.5	429.3	144.3	244.0	60.0	77.1	70.0
45°	68.6	228.0	414.7	129.7	256.2	65.0	84.5	83.0
50°	55.0	223.4	402.9	117.9	265.1	71.5	93.3	84.0
55°	41.7	213.3	393.6	108.6	261.8	90.6	104.2	104.2
60°	23.1	213.1	381.6	96.6	274.9	103.9	120.0	120.0

This apparatus is covered by U.S. Patent No. 5,885,521, European Patent No.1097010 in Austria, Belgium, Germany, Spain, France, United Kingdom, Ireland and Italy; other patents pending.

## Component Parts for 500 – 600 Aerial Modular Cam



SHOCK ABSORBERS – OPTIONAL		
Qty	PART NUMBER	DESCRIPTION
4	MSC100028	Shock Absorber Assemblies
Shock absorber locations noted in red on drawing		

Refer to 500 – 600 Series Specifications Table for Return Spring Options

COMPONENT PARTS FOR 500-600 SERIES AERIAL MODULAR CAMS							
ITEM NO	QTY	Description	PART NUMBER	ITEM NO	QTY	Description	PART NUMBER
			MCAXXXX04				MCAXXXX44*
1	2	Accelerator Block (See Notes 1 & 2)	14A1230@@R	24	2	Positive Return Bracket	NCM150008
3	2	Soc. Hd. Cap Screw M6x1.0x12	F010608	25	2	Positive Return Guideway	NCM150009
4	4	Soc. Hd. Cap Screw M6x1.0x16	F010609	26	4	Keeper Plate	NCM150010
5	4	Soc. Hd. Cap Screw M6x1.0x20	F010610	27	2	Spring Return Bracket	NCM200001
6	100	Soc. Hd. Cap Screw M8x1.25x16	F010809	28	2	Disk Plate	NCM200008
7	4	Soc. Hd. Cap Screw M8x1.25x20	F010810	29	2	Roller Shaft	NCM300011
8	4	Soc. Hd. Cap Screw M8x1.25x40	F010814	30	2	Roller/Liner Assembly	NCM300014
9	2	Soc. Hd. Cap Screw M8x1.25x90	F010823	31	2	Base (See Note 1)	NMA17@@13
10	6	Soc. Hd. Cap Screw M10x1.5x25	F011011	32	2	Driver (See Note 1)	NMA17@@24
11	4	Soc. Hd. Cap Screw M10x1.5x30	F011012	33	4	Bronze S/L Wearplate 12x30x160mm	WCC120006
12	12	Soc. Hd. Cap Screw M12x1.75x35	F011213	33	4	Steel S/L Wearplate 12x30x160mm	WCT120006
13	2	Soc. Hd. Cap Screw M12x1.75x45	F011215	34	8	Bronze S/L Wearplate 12x38x200mm	WCC120007
14	4	Soc. Hd. Cap Screw M12x1.75x90	F011223	34	8	Steel S/L Wearplate 12x38x200mm	WCT120007
15	8	Soc. Hd. Cap Screw M16x2.0x45	F011615	35	2	Bronze S/L Wearplate 12x100x240mm	WCC120008
17	10	Hex Locknut M12x1.75	M1217	35	2	Steel S/L Wearplate 12x100x240mm	WCT120008
18	2	NAAMS Key 25x25x50mm	M082505	36	12	Bronze S/L Wearplate 12x30x125mm	WCC120009
19	4	NAAMS Key 25x25x100mm	M082510	36	12	Steel S/L Wearplate 12x30x125mm	WCT120009
20	1	Base Plate	See Note 3	37	2	Steel Wearplate 12x100x290mm	WCS120006
21	1	Slide (0° – 50°)	MMA05034	38	4	Steel Wearplate 12x30x285mm	WCS120008
21	1	Slide (55° & 60°)	MMA06034	39	4	Hard Steel Wearplate 12x38x225mm	WCS120009
22	2	Rubber Bumpers	MSC100003	40	4	Hard Steel Wearplate 12x38x225mm (N)	WCS120014
23	2	Lockout Spacer	NCM070008				

Note 1: Insert Angle (00,05,10 etc.) for @@ in part number.

Note 2: No Accelerator is required for angles 55 & 60.

Note 3: Base Plate Part number is dependent on angle. (0°, 5°, 10°, 15°, 20°, 25° =MMA060001) (30°=MMA063001) (35°=MMA063501) (40°=MMA064001) (45°, 55°=MMA064501) (50°, 60°=MMA065001)

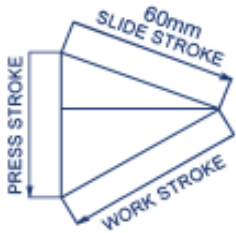
\*Option: Cams with double steel wearplates. This column calls out the part numbers for steel self-lubricating wear plates.

500-600 Series Specifications				RETURN SPRING KIT OPTIONS
Spring Kit Option	Spring Kit Part # (2 Required)	Pre-Load kg (lbs.) -f	Final Load kg (lbs.) -f	Recognizing that different cam applications have different requirements, Lamina offers three Return Spring Kit Options:
Mechanical	SKC170001	64 (141)	278 (613)	1 <b>Mechanical</b> - Employs conventional ISO Die Springs - used in cam applications where additional stripping force is not required.
Combination - Mech./Nitrogen (Kaller)	SKC170002	51.3 (113)	458 (1010)	
Combination - Mech./Nitrogen (Dadco)	SKC170012	51.3 (113)	458 (1010)	2 <b>Combination Mechanical/Nitrogen</b> -This unique Lamina design employs an ISO Die Spring in series combination with a Nitrogen Spring. This return system utilizes the mechanical spring for pre- load, keeping the forces low, while providing high final loads from the nitrogen spring for stripping.
Nitrogen (Kaller)	SKC170003	276 (609) (a)	373 (822)	
Nitrogen (Dadco)	SKC170013	276 (609) (a)	348 (767)	
Tooling Allowance	Protrusion - mm	175 Maximum		3 <b>Nitrogen</b> - This return system provides high return spring forces for stripping. By nature of the nitrogen spring, it also has higher initial contact force than other return spring options. This higher initial contact load may result in greater wear on the cam and its accelerator system (where applicable.)
	Weight - kg (lbs)	64 (140) Maximum		
Rated Capacity (b)	435 kN : 44.3 M-Tons : 48.8 US Tons			

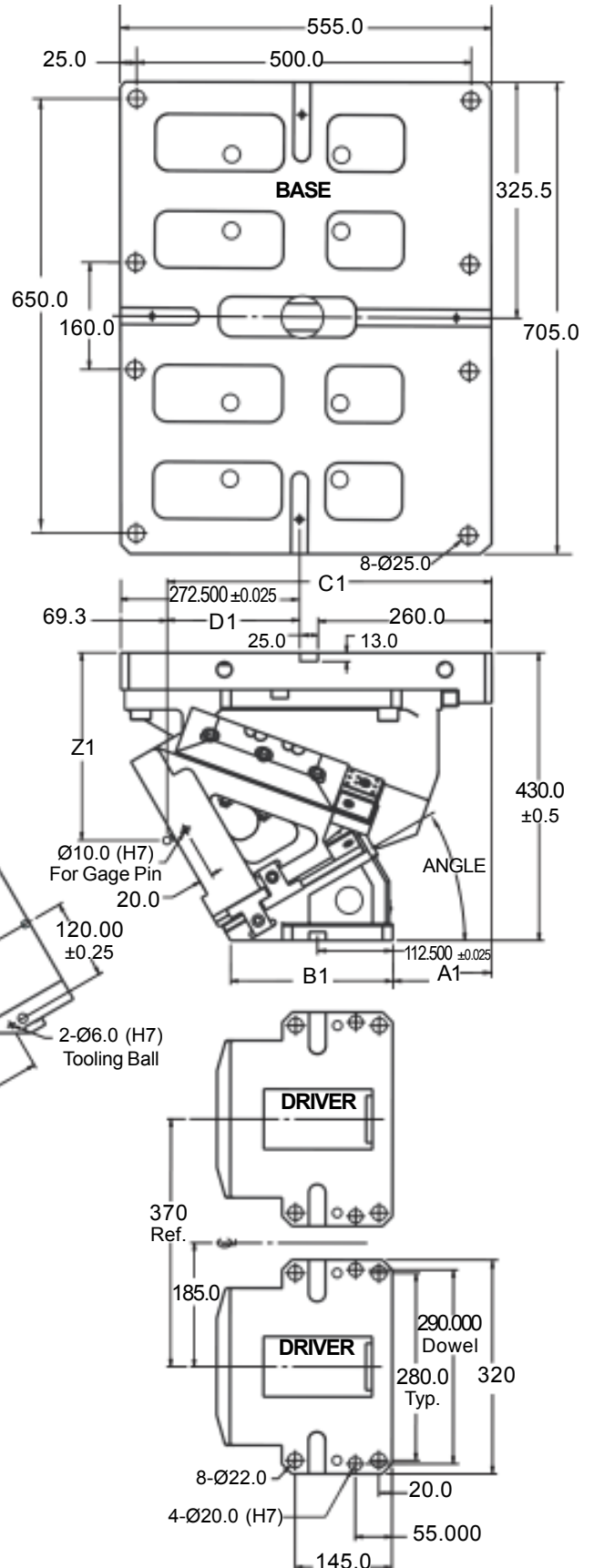
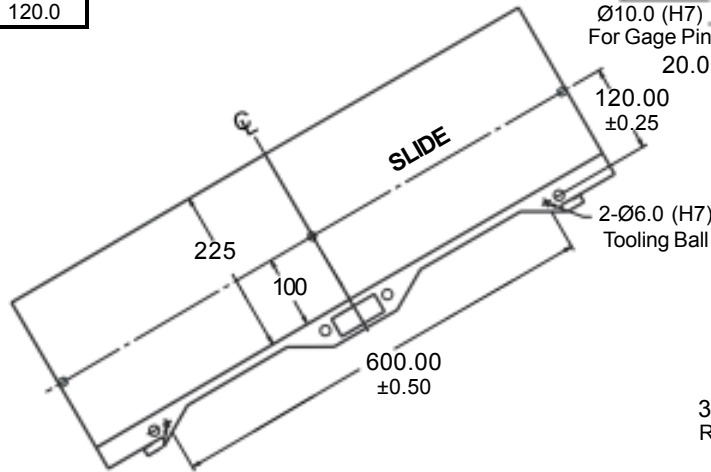
(a) Actual "preload" = 0, this force is at initial contact with nitrogen spring.

(b) @1.6 million cycles & 0.04mm wear

# 700 – 800 Series AERIAL MODULAR CAM



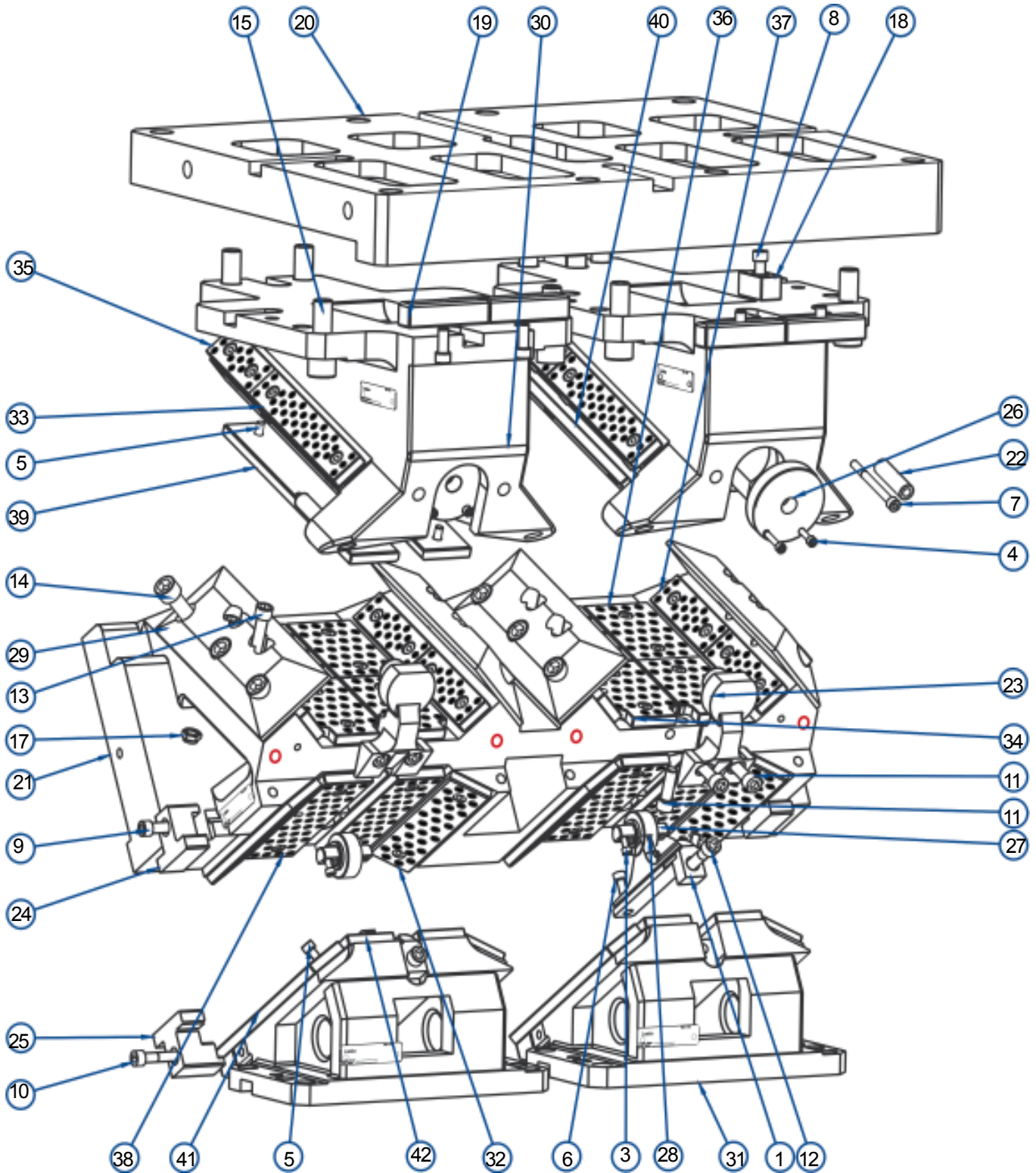
ANGLE	PRESS STROKE	WORK STROKE
0	46.0	38.6
5	46.1	42.6
10	46.7	46.7
15	47.6	50.9
20	48.9	55.3
25	50.7	60.0
30	53.1	65.1
35	56.1	70.8
40	60.0	77.1
45	65.0	84.5
50	71.5	93.3
55	90.6	104.2
60	103.9	120.0



AERIAL MODULAR CAM PART NUMBERS & WEIGHTS										
700 SERIES					A N G L E	800 SERIES				
PART NUMBER			WEIGHT			PART NUMBER			WEIGHT	
With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs
MCA070004M	MCA070004K	MCA070004D	535	1179	0	MCA080004M	MCA080004K	MCA080004D	543	1197
MCA070504M	MCA070504K	MCA070504D	528	1163	5	MCA080504M	MCA080504K	MCA080504D	536	1181
MCA071004M	MCA071004K	MCA071004D	515	1135	10	MCA081004M	MCA081004K	MCA081004D	523	1153
MCA071504M	MCA071504K	MCA071504D	510	1124	15	MCA081504M	MCA081504K	MCA081504D	518	1142
MCA072004M	MCA072004K	MCA072004D	513	1131	20	MCA082004M	MCA082004K	MCA082004D	521	1149
MCA072504M	MCA072504K	MCA072504D	527	1162	25	MCA082504M	MCA082504K	MCA082504D	535	1180
MCA073004M	MCA073004K	MCA073004D	521	1149	30	MCA083004M	MCA083004K	MCA083004D	529	1167
MCA073504M	MCA073504K	MCA073504D	520	1146	35	MCA083504M	MCA083504K	MCA083504D	528	1164
MCA074004M	MCA074004K	MCA074004D	519	1145	40	MCA084004M	MCA084004K	MCA084004D	528	1163
MCA074504M	MCA074504K	MCA074504D	522	1151	45	MCA084504M	MCA084504K	MCA084504D	530	1169
MCA075004M	MCA075004K	MCA075004D	525	1157	50	MCA085004M	MCA085004K	MCA085004D	533	1175
MCA075504M	MCA075504K	MCA075504D	542	1194	55	MCA085504M	MCA085504K	MCA085504D	548	1209
MCA076004M	MCA076004K	MCA076004D	537	1184	60	MCA086004M	MCA086004K	MCA086004D	544	1200
With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs
MCA070004MK	MCA070004MD	MCA070044	535	1179	0	MCA080004MK	MCA080004MD	MCA080044	543	1197
MCA070504MK	MCA070504MD	MCA070544	528	1163	5	MCA080504MK	MCA080504MD	MCA080544	536	1181
MCA071004MK	MCA071004MD	MCA071044	515	1135	10	MCA081004MK	MCA081004MD	MCA081044	523	1153
MCA071504MK	MCA071504MD	MCA071544	510	1124	15	MCA081504MK	MCA081504MD	MCA081544	518	1142
MCA072004MK	MCA072004MD	MCA072044	513	1131	20	MCA082004MK	MCA082004MD	MCA082044	521	1149
MCA072504MK	MCA072504MD	MCA072544	527	1162	25	MCA082504MK	MCA082504MD	MCA082544	535	1180
MCA073004MK	MCA073004MD	MCA073044	521	1149	30	MCA083004MK	MCA083004MD	MCA083044	529	1167
MCA073504MK	MCA073504MD	MCA073544	520	1146	35	MCA083504MK	MCA083504MD	MCA083544	528	1164
MCA074004MK	MCA074004MD	MCA074044	519	1145	40	MCA084004MK	MCA084004MD	MCA084044	528	1163
MCA074504MK	MCA074504MD	MCA074544	522	1151	45	MCA084504MK	MCA084504MD	MCA084544	530	1169
MCA075004MK	MCA075004MD	MCA075044	525	1157	50	MCA085004MK	MCA085004MD	MCA085044	533	1175
MCA075504MK	MCA075504MD	MCA075544	542	1194	55	MCA085504MK	MCA085504MD	MCA085544	548	1209
MCA076004MK	MCA076004MD	MCA076044	537	1184	60	MCA086004MK	MCA086004MD	MCA086044	544	1200

AERIAL MODULAR CAM DIMENSIONS								
700-800 SERIES								
ANGLE	A1	B1	C1	D1	Z1	PRESS STROKE	WORK STROKE	EFFECTIVE WORK STROKE
0°	269.0	250.0	522.7	237.7	221.2	46.0	38.6	27.0
5°	245.7	247.5	512.6	227.6	233.9	46.1	42.6	36.0
10°	209.3	245.0	495.5	210.5	245.3	46.7	46.7	36.0
15°	177.9	245.0	478.0	193.0	253.2	47.6	50.9	45.0
20°	143.7	248.0	462.6	177.6	265.5	48.9	55.3	45.0
25°	172.4	250.0	504.1	219.1	272.8	50.7	60.0	51.0
30°	148.2	242.5	485.7	200.7	280.5	53.1	65.1	55.0
35°	136.9	225.0	470.9	185.9	284.1	56.1	70.8	66.0
40°	113.7	225.0	454.2	169.2	305.7	60.0	77.1	69.0
45°	78.9	225.0	439.9	154.9	301.5	65.0	84.5	79.0
50°	71.3	220.0	426.5	141.5	329.5	71.5	93.3	87.0
55°	59.4	220.0	442.3	157.3	328.4	90.6	104.2	104.2
60°	38.8	220.0	423.5	138.5	341.5	103.9	120.0	120.0

## Component Parts for 700 – 800 Series Cams



SHOCK ABSORBERS – OPTIONAL		
Qty	PART NUMBER	DESCRIPTION
4	MSC100029	Shock Absorber Assemblies
Shock absorber locations noted in red on drawing		

Refer to 700 – 800 Series Specifications for Return Spring Options

**COMPONENT PARTS FOR 700-800 SERIES AERIAL MODULAR CAMS**

ITEM NO	QTY	Description	PART NUMBER	ITEM NO	QTY	Description	PART NUMBER	
			MCAXXX04				MCAXXX04	MCAXXX44*
1	2	Accelerator Block (See Notes 1 & 2)	14A1230@@R	26	2	Disk Plate	NCM300010	
3	4	Soc. Hd. Cap Screw M6x1.0x16	F010609	27	2	Roller Shaft	NCM300011	
4	4	Soc. Hd. Cap Screw M6x1.0x30	F010612	28	2	Roller/Liner Assembly	NCM300014	
5	108	Soc. Hd. Cap Screw M8x1.25x16	F010809	29	4	Keeper Plate	NCM303004	
6	2	Soc. Hd. Cap Screw M8x1.25x20	F010810	30	2	Base (See Note 1)	NMA25@@13	
7	2	Soc. Hd. Cap Screw M8x1.25x90	F010823	31	2	Driver (See Note 1)	NMA25@@24	
8	6	Soc. Hd. Cap Screw M10x1.5x25	F011011	32	4	Bronze S/L Wearplate 12x50x200mm	WCC120002	
9	2	Soc. Hd. Cap Screw M10x1.5x35	F011013	32	4	Steel S/L Wearplate 12x50x200mm		WCT120002
10	2	Soc. Hd. Cap Screw M10x1.5x50	F011016	33	4	Bronze S/L Wearplate 12x40x200mm	WCC120005	
11	6	Soc. Hd. Cap Screw M12x1.75x35	F011213	33	4	Steel S/L Wearplate 12x40x200mm		WCT120005
12	2	Soc. Hd. Cap Screw M12x1.75x45	F011215	34	4	Bronze S/L Wearplate 12x80x125mm (N)	WCC120015	
13	4	Soc. Hd. Cap Screw M12x1.75x100	F011224	34	4	Steel S/L Wearplate 12x80x125mm (N)		WCT120015
14	12	Soc. Hd. Cap Screw M16x2.0x50	F011616	35	4	Bronze S/L Wearplate 12x40x100mm	WCC120019	
15	8	Soc. Hd. Cap Screw M20x2.5x60	F012018	35	4	Steel S/L Wearplate 12x40x100mm		WCT120019
17	4	Hex Locknut M12x1.75	M1217	36	4	Bronze S/L Wearplate 12x80x125mm	WCC120020	
18	2	NAAMS Key 25x25x50mm	M082505	36	4	Steel S/L Wearplate 12x80x125mm		WCT120020
19	4	NAAMS Key 25x25x100mm	M082510	37	8	Bronze S/L Wearplate 12x40x125mm	WCC120021	
20	1	Base Plate	See Note 3	37	8	Steel S/L Wearplate 12x40x125mm		WCT120021
21	1	Slide (0° – 50°)	MMA085034	38	4	Bronze S/L Wearplate 12x60x200mm	WCC120022	
21	1	Slide (55° & 60°)	MMA086034	38	4	Steel S/L Wearplate 12x60x200mm		WCT120022
22	2	Lockout Spacer	NCM070008	39	2	Hard Steel Wearplate 12x150x300mm	WCS120001	
23	2	Spring Return Bracket	NCM300001	40	4	Hard Steel Wearplate 12x38x300mm	WCS120002	
24	2	Positive Return key – Slide	NCM300006	41	4	Hard Steel Wearplate 12x50x250mm	WCS120003	
25	2	Driver Return Bracket	NCM300008	42	4	Hard Steel Wearplate 12x58x250mm	WCS120004	

Note 1: Insert Angle (00,05,10 etc.) for @@ in part number.

Note 2: No Accelerator is required for angles 55° & 60°.

Note 3: Base Plate Part number is dependent on angle. (0°, 5°, 10°=MMA08001) (15°, 20°, =MMA081501) (25°, 30°=MMA082501) (35°=MMA083501) (40°=MMA084001) (45°=MMA084501) (50°=MMA085001) (55°=MMA085501) (60°=MMA086001)

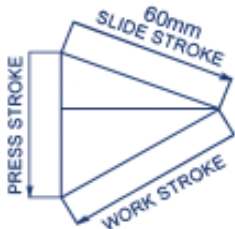
\*Option: Cams with double steel wearplates. This column calls out the part numbers for steel self-lubricating wear plates.

700-800 Series Specifications				RETURN SPRING KIT OPTIONS
<b>Spring Kit Option</b>	<b>Spring Kit Part # (2 Required)</b>	<b>Pre-Load kg (lbs.) -f</b>	<b>Final Load kg (lbs.) -f</b>	Recognizing that different cam applications have different requirements, Lamina offers three Return Spring Kit Options:
<b>Mechanical</b>	<b>IMD063305</b>	132 (290)	528 (1162)	
<b>Combination - Mech./Nitrogen (Kaller)</b>	<b>SKC250002</b>	113 (249)	703 (1550)	1 <b>Mechanical</b> - Employs conventional ISO Die Springs - used in cam applications where additional stripping force is not required.
<b>Combination - Mech./Nitrogen (Dadco)</b>	<b>SKC250012</b>	113 (249)	703 (1550)	
<b>Nitrogen (Kaller)</b>	<b>SKC250003</b>	345 (760) (a)	507 (1117)	2 <b>Combination Mechanical/Nitrogen</b> - This unique Lamina design employs an ISO Die Spring in series combination with a Nitrogen Spring. This return system utilizes the mechanical spring for pre-load, keeping the forces low, while providing high final loads from the nitrogen spring for stripping.
<b>Nitrogen (Dadco)</b>	<b>SKC250013</b>	345 (760) (a)	483 (1064)	
<b>Tooling Allowance</b>	<b>Protrusion - mm</b>	200 Maximum		3 <b>Nitrogen</b> - This return system provides high return spring forces for stripping. By nature of the nitrogen spring, it also has higher initial contact force than other return spring options. This higher initial contact load may result in greater wear on the cam and its accelerator system (where applicable.)
	<b>Weight - kg (lbs)</b>	130 (286) Maximum		
<b>Rated Capacity (b)</b>	670 kN : 68.3 M-Tons :75 US Tons			

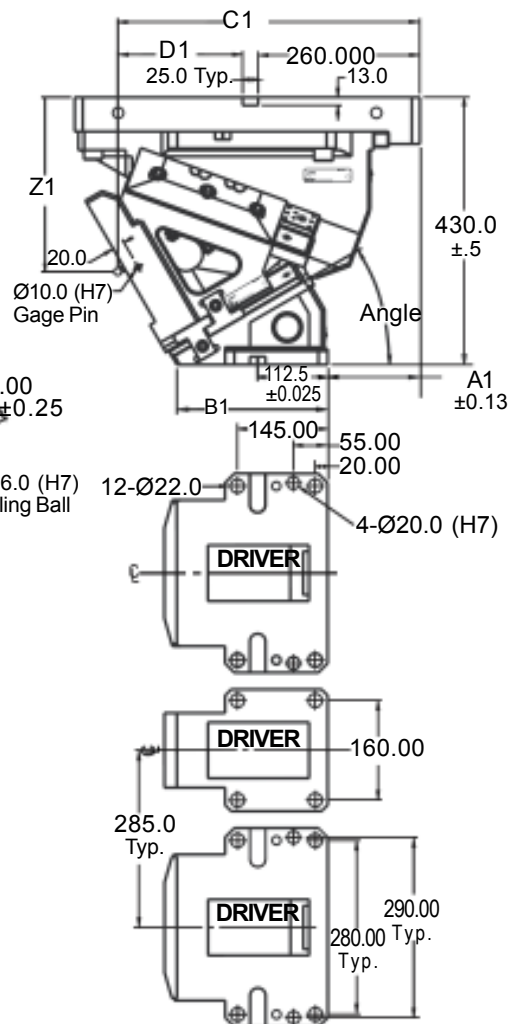
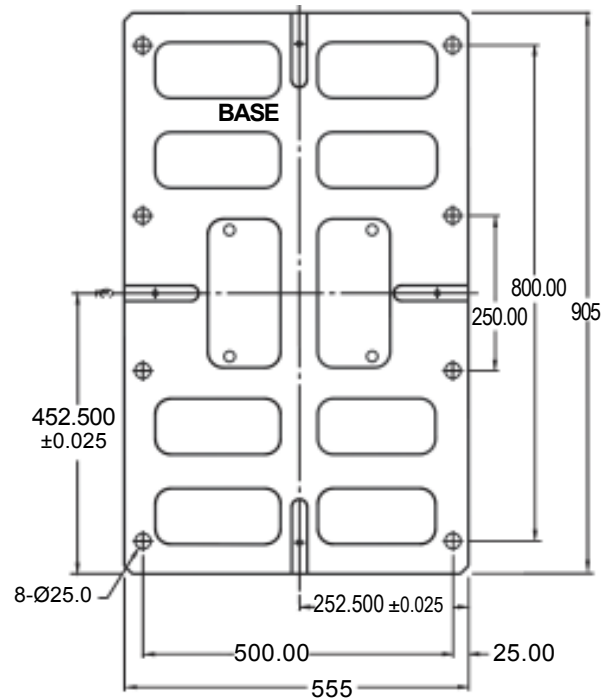
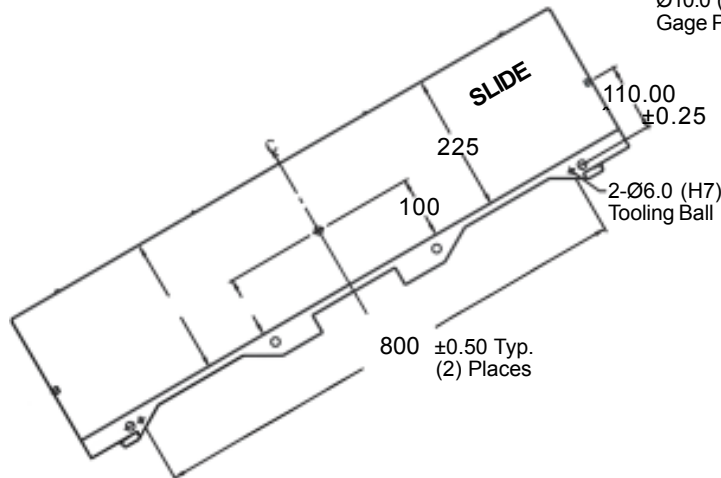
(a) Actual "preload" = 0, this force is at initial contact with nitrogen spring.

(b) @ 1.6 million cycles & 0.04mm wear

# 900 – 1000 Series AERIAL MODULAR CAM



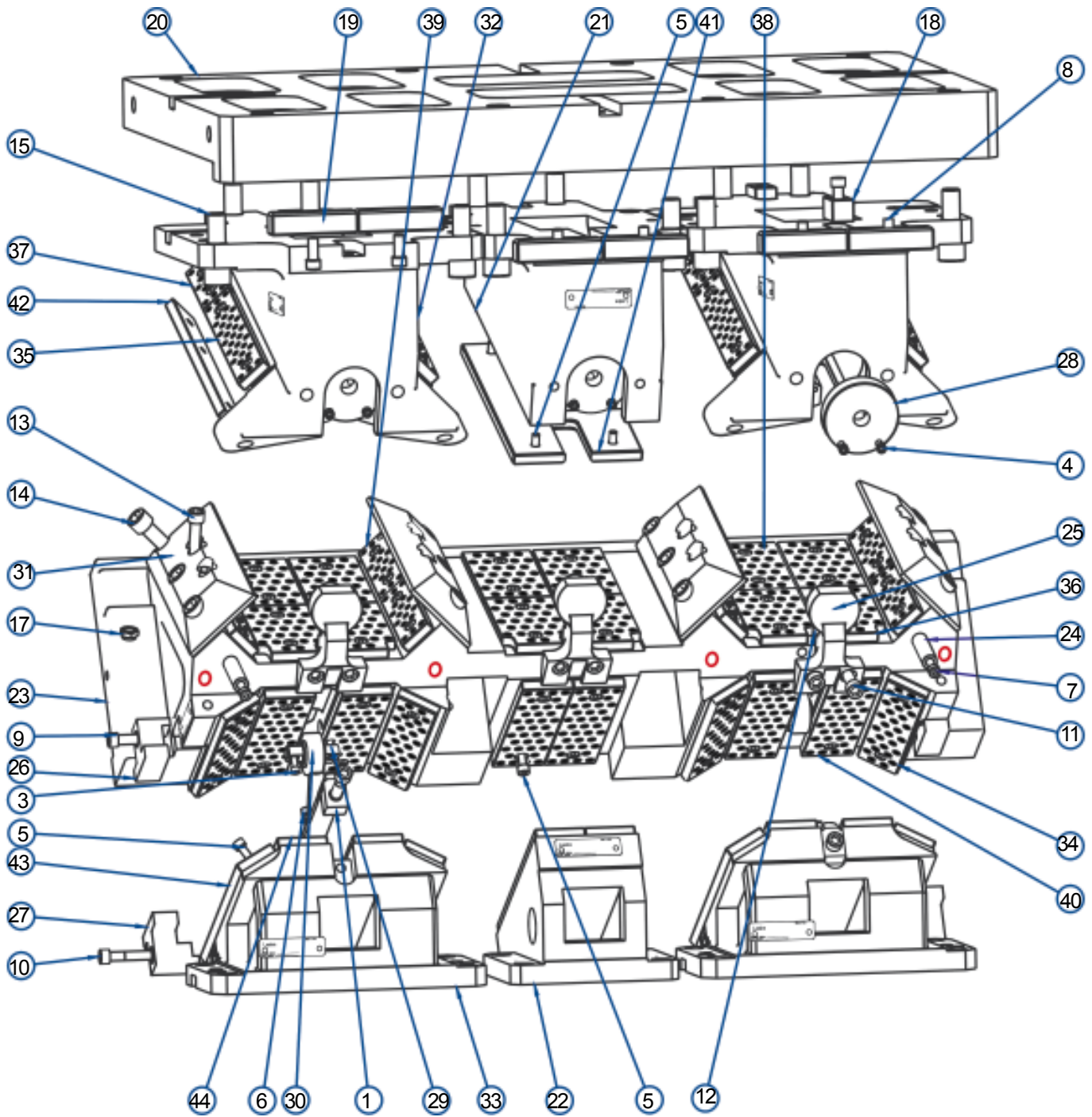
ANGLE	PRESS STROKE	WORK STROKE
0	46.0	38.6
5	46.1	42.6
10	46.7	46.7
15	47.6	50.9
20	48.9	55.3
25	50.7	60.0
30	53.1	65.1
35	56.1	70.8
40	60.0	77.1
45	65.0	84.5
50	71.5	93.3
55	90.6	104.2
60	103.9	120.0



AERIAL MODULAR CAM PART NUMBERS & WEIGHTS										
900 SERIES					A N G L E	1000 SERIES				
PART NUMBER			WEIGHT			PART NUMBER			WEIGHT	
With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs
MCA090004M	MCA090004K	MCA090004D	723	1595	0	MCA100004M	MCA100004K	MCA100004D	732	1613
MCA090504M	MCA090504K	MCA090504D	713	1571	5	MCA100504M	MCA100504K	MCA100504D	721	1589
MCA091004M	MCA091004K	MCA091004D	680	1500	10	MCA101004M	MCA101004K	MCA101004D	689	1518
MCA091504M	MCA091504K	MCA091504D	686	1512	15	MCA101504M	MCA101504K	MCA101504D	694	1530
MCA092004M	MCA092004K	MCA092004D	689	1519	20	MCA102004M	MCA102004K	MCA102004D	697	1537
MCA092504M	MCA092504K	MCA092504D	712	1569	25	MCA102504M	MCA102504K	MCA102504D	720	1587
MCA093004M	MCA093004K	MCA093004D	699	1541	30	MCA103004M	MCA103004K	MCA103004D	707	1559
MCA093504M	MCA093504K	MCA093504D	696	1534	35	MCA103504M	MCA103504K	MCA103504D	704	1551
MCA094004M	MCA094004K	MCA094004D	695	1533	40	MCA104004M	MCA104004K	MCA104004D	704	1551
MCA094504M	MCA094504K	MCA094504D	695	1533	45	MCA104504M	MCA104504K	MCA104504D	704	1551
MCA095004M	MCA095004K	MCA095004D	701	1546	50	MCA105004M	MCA105004K	MCA105004D	709	1564
MCA095504M	MCA095504K	MCA095504D	719	1585	55	MCA105504M	MCA105504K	MCA105504D	727	1603
MCA096004M	MCA096004K	MCA096004D	712	1569	60	MCA106004M	MCA106004K	MCA106004D	720	1587
With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs
MCA090004MK	MCA090004MD	MCA090044	723	1595	0	MCA100004MK	MCA100004MD	MCA100044	732	1613
MCA090504MK	MCA090504MD	MCA090544	713	1571	5	MCA100504MK	MCA100504MD	MCA100544	721	1589
MCA091004MK	MCA091004MD	MCA091044	680	1500	10	MCA101004MK	MCA101004MD	MCA101044	689	1518
MCA091504MK	MCA091504MD	MCA091544	686	1512	15	MCA101504MK	MCA101504MD	MCA101544	694	1530
MCA092004MK	MCA092004MD	MCA092044	689	1519	20	MCA102004MK	MCA102004MD	MCA102044	697	1537
MCA092504MK	MCA092504MD	MCA092544	712	1569	25	MCA102504MK	MCA102504MD	MCA102544	720	1587
MCA093004MK	MCA093004MD	MCA093044	699	1541	30	MCA103004MK	MCA103004MD	MCA103044	707	1559
MCA093504MK	MCA093504MD	MCA093544	696	1534	35	MCA103504MK	MCA103504MD	MCA103544	704	1551
MCA094004MK	MCA094004MD	MCA094044	695	1533	40	MCA104004MK	MCA104004MD	MCA104044	704	1551
MCA094504MK	MCA094504MD	MCA094544	695	1533	45	MCA104504MK	MCA104504MD	MCA104544	704	1551
MCA095004MK	MCA095004MD	MCA095044	701	1546	50	MCA105004MK	MCA105004MD	MCA105044	709	1564
MCA095504MK	MCA095504MD	MCA095544	719	1585	55	MCA105504MK	MCA105504MD	MCA105544	727	1603
MCA096004MK	MCA096004MD	MCA096044	712	1569	60	MCA106004MK	MCA106004MD	MCA106044	720	1587

AERIAL MODULAR CAM DIMENSIONS								
900-1000 SERIES								
ANGLE	A1	B1	C1	D1	Z1	PRESS STROKE	WORK STROKE	EFFECTIVE WORK STROKE
0°	269.0	250.0	522.7	237.7	221.2	46.0	38.6	27.0
5°	245.7	247.5	512.6	227.6	233.9	46.1	42.6	36.0
10°	209.3	245.0	495.5	210.5	245.3	46.7	46.7	36.0
15°	177.9	245.0	478.0	193.0	253.2	47.6	50.9	45.0
20°	143.7	248.0	462.6	177.6	265.5	48.9	55.3	45.0
25°	172.3	250.0	504.1	219.1	272.8	50.7	60.0	51.0
30°	148.2	242.5	485.7	200.7	280.5	53.1	65.1	55.0
35°	136.9	225.0	470.9	185.9	284.1	56.1	70.8	66.0
40°	113.7	225.0	454.2	169.2	305.7	60.0	77.1	69.0
45°	78.9	225.0	439.9	154.9	301.5	65.0	84.5	79.0
50°	71.3	220.0	426.5	141.5	329.5	71.5	93.3	87.0
55°	59.4	220.0	442.3	157.3	328.4	90.6	104.2	104.2
60°	38.9	220.0	423.5	138.5	341.5	103.9	120.0	120.0

## Component Parts for 900 – 1000 Series Cams



Refer to 900 – 1000 Series Specifications Table for Return Spring Options.

SHOCK ABSORBERS – OPTIONAL		
Qty	PART NUMBER	DESCRIPTION
4	MSC100029	Shock Absorber Assemblies
Shock absorber locations noted in red on drawing		

COMPONENT PARTS FOR 900-1000 SERIES AERIAL MODULAR CAMS							
ITEM NO	QTY	Description	PART NUMBER	ITEM NO	QTY	Description	PART NUMBER
			MCAXXXX04				MCAXXXX44*
1	2	Accelerator Block (See Notes 1 & 2)	14A1230@@R	27	2	Driver Return Bracket	NCM300008
3	4	Soc. Hd. Cap Screw M6x1.0x16	F010609	28	3	Disk Plate	NCM300010
4	6	Soc. Hd. Cap Screw M6x1.0x30	F010612	29	2	Roller Shaft	NCM300011
5	130	Soc. Hd. Cap Screw M8x1.25x16	F010809	30	2	Roller/Liner Assembly	NCM300014
6	2	Soc. Hd. Cap Screw M8x1.25x20	F010810	31	4	Keeper Plate	NCM303004
7	2	Soc. Hd. Cap Screw M8x1.25x90	F010823	32	2	Base (See note 1)	NMA25@@13
8	8	Soc. Hd. Cap Screw M10x1.5x25	F011011	33	2	Driver (See note 1)	NMA25@@24
9	2	Soc. Hd. Cap Screw M10x1.5x35	F011013	34	4	Bronze S/L Wear Plate 12x50x200mm	WCC120002
10	2	Soc. Hd. Cap Screw M10x1.5x50	F011016	34	4	Steel S/L Wear Plate 12x50x200mm	WCT120002
11	9	Soc. Hd. Cap Screw M12x1.75x35	F011213	35	4	Bronze S/L Wear Plate 12x40x200mm	WCC120005
12	5	Soc. Hd. Cap Screw M12x1.75x45	F011215	35	4	Steel S/L Wear Plate 12x40x200mm	WCT120005
13	4	Soc. Hd. Cap Screw M12x1.75x100	F011224	36	6	Bronze S/L Wear Plate 12x80x125mm (N)	WCC120015
14	12	Soc. Hd. Cap Screw m16x2.0x50	F011616	36	6	Steel S/L Wear Plate 12x80x125mm (N)	WCT120015
15	12	Soc. Hd. Cap Screw M20x2.5x60	F012018	37	4	Bronze S/L Wear Plate 12x40x100mm	WCC120019
17	4	Hex Locknut M12x1.75	M1217	37	4	Steel S/L Wear Plate 12x40x100mm	WCT120019
18	2	NAAMS Key 25x25x50mm	M082505	38	6	Bronze S/L Wear Plate 12x80x125mm	WCC120020
19	6	NAAMS Key 25x25x100mm	M082510	38	6	Steel S/L Wear Plate 12x80x125mm	WCT120020
20	1	Base Plate	See Note 3	39	8	Bronze S/L Wear Plate 12x40x125mm	WCC120021
21	1	Base (See Note 1)	MMA10@@12	39	8	Steel S/L Wear Plate 12x40x125mm	WCT120021
22	1	Driver (See Note 1)	MMA10@@22	40	6	Bronze S/L Wear Plate 12x60x200mm	WCC120022
23	1	Slide (0° – 50°)	MMA105034	40	6	Steel S/L Wear Plate 12x60x200mm	WCT120022
23	1	Slide (55° & 60°)	MMA106034	41	3	Hard Steel Wear Plate 12x150x300mm	WCS120001
24	2	Lockout Spacer	NCM070008	42	4	Hard Steel Wear Plate 12x38x300mm	WCS120002
25	3	Spring Return Bracket	NCM300001	43	4	Hard Steel Wear Plate 12x50x250mm	WCS120003
26	2	Positive Return Key-Slide	NCM300006	44	6	Hard Steel Wear Plate 12x58x250mm	WCS120004

Note 1: Insert Angle (00,05,10 etc.) for @@ in part number.

Note 2: No Accelerator is required for angles 45° & 50°.

Note 3: Base Plate Part Number is dependent on angle. (0°, 5°, 10°=MMA10001) (15°, 20°=MMA101501) (25°, 30°=MMA102501) (35°=MMA103501) (40°=MMA104001) (45°, 55°=MMA104501) (50°=MMA105001) (60°=MMA106001)

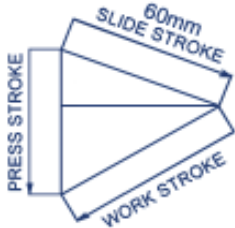
900-1000 Series Specifications				RETURN SPRING KIT OPTIONS	
<b>Spring Kit Option</b>	<b>Spring Kit Part # (3 Required)</b>	<b>Pre-Load kg (lbs.) -f</b>	<b>Final Load kg (lbs.) -f</b>	Recognizing that different cam applications have different requirements, Lamina offers three Return Spring Kit Options:	
<b>Mechanical</b>	<b>IMD063305</b>	132 (290)	528 (1162)		
<b>Combination - Mech./Nitrogen (Kaller)</b>	<b>SKC250002</b>	113 (249)	703 (1550)	1	<b>Mechanical</b> - Employs conventional ISO Die Springs - used in cam applications where additional stripping force is not required.
<b>Combination - Mech./Nitrogen (Dadco)</b>	<b>SKC250012</b>	113 (249)	703 (1550)		
<b>Nitrogen (Kaller)</b>	<b>SKC250003</b>	345 (760) (a)	507 (1117)	2	<b>Combination Mechanical/Nitrogen</b> - This unique Lamina design employs an ISO Die Spring in series combination with a Nitrogen Spring. This return system utilizes the mechanical spring for pre-load, keeping the forces low, while providing high final loads from the nitrogen spring for stripping.
<b>Nitrogen (Dadco)</b>	<b>SKC250013</b>	345 (760) (a)	483 (1064)		
<b>Tooling Allowance</b>	<b>Protrusion - mm</b>	200 Maximum		3	<b>Nitrogen</b> - This return system provides high return spring forces for stripping. By nature of the nitrogen spring, it also has higher initial contact force than other return spring options. This higher initial contact load may result in greater wear on the cam and its accelerator system (where applicable.)
	<b>Weight - kg (lbs)</b>	175 (386) Maximum			
<b>Rated Capacity (b)</b>	1000 kN : 102 M-Tons 112 US Tons				

\*Option: Cams with double steel wearplates. This column calls out the part numbers for steel self-lubricating wear plates.

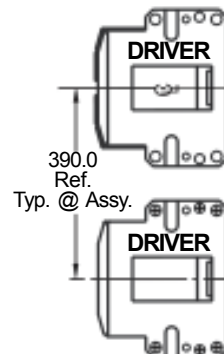
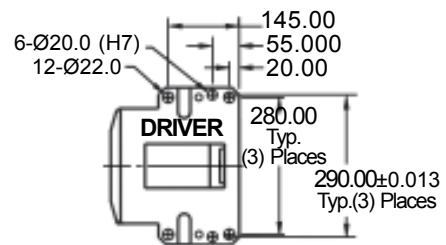
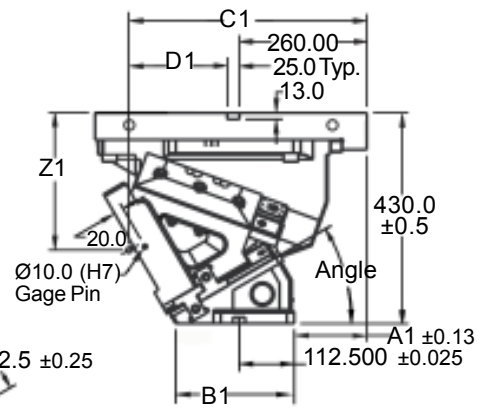
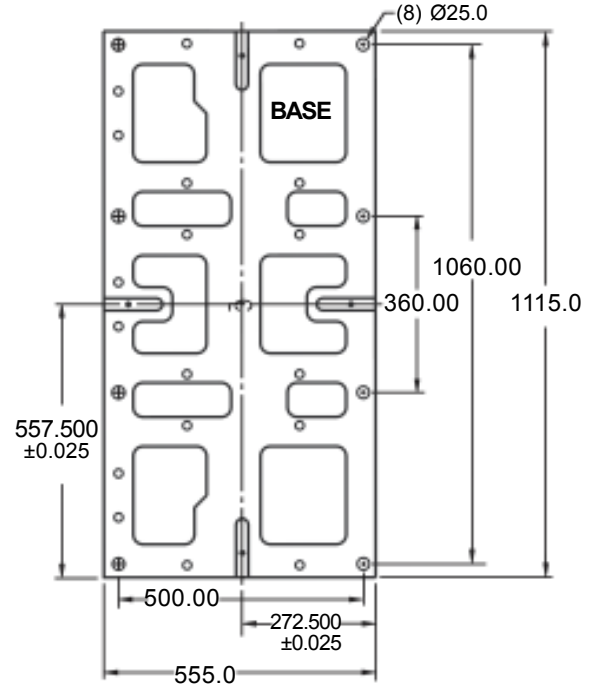
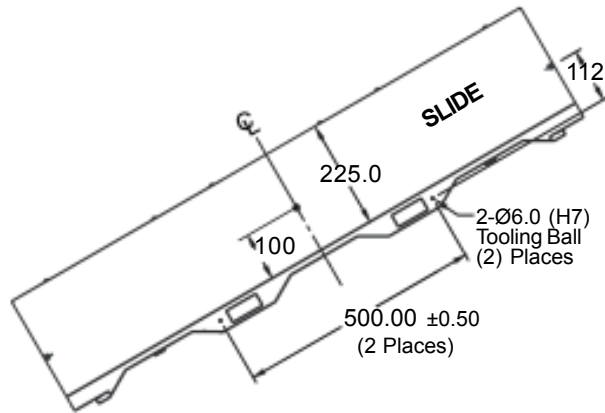
(a) Actual "preload" = 0, this force is at initial contact with nitrogen spring.

(b) @1.6 million cycles & 0.04mm wear

# 1100 – 1200 Series AERIAL MODULAR CAM



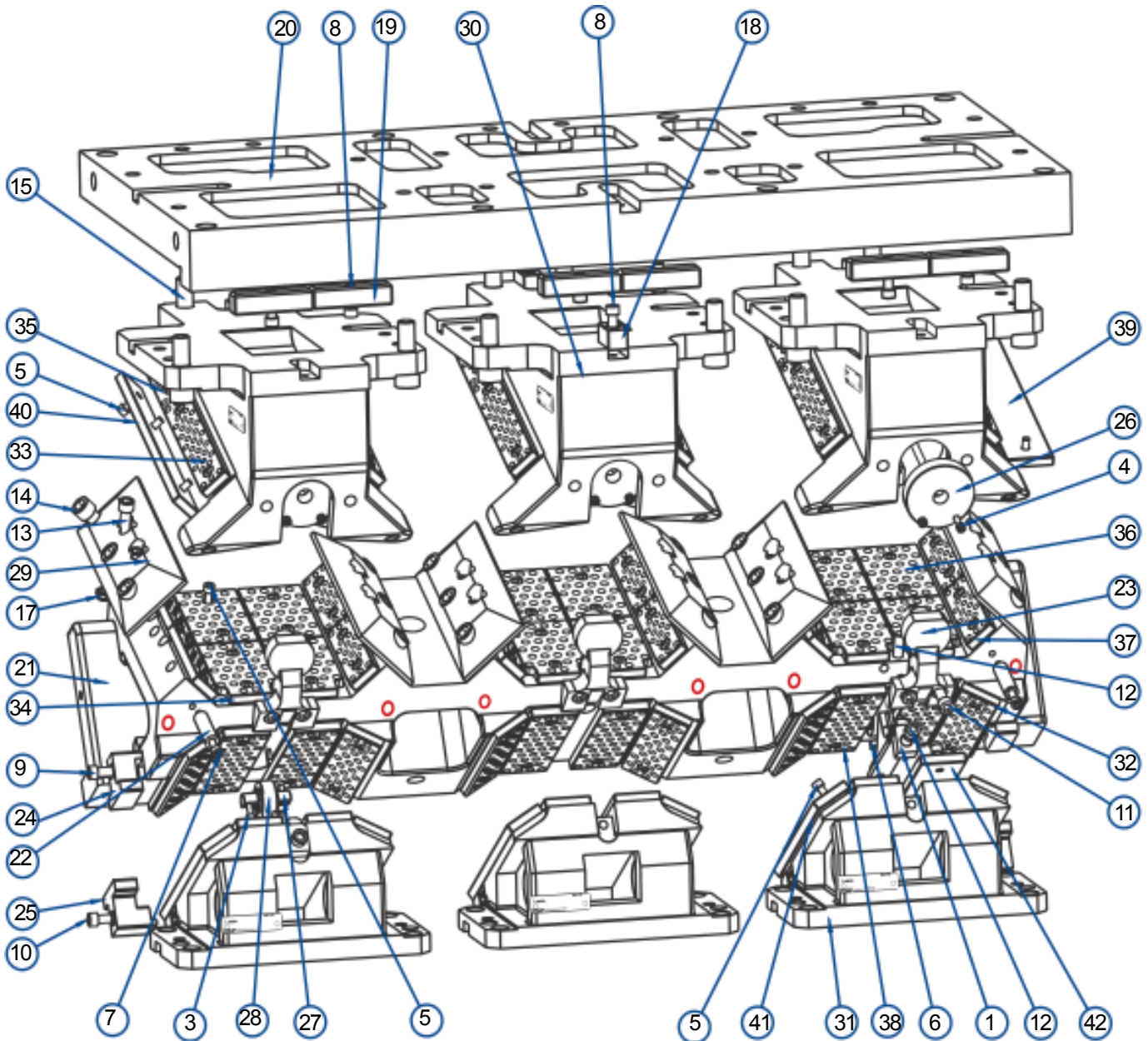
ANGLE	PRESS STROKE	WORK STROKE
0	46.0	38.6
5	46.1	42.6
10	46.7	46.7
15	47.6	50.9
20	48.9	55.3
25	50.7	60.0
30	53.1	65.1
35	56.1	70.8
40	60.0	77.1
45	65.0	84.5
50	71.5	93.3
55	90.6	104.2
60	103.9	120.0



AERIAL MODULAR CAM PART NUMBERS & WEIGHTS										
1100 SERIES					A N G L E	1200 SERIES				
PART NUMBER			WEIGHT			PART NUMBER			WEIGHT	
With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring Kit	With Kaller Gas Spring Kit	With Dadco Gas Spring Kit	kg	lbs
MCA110004M	MCA110004K	MCA110004D	833	1837	0	MCA120004M	MCA120004K	MCA120004D	841	1855
MCA110504M	MCA110504K	MCA110504D	824	1816	5	MCA120504M	MCA120504K	MCA120504D	832	1834
MCA111004M	MCA111004K	MCA111004D	800	1763	10	MCA121004M	MCA121004K	MCA121004D	808	1781
MCA111504M	MCA111504K	MCA111504D	796	1754	15	MCA121504M	MCA121504K	MCA121504D	804	1772
MCA112004M	MCA112004K	MCA112004D	800	1764	20	MCA122004M	MCA122004K	MCA122004D	808	1782
MCA112504M	MCA112504K	MCA112504D	821	1810	25	MCA122504M	MCA122504K	MCA122504D	829	1828
MCA113004M	MCA113004K	MCA113004D	812	1790	30	MCA123004M	MCA123004K	MCA123004D	820	1808
MCA113504M	MCA113504K	MCA113504D	810	1785	35	MCA123504M	MCA123504K	MCA123504D	818	1803
MCA114004M	MCA114004K	MCA114004D	808	1782	40	MCA124004M	MCA124004K	MCA124004D	817	1800
MCA114504M	MCA114504K	MCA114504D	810	1786	45	MCA124504M	MCA124504K	MCA124504D	818	1804
MCA115004M	MCA115004K	MCA115004D	814	1795	50	MCA125004M	MCA125004K	MCA125004D	822	1813
MCA115504M	MCA115504K	MCA115504D	844	1861	55	MCA125504M	MCA125504K	MCA125504D	853	1881
MCA116004M	MCA116004K	MCA116004D	837	1846	60	MCA126004M	MCA126004K	MCA126004D	846	1866
With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs		With Mechanical Spring & Kaller Gas Spring Kit	With Mechanical Spring & Dadco Gas Spring Kit	With double steel wearplates & Dadco Gas Spring Kit	kg	lbs
MCA110004MK	MCA110004MD	MCA110044	833	1837	0	MCA120004MK	MCA120004MD	MCA120044	841	1855
MCA110504MK	MCA110504MD	MCA110544	824	1816	5	MCA120504MK	MCA120504MD	MCA120544	832	1834
MCA111004MK	MCA111004MD	MCA111044	800	1763	10	MCA121004MK	MCA121004MD	MCA121044	808	1781
MCA111504MK	MCA111504MD	MCA111544	796	1754	15	MCA121504MK	MCA121504MD	MCA121544	804	1772
MCA112004MK	MCA112004MD	MCA112044	800	1764	20	MCA122004MK	MCA122004MD	MCA122044	808	1782
MCA112504MK	MCA112504MD	MCA112544	821	1810	25	MCA122504MK	MCA122504MD	MCA122544	829	1828
MCA113004MK	MCA113004MD	MCA113044	812	1790	30	MCA123004MK	MCA123004MD	MCA123044	820	1808
MCA113504MK	MCA113504MD	MCA113544	810	1785	35	MCA123504MK	MCA123504MD	MCA123544	818	1803
MCA114004MK	MCA114004MD	MCA114044	808	1782	40	MCA124004MK	MCA124004MD	MCA124044	817	1800
MCA114504MK	MCA114504MD	MCA114544	810	1786	45	MCA124504MK	MCA124504MD	MCA124544	818	1804
MCA115004MK	MCA115004MD	MCA115044	814	1795	50	MCA125004MK	MCA125004MD	MCA125044	822	1813
MCA115504MK	MCA115504MD	MCA115544	844	1861	55	MCA125504MK	MCA125504MD	MCA125544	853	1881
MCA116004MK	MCA116004MD	MCA116044	837	1846	60	MCA126004MK	MCA126004MD	MCA126044	846	1866

AERIAL MODULAR CAM DIMENSIONS								
1100-1200 SERIES								
ANGLE	A1	B1	C1	D1	Z1	PRESS STROKE	WORK STROKE	EFFECTIVE WORK STROKE
0°	269.0	250.0	522.7	237.7	221.2	46.0	38.6	27.0
5°	245.7	247.5	512.6	227.6	233.9	46.1	42.6	36.0
10°	209.3	245.0	495.5	210.5	245.3	46.7	46.7	36.0
15°	177.9	245.0	478.0	193.0	253.2	47.6	50.9	45.0
20°	143.7	248.0	492.6	177.6	265.5	48.9	55.3	45.0
25°	172.4	250.0	504.1	219.1	272.8	50.7	60.0	51.0
30°	148.2	242.5	485.7	200.7	280.5	53.1	65.1	55.0
35°	136.9	225.0	470.9	185.9	284.1	56.1	70.8	66.0
40°	113.7	225.0	454.2	169.2	305.7	60.0	77.1	69.0
45°	78.9	225.0	439.9	154.9	301.5	65.0	84.5	79.0
50°	71.3	220.0	426.5	141.5	329.5	71.5	93.3	87.0
55°	59.4	220.0	442.3	157.3	328.4	90.6	104.2	104.2
60°	38.8	220.0	423.5	138.5	341.5	103.9	120.0	120.0

## Component Parts for 1100 – 1200 Series Modular Cams



Refer to 1100 – 1200 Series Specifications Table for Return Spring Options.

SHOCK ABSORBERS – OPTIONAL		
Qty	PART NUMBER	DESCRIPTION
6	MSC100029	Shock Absorber Assemblies
Shock absorber locations noted in red on drawing		

COMPONENT PARTS FOR 1100-1200 SERIES AERIAL MODULAR CAMS							
ITEM NO	QTY	Description	PART NUMBER	ITEM NO	QTY	Description	PART NUMBER
			MCAXXX04				MCAXXX44*
1	2	Accelerator Block (See Notes 1 & 2)	14A1230@@R	26	3	Disk Plate	NCM300010
3	4	Soc. Hd. Cap Screw M6x1.0x16	F010609	27	2	Roller Shaft	NCM300011
4	6	Soc. Hd. Cap Screw M6x1.0x30	F010612	28	2	Roller/Liner Assembly	NCM300014
5	162	Soc. Hd. Cap Screw M8x1.25x16	F010809	29	6	Keeper Plate	NCM303004
6	2	Soc. Hd. Cap Screw M8x1.25x20	F010810	30	3	Base (See Note 1)	NMA25@@13
7	2	Soc. Hd. Cap Screw M8x1.25x90	F010823	31	3	Driver (See Note 1)	NMA25@@24
8	8	Soc. Hd. Cap Screw M10x1.5x25	F011011	32	6	Bronze S/L Wear Plate 12x50x200mm	WCC120002
9	2	Soc. Hd. Cap Screw M10x1.5x35	F011013	32	6	Steel S/L Wear Plate 12x50x200mm	WCT120002
10	2	Soc. Hd. Cap Screw M10x1.5x50	F011016	33	6	Bronze S/L Wear Plate 12x40x200mm	WCC120005
11	6	Soc. Hd. Cap Screw M12x1.75x35	F011213	33	6	Steel S/L Wear Plate 12x40x200mm	WCT120005
12	6	Soc. Hd. Cap Screw m12x1.75x45	F011215	34	6	Bronze S/L Wear Plate 12x80x125mm (N)	WCC120015
13	4	Soc. Hd. Cap Screw M12x1.75x100	F011224	34	6	Steel S/L Wear Plate 12x80x125mm (N)	WCT120015
14	18	Soc. Hd. Cap Screw M16x2.0x50	F011616	35	6	Bronze S/L Wear Plate 12x40x100mm	WCC120019
15	12	Soc. Hd. Cap Screw M20x2.5x60	F012018	35	6	Steel S/L Wear Plate 12x40x100mm	WCT120019
17	4	Hex Locknut M12x1.75	M1217	36	6	Bronze S/L Wear Plate 12x80x125mm	WCC120020
18	2	NAAMS Key 25x25x50mm	M082505	36	6	Steel S/L Wear Plate 12x80x125mm	WCT120020
19	6	NAAMS Key 25x25x100mm	M082510	37	12	Bronze S/L Wear Plate 12x40x125mm	WCC120021
20	1	Base Plate	See Note 3	37	12	Steel S/L Wear Plate 12x40x125mm	WCT120021
21	1	Slide (0° - 50°)	MMA125034	38	6	Bronze S/L Wear Plate 12x60x200mm	WCC120022
21	1	Slide (55° & 60°)	MMA126034	38	6	Steel S/L Wear Plate 12x60x200mm	WCT120022
22	2	Lockout Spacer	NCM070008	39	3	Hard Steel Wear Plate 12x150x300mm	WCS120001
23	3	Spring Return Bracket	NCM300001	40	6	Hard Steel Wear Plate 12x38x300mm	WCS120002
24	2	Positive Return Key-Slide	NCM300006	41	6	Hard Steel Wear Plate 12x50x250mm	WCS120003
25	2	Driver Return Bracket	NCM300008	42	6	Hard Steel Wear Plate 12x58x250mm	WCS120004

Note 1: Insert Angle (00,05,10 etc.) for @@ in part number.

Note 2: No Accelerator is required for angles 55° - 60°.

Note 3: Base Plate Part Number is dependent on angle. (0°, 5°, 10°=MMA121001) (15°, 20°=MMA122001) (25°, 30°=MMA123001) (35°=MMA123501) (40°=MMA124001) (45°, 55°=MMA124501) (50°=MMA125001) (60°=MMA126001)

\*Option: Cams with double steel wearplates. This column calls out the part numbers for steel self-lubricating wear plates.

900-1000 Series Specifications				RETURN SPRING KIT OPTIONS	
Spring Kit Option	Spring Kit Part # (3 Required)	Pre-Load kg (lbs.) -#	Final Load kg (lbs.) -#	Recognizing that different cam applications have different requirements, Lamina offers three Return Spring Kit Options:	
Mechanical	IMD063305	132 (290)	528 (1162)	1	<b>Mechanical</b> - Employs conventional ISO Die Springs - used in cam applications where additional stripping force is not required.
Combination - Mech./Nitrogen (Kaller)	SKC250002	113 (249)	703 (1550)		
Combination - Mech./Nitrogen (Dadco)	SKC250012	113 (249)	703 (1550)	2	<b>Combination Mechanical/Nitrogen</b> - This unique Lamina design employs an ISO Die Spring in series combination with a Nitrogen Spring. This return system utilizes the mechanical spring for pre-load, keeping the forces low, while providing high final loads from the nitrogen spring for stripping.
Nitrogen (Kaller)	SKC250003	345 (760) (a)	507 (1117)		
Nitrogen (Dadco)	SKC250013	345 (760) (a)	483 (1064)		
Tooling Allowance	Protrusion - mm	200 Maximum		3	<b>Nitrogen</b> - This return system provides high return spring forces for stripping. By nature of the nitrogen spring, it also has higher initial contact force than other return spring options. This higher initial contact load may result in greater wear on the cam and its accelerator system (where applicable.)
	Weight - kg (lbs)	175 (386) Maximum			
Rated Capacity (b)	1000 kN : 102 M-Tons 112 US Tons				

(a) Actual "preload" = 0, this force is at initial contact with nitrogen spring.

(b) @1.6 million cycles & 0.04mm wear

\* Per unit

## Installation Instructions

The following information will be helpful during installation and testing of the cam unit. Before installation, please read these instructions thoroughly and note all precautions presented. Keep these instructions with the cam unit until installation is complete and then file them for future reference.

**CAUTION: When installing the cam unit while the die set is mounted in the press, ensure that safety blocks are in place.**

### INSTRUCTIONS WITHOUT INSTALLATION TOOL

1. Verify that the Return Spring Kit is not in the cam and that the Lockout Kits are installed. If the Spring Kit is installed in the cam:

a. Remove the disk plate, spring return bracket (behind disk plate) (caution: the spring return bracket has spring pre-load force pushing against it) and spring kit.

b. Install the lockout kits by placing the lockout spacer between the slide and the ears of the cam base; install the cap screws provided through the ears, lockout spacer and thread into back of slide. This lock-out position of the slide relates to the specified shut height of the cam assembly.

c. Remove the positive return guide from the slide and accelerator (where applicable) from the driver.

2. Secure the cam unit base/slide assembly onto punch shoe using the print dimensions for location (locate within the indicated tolerance  $\pm 0.5\text{mm}$  left/right & back/front).

a. Assemble/match upper and lower die shoes to prescribed shut height.

b. Fit cam driver assembly to cam slide by allowing it to nest laterally.

c. Do not tighten the driver mounting screws 100% at this point; tighten only after the driver is seated properly with upper slide cam assembly. After this, drill and ream for dowels.

3. Position the tooling components onto the slide face and transfer their mounting screw holes. Utilize established die steels or buttons to determine this location.

Drill and tap the slide face for the tooling components. Removing the slide from the cam unit base assembly may allow easier machining. To remove the slide:

a. Remove lockout kit.

b. **Securely support the slide to prevent its falling to prevent damage or injury.** Carefully remove the keeper plates by removing 5 screws from each keeper plate. The slide may be removed from the cam base.

c. After machining for tooling components, assemble the slide back into the cam base by reinstalling keeper plates (torque screws properly) and mount the tooling com-

ponents to the slide face, fastening with mounting screws (do not fully tighten).

4. Position the tooling components into their final location by using the corresponding die steels/buttons and assuring proper die clearances. When the location has been satisfied, tighten mounting screws to proper torque.

5. Drill and ream the slide face to dowel the tooling components to slide (refer to # 4 above). Use of pull dowels is recommended to locate tooling components.

6. Re-attach positive return guide to slide and accelerator to the driver. Determine if accelerator mounting surface must be ground or shimmed to allow smooth engagement of upper roller into lower accelerator (where applicable).

7. Thoroughly clean the cam unit; lubricate the wear plates with light to medium oil. Assemble the cam (if disassembled) and install in die set. This initial lubrication is very important to allow for proper break-in of the cam unit assembly.

8. Verify the free movement of all sliding components. When satisfied as to its function, install the return springs into the cam.

9. Torque all mounting screws to their specified torque ratings.

SEATING TORQUE TABLE

Soc. Hd. Cap Screw Size	TORQUE N.m/In-Lbs	Soc. Hd. Cap Screw Size	TORQUE N.m/In-Lbs	Low Soc. Hd. Cap Screw Size	TORQUE N.m/In-Lbs
M6	16/140	M12	135/1,200	M6	14.5/130
M8	39/350	M16	330/2,900	M8	35/310
M10	77/680	N/A	N/A	M10	70/620

### INSTRUCTIONS USING INSTALLATION TOOL

With the use of our Installation Tool, Aerial Cams may be placed in a fraction of the time needed to install them without the tool.

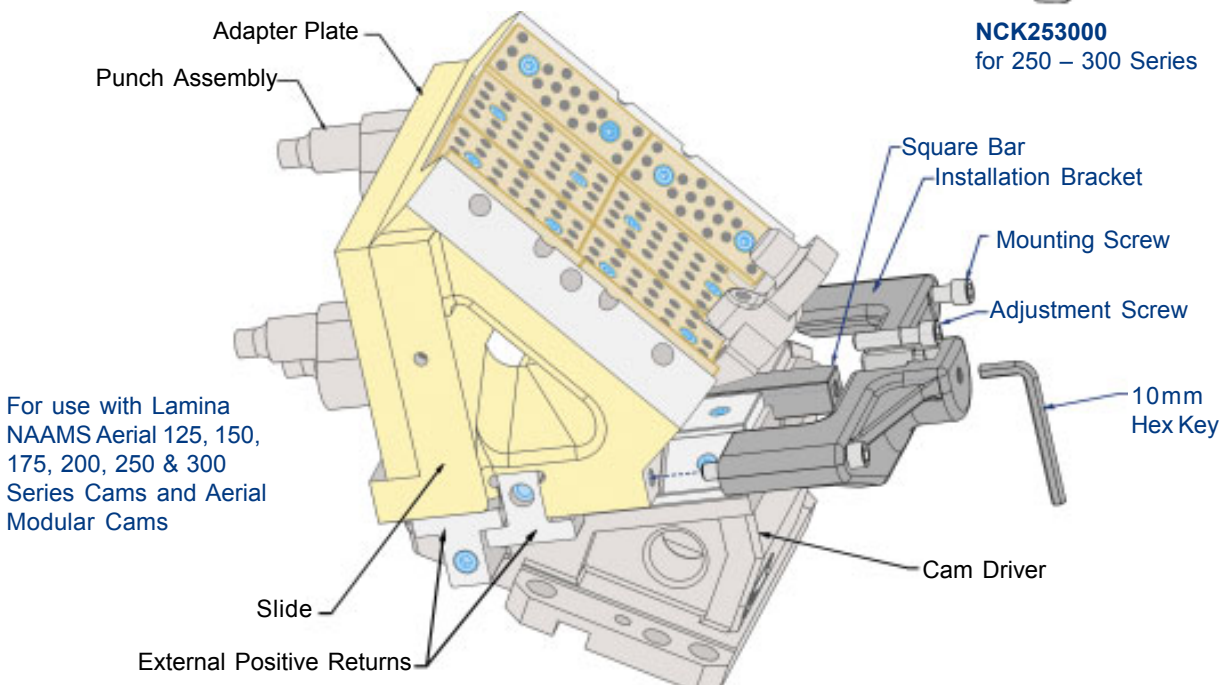
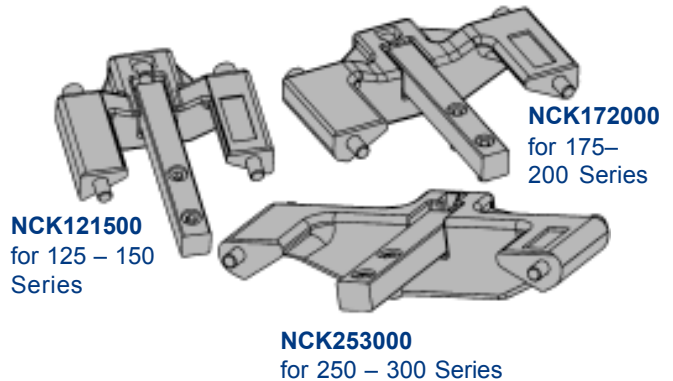
1. After location of the cam is determined between the upper and lower die and the die is open and separated in the die work area, carefully remove the slide from the cam body using handling holes (if necessary).
2. Remove accelerator bracket from slide (where applicable). (55° and 60° cams do not have accelerator brackets.)
3. Remove accelerator ramp from driver (where applicable). (55° and 60° cams do not have accelerator ramps.)
4. Bolt the **square bar** to the center slot of the cam driver. (The tapped hole at the end of the **square bar** should face toward the back of the cam away from the cam work area.)
5. Position the cam slide onto the cam driver. Let the slide nestle on the driver toward the forward position while engaging the external positive returns (close to the work area).
6. Attach the cam **installation bracket** to the back of the cam slide using the two **mounting screws** provided. Be sure that the slide is properly seated on wear surfaces of the driver and at the same time the bracket should be properly seated against bottom side of the **square bar**. No gap should

be present between the 30° wear plates of the slide and driver. Tighten the two **mounting screws** securely to the slide. (It may be necessary to simultaneously push the slide to the driver and the bracket against the bottom of the **square bar**.)

7. Insert the **adjustment screw** in the slot provided in the bracket which will put the **adjustment screw** in line with the hole in the end of the **square bar**.

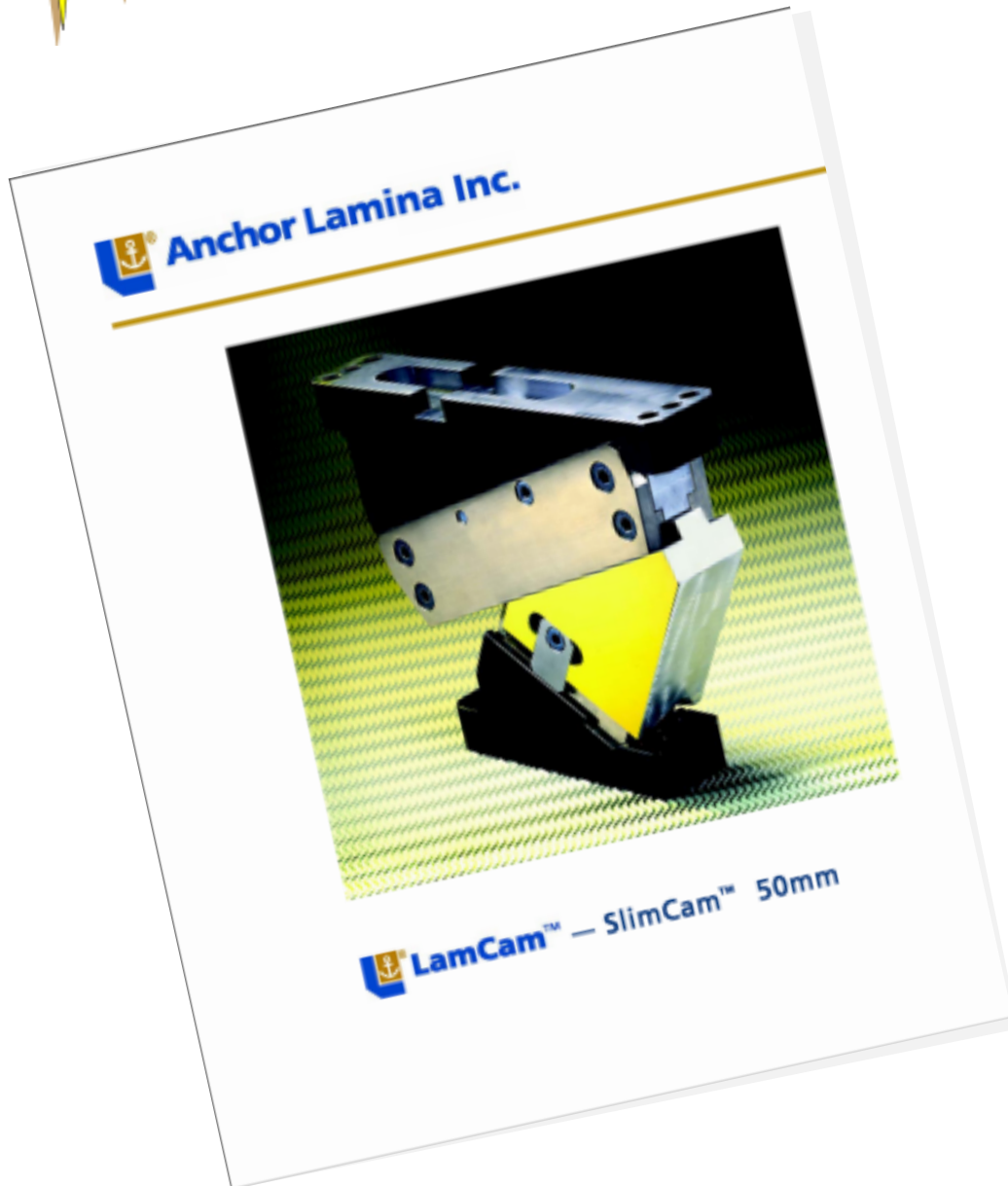
8. Use of a **10mm Hex Key** or Air Ratchet to rotate **adjustment screw** counter clockwise or clockwise will accurately simulate the slide movement on the driver for evaluating or precise setting of punches and trim steels.

SEATING TORQUE TABLE					
Soc. Hd. Cap Screw Size	TORQUE N.m/In-Lbs	Soc. Hd. Cap Screw Size	TORQUE N.m/In-Lbs	Low Soc. Hd. Cap Screw Size	TORQUE N.m/In-Lbs
M6	16/140	M12	135/1,200	M6	14.5/130
M8	39/350	M16	330/2,900	M8	35/310
M10	77/680	N/A	N/A	M10	70/620





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# Anchor Lamina Inc.



### Lamina Components

38505 Country Club Drive Suite 100

Farmington Hills, MI USA 48331

Tel: 248-489-9122, 800-652-6462

Fax: 248-553-6842, 800-406-4410

Email: [sales@lamina.com](mailto:sales@lamina.com)

**[www.anchorlamina.com](http://www.anchorlamina.com)**