About Analog Current

(4-20 mA)

The Servo Cylinder's motion controller is fully closed loop, but many industrial processes and systems require direct position feedback to close the loop on their processes or to control a larger system. For these cases, Servo Cylinder models are available with multiple output protocols including an analog current output feature with a configurable data source. This can be used to output an analog current signal (4-20 mA) proportional to position, force, velocity, and several other diagnostic features.

About this Guide

This guide is meant to provide a quick reference for using the 4-20 mA output feature. If you are just getting started with the Servo Cylinder, please reference the Servo Cylinder Manual or applicable quick start guide.

Getting Started

You will need a Servo Cylinder with a -P- controller that is setup in serial or 4-20 mA mode (opmode 1 or 2)

⚠️ WARNING: The power supply used to power the analog current output loop MUST be isolated from any other voltages used by the actuator. If the bus voltage (the voltage used to power the actuator) or a non-isolated voltage is used to power the analog current loop, the actuator WILL be damaged. Read more below.

Controller:	"P" – Industrial Controller
Modes:	None, used only for Analog Current Output and feedback
Ratings:	For Loop Voltage: 8 VDC to 36 VDC
Ground:	See below

Servo Cylinders fitted with the "P" – Industrial Controller have the ability to provide an isolated 4-20 mA current feedback for a wide variety of data sources (see xOutSrc table below). To function, an isolated power supply must be used to provide a loop voltage. If the Analog Current receiver has an integrated isolated loop voltage then an external supply is not needed.
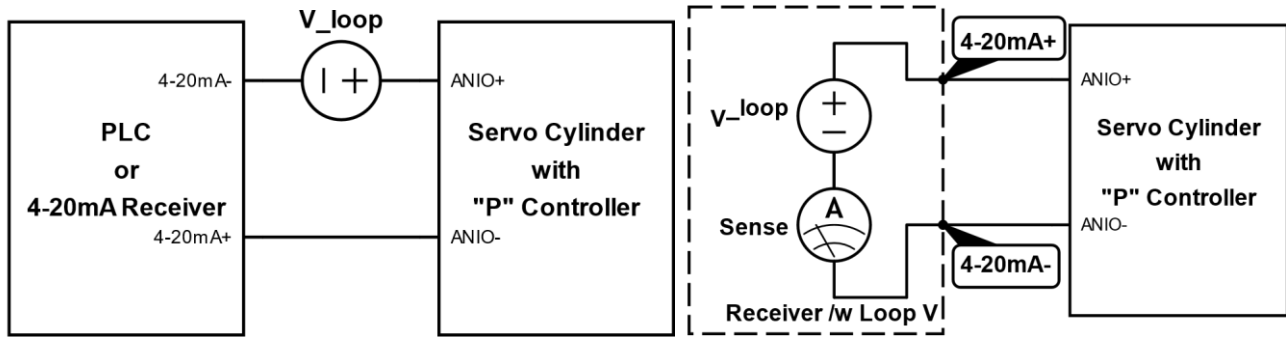
Figure 1: Schematics of Analog Current Output circuits. In the left schematic, an external isolated loop power supply is present. In the right schematic, a 4-20 mA analog current receiver is present with an integrated loop voltage supply.

Connector Pin Reference

The pins required to use the 4-20 mA output vary depending upon the model Servo Cylinder you are using:

- **A1** Model uses **pin 1** (ANIO-) and **pin 2** (ANIO+) for the 4-20mA output
- **A2** Model uses **pin J** (ANIO-) and **pin L** (ANIO+) for the 4-20mA output
- **AM** Model uses **pin 9** (ANIO-) and **pin 11** (ANIO+) for the 4-20mA output
- **AU** Model uses **pin 9** and **pin 11** (ANIO+) for the 4-20mA output

Reference UM711293 (Servo Cylinder Manual) for detailed pinouts for all models.

Configuration variables for Analog Current

(4-20 mA) Output

xOutSrc – Analog Current Output Data Source

Controllers:	"P" – Industrial Controller
Variable Type:	Integer
Valid Range:	0 to 6
Set Command:	MS

Defines which data source the analog current output is providing. For xOutSrc = 6, the analog current output is directly controlled using serial commands, which is helpful for calibration, development, and debugging.

Setting	Data Source	Setting	Data Source
0	Position	**4**	Temperature
1	Torque	**5**	Humidity
2	Velocity	**6**	CLI command (CO)
3	Bus Voltage		

Table 1: Data sources for proportional 4-20mA Output

xOutMin and xOutMax – Data Range for Analog Current Position Feedback (Min and Max Respectively)

Controllers:	"P" – Industrial Controller
Variable Type:	Integer
Valid Range:	See Description
Default:	xOutMin = spMin and xOutMax = spMax
Set Command:	MN and MX

These settings define the range of sensor counts which the Servo Cylinder will output a proportional analog current signal between cOutMin and cOutMax. The count unit used by xOutMin and xOutMax is the count unit of the data source selected with xOutSrc. For example, if outputting position (xOutSrc=0), xOutMin and xOutMax are in position counts. Alternatively, if outputting torque (xOutSrc=1), xOutMin and xOutMax are in torque counts.

The values for xOutMin and xOutMax must be within the possible data range of that particular data type (e.g. when in position output (xOutSrc=0), spMin ≤ xOutMin < xOutMax ≤ spMax).

cOutMin and cOutMax – Current range for Analog Current Position Feedback (Min and Max Respectively)

Controllers:	"P" – Industrial Controller
Variable Type:	Integer
Valid Range:	0 to 65535
Default:	cOutMin = 1064, cOutMax = 61975
Set Command:	YN and YX

Defines the analog current output range between which the output will vary. Default values correspond to approximately 4 mA to approximately 20 mA.

revCout – Inversion of Analog Current Output Signal Response

Controllers:	"P" – Industrial Controller
Variable Type:	Integer
Valid Range:	0 or 1
Default:	0
Set Command:	YR

Inverts the response of the analog current output with respect to the selected data source.