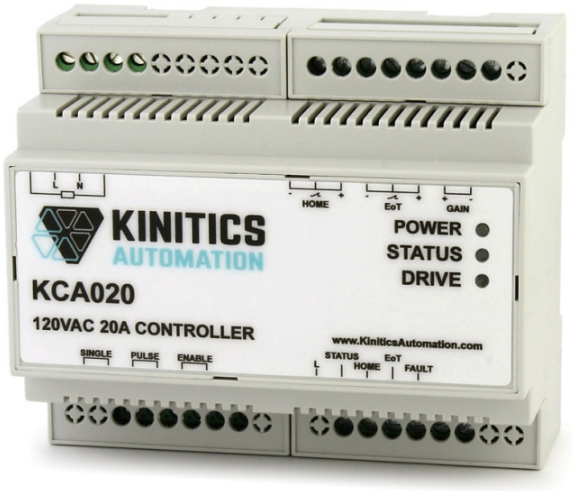
Kinitics AC Controller

KCA020

The Kinitics KCA020 AC Controller provides AC control for Kinitics KLA Linear Actuators and KPP Piston Pumps by interfacing easily with a PLC, control switches, relays, or standard I/O cards. The controller accepts single-phase, 120 VAC 60 Hz power and controls a maximum load of 2500 watts at a nominal 120 VAC. Discrete I/O and analog gain input allow for multiple control strategies that incorporate sensor feedback for position or force control with a KLA Linear Actuator or displacement, flow or pressure control with a KPP Piston Pump.

Features

- Single-phase 120 VAC 60 Hz input
- DIN rail or panel mounting
- Internal over-temperature protection
- Discrete I/O for simple or complex control
- Analog gain input allows for multiple control strategies
- Terminal block connections
- Built-in over-travel protection for Kinitics Linear Actuators



Applications

- Process automation
- Manufacturing
- Academia

Power Specifications

Input voltage	85 to 125 VAC
Input frequency	57 to 63 Hz
Maximum load	2500 W
Maximum output	20.7 A RMS[1]
Continuous rated output	5.0 A RMS[1]

1) See Figures 6 and 7.

Environmental and Safety

Operating temperature	0° to 40° C (32° to 104° F)
Storage temperature	-20° to 70° C (-4° to 158° F)
Humidity	5% to 95% non-condensing
Ingress protection rating	IP20

Electrical

Enable and Single discrete inputs (sink or source)	
Input voltage (on)	24 to 130 VAC @ 50 to 60 Hz or 24 to 48 VDC
Off-to-on response time	6 ms
On-to-off response time	6 ms
Input current, typ.	3.5 mA @ 120 VAC, 3.0 mA @ 24 VDC
Pulse discrete input (sink or source)*	
Input voltage (on)	70 to 130 VAC @ 50 to 60 Hz or 12 to 48 VDC
Off-to-On response time	25 µs
On-to-Off response time	6 ms (AC), 100 µs (DC)
* A 200 Hz, 12-48 VDC PWM signal can be used at the Pulse input	
Analog gain input	
Current range	4-20 mA
Maximum allowable input current	35 mA
Maximum reverse current	35 mA
Nominal input impedance	230 Ω
Response time	300 µs full scale
Home and EoT proximity switch inputs	
Rated operating voltage	12 VDC
Rated operating current	7.5 mA
Required switching output	PNP normally closed
Fault, Status, Home and EOT discrete outputs (source)	
Maximum off-state voltage	130 VAC
Maximum on-state current	400 mA
AC frequency	47 to 63 Hz
Off-to-On response time	1 ms
On-to-Off response time	<8.5 ms

Mechanical Dimensions and Panel Mounting

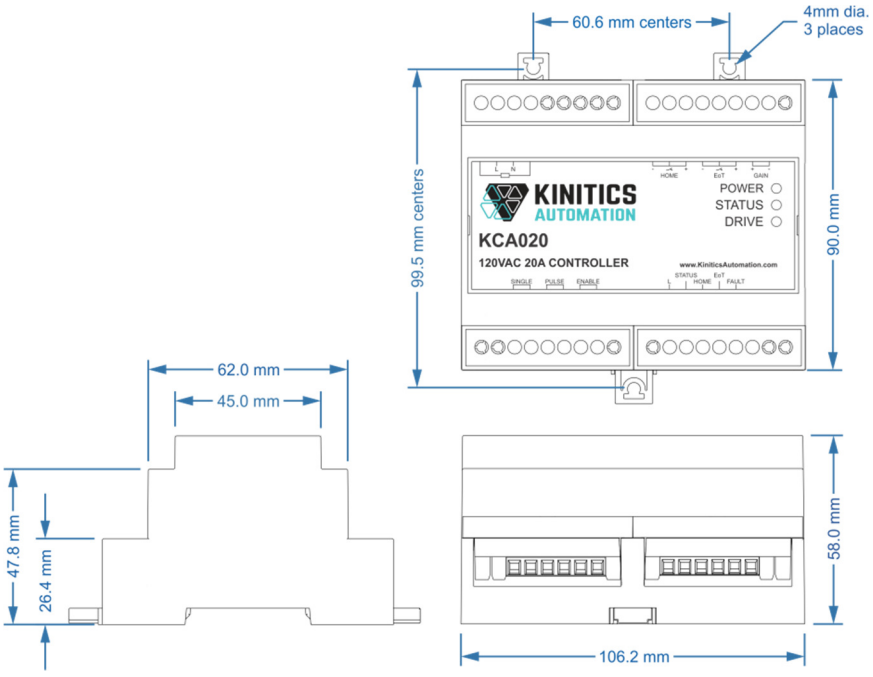


Figure 2 – KCA020 Mechanical Dimensions

Dimensions (W x H x D)	106 x 90 x 58 mm
Weight	240 grams
Mounting	Standard 35mm DIN rail, snap-mount; panel mount
Case material	Flame retardant UL94V-0 plastic

Connection diagram

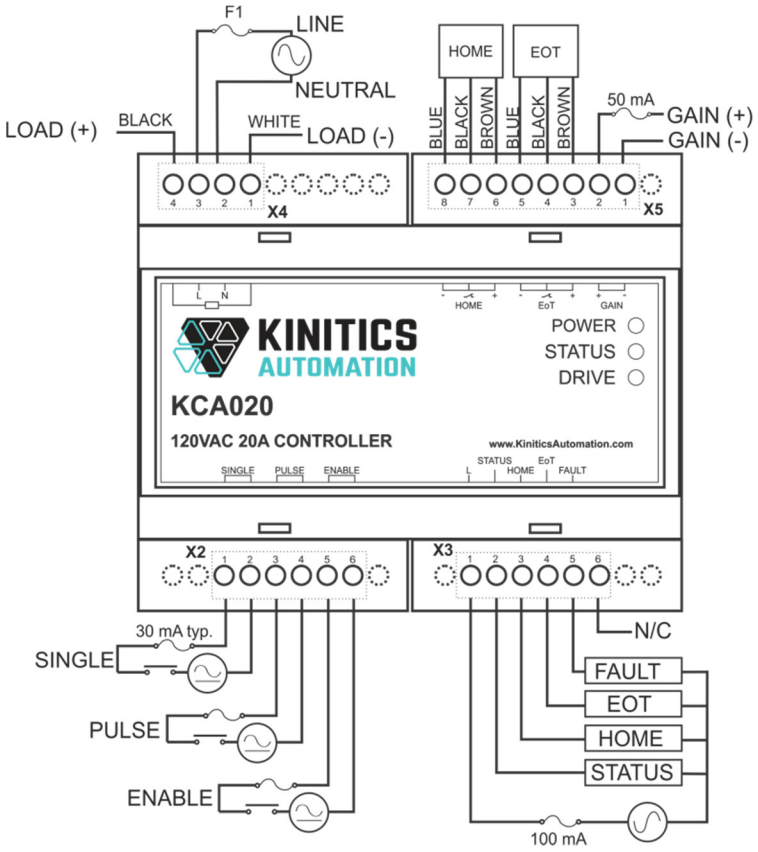


Figure 1 - KCA020 Connection Diagram

F1: Select fuse amperage based on the current draw of the actuator or pump used.

Electrical connections X4 (Power input and load)

Wire range	12-14 AWG
Stripping length	8 mm
Tightening torque	.5 ~ .6 N·m

X4-1	Load negative (white)
X4-2	Neutral (white)

X4-3	Line (black)
X4-4	Load positive (black)

Electrical connections X2, X3, X5 (discrete I/O, analog input and EOT/home switches)

Wire range	16-26 AWG
Stripping length	6 ~ 7 mm
Tightening torque max	.4 N·m

X2-1 & X2-2	Single discrete input
X2-3 & X2-4	Pulse discrete input
X2-5 & X2-6	Enable discrete input
X3-1	Discrete output common (Line)
X3-2	Status discrete output (sourcing)
X3-3	Home discrete output (sourcing)
X3-4	EoT discrete output(sourcing)
X3-5	Fault discrete output (sourcing)
X3-6	N/C (may be covered)

X5-1	Gain input 4-20 mA negative
X5-2	Gain input 4-20 mA positive
X5-3	EoT switch positive (brown)
X5-4	EoT switch signal (black)
X5-5	EoT switch ground (blue)
X5-6	Home switch positive (brown)
X5-7	Home switch signal (black)
X5-8	Home switch ground (blue)

Operation

The Kinitics KCA020 Controller interfaces Kinitics Piston Pumps or Linear Actuators with a power source and logic controls. The minimum connections and signals to operate an actuator in any mode are 120 VAC input power, load, the End of Travel (EoT) switch, the Enable discrete input, and either of the Single or Pulse discrete inputs.

The Eot switch signals the actuator has reached its end of travel position, and must be present and connected for the actuator to function. The Home switch signals the actuator is in the home position and is optional for functionality of the controller, but must be present when operating in pump mode.

LED Indicators:

Power: The controller is receiving AC power and is functioning.

Status: The controller is enabled via the Enable discrete input. If the actuator is driven beyond its duty cycle limits, the over-temperature protection circuit may engage and automatically disable the controller output; the Status light will extinguish even though the Enable input is active.

Drive: The controller is providing power to the load.

Discrete inputs:

These input circuits interface with standard PLC outputs for device control and will accommodate AC or DC signals.

Enable: Driving of the actuator is conditional on the presence of a signal at the Enable discrete input.

Single: When a positive transition signal is received at the Single discrete input, the Linear Actuator or Piston Pump will stroke from its present position to its End of Travel position limit, triggered by the EoT switch input. The actuator will complete the stroke regardless of the Single input signal being released. When the actuator or pump reaches its End of Travel position, there is a delay of approximately 150 ms before it can be activated again. The actuator or pump does not have to return to the home position to initiate a subsequent stroke, but the Single input must be released and re-applied. To cancel the Single stroke operation at any time before the actuator reaches its End of Travel position, the Enable input can be released.

Pulse (momentary operation): When a signal is received at the Pulse discrete input, the actuator or pump will stroke provided the signal is maintained. The actuator will stroke from its present position to its End of Travel position limit, triggered by the EoT switch. The controller will cease driving the actuator or pump, even though the Pulse input may remain active.

Pulse (pump mode operation): Maintaining the Pulse signal will result in a pumping action. The actuator or pump will stroke from its present position to its End of Travel position limit, triggered by the EoT switch, and the controller will cease driving the actuator or pump. Once the actuator or pump relaxes to its home position, as indicated by the Home switch, the controller will automatically initiate another stroke to its End of Travel position. The controller will continue in this manner provided the Pulse signal is maintained. At any time during the return stroke, the Pulse input may be released and re-triggered to drive the actuator or pump before it reaches the Home position.

Pulse (PWM operation): The Pulse input may also be used for complex control of the actuator or pump, via a 200 Hz, 12-48 VDC PWM signal as shown in Figure 3. PWM operation cannot be combined with cycling operation; the

controller with not cycle properly if a PWM signal is used at the Pulse input. Use the Analog Gain input to control gain for this operation.

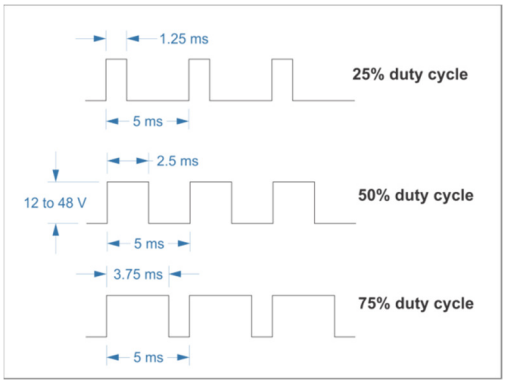


Figure 3 – Pulse Input PWM Signal Characteristics for gain control.

Analog Gain Input:

This 4-20 mA input can be used for complex control of the actuator or pump by driving the Linear Actuator or Piston Pump at less than full power; see Figures 4 and 5. If signal current is below 2 mA or not connected, the duty cycle will default to 100% operation.

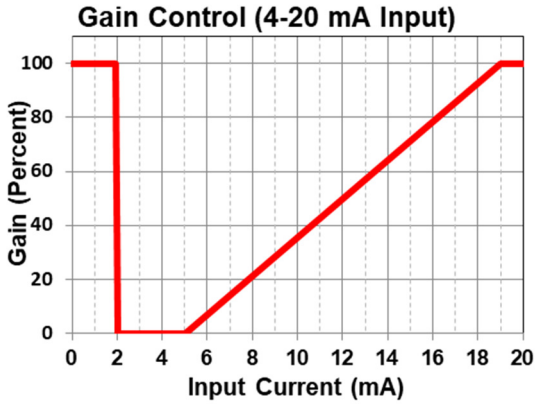


Figure 4 – Gain Input: Gain vs. Input Current

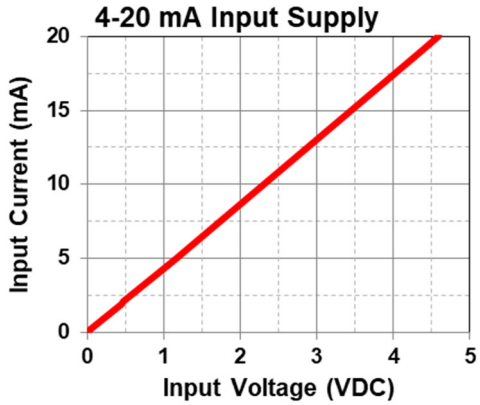


Figure 5 – Gain Input: Input Current vs. Voltage

Discrete Outputs:

Status: Indicates that a signal is present at the Enable input, and the controller is not in an over-temperature condition. The Status LED will illuminate to indicate that Status is active.

EoT: Signals the actuator is at its End of Travel position.

Home: Signals the actuator is in the Home position. The optional Home switch must be installed for this output to function; if there is no Home switch installed, the Home output defaults to an on state.

Fault: Signals an error condition has caused AC voltage to be present at the load when the controller is not actively driving the load, or that there is no AC voltage at the load when the controller is actively driving the load. Power to the controller should be immediately removed when a fault occurs and not reapplied until the fault has been identified and corrected.

Behaviour Curves:

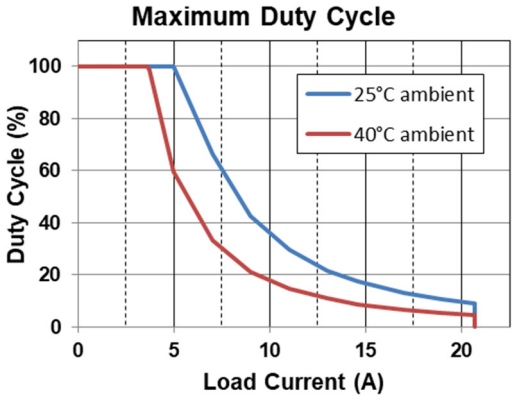


Figure 6 – Maximum Duty Cycle vs. Load

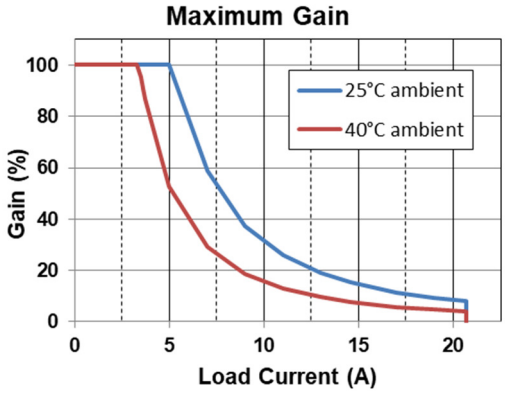


Figure 7 – Maximum Gain vs. Load

Glossary of Terms:

Maximum Gain:
Maximum gain refers to the power delivered to the Piston Pump or Linear Actuator for continuous duty applications, as a percentage of full power output, and is determined by the Gain Control input or a PWM signal used at the Pulse input.

Maximum Duty Cycle:
Maximum duty cycle is the ratio of on time versus total time cycle time when operated in repetitive cycling applications. It is not applicable to continuous duty applications. Actuator temperature, ambient temperature, coolant type, applied voltage, operating return position, and power gain will affect the maximum possible duty cycle.

$$Maximum\ Duty\ Cycle = \frac{Time_{Response}}{Time_{Response} + Time_{cooling}}$$

Response Time:
The response time is the time required for an actuator at 20°C [68°F] to reach its rated stroke when its Operating Voltage is applied to it. Changes in actuator temperature, operating voltage, and power gain will affect the actuators response time.

Document Version

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