The ability to do work and verify its accuracy at the same time.
SMAC Product Overview

**Electric Cylinders**

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

- **CAL36**
  - Stroke [mm]: 15, 25, 50
  - Force [N]: 12 - 41

- **CAL75**
  - Stroke [mm]: 15, 25, 50
  - Force [N]: 25 - 150

- **NEW CBL35**
  - Stroke [mm]: 10, 15, 25
  - Force [N]: 8.5 - 18

- **NEW CBL35C with Built-in Controller**
  - Stroke [mm]: 10, 15, 25
  - Force [N]: 8.5 - 18

- **NEW CBL50**
  - Stroke [mm]: 10, 25
  - Force [N]: 28, 50

**Linear & Linear/Rotary Actuators**

- **LCA8**
  - Stroke [mm]: 10, 25, 50
  - Force [N]: 2.6 - 4

- **LCR13**
  - Stroke [mm]: 25
  - Force [N]: 7

- **LCA16 / LCR16**
  - Stroke [mm]: 10, 15
  - Force [N]: 6, 8, 13

- **LCA25**
  - Stroke [mm]: 10 - 200
  - Force [N]: 7.4 - 22

- **LCA31 / LCA32**
  - Stroke [mm]: 12
  - Force [N]: 38, 76

- **NEW LCA50**
  - Stroke [mm]: 25 - 250
  - Force [N]: 40 - 110

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

- **LAL20 / LAR20**
  - Stroke [mm]: 10, 15, 25
  - Force [N]: 5.4 - 12

- **LAR31**
  - Stroke [mm]: 30, 50
  - Force [N]: 11, 20

- **LAL300 / LAR300**
  - Stroke [mm]: 50
  - Force [N]: 202

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

- **NEW LAL1500**
  - Stroke [mm]: 25, 50
  - Force [N]: 500

- **LAL300 / LAR300**
  - Stroke [mm]: 50
  - Force [N]: 202

- **LAL500**
  - Stroke [mm]: 25, 50
  - Force [N]: 500
Linear Slide Actuators

**SLA25**
Stroke [mm]: 10
Force [N]: 4

**LCS8**
Stroke [mm]: 10, 25, 50
Force [N]: 2.6 - 4

**LCS25**
Stroke [mm]: 10 - 200
Force [N]: 7.4 - 22

**LCS30**
Stroke [mm]: 10
Force [N]: 6, 6

**LCS50**
Stroke [mm]: 25 - 250
Force [N]: 30 - 110

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

**LAS20**
Stroke [mm]: 10, 15, 25
Force [N]: 6, 7, 5.5

**LAS20W**
Stroke [mm]: 25
Force [N]: 19

**LAS35**
Stroke [mm]: 25, 50, 100
Force [N]: 6 - 31.5

**LAS55**
Stroke [mm]: 50, 100, 150
Force [N]: 13 - 40

**LAS85**
Stroke [mm]: 15, 25, 50
Force [N]: 65 - 185

**LAS300**
Stroke [mm]: 50
Force [N]: 202

Grippers

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

**GRP35**
Stroke [mm]: 30
Force [N]: 25, 26

**GRP50**
Stroke [mm]: 30
Force [N]: 35, 45

XY Stages

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

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

Controllers & Amplifier

**CBC**
Single axis miniature integrated drive / controller

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

**LAC-1**
Single axis controller

**LAC-26**
2 axis controller with built in amplifier

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

**MAAC4-7**

**LAA-5**
Single axis amplifier

**LAD-1**
Single axis smart driver

**MIOE-8/8**
Expansive I/O module for LAC-1, LAC-25 and LAC-45

www.smac-mca.com
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 150N, position encoder resolution 5µm standard, 1 and 0.1µm option for most actuators.
- Programmable force, position, acceleration and velocity.
**Linear:**
- Stroke up to 250mm, force up to 500N, position encoder resolution 5µm standard, 1 and 0.1µm option for most actuators.
- Programmable force, position, acceleration and velocity.

**Rotary:**
- Multi-turn servo motor, torque up to 4.5Nm, velocity up to 5000 rpm, resolution up to 132,000 increments per revolution.
- Programmable force, position, acceleration and velocity.

---

**Linear Rotary**

**LAR Series**
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.

\[ F \propto NIB \]

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).

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 life cycle 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
- Quiet, airless and energy efficient

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.
## Part Numbering System

<table>
<thead>
<tr>
<th>Model</th>
<th>Series</th>
<th>Cylinder</th>
<th>Linear</th>
<th>Linear/Rotary</th>
<th>Slide</th>
<th>Encoder</th>
<th>Number of Coil</th>
<th>Vacuum</th>
<th>Mounting</th>
<th>MOD</th>
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### Part Number Examples:
- **CBL35-010-75-3-F3**
  - CBL35 series electric cylinder, 10mm stroke, 48volt single phase, 5 micron encoder, 3-coil, female shaft end, and flying lead
- **CBL35C-010-75-1-F3**
  - CBL35 series electric cylinder with built-in controller, 10mm stroke, 48volt single phase, 5 micron encoder, single coil, female shaft end, and flying lead
- **LCA25-200-31-6-F3**
  - LCA25 linear actuator, 200mm stroke, 48volt multi phase, 1 micron encoder, 6-coil, female shaft end, and flying lead
- **LCA31-010-75-3-F3**
  - LCA31 series linear actuator, 10mm stroke, 48 volt single phase, 5 micron encoder, 3-coil, female shaft end, and flying lead
- **LCS50-050-35-3**
  - LCS50 series linear slide actuator, 50mm stroke, 48volt, multi phase, 5 micron encoder and 3-coil
- **SLA25-010-55-1-3**
  - SLA25 series linear slide, 10mm stroke, 24 volt, single phase, 5 micron encoder, single coil, and flying lead

### NOTES:
- Series will not have leading zeros (e.g. CBL35)
- Stroke must include zeros (e.g. 050)
- Spring must be specified as full return or counter balance, payload and orientation (vertical or horizontal)

* Applicable for LCA series
** Consult factory
*** Applicable for CAL, CBL and LCA series
**** Available for CAL and CBL series
***** Available for CBL series

www.smac-mca.com
# Electric Cylinders - CAL Series

<table>
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<tr>
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<td>0.81</td>
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</table>

**NOTE:** SMAC requires that all units must be operated at less than suggested duty cycle (%). Please see page 22.

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:**
  - CAL12 series: 1µm standard. 0.1µm optional.
  - CAL36 and CAL75 series: 5µm standard. 0.5µm, 1µm and 0.1µm 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 optional. Threaded mount is available for CAL12 series only.
## Electric Cylinders - CBL Series

<table>
<thead>
<tr>
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</tbody>
</table>

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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):

- **Built-in Controller**: CBL35C series with built-in controller is available for simple installation and effective use of space.
- **Encoder resolutions**: 5µm standard, 1µm optional.
- **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 optional.
- **Protection**: IP65 / 67 available
# Linear Actuators - LCA series

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(*) Consult factory

**NOTE:** SMAC requires that all units must be operated at less than 40% maximum duty cycle. Please see page 22 or user manual for further explanation on how to calculate duty cycle.

We manufacture actuators to suit our customers’ requirements. Please call us if you do not find the right actuator in this list. Linear actuators are also available as linear slides (See page 12)

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

- **Linear encoder resolutions:** 5 µm standard. 1µm and 0.1µm optional for most units. Consult factory for availability.
- **Shaft ends:** Male, Female, Blank and Custom (check availability of custom option)
- **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.
- **Extended nose bushing:** For tighter shaft run-out and higher side load onto the shaft.
- **Increase of max. force & acceleration:** 48 volt coil and double coil options are available for some units with 24 volt single coil.
- **Increase of force accuracy & lifetime:** Extra long life linear guide / Low friction linear guide
Linear/Rotary Actuators - LCR Series

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NOTE: SMAC requires that all units must be operated at less than 40% maximum duty cycle. Please see page 22 or user manual for further explanation on how to calculate duty cycle.

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):

- Linear encoder resolutions: 5µm standard. 1µm optional.
- Shaft ends: Male, Female, Blank and Custom (check availability of custom option)
- Return spring: Prevents the shaft from dropping during vertical operation when power is cut.
- Vacuum: For pick and place applications
- Extended nose bushing: For tighter shaft run-out and higher side load onto the shaft.
- Increase of max. force and acceleration: 48 volt coil and double coil options are available for some units with 24 volt single coil.
- Increase of torque/gear ratio: Alternative geared motors are available for some units.
- Rotary encoder resolution: Consult factory for higher resolution.
- Increase of force accuracy & lifetime: Extra long life linear guide, Low friction linear guide

* Torque and velocity can vary based on your specific application.
# Linear Slides - LCS / SLA series

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(*) Consult factory

NOTE: SMAC requires that all units must be operated at less than 40% maximum duty cycle. Please see page 22 or user manual for further explanation on how to calculate duty cycle.

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):

- **Linear encoder resolutions:** LCS series: 5µm standard. 1µm optional. SLA25 series: 5µm standard. 1µm, 0.1µm and 0.05µm optional.
- **Return spring:** Prevents the shaft from dropping during vertical operation when power is cut.
- **Increase of maximum force & acceleration:** 48 volt coil and double coil options are available for some units with 24 volt single coil.
- **Increase of force accuracy & lifetime:** Extra long life linear guide, Low friction linear guide
**Part Numbering System**

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<th>VOLT</th>
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**LINEAR**
- **L:** Linear

**LINEAR/ROTARY**
- **L:** Linear
- **A:** Actuator

**SLIDE**
- **L:** Slide

**XY TABLE**
- **L:** X, Y

**GRIPPER**
- **G:** Gripper

---

**Part Number Examples:**

**LAS20-010-55**
LAS20 linear slide, 10mm stroke, 24 volt single coil, 5 micron encoder

**LAL300-050-85-F**
LAL300 linear actuator, 50mm stroke, 48 volt 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

---

**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 counter balance, payload and orientation (vertical or horizontal)

* Consult factory
## Linear Actuators - LAL series

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**NOTE:** SMAC requires that all units must be operated at less than 40% maximum duty cycle. Please see page 22 or user manual for further explanation on how to calculate duty cycle.

We manufacture actuators to suit our customers’ requirements. Please call us if you do not find the right actuator in this list. Linear actuators are also available as linear slides (See page 14)

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

- **Linear encoder resolutions:** 5µm standard, 1µm, and 0.1µm optional for most units. Consult factory for availability.
- **Shaft ends:** Male, Female, Blank and Custom (check availability of custom option)
- **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.
- **Extended nose bushing:** For tighter shaft run-out and higher side load onto the shaft.
- **Increase of max. force & acceleration:** 48 volt coil and double coil options are available for some units with 24 volt single coil.
- **Increase of force accuracy & lifetime:** Extra long life linear guide / Low friction linear guide
## Linear/Rotary Actuators - LAR Series

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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):

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- **Shaft ends:** Male, Female, Blank and Custom (check availability of custom option)
- **Return spring:** Prevents the shaft from dropping during vertical operation when power is cut.
- **Vacuum:** For pick and place applications
- **Extended nose bushing:** For tighter shaft run-out and higher side load onto the shaft.
- **Increase of max. force and acceleration:** 48 volt coil and double coil options are available for some units with 24 volt single coil.
- **Increase of torque/gear ratio:** Alternative geared motors are available for some units.
- **Rotary encoder resolution:** Consult factory for higher resolution.
- **Increase of force accuracy & lifetime:** Extra long life linear guide, Low friction linear guide

* Torque and velocity can vary based on your specific application.
Linear Slides - LAS series

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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):

Linear encoder resolutions: 5µm standard, 1µm and 0.1µm optional for most units. Consult factory for availability.

Return spring: Prevents the shaft from dropping during vertical operation when power is cut.

Increase of maximum force & acceleration: 48 volt coil and double coil options are available for some units with 24 volt single coil.

Increase of force accuracy & lifetime: Extra long life linear guide, Low friction linear guide
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<td>15</td>
<td>25</td>
<td>10</td>
<td>17</td>
<td>0.1</td>
<td>25</td>
<td>10</td>
<td>17</td>
<td>0.1</td>
</tr>
<tr>
<td>GRP35-030-7</td>
<td>48</td>
<td>93x110x38</td>
<td>15</td>
<td>26</td>
<td>10</td>
<td>13</td>
<td>0.1</td>
<td>26</td>
<td>10</td>
<td>13</td>
<td>0.1</td>
</tr>
<tr>
<td>GRP50-030-5</td>
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<td>90x125x55</td>
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<td>35</td>
<td>14</td>
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<td>35</td>
<td>14</td>
<td>25</td>
<td>0.15</td>
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<tr>
<td>GRP50-030-7</td>
<td>48</td>
<td>90x125x55</td>
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<td>45</td>
<td>18</td>
<td>22.5</td>
<td>0.15</td>
<td>45</td>
<td>18</td>
<td>22.5</td>
<td>0.15</td>
</tr>
</tbody>
</table>

**NOTE:** SMAC requires that all units must be operated at less than 40% maximum duty cycle. Please see page 22 or user manual for further explanation on how to calculate.

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):**

- **Linear encoder resolutions:** GRP20: 1µm standard and 0.1µm optional. GRP35 and GRP50: 5µm standard, 1µm and 0.1µm optional.
- **Increase of the maximum force & acceleration:** 48 volt coil and double coil options are available for some units with 24 volt single coil.
- **Increase of the force accuracy & lifetime:** Extra long life linear guide Low friction linear guide

### XY Stages

<table>
<thead>
<tr>
<th></th>
<th>Axis 1</th>
<th>Axis 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage [DC]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Stroke per Axis [mm]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Maximum Force [N]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Force Constant [N/A]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Moving Mass [kg]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Continuous Force [N]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Force Constant [N/A]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Moving Mass [kg]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Weight [kg]</td>
<td>[N]</td>
<td>[N]</td>
</tr>
<tr>
<td>Maximum开口</td>
<td>[N]</td>
<td>[N]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>LXY15-015-8</td>
<td>48</td>
<td>111x112x86</td>
<td>15</td>
<td>22</td>
<td>11</td>
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<td>25</td>
<td>12</td>
<td>12</td>
<td>0.22</td>
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<tr>
<td>LXY25-025-8</td>
<td>48</td>
<td>125x125x65</td>
<td>25</td>
<td>42</td>
<td>17</td>
<td>14</td>
<td>0.19</td>
<td>42</td>
<td>17</td>
<td>14</td>
<td>1.5</td>
</tr>
</tbody>
</table>

**NOTE:** SMAC requires that all units must be operated at less than 40% maximum duty cycle. Please see page 22 or user manual for further explanation on how to calculate.

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):**

- **Linear encoder resolutions:** 5µm standard, 1µm and 0.1µm optional for most units. Consult factory for availability.
- **Increase of maximum force & acceleration:** 48 volt coil and double coil options are available for some units with 24 volt single coil.
Multi-Axis Systems

SMAC offers versatile and flexible multi-axis solutions. The systems with SMAC multi-axis solutions deliver the capability to learn and follow a 3D contour or motion path with a high degree of speed, precision, accuracy, and repeatability. All combinations of SMAC actuators can be used: linear, linear slide, linear/rotary and XY stage axis.

SMAC multi-axis solutions feature and utilize linear/circular interpolation and electronic gearing which enables a constant speed while following the chosen XYZ axis contour. Ideal applications are measuring and testing (Quality Control), pick and place, deposition, machining, scoring and cutting, to name a few.

Multi-axis systems with SMAC actuators enable total programmability of speed, position and force, all at the same time, with an exceptional degree of accuracy and repeatability. These multi-axis systems offer a wide range of solutions with a number of highly flexible control interfaces. When system integrators consider SMAC actuators, many new opportunities are now available with airless, clean-room capable features.
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.

**CBC**
Single axis miniature integrated driver & controller
Single phase brush/3 phase brushless motor
Easy expansion to multi-axis

**Mode:** Position / Velocity / Force

- 8-48VDC
- Encoder interface TTL differential
- 2 PLC level (24V), non-isolated digital input
- 2 Open drain digital output
- 1 Analog input (single end) 0 -5V
- 1.5 amp cont., 4 amp peak
- RS232 or CAN bus interface
- Unfolded: 45.7mm x 28mm x 7mm
- Folded: 20mm x 28mm x 16mm

**LCC-10 (LCC-11)**
Single axis controller with built-in amplifier
Single phase brush/3 phase brushless motor
Easy expansion to multi-axis

**Mode:** Position / Velocity / Force

- 24-48VDC
- 2 amp cont., 4 amp peak
- 4 TTL input/output,
- 1 analog output, 10 bit standard
- (16 bit optional as model # LCC-11)
- RS232 or CAN bus interface
- Can be run as drive only

**LAC**
Single axis controller with built-in amplifier
Single phase brush motor

**Mode:** Position / Velocity / Force

- 12-48VDC
- 3 amp cont., 6 amp peak
- 8 TTL input/output
- 3 analog input
- RS232 interface

**LAC-26**
2 axis controller with built-in amplifier
1st axis single phase brush
2nd axis brush/brushless motor

**Mode:** Position / Velocity / Force / Gearing

- 12-48VDC
- 3 amp cont./axis, 6 amp peak/axis
- Independent or coordinated
- 2 axis motion
- 3 opto-isolated input, 2 opto-isolated output
- 1 analog output/axis
- RS232 interface

**LAC-25**
2 axis controller with built-in amplifier
Single phase brush motor

**Mode:** Position / Velocity / Force / Gearing

- 12-48VDC
- 3 amp cont./axis, 6 amp peak/axis
- Independent or coordinated
- 2 axis motion
- 4 opto-isolated input/output
- 1 analog output/axis
- RS232 interface

**LAC-45**
4 axis controller with built-in amplifier
Single phase brush motor

**Mode:** Position / Velocity / Force / Gearing

- 12-48VDC
- 3 amp cont./axis, 6 amp peak/axis
- Independent or coordinated
- 4 axis motion
- 8 opto-isolated input/output
- 1 analog output/axis
- RS232 interface

**MAAC4-7**
4 axis brushed/brushless controller
Integrated high end amplifier
Advanced math capability
Circular interpolation
Teach path function

- 24-48VDC
- 6 amp cont./axis, 10 amp peak/axis
- 8 TTL input, 7 TTL output
- RS-232 and Ethernet Interface

**LAA-5**
Single axis amplifier

- 24-48VDC
- 3 amp cont., 6 amp peak
- +/- 10 Volt command input
- 3 amp output

**LAD-1**
Smart Driver for single axis stepper input to servo output

- 24-48VDC
- RS232 Interface

**MIOE-8/8**
Expansive I/O module for LAC-1, LAC-25 and LAC-45

- 24-48VDC
- 8 opto-isolated input/output
Why Use SMAC Cables?
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.

<table>
<thead>
<tr>
<th>Models</th>
<th>Single Axis Controller</th>
<th>Dual Axis Controller</th>
<th>Amplifier</th>
<th>Smart Driver</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>LAC-1</td>
<td>LCC-10(11)</td>
<td>LAC-26</td>
<td>LAA-5</td>
</tr>
<tr>
<td>CAL</td>
<td>CAH-LOD26-03</td>
<td>CAH-LOD26-03</td>
<td>CAH-LAD26-03</td>
<td>CAH-LSD26-03</td>
</tr>
<tr>
<td>2x CAL</td>
<td></td>
<td></td>
<td>No cable required for flying lead option</td>
<td></td>
</tr>
<tr>
<td>CBL</td>
<td>CAH-LOD26-03</td>
<td>CAH-LOD26-03</td>
<td>CAH-LAD26-03</td>
<td>CAH-LSD26-03</td>
</tr>
<tr>
<td>2x CBL</td>
<td></td>
<td></td>
<td>No cable required for flying lead option</td>
<td></td>
</tr>
<tr>
<td>LCA(5) single/double coil</td>
<td>CAH-LOD26-03</td>
<td>CAH-LOD26-03</td>
<td>CAH-LAD26-03</td>
<td>CAH-LSD26-03</td>
</tr>
<tr>
<td>LCA 6-coil</td>
<td></td>
<td>MAH-LOD26-03</td>
<td>No cable required for flying lead option</td>
<td></td>
</tr>
<tr>
<td>SLA</td>
<td>CAH-LOD26-03</td>
<td>CAH-LOD26-03</td>
<td>CAH-LAD26-03</td>
<td>CAH-LSD26-03</td>
</tr>
<tr>
<td>LA15</td>
<td>LAH-LOD26-03*</td>
<td>LAH-LOD26-03*</td>
<td>LAH-LAD26-03</td>
<td>LAH-LSD26-03</td>
</tr>
<tr>
<td>LA20/LA35/ LA95</td>
<td>LAH-LOD26-03</td>
<td>LAH-LOD26-03</td>
<td>LAH-LAD26-03</td>
<td>LAH-LSD26-03</td>
</tr>
<tr>
<td>LAL55/ LAL300/ LAL500</td>
<td>LAH-LOD26-03</td>
<td>LAH-LOD26-03</td>
<td>LAH-LAD26-03</td>
<td>LAH-LSD26-03</td>
</tr>
<tr>
<td>LAR15*</td>
<td>LAH-RED-03 (with 2x LAC-1s)</td>
<td>LAH-RED-03 (with 2x LCC-10s)</td>
<td>LAH-RTD26-03*</td>
<td>LAH-RAD26-03</td>
</tr>
<tr>
<td>LAR20/LAR35</td>
<td>LAH-RED-03 (with 2x LAC-1s)</td>
<td>LAH-RED-03 (with 2x LCC-10s)</td>
<td>LAH-RTD26-03</td>
<td>LAH-RAD26-03</td>
</tr>
<tr>
<td>LAR31</td>
<td>LAH-RED-03 (with 2x LAC-1s)</td>
<td>LAH-RED-03 (with 2x LCC-10s)</td>
<td>MAH-RTD26-03</td>
<td></td>
</tr>
<tr>
<td>LAR55/ LAR95/ LAR300</td>
<td>LAH-RED-03 (with 2x LAC-1s)</td>
<td>LAH-RED-03 (with 2x LCC-10s)</td>
<td>LAH-RTD-03</td>
<td>LAH-RAD-03</td>
</tr>
<tr>
<td>2x LAL15</td>
<td></td>
<td>LAL-LOD26-03</td>
<td>No cable required for flying lead option</td>
<td></td>
</tr>
<tr>
<td>2x LAL20/ LAL35/LAL95</td>
<td>LAH-LOD26-03</td>
<td>LAH-LOD26-03</td>
<td>No cable required for flying lead option</td>
<td></td>
</tr>
<tr>
<td>2x LAL55/ LAL300/ LAL500</td>
<td>LAH-LOD26-03</td>
<td>LAH-LOD26-03</td>
<td>No cable required for flying lead option</td>
<td></td>
</tr>
<tr>
<td>GRP20</td>
<td>LAH-RED-03</td>
<td>LAH-RED-03</td>
<td>LAH-RTD26-03</td>
<td></td>
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<td>GRP35</td>
<td>LAH-RED-03</td>
<td>LAH-RED-03</td>
<td>LAH-RTD26-03</td>
<td></td>
</tr>
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<td>GRP50*</td>
<td>LAH-RED-03</td>
<td>LAH-RED-03</td>
<td>LAH-RTD26-03</td>
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<td>LXY15</td>
<td>LAH-GRP-03</td>
<td>LAH-GRP-03</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LXY25</td>
<td>LAH-GRP-03</td>
<td>LAH-GRP-03</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All cables are 3m standard, optional 10m length is available. (Consult factory for other length.) Superflex is available as an option. Suitable for robotic applications.

*1 Requires LAH-PT30-26 (Jumper to 26 pin cable) or LAH-PT30-26 (Jumper to 26 pin cable) as supplement.
*2 Old type of GRP50 requires LAH-GRP26-03 cable.
System Configuration

LCA & LA Series

Configuration with SMAC Controllers

- RS232 cable
- I/O analog single cable
- External controller

CPU

SMAC actuator

SMAC controller

Configuration with Non-SMAC Controllers

- Voltage Command, or Step/Dir
- LCC-10 controller used as drive only
  - LAA-5 amplifier
  - or
  - LAD-1 smart driver

External Servo or Stepper (Non-SMAC controller)

SMAC actuator

LAA-5 amplifier or LAD-1 smart driver

SMAC controller

CAL & CBL Series

Configuration for Flying Lead Cable

- Flying lead (3m standard)
- Extra length to Max. 10m

SMAC Actuator

SMAC controller

Configuration for Pigtail Cable

- Pigtail (0.5m standard)
- Extra length to Max. 10m

SMAC controller

or

Non-SMAC Controller

SMAC Actuator

CAH-LOD26-03 (3m standard)

Pigtail (0.5m standard)

Extra length to Max. 10m

Pigtail (0.5m standard)

Extra length to Max. 10m

www.smac-mca.com
Installation Guideline

Duty cycle
SMAC requires that all units must be operated at less than 40% maximum duty cycle. % of maximum force applied x % of cycle time it is applied = % 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.

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

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 and LCA series actuators.

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.
Select Your Actuator

In order to select the correct actuator for your application following parameters should be known.

<table>
<thead>
<tr>
<th>Machine Function:</th>
<th>Mount Details:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space Available [mm]: x= y= z=</td>
<td>Mount surface: Axis side surface / Actuator side surface</td>
</tr>
<tr>
<td>Orientation: Horizontal / Vertical rod down / Vertical rod up</td>
<td>Environment: Debris / Dust / Vapor / Temperature / Harsh Cleaning Chemicals</td>
</tr>
</tbody>
</table>

**Specifications**

<table>
<thead>
<tr>
<th>Linear</th>
<th>Rotary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stroke [mm]:</td>
<td>Degree of Rotation:</td>
</tr>
<tr>
<td>Max. Velocity:</td>
<td>Max. Rot. Velocity:</td>
</tr>
<tr>
<td>Min. Velocity:</td>
<td>Min. Rot. Velocity:</td>
</tr>
<tr>
<td>Max. Acceleration:</td>
<td>Max. Rot Acceleration:</td>
</tr>
<tr>
<td>Max Force [N]:</td>
<td>Continuous force [N]:</td>
</tr>
<tr>
<td>Max Force [N]:</td>
<td>Max Torque:</td>
</tr>
<tr>
<td>Force Resolution [N]:</td>
<td>Torque Resolution:</td>
</tr>
<tr>
<td>Force Repeatability [N]:</td>
<td>Torque Repeatability:</td>
</tr>
<tr>
<td>Encoder Resolution [µm]: 5 / 1 / 0.1 / other ( )</td>
<td>Encoder Resolution</td>
</tr>
<tr>
<td>Encoder Resolution</td>
<td></td>
</tr>
<tr>
<td>Encoder Resolution</td>
<td></td>
</tr>
<tr>
<td>Repeatability [µm]:</td>
<td>Repeatability:</td>
</tr>
<tr>
<td>Cycles/sec:</td>
<td>Cycles/sec:</td>
</tr>
<tr>
<td>Expected Cycle Life:</td>
<td>Expected Cycle Life:</td>
</tr>
</tbody>
</table>

**Rod**

<table>
<thead>
<tr>
<th>Moving part: Rod / Slide</th>
<th>Rod Length (Full Retract) [mm]:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material requirement:</td>
<td>Tip: Male / Female / Blank / Custom</td>
</tr>
<tr>
<td>Vacuum through shaft:</td>
<td>Thread of shaft: Standard / M ....</td>
</tr>
</tbody>
</table>

**Special Features**


**Controller or Amplifier**

| Location: Built In / External at ... [m] | Cable: Standard / flying lead | I/O: Number and TTL / 24V | Smart Driver: Yes / No |

**Payload**

<table>
<thead>
<tr>
<th>Weight [gram]:</th>
<th>Size: (LxWxH)</th>
<th>Inertia:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape: Relation to rod/slide: Fixed / Push only / Other</td>
<td>Remarks:</td>
<td></td>
</tr>
</tbody>
</table>
# 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^{-7} 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. (＞10µm 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**
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. High speed, longer life and quiet operation.
- **Bottle Filling**: Excellent flexibility in motion profile and speed of the filling process based upon the material and container size.
- **De-blistер**: Automates dispensing of tablets gently from foil and plastic containers. Key points of using SMAC actuators are long life, speed, force, and stroke control, along with quiet operation. Pills are not damaged and stay in recovery container due to force control. Zero compressed air required.
- **Bottle Rejecting, Diverting, and Multi-lane Sorting**: SMAC can reject or divert one container only at line speeds over 1200 containers/minute. Movement of container is smooth, fast, and gentle with unique “soft land” feature. Container will not tip over because of force and velocity control.
- **Efficient Liquid Nitrogen Dosing**: SMAC’s unique Soft-Land function prevents damage to the valve when closing which increased valve’s life time. This will increase uptime and make the end user more profitable.
- **High Speed on the Fly Labeling**: The label applicator (SMAC actuator) matches the speed of the conveyor as the product comes through. Adjustable speed and height for the different kind of products and then Soft-Land with controlled force.
- **Capping of Bottles**: Cap rotates to engage slot. Detect and report no/obstructed nozzle. 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.
- **Parts Feeding**: 50,000 cycles/hour, 24/7 operation.

Medical & Bio-Science

- Scanning 1000 micro machined posts looking for cancer cells. Achieved improving the process time from 8 hours to 15 minutes.
- Precisely moving a lens for the microscope for fine focusing. Achieved 10% cost down and >4 times faster processing speed.
- 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

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
The SMAC 12 Month Product Guarantee

SMAC Corporation designs and manufactures advanced electric actuators. All SMAC actuators are quality products specifically designed and built for long service. Therefore, all actuators appearing in this catalog are guaranteed for a period of twelve months from the original date of shipment from our factory.

The guarantee conditions are effective when a SMAC Actuator is connected via a SMAC or SMAC Approved cable/connector and controlled by either a SMAC or SMAC Approved Controller. If a customer wishes to use a cable/connector or controller which is neither manufactured by, nor qualified/approved by SMAC, SMAC offers a test and qualification service to the customer. Once tested and approved the standard SMAC guarantee applies. Please contact your local SMAC branch for details. This guarantee is limited to a one-time replacement or rebuilding of any actuator which should fail to operate properly. Actuators must be returned with transportation prepaid and received at our factory within the guarantee period. They will be returned to the customer at the expense of SMAC.

No claims for labor, material, time, damage or transportation are allowable. Actuators damaged as a result of misapplication by the customer are excluded from this guarantee. The guarantee does not apply to loss or damage caused by fire, theft, riot, explosion, labor dispute, act of God or other causes beyond the control of SMAC. SMAC shall in no event be liable for remote, special or consequential damages, under the SMAC guarantee or under any implied warranty.

The above guarantee is our manner of extending the engineering and service resources of the SMAC organization to assure our customers long and continued satisfaction.

The SMAC Rebuild Program

Actuators no longer covered by the SMAC guarantee can be rebuilt under the SMAC rebuild program. Our continued research and development program extends the life of our actuators making them even more reliable under adverse operating conditions. Actuators returned under this program are completely disassembled, inspected and rebuilt to current operating standards wherever possible, tested and returned within a few days for a reasonable charge (typically 35% of standard list price). For 90 days from date of shipment from our factory, all rebuilt actuators carry the same guarantee as provided for new actuators.

SMAC products have been tested and found to be fully compliant with EN 50082-2 & EN 55011 Group 1, Class A.

Terms & Conditions of Sale

SMAC manufactures and sells actuators, controllers and cables. It has a standard warranty policy covering these products. SMAC does not offer integration services. These are the responsibility of SMAC distribution and their customers. This means SMAC takes no responsibility for software programming, mechanical designs and all other engineering involved in a project using SMAC devices. SMAC may, at its discretion, offer technical recommendations or suggestions to help its customer, the distributor, on a particular application. SMAC will only do this once a signed release of responsibility is received from its customer.

U.S. and world wide patents issued & applied for. SMAC improves its product line on a continuing basis. Specifications and mechanical dimensions are subject to change without notice. Please consult factory before proceeding with your design.
**National & International Offices**

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