

A detailed technical drawing of a moving coil actuator, showing various components and dimensions. The drawing is rendered in a light gray color against a dark background. Dimensions include 55, 33, 12.5, 17.1, 54.5, 231.5, 18, 8.8, 10, 30, 25, 30, 10, 20, 20, and 19. The drawing shows a cross-section of the actuator's internal mechanism, including a coil and a plunger.

**SOFT LANDING**

Press & Hold

Switch from position to velocity servo

Friction

Impact Point

ACCELERATING

DECELERATING

Switch from velocity servo to force control

1. Monitor coil current at point of switch
2. Set force control with same current
3. Ramp current up

# MOVING COIL ACTUATORS

*The ability to do work and verify its accuracy at the same time.*

# SMAC Product Overview

## Cylinder



**CAL12**  
Stroke [mm]: 10  
Force [N]: 1.5



**CAL36**  
Stroke [mm]: 15, 25, 50  
Force [N]: 12 - 18



**CAL75**  
Stroke [mm]: 15, 25, 50  
Force [N]: 25 - 90

## Linear & Linear/Rotary Actuators



**LCA25**  
Stroke [mm]: 10 up to 200  
Force [N]: 8 - 22



**LCA50**  
Stroke [mm]: 25  
Force [N]: 40, 50



**LAL15 / LAR15**  
Stroke [mm]: 15  
Force [N]: 5



**LAL20 / LAR20**  
Stroke [mm]: 10, 15, 25  
Force [N]: 8, 7, 5



**LAR31**  
Stroke [mm]: 17, 27, 31  
Force [N]: 14, 12, 11



**LAL35 / LAR35**  
Stroke [mm]: 25, 50, 100  
Force [N]: 12, 10, 6



**LAL55 / LAR55**  
Stroke [mm]: 50, 100, 150  
Force [N]: 25, 16, 13



**LAL95 / LAR95**  
Stroke [mm]: 15, 50  
Force [N]: 100, 60



**LAL300**  
Stroke [mm]: 50  
Force [N]: 202



**LAL500**  
Stroke [mm]: 25, 50  
Force [N]: 500

## Linear Slide Actuators



**LCS25**  
Stroke [mm]: 10  
Force [N]: 8, 12



**LAS15**  
Stroke [mm]: 15  
Force [N]: 5



**LAS20**  
Stroke [mm]: 10, 15, 25  
Force [N]: 8, 7, 5



**LASW20**  
Stroke [mm]: 11  
Force [N]: 8



**LAS35**  
Stroke [mm]: 25, 50, 100  
Force [N]: 12, 10, 6



**LAS55**  
Stroke [mm]: 50, 100, 150  
Force [N]: 25, 16, 13



**LAS95**  
Stroke [mm]: 15, 50  
Force [N]: 100, 60

## Grippers



**GRP20**  
Stroke [mm]: 10  
Force [N]: 8



**GRP35**  
Stroke [mm]: 30  
Force [N]: 25



**GRP50**  
Stroke [mm]: 30  
Force [N]: 45

## XY Stages



**LXY15**  
Stroke [mm]: 15  
Force [N]: 22



**LXY25**  
Stroke [mm]: 25  
Force [N]: 42



**LXYM15**  
Stroke [mm]: 15  
Force [N]: 14 - 27

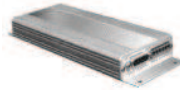
## Controllers & Amplifier



**LCC-10 (LCC-11)**  
Single axis brushless controller



**LAC-1**  
Single axis controller



**LAC-25**  
2 axis controller with built in amplifier



**LAC-15/LAC-20**  
Single or double axis brushless controller.



**LAC-45**  
4 axis controller with built in amp



**MAAC4-7**  
Multi axes [4] Galil based controller



**Built-in Controller**



**LAA-5**  
Amplifier for 1 axis



**LAD-1**  
Smart drive for 1 axis

# The SMAC Advantages

- Absolute control over: force, position, acceleration and velocity
- Direct drive actuator, therefore a very high degree of accuracy & repeatability
- Integrated position measuring system with glass scale and optical reader head (no wear)
- Very long lifetime due to oversized linear guides
- Force measurement through monitoring of current
- Digital and analog in/output channels
- Ability to switch between operations - force, position and velocity mode - at any time
- Extremely high acceleration and velocity
- Unique “Soft-Land” function

## Programmable Features

The actuator is totally programmable for force, acceleration and velocity, and can operate in three different modes:

**Force Mode:** Force Mode is open loop, using no feed back from the encoder. The actual position is still monitored but has no effect upon the output.

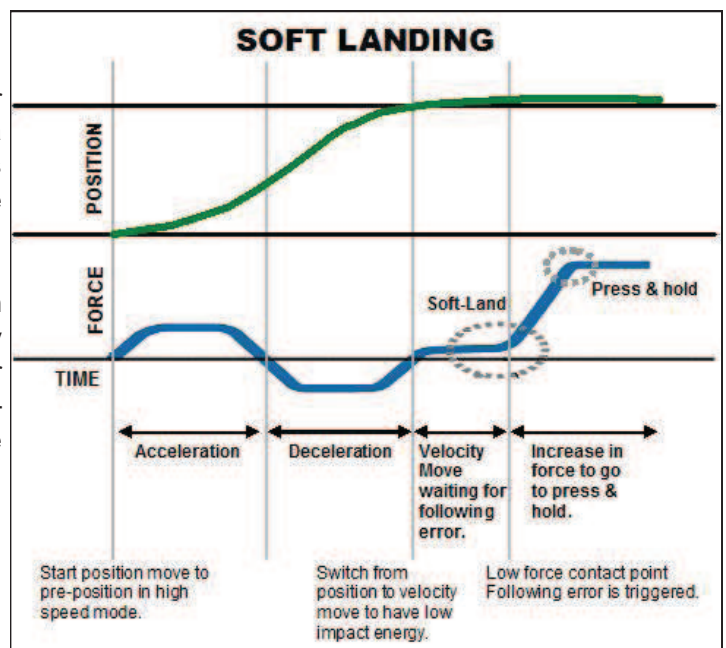
**Velocity Mode:** Velocity Mode allows the actuating rod to be moved with a given velocity, acceleration, force and direction. Typically used for a “Soft-Land” routine.

**Position Mode:** Position Mode will allow the actuating rod to be moved to various positions along the stroke using acceleration, velocity and force. It is possible to perform absolute, relative and “learned position” moves.

## What is a Soft-Land?

The “Soft-Land” is a routine which allows the actuator rod or gripper jaw to land on the surface of a component with a low programmed force. This is particularly useful for handling delicate or high value components.

The routine consists of a controlled low force approach in velocity mode, whilst the position error is constantly monitored. Once contact is made the position error builds up until a pre-programmed figure is reached - resulting in the rod maintaining position on the surface of the component.

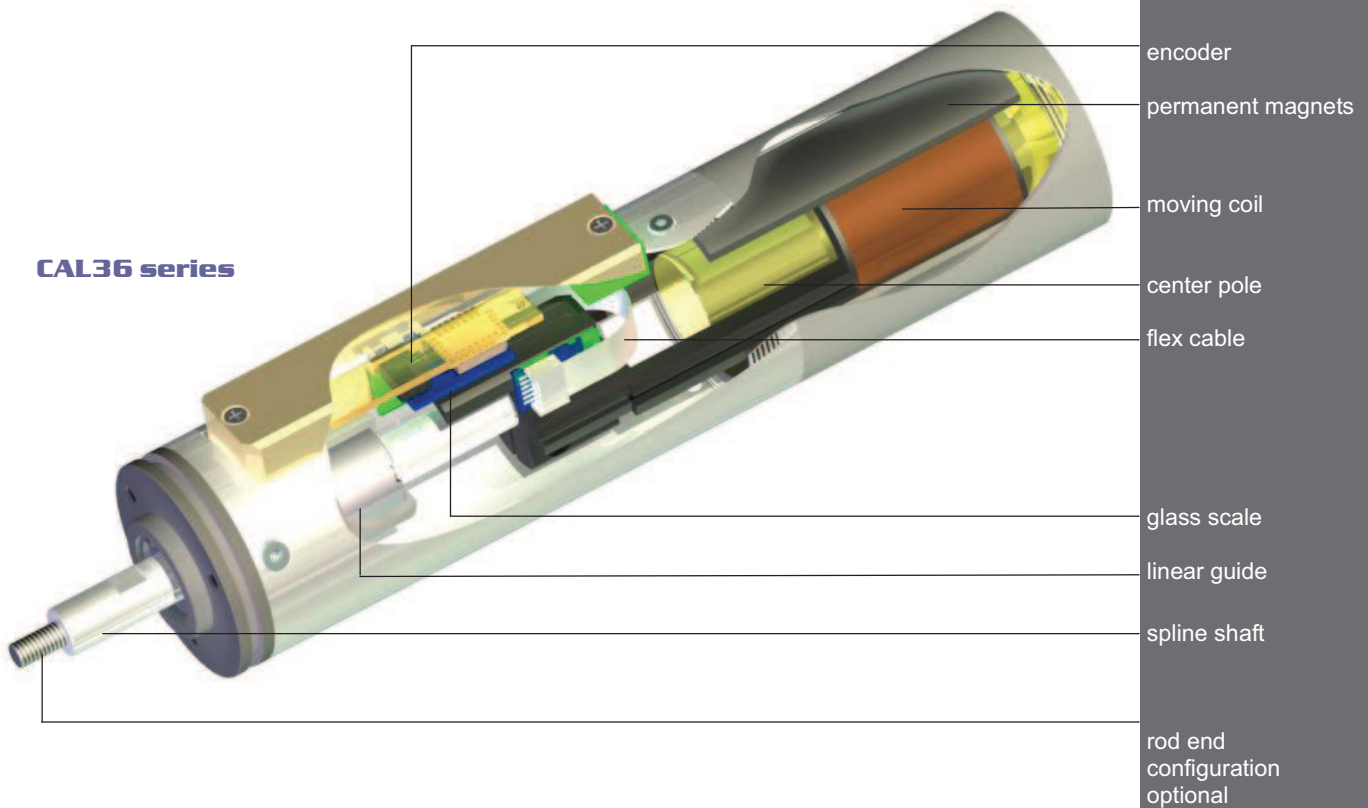


# Electric Cylinder

The CA range of multi patented electric cylinders have been designed with the most demanding & arduous of automation tasks in mind. That's why they are ideal for high speed packaging, labelling & bottling applications, pick & place systems, parts feeders & electronic assembly machines along with many, many others where the need for speed, accuracy, precision & repeatability is paramount. They have been designed to replace & fit exactly where standard pneumatic cylinders are currently used but need continuous repair, replacement & maintenance due to high cycle rates, shock & wear. With the SMAC CA range these shortcomings are eradicated.

## Linear:

- Stroke up to 50mm, force up to 90N, position encoder resolution 5 $\mu$ m standard, 1 and 0.1 $\mu$ m option for most actuators.
- Programmable force, position, acceleration and velocity.



# Moving Coil Technology (Voice Coil)

At the heart of all SMAC actuators is the moving coil, also described as a voice coil actuator. The essential principle is the same as you will find in any permanent magnet loudspeaker. The coil is enclosed in a magnet housing, and by passing a current through the coil, a magnetic field is generated.

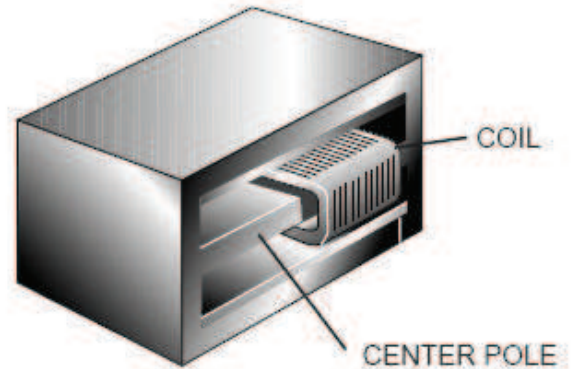
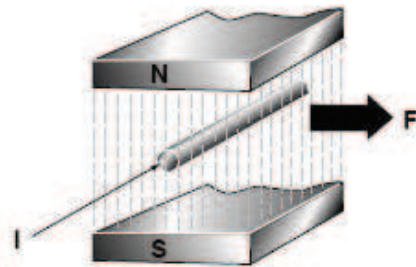
The amount of force generated is governed by the equation

$$F \propto N I B$$

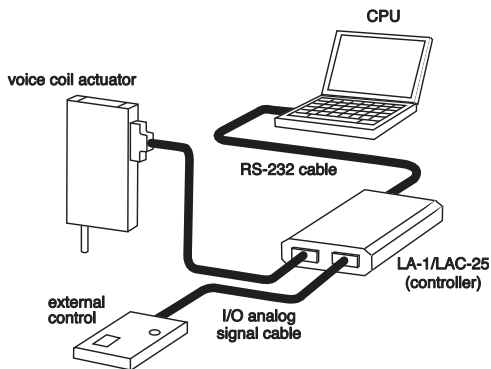
where;

- F** is the force generated
- N** is the number of turns in the winding (Constant)
- I** is the current flowing through the winding and
- B** is the magnetic flux (Constant)

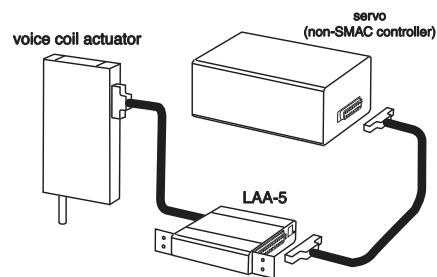
Therefore, doubling **I (current)** doubles **F (Force)**.



## Hardware Configuration



Hardware with SMAC Controllers



Hardware with SMAC Amplifier

# Part Numbering System

	MODEL	SERIES	STROKE	VOLT	ENCODER	SHAFT	VACUUM	SPRING	*** Cable	*** Mounting	MOD
	□	□	□	□	□	□	□	□	□	□	□
<b>CYLINDER</b>	<b>C</b>	<b>A L</b>	<b>3 6</b>	<b>0 2 5</b>							
<b>LINEAR</b>	<b>L</b>	<b>A L</b>	<b>3 0 0</b>	<b>0 5 0</b>							
	<b>L</b>	<b>C A</b>	<b>2 5</b>	<b>0 1 0</b>							
<b>LINEAR/ ROTARY</b>	<b>L</b>	<b>A R</b>	<b>3 5</b>	<b>0 5 0</b>							
<b>SLIDE</b>	<b>L</b>	<b>A S</b>	<b>5 5</b>	<b>1 0 0</b>	<b>1</b>						<b>= 24 volt 6 coil *</b>
<b>XY TABLE</b>	<b>L</b>	<b>X Y</b>			<b>3</b>						<b>= 48 volt 6 coil *</b>
<b>GRIPPER</b>	<b>G</b>	<b>R P</b>			<b>5</b>						<b>= 24 volt single coil</b>
					<b>6</b>						<b>= 24 volt double coil**</b>
					<b>7</b>						<b>= 48 volt single coil</b>
					<b>8</b>						<b>= 48 volt double coil**</b>
											<b>1 = 1.0µm</b>
											<b>2 = 0.1 µm**</b>
											<b>3 = 0.05µm**</b>
											<b>5 = 5.0µm</b>
											<b>7 = 20µm</b>
											<b>B = BLANK (standard)</b>
											<b>F = FEMALE</b>
											<b>M = MALE</b>
											<b>C = CUSTOM</b>
											<b>V = VACUUM</b>
											<b>S = SPRING</b>
											<b>3 = Flying Lead</b>
											<b>5 = Pigtail</b>
											<b>A = Front Mount</b>
											<b>B = Base Mount</b>

## Part Number Examples:

### LAL20-010-55

LAL20 linear slide, 10mm stroke, 24volt single coil,  
5 micron encoder.

### LAL300-050-85-F

LAL300 linear actuator, 50mm stroke, 48volt double coil  
5 micron encoder, female rod end.

### LAR55-100-75-MS-MOD674

LAR55 linear/rotary actuator, 100mm stroke, 48 volt single coil,  
5 micron encoder, male thread, spring,  
mod 674 specification.

### CAL36-015-55F3A

CAL36 electric cylinder, 36mm dia., 15mm stroke, 24volt single coil,  
5 micron encoder, female shaft end, flying lead and front mount

\*LCA series only  
\*\*Check availability  
\*\*\* CA and LCA series only

## NOTES:

Series will not have leading zeros (e.g. LAL95).

Stroke must include zeros (e.g. 050).

Spring must be specified as full return or counterbalance, payload and orientation (vertical or horizontal).

# Electric Cylinder

	Voltage [DC]	Size: Dia x L [mm]	Stroke [mm]	Maximum Force [N]	Force Constance [N/A]	Moving Mass [kg]	Max Current [Amp]	Weight [kg]
CAL12-010-5	24	Ø12x112	10	1.5	1	0.01	1.5	0.08
CAL36-015-5	24	Ø36x145	15	18	18	0.08	1	0.8
CAL36-025-5	24	Ø36x155	25	15	15	0.08	1	0.95
CAL36-050-5	24	Ø36x230	50	12	12	0.095	1	1.15
CAL75-015-5	24	Ø75x249	15	40	31	0.44	1.3	4.8
CAL75-015-7	48	Ø75x249	15	62	48	0.44	1.3	4.8
CAL75-025-5	24	Ø75x262	25	27	22	0.44	1.3	5.1
CAL75-025-7	48	Ø75x262	25	53	44	0.44	1.3	5.1
CAL75-050-5	24	Ø75x283	25	25	19	0.44	1.3	5.6
CAL75-050-7	48	Ø75x283	50	40	32	0.44	1.3	5.6
CAL75-050-8	48	Ø75x385	50	90	33.5	0.81	2.7	8



**CAL12**



**CAL36**



**CAL75**

**NOTE: SMAC requires that each CA series unit must be operated at less than suggested duty cycle (%). Please see page 8.**

We manufacture actuators to suit our customers' requirements. Please call us if you do not find the right actuator in this list.

## Options & Modifications (Consult factory for availability):

Encoder resolutions:	5µm standard. 1µm, 0.1µm and 0.05µm optional for most units.
Shaft ends:	Male, Female, Blank and Custom
Return spring:	Prevents the shaft from dropping during vertical operation when power is cut.
Vacuum:	Vacuum through the shaft or on the shaft for pick and place applications.
Mount:	Face mount (standard) , foot mount or threaded mount (CAL12 series only)

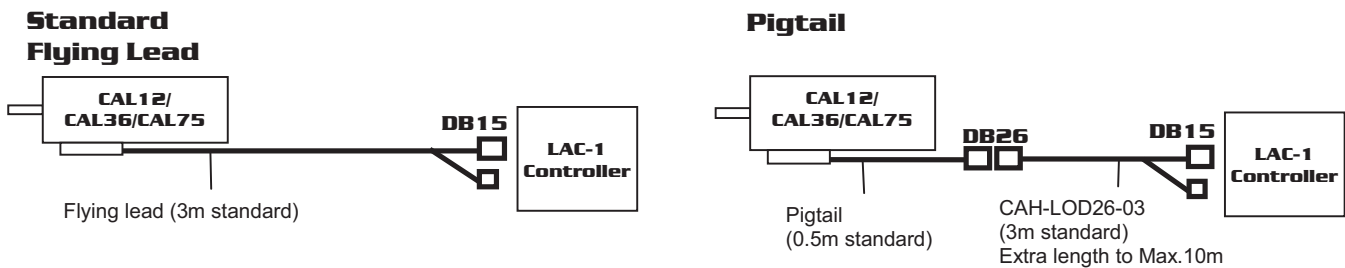
# Cables

## Why Use Them?

SMAC actuators are used in numerous high speed, high cycle applications and are guaranteed for millions of cycles. For this reason, it is imperative that the cables used to connect with our actuators are capable of similar arduous duty cycles and life span. Only cables manufactured by SMAC can be guaranteed to meet the rigorous standards required during use. Many years of experience has taught us that cheaper third party cables simply are not up to the task required. They are, in fact, one the most common causes of all the technical problems experienced by our customers.

## Cable Chart for the CA series Electric Cylinder

Actuator	Single Axis Controller	Dual Axis Controller		Amplifier	Smart Driver
	LAC-1	LAC-20	LAC-25	LAA-5	LAD-1
<b>CAL12</b>	Flying lead type or CAH-LOD26-03 for pigtail type	N/A	N/A	CAH-LAD26-03	CAH-LSD26-03
<b>CAL36</b>					
<b>CAL75</b>					
<b>2x CAL12(* 1)</b>	N/A	LAT-26C-0003-03 for pigtail type	CAH-LTD26-3	N/A	N/A
<b>2x CAL36</b>		LAT-26C-0003-03 for pigtail type	CAH-LTD26-03 for pigtail type	N/A	N/A
<b>2x CAL75</b>		LAT-26C0003-03 for pigtail type	CAH-LTD26-03 for pigtail type.	N/A	N/A



Superflex is available as an option. Suitable for robotic applications.

# Controllers / Amplifiers

SMAC supplies a range of single and multi axis controllers together with stand alone amplifiers and stepper driven driver. Controllers are programmed by mnemonic type command instructions via an RS-232 interface into NVRAM. They require no supplementary software.



## LCC-10 (LCC-11)

Single axis brushless controller  
Built-in amplifier  
Easy expansion to multi-axis

**Mode:**

- Position
- Velocity
- Force

10 bit analogue output  
(16 bit option available as  
Model # LCC-11)  
1 Port per axis  
RS232 up to 115200 bps  
CAN bus 2.0B up to 1MB/s



## LAC-20

Double axis brushless controller  
Built-in amplifier  
Easy expansion to multi-axis

**Mode:**

- Position
- Velocity
- Force
- Step/Direction

1 Port per axis  
RS232 up to 115200 bps  
CAN bus 2.0B up to 1MB/s



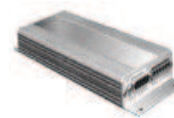
## LAC-1

Single axis controller  
Built-in amplifier

**Mode:**

- Position
- Velocity
- Force

8 input/8 output TTL general purpose I/O's  
RS232 Interface  
3 analog INPUT



## LAC-25

2 axis controller  
Built-in amplifier

**Mode:**

- Position
- Velocity
- Force
- Gearing

Independent or coordinated 2 axis motion  
4 input/4 output  
Opto-isolated general purpose I/O's  
2 analog input/output  
RS232 Interface



## LAC-45

4 axis controller  
Built-in amplifier

**Mode:**

- Position
- Velocity
- Force
- Gearing

Independent or coordinated 4 axis motion  
8 input/8 output  
Opto-isolated general purpose I/O's  
6 analog input/4 analog output  
RS232 Interface



## MAAC4-7

4 axis controller brushed/brushless  
Integrated high end amplifier  
Advanced math capability  
Circular interpolation  
Teach path function  
Additional controllers can be added to work together on systems requiring more than 4 axes.



## LAA-5

Single axis amplifier  
+/- 10 Volt input  
3 Amp output



## LAD-1

Smart Driver for single axis  
stepper input to servo output  
RS232 Interface



## MIOE-8/8

Expansive I/O modular  
8 input/8 output  
Opto-isolated general purpose I/O



## Built-in Controller

Consult factory for available actuator

# Installation Guideline

## Duty cycle

SMAC requires that all units must be operated at less than 40% maximum duty cycle. This does not apply to CA series and can be calculated as follows:

$\% \text{ of max force applied} \times \% \text{ of cycle time it is applied} = \% \text{ duty cycle}$

For example:

- 100% force x 40% of cycle time = 40% duty cycle.
- 60% force x 50% of cycle time = 30% duty cycle.
- 40% force x 100% of cycle time = 40% duty cycle.

Recommendation from SMAC is that the duty cycle must not be exceeded over a one second time period.

NOTE: Failure to observe this duty cycle recommendation may result in the actuator sustaining damage through overloading. Overloading will overheat the coil and may cause deformation or an impact on the magnet housing.

All CA series units must be operated at less than below suggested duty cycle (%).

	24V	48V
CAL12	80%	40%
CAL36	80%	40%
CAL75	80%	40%

## Continuous Force

Peak force applied for duration shorter than 0.4 sec. in one second interval.

(force mode): 40% of peak force, continuous

## Force Mode

The specified current may be applied continuously to generate the desired force. However, the recommended continuous force limit should be set in the control program.

In vertical operation, the actuator rod will drop when power is cut off. The rod in a lowered position may be damaged by other moving parts in the machine. A return spring (optional feature) will keep the rod raised. A safety lock-out should be installed in the machine program to confirm the rod location before another interfering component can be moved.

SMAC actuators are equipped with these safety features:

- Limit switches: indicate end-of-stroke
- Index line/home position: used to monitor absolute position
- Breakaway shaft (optional)

## Safety Considerations

Unintentional full force may be applied continuously under the following conditions:

- missed target position
- excessive friction
- equipment malfunction, i.e. jam

If left undetected, this can cause destruction of the coil in some units. A servo program should perform the following checks regularly:

- Re-home: to assure target position has not shifted beyond end of stroke
- Time-outs: to shut power down within 10 seconds of error detection
- Following Error Limits: software safety
- Check limit switches
- Check temperature sensor

## Mounting

If the actuator is mounted vertically, the shaft drops down when the actuator is powerless. It is possible that other moving parts of the machine may damage the actuator at this position.

A return spring would hold the actuator in an upper position when it is powerless.

A safety function in your machine should check the actuator's current position before other components may move into the working area of the actuator.

# Individual Modifications

Many of our standard actuators listed on previous pages are compatible with both add-on options and modifications. In addition to the standard vacuum and spring option SMAC can offer the following modifications subject to approval by the factory.

## Linear Guide Options

Increased rigidity and side load tolerance can be gained by using a higher specification "wide guide". Additionally, in force sensitive applications we can fit a low friction guide.

## Double Coil

Integrating an extra coil can enhance both force and acceleration.

## Custom Nose-Bush

An extended nose bush with increased side load tolerance are available on many models. We can also offer scraper and wiper seals around the shaft to protect the bearings from excessive wear in harsh environments.

## Custom Shafts

In addition to the standard male/female rod ends we can also offer options such as "breakaway" shafts and custom shaft diameters.

## 10µm T.I.R.

Total indicator run-out under 10µm is available on several linear/rotary models.

## Rotary

Increased torque/gear ratio can be gained by using alternative geared motors or direct drive motors.

Higher rotary encoder resolutions are optional. Please consult factory for availability.

If a longer life rotary is required, then we can fit a brushless rotary motor.

## Flying Lead

Instead of the standard chassis connector we can offer a flying lead option. The flying lead is standard for all the CA series actuators, except the CAL35 series.

## Cable Options

Whenever an SMAC actuator is mounted to any 3rd party device such as a gantry or multi-axis robot, SMAC strongly recommends that a superflex cable is used. Cable lengths with a standard of 3 meters up to a maximum of 10 meters can be offered.



# Sample Applications

## Switch Test

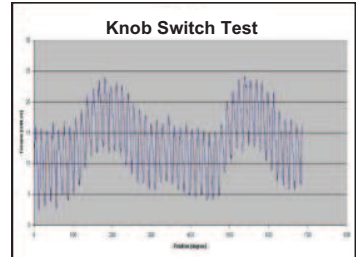
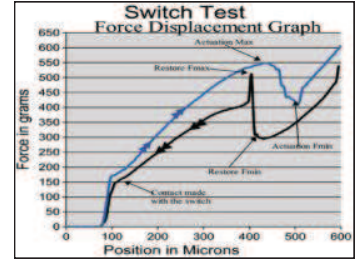


### Application Examples

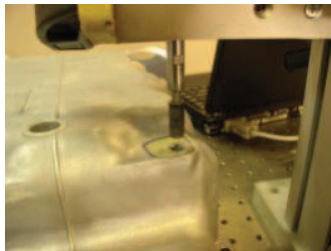
- Automotive switch test
- Cell phone keypads, membrane keypads
- Touch screens
- Valves, sensors and relays
- PC Keyboards, ATM keypads
- Springs, door latches, etc...

### The SMAC Advantage

- Verify hysteresis and switch differential
- Accurate simulation of human motion profiles
- Combined force and position measurement
- High speed life testing
- 1,000,000 cycles in 8 hours
- QA reporting functions to verify 100% test



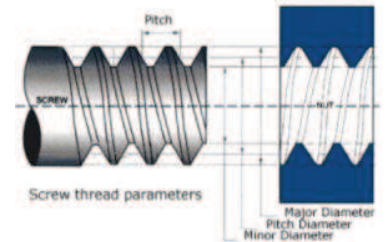
## 100% Automated Thread Check



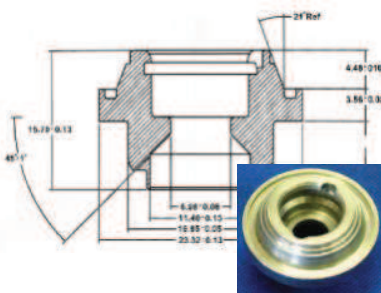
### Verification of:

- Oversized / undersized thread
- Number of threads
- Cross thread
- Thread depth
- No thread or dislocated thread
- Pitch measurement
- Shallow / blocked hole

Increase of torque/gear ratio or higher rotary encoder resolutions are available.



## Measuring, Bore Gauging and Groove Inspection



- Airbag components
- Fuel Injector Plug
- Assembly part inside the fuel injector
- XYZ-Mini CMM
- Internal and External Diameter Gauging
- Height Gauging
- Thickness Gauging
- Multiple Point Gauging

Resolution: 5µm (0.0002 inch) to 0.05µm (1.968x10<sup>-7</sup> inch)



- Verifying the depth and diameter of 50µm x 50µm small pockets in a drum for cigarette manufacturing.

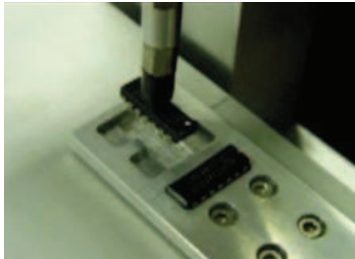
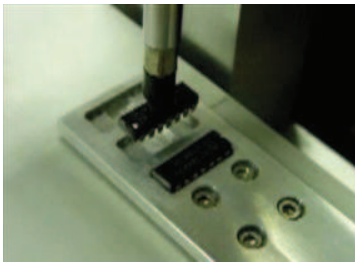
### Problem:

The previous inspection system included a vision system that measured the diameter of each hole but not the depth. The depth could only be verified by manual spot checks.

### SMAC Advantage:

- Precision & contact measuring; the previous system could only measure diameter, but not the depth.
- Fully automate the verification process

## Pick & Place



### Problem:

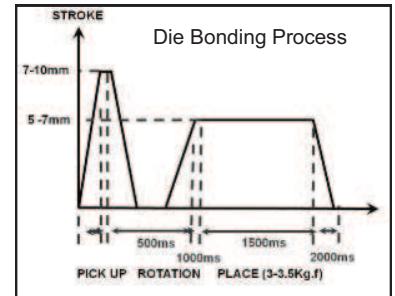
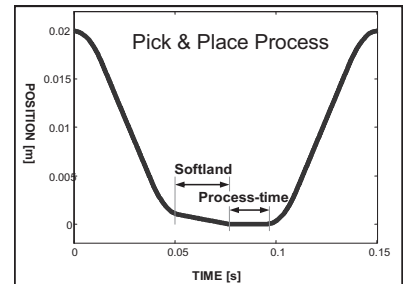
- Different pick up height due to mechanical tolerances
- Low throughput of the machine
- Position accuracy – linear and rotary
- Constant force for positioning needed

### SMAC Solution:

- Finding the chip surface with the Soft-Land function to avoid damages on the parts
- High speed positioning with a direct drive system
- High resolution positioning up to 0.1 micron
- Up to 50000 counts/revolution - 0.007 degrees
- Controlled precise force
- Shaft run-out 20µm standard. (>10micron option)
- Accurate repeatable positioning at +/- 2 encoder counts
- Programmable force/torque, position and velocity in all axes

### Pick & Place Application Examples

- Die bonding
- Smart Card (IC chip mounting)
- Gauging & sorting parts
- Handling small and fragile components



## Tapping



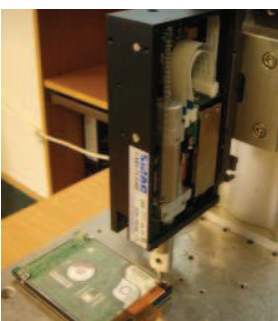
### Application

0.38mm Diameter Smart Tapping for a watch manufacture by using LAR35-050-55F  
The diameter of the part is about 3.5mm and the hole to tap is about 0.38mm.

### Key Features

- Precise force control
- Soft-Land capability
- Precise position control
- Verify thread as the part being tapped.

## Screw Driver



Application image with a LAR31 series linear rotary actuator

### Application

Simplifying the disc drive assembly system by replacing three devices with one linear rotary actuator.

### Problem:

- Difficult to keep precise height alignment at pick and place locations.
- The manual tuning since the end of stroke is a physical adjustment and not programmable.
- The rotary axis is not able to determine position or the linear movement, thus neither the pitch, the number of rotations nor the first thread CCW can be confirmed.
- The cost of the combination, an electric screw driver attached with 2 pneumatic slide, can run up to US\$10,000.

### The SMAC Advantage

- SMAC linear rotary electric actuator is an all in one, off the shelf solution.
- A long stroke with fast approach.
- Soft-Landing function at both linear and rotary positions.
- Constant accurate force control while threading.
- Monitoring the torque and pitch verification: Good, shallow, cross, or no threads as well as the precision of the thread are detected through linear position feedback.
- SMAC provides this at 50% less the cost of the previous method.

## Packaging



- **Cup dispensing:** High speed dispensing at **400+ per minute**. Replaces pneumatic cylinders for higher speed, longer life and quiet operation.
- **De-blistering:** Popping pills is the machine which automates dispensing of tablets from foil and plastic containers. Key points are speed, force control, stroke adjustment and noise.
- **Capping of bottles:** Cap rotates to engage slot. Detect and report no/obstructed nozzle. SMAC actuators can adjust force and torque, show the different quality check capabilities such as cap height, torque limit, force required to press in, and even check the clicks on child proof caps.
- **High Speed on the Fly Labeling:** The label applicator (SMAC actuator) matches the speed of the conveyor as the product through. Adjustable speed and height for the different kind of products and then Soft-Land with controlled force.
- **The Bottle/Carton Ejector for Filling Lines** - Programmable force & speed control adapt easily to different size of bottles and fill level. **Total out and back is 50ms, 1200/min.**
- **Parts Feeding:** 50,000 cycles/hour, 24/7 operation.

## Glass



### Measuring Thickness of Thin Flexible Glass

**Problem:** Accuracy of the current air cylinder, LVDT and force control system.

**Solution:** The customer used the Soft-Land feature of the SMAC LAL20 in conjunction with a load cell mounted on the rod of the SMAC actuator. The LAL20 is controlled by a dual-axis LAC25.

### Glass Grinding

**Problem:** The grinding process produces a 125µm finish with less than a 50µm variation. Damage to the glass at the beginning and end of the grinding cycle is caused by inadequate force control of the air cylinder which is driving the grind wheel. The force required is 2 to 4 Newtons, with a 5mm stroke.

**Solution:** Customer was able to land softly on the glass panel and provide a constant force using the "force mode" of the LAL55 at both beginning and end of the stroke.

### Glass Scoring (V-Cutting)

- Scoring Organic Light Emitting Display (OLED) which measures only 0.5mm thick by using CAL36 series of electric actuator. Precise force control of less than 0.05N required. Soft-Land capability and low friction are key.

### Glass Application Examples

- Glass cutting, de-burring, positioning
- Glass scoring (V-Cutting) for solar panels and LCDs
- Chamfering and bevelling
- Measuring surface profile

## Medical & Bio-Science



- Pull test on medical stent used in Catheters
- Automated screwing caps on a syringe
- Catheter Tube Welding
- Push/Pull testing of Hypodermic Needles
- Measuring cells height in two conditions, dry and saturated.
- Measuring the amount of wear on a knee replacement plate over x amount of time.
- Medical catheter assembly
- Soft contact lens moulding

## Welding

### Key Operation:

Applying even and consistent pressure for EDM assembly electronic-welding equipment.

### SMAC Advantage:

Precise control of the contact force to avoid damaging the parts.

Soft-landing profile uses a high speed approach to save time.

Precise and repeatable positioning.

## Scanning

### Key Operation:

Moving camera/micro scope lens to focus material for inspection or analyse

### SMAC Advantage:

Accurate and repeatable force control and positioning with sub-micron resolution.

Compact size.

Easy set up and programming.