Joyce Controls for Joyce Jacks

Actuator
Controls

Motor
Starters

Positioning
Systems

Custom
Controls

Joyce provides motor controls ranging from simple motor starters to complex positioning systems and custom controls.

Joyce Systems + Controls
Putting it all Together

Every system that is powered by an electric motor requires some type of control system. Joyce offers a number of control options.

Simple → **Complex** → **Custom**

Basic motor starter *Positioning System* *Unique*

Std. Catalog item *Enhanced features* *Designed to Specs*

Choosing the best option can be a challenge.

That's why our Engineers are available to help you through the process.

# Joyce Systems + Controls
Putting it all Together
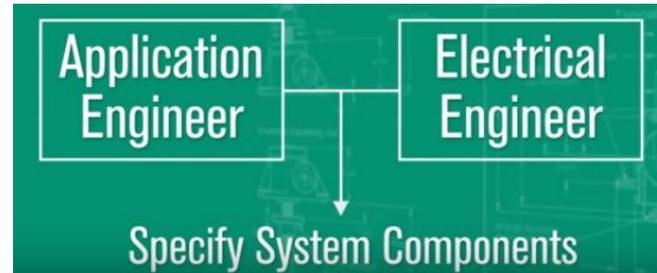
Consider the benefits of specifying Controls with your Mechanical system:

- Simplified Project Management
- Engineering Support (both Mechanical & Electrical)
- System Components are Compatible
- Coordinated Delivery Schedule
- Great Customer Service & On-time Delivery Record

Control Systems
Basic Terms & Concepts
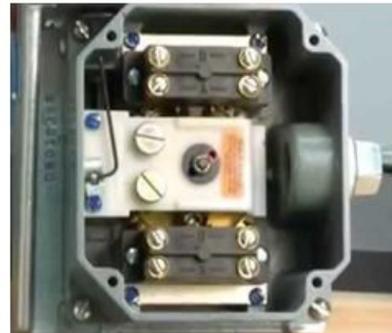
Control Systems Outline

<u>Electrical Control System</u> - A combination of electrical components working together to operate single or multiple motor systems.

- Analog Inputs

- Discrete Inputs

- Outputs

- Open loop positioning systems

- Closed loop positioning systems

What is an input?

Inputs - Components that answer questions about the status of the system.

- Inputs determine when the actuator or jack needs to extend or retract.

- Inputs are divided into two classes:
    - Analog
    - Discrete

Analog Inputs

__Analog inputs__ – Components that can assume any value within a specific range. Think of a dimmer switch you have in your home. The dimmer switch controls the intensity of the light. The dimmer input allows the light to shine at any value between 0 and 100%.

- The most common analog inputs are 4-20 mA and 0-10 V.

- Analog inputs answer quantitative questions about the system.

- What is the position of the screw jack? (inches)

- What is the speed of the motor? (rpm)

- How much current is the motor seeing? (amps)

Analog Inputs

- **_Potentiometer_** - Provides the exact position of the actuator or jack and are also used to control the speed of motor.

- **_Transducer_** - Measures the motor current.

- **_Thermocouple_** - Measures the motor or screw temperature.

- **_Inclinometer_** - Measures the angle of elevation of a platform.

Discrete Inputs

Discrete inputs – Devices that produce signals with a value of 0 or 1. A value of 0 indicates the input is off. A value of 1 indicates the input is on.

- A light switch is a discrete input. The light switch is either in the on or off position.

- Discrete inputs provide answers to "yes" or "no" questions about the system.
- Is the screw jack at the upper travel limit?
- Is the motor overloaded?
- Is the extend or retract button being pressed?

Discrete Inputs

Discrete inputs are grouped in two categories:

- *__Momentary__* – Inputs that automatically **return** to their previous state when pressure is not applied to them. A car horn only beeps while it is being pressed. The beeping stops when the pressure is removed. Momentary inputs are also called "dead-man" inputs.

- *__Maintained__* – Inputs that **keep** their new state when pressure is not applied to them. The light switch remains in the "off" or "on" position after it has been changed. Maintained inputs are also called "latching" inputs.

Discrete Inputs

- *__Push Buttons__* – Used to turn lights, motors, and relays on and off. (momentary input / car horn)

- *__Selector Switches__* – Used to turn lights, motors, and relays on and off. (maintained input / light switch)

- *__Limit Switches__* – Used to set the end of travel limits for actuators and screw jacks. (maintained input / light switch)
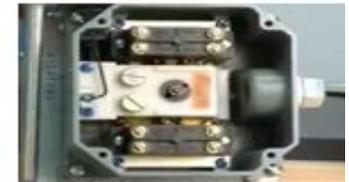
What is an output?

Output – A device that can be turned on or off when a specific input condition occurs.

- Outputs generate system responses such as a motor rotating or a warning light flashing.

- The proper voltage and current must be provided for the output to function correctly.

Examples of output devices

- **Motor contactor** – Enables motor rotation by providing the required power to the motor.

- **Frequency drive** - Changes the motor rpm by varying the motor frequency.

- **Indicator stack** – Produces audible and visual signals when a specific input condition occurs such as a motor overload.

Open Loop Controls from Joyce

<u>Open loop positioning</u> – Applications that only require the end of travel positions to be defined. The exact position of the actuator or jack is not required to be known. The operator only needs to know when the actuator or jack is fully extended or retracted.

Open loop applications use discrete inputs such as a LS8 limit switch to establish the end of travel limits.

- Example: Standard motor starter boxes 07990377-1 thru 07990377-44.

- Example: Standard actuator boxes 07991139 (DC) or 7990964 (AC)

Standard Motor Starters
Open Loop Positioning

Joyce motor starters provide a simple solution for basic control of a motorized jack, actuator, electric cylinder, or ComDrive.

- Designed exclusively for constant speed applications

- Suitable for single or multiple motor applications.

- Compatible with single and three phase induction motors.

- Provisions for end of travel limit switches are included in the design.

- Ideal for an application where a jack needs to travel at a constant speed between two travel limits.

Closed Loop Controls from Joyce

Closed loop positioning – Applications that require the exact position of the actuator or jack to be known at all times.

Closed loop systems require encoder or potentiometer feedback to provide the exact position.

- Closed loop positioning is always provided with our VSPS and synchronizing applications.
- A touchscreen is typically used in closed loop applications to display the position of the actuator or jack.

Variable Speed Positioning Controls
Closed Loop Positioning

Joyce VSPS systems are a step-up from the standard motor starter and offer more capabilities and features than standard motor starters. For example:

- Operator has the ability to control the motor speed by using a rotary potentiometer.

- Speed control is useful in applications where different speeds are required between the travel limits or travel directions.

- The VSPS allows the operator to program up to ten stopping positions.

- A six-inch color touchscreen is provided to control the motor, program, the stopping positions and, to view system status information.

Synchronized Control System

Closed Loop Positioning System

Joyce synchronized systems combine variable speed control along with closed loop positioning to maintain a specified tolerance between multiple jacks while the jacks are moving between the traveling limits. These are built to customer specifications.

- A six-inch color touchscreen is provided to control the motors, set the synchro tolerance, and view system status information.

- A synchronized system is ideal for an application where multiple jacks must travel together to prevent damage from occurring to a platform or structure due to a tolerance error between the jacks.

- 4 Jack Electronically Synchronized System Demo

Test Your Knowledge

A few practical example questions to help you remember what you just learned.

Select the Best Controls Option

Question 1:

A single jack system with a traveling distance of 10 feet is required. The system must have an adjustable travel rate between 5 to 10 in./min. The customer wants the jack to automatically stop when it reaches the 3 foot, the 8 foot, and the 10 foot position.

A. Standard motor starter

B. Variable Speed Positioning System (VSPS)

C. Synchronizing system

D. Custom control system

Select the Best Controls Option

Question 1:

A single jack system with a traveling distance of 10 feet is required. The system must have an adjustable travel rate between 5 to 10 in./min. The customer wants the jack to automatically stop when it reaches the 3 foot, the 8 foot, and the 10 foot position.

ANSWER: B.   Variable Speed Positioning System (VSPS)

The phrase "adjustable travel rate" implies this is a variable speed application. The customer is also requesting three stopping positions at 3ft, 8ft, and 10ft. This application describes a Joyce VSPS system.

Select the Best Controls Option

Question 2:

A customer requires a three jack system with a traveling distance of 7 feet. The jacks must maintain a 1/2 inch tolerance when extending or retracting to avoid alignment problems. The system must automatically correct itself if any jack exceeds the 1/2 inch tolerance requirements.

A. Standard motor starter

B. Variable Speed Positioning System (VSPS)

C. Synchronizing system

D. Custom control system

Select the Best Controls Option

Question 2:

A three jack system with a traveling distance of 7 feet is required. The jacks must maintain a 1/2 inch tolerance when extending or retracting to avoid alignment problems. The system must automatically correct itself if any jack exceeds the 1/2 inch tolerance requirements.

ANSWER: C.   Synchronizing system

The phrase "maintain a 1/2 inch tolerance" implies a synchronizing application. This is an example of a three jack synchronizing system. The tolerance of the jacks is 1/2 inch. Frequency drives are used to slow down or speed up the appropriate jack to maintain the 1/2 inch tolerance requirements. A potentiometer or encoder would provide the positional information for each jack. A touch-screen would be used to operate the system.

Select the Best Controls Option

Question 3:

A constant speed single motor system with two jacks shafted together is required. The jacks are attached to a rectangular frame that moves 15ft. The customer does not want the jacks to move unless the operator's hand is pressing the extend or retract button.

A. Standard motor starter

B. Variable Speed Positioning System (VSPS)

C. Synchronizing system

D. Custom control system

Select the Best Controls Option

Question 3:

A constant speed single motor system with two jacks shafted together is required. The jacks are attached to a rectangular frame that moves 15ft. The customer does not want the jacks to move unless the operator's hand is pressing the extend or retract button.

ANSWER: A. Standard motor starter

This application describes a standard Joyce motor starter with momentary push buttons. A LS7 or LS8 limit switch can be added to set the maximum travel at 15ft.

Select the Best Controls Option

Question 4:

Two jacks are needed to move a small platform up and down 20ft. The platform must automatically extend up 4 feet then stop every 30 minutes. This cycle repeats until the platform reaches 20 feet. A flashing beacon and an alarm bell will turn on when the platform reaches 20 feet. The operator will use a momentary push button to lower the platform back to starting position.

A.   Standard motor starter

B.   Variable Speed Positioning System (VSPS)

C.   Synchronizing system

D.   Custom control system

Select the Best Controls Option

Question 4:

Two jacks are needed to move a small platform up and down 20ft. The platform must automatically extend up 4 feet then stop every 30 minutes. This cycle repeats until the platform reaches 20 feet. A flashing beacon and an alarm bell will turn on when the platform reaches 20 feet. The operator will use a momentary pushbutton to lower the platform back to starting position.

ANSWER: D.   Custom control system

This example combines the features from several of our control systems. Closed loop positioning along with momentary control is required for this example. The alarm bell and flashing beacon are additional outputs to be controlled. The controls could be designed for a constant or variable speed application.   This would be a custom control system.

Joyce Builds System Controls

- Basic Motor Starters for single or multiple AC induction motors.

- Basic Actuator Controls for AC and DC Multipurpose Actuators.

- Controls for positioning systems with variable frequency drives and programmable positions.

- Controls for synchronizing systems.

- Custom controls to meet complex requirements.

Joyce Offers Comprehensive Support

- Customer Service Representatives can help specify motor controls based on constant speed horsepower and voltage requirements.

- Application Engineers are available to help specify controls for more complex systems.

- Consult with our Electrical Engineer when highly specialized systems are needed.

Joyce Controls Worksheet

- Controls Selection Guide Worksheet - your guide for defining system control requirements.

- Complete as much information as you can, and our Application Engineers will work with you on the details after it is submitted.

- You may contact us at any time. We will be glad to help you.

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Contact Joyce Today!

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