

Proportional Valve Controllers—Set-up Instructions

SETUP INSTRUCTIONS

Preparation

Make sure that the controller/amplifier is connected to an operating proportional valve.

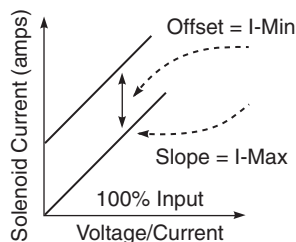
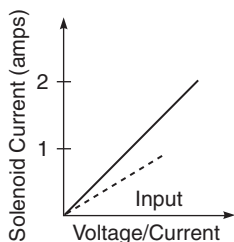
For the coil mount version, use a small screwdriver to loosen the mounting screw and remove the transparent cover. Use a jeweler's size screwdriver (slotted 1.5) to make adjustments to the trim pots.

For the metal box style, use a screwdriver to remove the metal cover. Use a small screwdriver to make adjustments to the trim pots.

Interaction Between Maximum Current (I-Max.) and Minimum Current (I-Min.) Adjustments

- Adjusting the maximum current (I-Max.) does not affect the minimum current (I-Min.) setting.
- Adjusting the minimum current (I-Min.) will shift the maximum current (I-Max.) setting.

- Factory Setting: I-Max. = 100%; I-Min. = 0%
- - - Adjustment to I-Max. = 50%; I-Min. remains at 0%



Setting the Minimum Current (I-Min.)

The minimum setting can be used to take into account the mechanical valve deadband and provide desired offsets from zero to allow full control within the functional range of the specific valve.

1. **Set the minimum current before setting the maximum current.**
2. Apply appropriate minimum input (4mA, 0V or potentiometer, 0V or 0A).
3. The factory setting for the I-Min. trim pot is zero, fully counterclockwise (CCW).
4. If the desired minimum current is greater than zero, adjust the trim pot clockwise (CW) until the desired current is achieved.

Setting the Maximum Current (I-Max.)

1. Apply appropriate maximum control (20mA, 5V or control pot at maximum, 10V)
2. Factory setting for the I-Max. trim pot is 100% or fully clockwise (CW).
3. Turn the trim pot counterclockwise (CCW) to adjust the current downwards to the desired maximum.

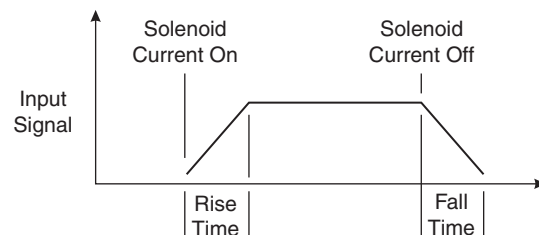
The maximum current setting is adjusted to match the customer's working pressure or flow range to the full scale signal input range. This provides maximum control for a specific application.

Setting the Ramp Times

1. The factory setting for ramp times is the minimum (0.01 seconds) or fully CCW.
2. **If the ramp time settings are not needed, leave the settings at the minimum value.** (The "Economy" version controller has no ramps.)
3. To change the ramp times, adjust the trim pot CW to increase the time.
4. Rising (ramp up) and falling (ramp down) times are independent.

Ramp times are application dependent. They limit the rate of change or how fast the operation happens.

Note: If the input signal is not applied long enough for the ramp time that has been set, the desired solenoid current will not be reached.



Setting the Dither Amplitude

1. The factory setting for dither amplitude is 0% (CCW).
2. To adjust dither amplitude, turn the trim pot clockwise until small changes in the input signal register similar changes in current output.
3. **Choose the smallest effective dither amplitude.** (The "Economy" version controller has no dither amplitude adjustment.)

Dither amplitude is adjustable from 0 to 10% of rated maximum current. Dither amplitude and frequency are dependent on the specific valve. The effects of static friction on the operation of the solenoid are reduced by the application of a small AC current. The hysteresis and repeatability of the valve are improved by this practice. The optimum dither amplitude is attained when small input signal changes register similar changes in current output (pressure or flow through the valve).

Setting the Dither Frequency

1. The factory setting for dither frequency is the minimum or 0% (CCW).
2. To adjust dither frequency, turn the trim pot clockwise until the desired frequency is set.
3. For the dither rating of a particular valve, refer to the HydraForce catalog.

Start Up Procedures

1. Make sure that all components, such as the cover, compression washer, O-ring and base gasket, are correctly in place (necessary for IP65 protection).
2. Attach the proportional valve amplifier to the load.
3. Switch on the power supply to the controller/amplifier and apply a control signal.

Proportional Valve Controllers—Glossary

ELECTRONIC TERMS & DEFINITIONS

1. **Ohms Law:** $\text{Current} = \text{Voltage} \div \text{Resistance}$ ($I = E \div R$)
2. **Current:** The flow of electrons in a conductor. It is normally measured in amperes (A) or milli-amperes (mA). Calculations and electrical diagrams sometimes use the abbreviation “I” to symbolize current.
3. **Voltage:** The potential for current flow in an electrical circuit. It is measured in volts, and is sometimes abbreviated (V or E). Generally, higher voltage will induce higher current.
4. **Resistance:** Anything that causes an opposition to the flow of electrical current. It is used to control the amount of voltage and/or amperage in a circuit. Everything in a circuit, including wire, causes some resistance. Resistance is measured in units called Ohms and is sometimes abbreviated “R” or “ Ω ” (Greek letter omega).
5. **Hysteresis:** The measurement of the difference in output when current in a device is increasing vs. when current is decreasing. It is normally expressed as a percentage of the total change in input.
6. **Proportional Controller/Amplifier:** A device that converts a low-power input signal into an output signal that is capable of operating the valve. This output signal can be modified to include PWM, ramping, or dither.
7. **PWM (Pulse Width Modulation):** An efficient technique to control current. A PWM-switched signal pulses on and off to achieve the current flow required. PWM frequency can be low (100 to 400 Hz) or high (over 5000 Hz). High frequency produces a more constant ripple-free amperage output.
8. **Ramping:** The ability to control the rate of change of the output of an amplifier or controller.
9. **Dither (Current Ripple):** A rapid, small movement of the valve spool around the desired position. Dither keeps the spool moving to avoid “stiction” and to help average-out hysteresis.
10. **I-Min. and I-Max.:** The minimum and maximum control current induced into a proportional valve coil.
11. **No Load Power:** The power consumed by the amplifier or proportional controller when there is no output to the valve coil.
12. **Maximum Control Current:** The point where increasing current input no longer results in an increase in valve flow.
13. **Threshold Current:** The amount of current required to reach the point where increasing current input causes flow from the valve to begin to increase (normally closed valve) or decrease (normally open valve).
14. **Compensator:** A hydraulic device that maintains a fixed pressure drop across a fixed or variable orifice by restricting or bypassing flow.