Product / Applications Overview

Rev 5.08

kyntronics.com
- Kyntronics specializes in Actuation Solutions across many industries including Medical, Aerospace & Industrial.

- The Kyntronics team has extensive Motion Control experience with Electrical, Software and Mechanical Engineers on staff.

- Our business culture is customer focused, with an innovative design team, utilizing Lean Six Sigma concepts with a continuous improvement conviction.

- AS9100D, ISO9001:2015 Certified Quality System

- Kyntronics is located near Cleveland Ohio.

Our mission is to help customers solve Motion Control problems more effectively, using proven technologies in innovative ways.
Standard Actuator Offering

EMA (Electro-Mechanical Actuation)
- 40-1200 lbf (5.3kN) – [linear]
- 5-2400 in-lbs (271N-m) – [rotary]
- Smart Actuation (integrated electronics)
- Ideal for OEMs
- Lighter Weight
- Easy Manual Release
- Motor / Brake
- Accurate Position Control

SHA (SMART Hydraulic Actuation)
- 800 – 170,000 lbf (755kN) – [linear]
- High Efficiency
- Smart Actuation (integrated electronics)
- Accurate Position Control
- No Brake to Hold Position
- IP65 Rated
- High Shock Load Capable
- Field Bus Connectivity

Modularity
SHA Overview

- High-Resolution Position Sensor
- Heavy-Duty Rod / Cylinder w/Patent-Pending Rod Compensation
- Precision Controlled Brushless Servo Motor
- Precise Displacement Bi-Directional Variable Speed Pump
- Valve Control / Manifold
- Inner Pressure Cylinder
- Foam
- Outer Cylinder (Reservoir)
SHA All-In-One System Solution

Included:

- Servo Controller/System (Designed, wired & tested)
- Servo Motor
- Configurable Actuator
- Software - Factory Programmed as Desired

- Optimal System Sizing (work closely with our customers) – Motor, Pump, Drive & Actuator
- Cooling as Required
- Factory Tested to Customer Specifications
  - Cycled & Tuned
- Precision Feedback Devices
  - PSI (Force)
  - Position
- Simple to use Setup / Installation Instructions
  - Manuals & Wiring Diagrams

The SHA provides substantial hardware savings, reduces Engineering, Assembly and Testing time.
SMART Hydraulic (SHA) – Modularity

60, 80, 120, 130, 142, 160, 190mm

80, 120 Manifold
Group 0, 1 Pumps

80, 120 Power Units

Panel
Enclosure

120, 240 & 480Vac – 1ph, 3ph
12, 24, 48 & 96Vdc

1, 1.5, 2in
2.5, 3.25in
4, 5, 6in

>500 Million Combinations
# Product Families

### Available for all actuators:
- Brushless Servo
- Precision Control
- Feedback Sensors
- Relief Valves
- Check Valves (as needed)
- Fieldbus Control
- 120, 240 & 480vac

<table>
<thead>
<tr>
<th>80 &amp; 120 Series</th>
<th>‘S’ Series</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 thru 3.25in Up to 25,000lbf (111kN)</td>
<td>Used for most actuator applications ranging from 500lbf to 85,000lbf</td>
</tr>
<tr>
<td>4.5 &amp; 6in Up to 85,000lbf (377kN)</td>
<td>All-in-One Solution</td>
</tr>
<tr>
<td>1 thru 3.25in Up to 25,000lbf (111kN)</td>
<td>Excellent for replacing Central-Hydraulic as well as EMA actuation solutions</td>
</tr>
</tbody>
</table>

### ‘E’ Series
- 24Vdc, IP68
- Up to 9,500lbf (42kN)
- Cost Effective
- All-in-One Solution
- Harsh Environments

### ‘S’ Series
- 240, 250 & 260 Series
- Cost Effective
- All-in-One Solution
- Harsh Environments

### ‘H’ Series
- High-Speed with momentary High-Force needs
- All-in-One Solution
- Excellent for Clamping and Pressing

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Example Product Configurations

- **Parallel**
- **In-Line**
- **Right Angle**

**Manifold Orientation**

- **24Vdc – IP68**
- **Totally Enclosed**
- **All-in-One**

**Custom Supplied Motor**

- **Customer Supplied Motor**

- **All-in-One**
  - Attached Enclosure

- **All-in-One**
  - Separate Enclosure/Panel
SHA Control / Software Capabilities

- Position Control
- Force Control
- Position & Force Control
- Position Control with Force & Speed Limiting
- Force Control with Position & Speed Limiting
- Compound Moves
- Multiple Gain Sets
- Coordinated Motion
- Sequencing & Custom Programming
- GUI Development
  - Touchscreen
  - VB Applications
- Diagnostics as desired
- Field Bus Integration
  - AB, Siemens, MTS, PC, AutomationDirect etc.
SHA Advantages – (Latest Technology)

- Cost effective – No hydraulic infrastructure
- All-in-One Solution – (Motor, Drive & Actuator included)
- Energy Efficiency (the SHA is up to 50% more efficient)
  - Smaller motor & drive – more compact
- Power-On-Demand (Motor runs only when demanded)

<table>
<thead>
<tr>
<th>Requirement</th>
<th>SHA Characteristics</th>
<th>Feature / Benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Force Density / Small Footprint</td>
<td>X (Central Hydraulic Cylinder) X (Electro-Mechanical Ball / Roller Screw (EMA))</td>
<td>Hydraulics provide the highest force density.</td>
</tr>
<tr>
<td>Variable Speed Servo Technology - Precise control of speed, force and position</td>
<td>X (Central Hydraulic Cylinder) X (Electro-Mechanical Ball / Roller Screw (EMA))</td>
<td>Precise servo-controlled solution (Force, Speed and Position).</td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>Hydraulics is the most efficient means of converting electrical power to linear power with the power on demand of the SHA.</td>
</tr>
<tr>
<td>All-In-One System</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>Servo Motor &amp; Drive optimally sized for the application.</td>
</tr>
<tr>
<td>Ability to sustain &quot;shock loading&quot; conditions</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>Hydraulics is the ideal solution for repeat high impact loads.</td>
</tr>
<tr>
<td>Cost Effective / Lower Equipment Cost</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>Higher efficiency leads to reduced motor/drive sizes and lower costs.</td>
</tr>
<tr>
<td>Reliability / Low Maintenance</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>Hydraulics provide the highest reliability numbers of any technology. There are no metal to metal wear items.</td>
</tr>
<tr>
<td>Simple Fieldbus Control Connectivity, IoT integration</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>Easy to use control integration.</td>
</tr>
<tr>
<td>No Back driving</td>
<td>X (Central Hydraulic Cylinder)</td>
<td>The SHA locks in place when power is removed. EMAs require a brake and are back-drivable.</td>
</tr>
</tbody>
</table>

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### EMA vs. SHA – (Reliability & Costs)

#### EMA (Electro-Mechanical Actuation)
- At 10,000lbf (44kN) EMA is at 100,000 inches (254,000 cm) of travel
- At 1,000lbf (4.4kN), EMA is at 10,000,000 inches (25,400,000 cm) of travel

#### SHA (SMART Hydraulic Actuator)
- Exceeds 50,000,000 in (127,000,000 cm) of travel with no Maintenance
- Exceeds 100,000,000 in (254,000,000 cm) of travel with a simple Rod Seal Cartridge change

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**Kyntronics SHA:** No metal to metal contact leads to increased reliability (load independent)

**Kyntronics SHA:** Significantly more cost effective vs. EMA as the load increases

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<table>
<thead>
<tr>
<th>Lbf</th>
<th>EMA $</th>
<th>SHA $</th>
</tr>
</thead>
<tbody>
<tr>
<td>2,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8,000</td>
<td></td>
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<tr>
<td>10,000</td>
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<tr>
<td>12,000</td>
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<tr>
<td>20,000</td>
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<tr>
<td>40,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>60,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>80,000</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
H-Series
High Speed / High Force (HSHF) Technology
High Speed-High Force Press / Clamp

- Multi-Cylinder design
- High Speed - up to 45in/sec
- High Load - up to 85tons for <2sec
- Single Pump & Motor
- Coordinated Motion
- Position and Force Control
- Servo Drive with integral motion control
- Versatile Control
  - Fieldbus
  - I/O (Selectable indexes)
  - Analog (0-10vdc or 4-20ma)
- 4-Quadrant Control

<table>
<thead>
<tr>
<th>Series</th>
<th>HS Force - lbf (N)</th>
<th>Avg HS* - in/sec (cm/sec)</th>
<th>HF Force - lbf [Ton] (kN)</th>
<th>Avg HF Speed - in/sec (cm/sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1H19C10-32-31</td>
<td>1,261 (5,608)</td>
<td>27.2 (69.2)</td>
<td>24,887 [12.4] (111)</td>
<td>1.8 (4.5)</td>
</tr>
<tr>
<td>1H19C10-40-31</td>
<td>1,236 (5,497)</td>
<td>27.2 (69.2)</td>
<td>37,699 [18.8] (168)</td>
<td>1.2 (3.1)</td>
</tr>
<tr>
<td>1H19C10-50-31</td>
<td>1,186 (5,275)</td>
<td>27.2 (69.2)</td>
<td>58,905 [29.5] (262)</td>
<td>0.8 (2.0)</td>
</tr>
<tr>
<td>1H19C10-60-31</td>
<td>1,161 (5,164)</td>
<td>27.2 (69.2)</td>
<td>84,823 [42.4] (377)</td>
<td>0.6 (1.4)</td>
</tr>
<tr>
<td>2H19C10-32-31</td>
<td>1,261 (5,608)</td>
<td>27.2 (69.2)</td>
<td>49,775 [24.9] (221)</td>
<td>1.8 (4.5)</td>
</tr>
<tr>
<td>2H19C10-40-31</td>
<td>1,236 (5,497)</td>
<td>27.2 (69.2)</td>
<td>75,398 [37.7] (335)</td>
<td>1.2 (3.1)</td>
</tr>
<tr>
<td>2H19C10-50-31</td>
<td>1,186 (5,275)</td>
<td>27.2 (69.2)</td>
<td>117,810 [58.9] (524)</td>
<td>0.8 (2.0)</td>
</tr>
<tr>
<td>2H19C10-60-31</td>
<td>1,161 (5,164)</td>
<td>27.2 (69.2)</td>
<td>169,646 [84.8] (755)</td>
<td>0.6 (1.4)</td>
</tr>
<tr>
<td>2H19C10-32-34</td>
<td>1,206 (5,365)</td>
<td>36.0 (91.5)</td>
<td>47,880 [23.9] (213)</td>
<td>2.4 (6.0)</td>
</tr>
<tr>
<td>2H19C10-40-34</td>
<td>1,181 (5,254)</td>
<td>36.0 (91.5)</td>
<td>72,528 [36.3] (323)</td>
<td>1.6 (4.1)</td>
</tr>
<tr>
<td>2H19C10-50-34</td>
<td>1,131 (5,032)</td>
<td>36.0 (91.5)</td>
<td>113,324 [56.7] (504)</td>
<td>1.0 (2.7)</td>
</tr>
<tr>
<td>2H19C10-60-34</td>
<td>1,106 (4,920)</td>
<td>36.0 (91.5)</td>
<td>163,187 [81.6] (726)</td>
<td>0.7 (1.9)</td>
</tr>
</tbody>
</table>

* Depends on system inertia and stroke lengths

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H-Series SMART Hydraulic Actuator - Design

All-In-One Actuator that Combines High Speed & High Force Functionality

- Manifold with Integral Valve Controls
- Optional Pressure Sensor for Force Control Operation
- Compact/Integrated Accumulator
- Servo-Controlled, Precise Displacement Bi-Directional Pump / Power Unit
- High-Resolution Position Sensor
- Brushless Servo Motor
- High Force Cylinder
- High Speed Cylinder

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H-Series Unique Technology – Patent Pending

- Provides the customer the ability to switch from High Speed mode to High Force mode at any position
- Has the capability to switch multiple times as desired during the stroke
- It is an All-in-One SHA solution
  - Servo drive, servo motor, actuator & software – fully integrated
  - No hoses
- The offering is a modular solution ranging from 15,000lbf to 170,000lbf
- Speeds up to 45in/sec
- Four quadrant servo motion control in both the High Speed or High Force modes
- Position or Force or Position & Force Control
Tools
Kyntronics Controller (veKtor) – Overview

Features:
• Robust GUI
  – Easy to setup & startup
  – Auto Tuning, Logging etc
• Programable motion control
• Coordinated motion
• Digital / Analog I/O
• Position and Force control
• Modbus RTU as standard (Robust)
• Fieldbus control (Optional)

**Phase I – Q1 ‘20 target**
**Goal is for an efficient quoting process**

- Our target is to turn quotes around in 1-2 days
- Application Sheet – filled out the best you can
  - Minimize back & forth with the customer
- Speed & Force cost $$
doubling speed – doubles the power required
Product Configurator & Pricing

- Easily configure your product
- Auto generated P/N
- Provides pricing / quote information
- Works off-line
- Syncs & provides updates when you are connected
Increasing Sales – Minimize Time

Inquiry from the Customer... Identify Needs: (Force / Speed / Control...)

### Existing Methodology

1. Draw system diagram  
2. Select pump  
3. Select motor  
4. Select appropriate hose sizes  
5. Select appropriate hose lengths  
6. Select appropriate connectors  
7. Select necessary control valves  
8. Decide on space / layout  
9. Decide on mounting  
10. Conduit runs / wiring  
11. Etc...  
12. Quote

### Using Kyntronics

1. Open Configurator  
2. Select Options  
3. Quote

% wins increase – time is minimized
Applications
Successful Application Targets

Central Hydraulic System Replacement – *(requiring motion control)*

- Saves time and money designing a system
- Power-On-Demand - - only runs when commanded
- Eliminates ALL Hosing, Leaks and associated environmental issues - - Customers are demanding “no hydraulic infrastructures”
- Versatile force and position control (ranges)

Replacing Electro-Mechanical Actuators

- Very cost effective, especially with higher forces
- Significant increase in reliability 2-3x more uptime (no metal to metal contact)

Presses / Clamping

- Takes advantage of hydraulics
  - High speeds with low force & High force at low speeds (e.g. Our H-Series)
- Significant power, replacing the large HPU
- Locks into position, no brake

Testing Applications

- Versatile control
- Simple setup
- Environmentally friendly
- Diagnostics & Fieldbus

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Hydraulic Replacement
Advantages

- Needs higher speeds at a low force most of the stroke, high force at low speed for a small segment of the stroke
- Significant power, replacing the large HPU
- Accurate Position and Force control
- Easy to install, saves time and money

Industries

- Automotive
- Assembly
- Press Braking
- Metal Bending
Advantages

- Needs higher speeds at a low force most of the stroke, high force at low speed for a small segment of the stroke
- Take advantage of hydraulics (HSHF)
  - High speeds with low force & High force at low speeds
- Significant power, replacing the large HPU
- No hoses, no leaks & more efficient
- Versatile control capabilities
- Easy to install, saves time and money

Industries

- Automotive
- Assembly
- Metal Forming
**Hemp Oil Extractor – HSHF Press**

**Kyntronics Advantages:**

- HSHF solution, required fast speeds along with large forces for a small period of time.
- Up to 84,000lbf
- Up to 20in/sec
- Position Control with Force Limiting
- Eliminates hoses and HPU - Quiet
# Testing Solutions

## Advantages
- Replaces HPUs – complex infrastructure
- Versatile Control, easy to change the setup
  - Expensive and difficult to install and setup control with a hydraulic system
  - Force and / or Position
- Fieldbus connectivity to the main controller
  - Data acquisition
- Easy to setup / modify various control profiles
- Portable, easy to move and setup (115V / 230V)

## Industries
- Automotive
- Utility Vehicles
- Aerospace
- Material Testing
- Marine
- Military
- Valves
Advantages per the Customer:

- Self-contained system with all functionality we need for this test. As an alternate, we would’ve had to design our own mini load control system with either servo proportional valve + external motion controller OR a gamut of manual hydraulic valves for precise load control.
- It saved us many days of assembly/set-up/testing/tuning and cost as well.
- The biggest challenge with these kind of systems is force control at low ends. With conventional hydraulic components, tuning takes majority of the testing time.
- Also, this system gives the customer ability to test the unit without using external hydraulic power which makes it very portable and manageable.
Final Test – Force Control

(4) Coordinated SHA Systems

Kyntronics Advantages:
- Replaced an HPU (more eff)
- Added Ethernet comms
- Increased product test quality

SHA Assembly
C-Frame Fatigue Test

Kyntronics Advantages:
- All-In-One Solution
  - Tested & Setup
- Frequency testing (3-5Hz)
- Closed Loop Force with Load Cell
- Amplitude adjustment
- Ethernet IP
- Increased product test quality
Clamping

Advantages
• Needs higher speeds at a low force the entire stroke
• Locks into position when stopped
• Take advantage of hydraulics (HSHF)
  • High speeds with low force
• Solves many existing issues / clamping techniques
  • Mechanical locking devices, large hoses etc
• Electro-mechanical actuators are constantly stopping at the same position significantly reducing the life
• HPUs are oversized, constantly running with large hoses
• No hoses, no leaks
• Versatile control capabilities
• Easy to install, saves time and money

Industries
• Injection Molding
• Metal Fabricating
• Wire Clamping
Navy Hexapod Application

Multiple modes, with one actuator design
• 2in/sec (5cm/s) at 900lbf (4kN)
• 0.5in/min (1.3cm/m) at 4200lbf (18.7kN)

A Single SHA Provides:
• 240x speed change
• 4.7x load change
Large Wire Bending / Force Control / Clamp

**Kyntronics Advantages:**
- Replaced the HPU – drop in solution
  - Quieter & more efficient
- Accurate Force Control, better product quality
- Increased load capacity & faster cycle times
- Less maintenance
Advantages / Specifications

- Replaced an EMA which had a very low life
  - The SHA significantly increased uptime
- The SHA has no issues with impact loading
- 5,000lbf & 10in/sec
- Internal Position Sensor
Material Handling

Advantages

- Integrated 24Vdc drive / controller
- Brushless Servo Motor
- Precision Position Control
- IP68 rated actuator – sealed solution
- Replacing mechanical actuators which have a significant down time – do not perform well under shock loading / environment

Industries

- Steel – Tubing – Bar
- Lumber
- Fracking
High Impact Applications

Kyntronics Advantages:
- Impact resistant (high shock)
- Accurate positioning
- Faster cycle times
- Fieldbus connectivity
- Force limiter (like a clutch) to avoid excess loading on the actuator (Relief Valves)

Industries
- Steel – Tubing – Bar
- Lumber
- Entertainment
Summary – Kyntronics Advantages

Unique product with many benefits

• All-in-One Solution
• Most reliable actuation offering
• Most efficient actuation offering
• Versatile & accurate control
• Very cost-effective solution
• Modular solution from low forces to 170,000lbf
Kyntronics – Who We Are...

• *We are* Solution Oriented – Innovative

• *We are* Passionately Customer Focused

• *We are* Actuation and Motion Control Experts

• *We have* a Continuous Improvement Culture

• *We are* Manufacturing & Quality Focused – OTD driven
Contact Kyntronics
855-596-8765
www.kyntronics.com