



RS232 • Ethernet • Wireless 802.11B Ethernet • USB • 4-20mA • RS485 • Fiber Optic

4-20mA Option

OVERVIEW

4-20mA has been available as a communications protocol for data collection, systems monitoring and control since the 1960's. 4-20mA is still widely used today with remote indicators, PLC's and legacy equipment. Although dated, 4-20mA offers ease of use and affordability that many other communications protocols cannot.

4-20mA BACKGROUND

The simplicity of 4-20mA communications starts with a current loop circuit that provides the supply voltage and measuring current with only two wires. A base current signal of 4mA provides an indication of a loss of signal due to a poor connection or a broken wire that results in a 0mA current signal. In addition, a current signal is immune to any electrical interference and can be transmitted over long distances.

Continuing the simplicity of 4-20mA, is the measuring current output in relation to weight on the scale. A 4mA signal is equal to 0% of full capacity and a 20mA signal relates to 100% of capacity. For instance, a scale calibrated to a capacity of 100 lb will have the following signal output, based upon the displayed weight, as seen in the table below.

Displayed Weight	4-20mA Output Signal
0.00 lb	4mA
50.00 lb	12mA
100.00 lb	20mA
Gross Overload Error	24mA
Negative Weight or Gross Underload Error	3.5mA

Many third parties supply 4-20mA instrumentation that can typically be programmed to read in weight units or as a percentage of total capacity. Be aware that most instrumentation available is based upon 8-bit technology, which will reduce Doran's 12-bit accuracy. If maximum accuracy is required, be sure to purchase 4-20mA instrumentation that operates on 12-bit or higher technology.

To be compatible with all third party instrumentation, the Doran 4-20mA option has two settings, active or passive output. When set to active, the Doran 4-20mA option provides the supply voltage and controls the measuring current. Setting the 4-20mA option to passive requires an external supply voltage or instrumentation that provides the supply voltage.

Although no calibration is necessary to configure the Doran 4-20mA option, minor adjustments to the measurement current output can be made to compensate for any irregularities in third party instrumentation. In addition, Doran's 4-20mA option provides a test mode where a 4mA and 20mA signal can be generated in order to calibrate the third party indicator.

APPLICATION DESCRIPTION

PLC System Control

A manufacturing plant wants to station three 500 lb capacity scales on the production floor and transmit all weighments to a PLC, which will control a filling process. Although RS-232 is available in each scale, three 4-20mA inputs is a much more affordable option for the PLC. Furthermore, the PLC programmer finds it much easier to setup and configure inputs from a 4-20mA signal.

An empty 55 gallon drum is set on each scale platform and a remote PLC based start switch is pressed to begin the filling process for each scale. To begin the filling process, the PLC activates a relay to open a valve for each scale. The PLC monitors the three 4-20mA input levels and deactivates the valve control relays to stop the filling process at the proper weight limit.

AVAILABILITY AND ORDERING INSTRUCTIONS

Doran is able to provide the following option for 4-20mA Analog Output, this option can be found in the Option Section of all Excel Series Scales:

EXOPT100: 4-20mA Analog Output, 12-bit accuracy. Includes: Internal 4-20mA interface board and 12 feet of cable.