



Analog Signals – Current vs. Voltage

Comparison of analog signals commonly used for position and process measurement

Introduction

Industrial sensors used for continuous position or process measurement commonly provide output signals in the form of either an analog voltage or an analog current. Both are relatively simple interfaces, but there are things to consider when choosing between the two.

Variations

Current



Industrial sensors with current output are typically available with output ranges of:

- 0 to 20 mA
 - Can be converted to 0-10 VDC by using a 500 Ω resistor in parallel at the controller input
- 4 to 20 mA
 - Provides inherent error detection capability; absence of signal (e.g. 0 mA) indicates error condition
 - Can be converted to 1-5 VDC by using a 250 Ω resistor in parallel at the controller input

VS

Voltage



Industrial sensors with voltage output are typically available with output ranges of:

- 0 to 10 VDC (most common)
- -10 to +10 VDC
- -5 to +5 VDC
- 0 to 5 VDC
- 1 to 5 VDC

Strengths

- Allows use of longer cable runs without signal loss
- More immune to electrical noise
- 4 to 20 mA signals provide error detection capability
- Easily converted to voltage using a simple resistor

- Simple to troubleshoot
- Very common interface, compatible with most industrial controllers
- Sometimes slightly less expensive compared to current output

Considerations

- Most, but not all, industrial controllers are capable of accepting current signals
- Requires low impedance input
- Requires shielded cable

- Compared to current signals, voltage signals are more susceptible to interference from electrical noise
- To avoid signal loss, cable length must be limited
- Requires high impedance input
- Requires shielded cable