Technical Bulletin: 34

Data Industrial®
A BadgerMeter, Inc. Company

September 2002

Model 500 Analog Transmitter
(For Use With Data Industrial Flow Sensors)

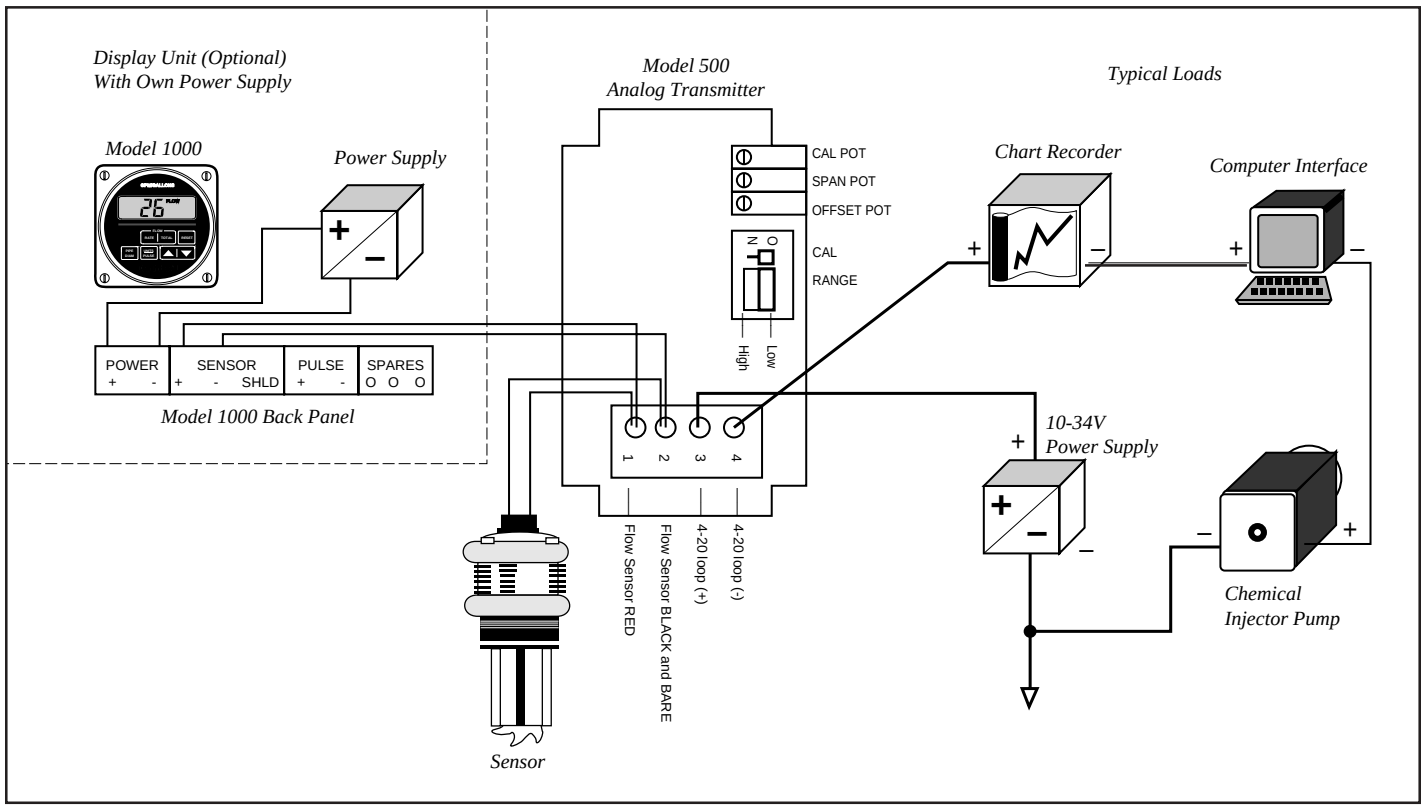
PRODUCTS
200 ✓
4000
310
320
600
800
1400
1500
2100
2200
2300
HTT
WSS

A Signal Converter
The Model 500 is a two-wire loop powered 4-20ma frequency-to-current converter designed to operate with Data Industrial's complete line of impeller type flow sensors. In converts digital data from a sensor into an analog format compatible with computers, meters and other analog-based applications.

No Independent Power Supply Required
The Model 500 modulates loop current proportional to the flow rate. Unlike Type 4 instruments, which require an additional power supply, the Model 500 draws its power directly from the system loop and provides power to both itself and the Data Industrial sensor in the system. Power is supplied from the voltage drop that results from the changes in loop current across the Model 500.

Teamed With A Display Unit
The Model 500 can be used in the same system with a Data Industrial display unit such as the Model 1000. If your display unit shares a sensor with the Model 500, the Model 1000 should have an independent power supply outside the system loop, because the Model 500 has a non-isolated output. See below.

Application Illustration



Design Standard

Model 500 design complies with ISA standard S50.1 as a Type 2, Class U, Non-isolated transmitter.

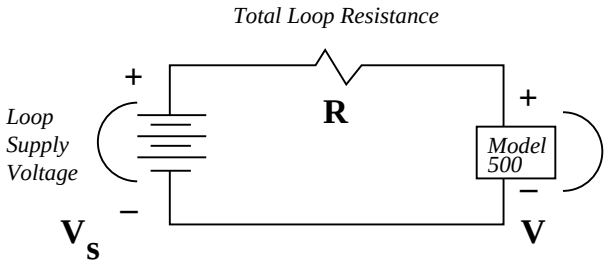
Computing Loop Resistance and Power Supply

The voltage across the Model 500 input terminal, V must be maintained between 10 volts and 34 volts, taking into account these variables:

Loop power supply voltage, **V,**
Total loop resistance (including loop devices, wiring, etc.), **R**
Loop current, **I**

According to the following equations: $VI = Vs - IL \times RL$

$V = V_S - (I \times R)$ or $V_S = V + (I \times R)$



You can solve for the necessary limits of your power supply once you have figured the loop resistance with the above equation. Or, if you already have a power supply with a given maximum limit, you can solve for the maximum loop resistance of your system.

Example 1: Determining Power Supply Voltage Limits

V_S max = 34 + (.004 X R)
V_S min = 10 + (.020 X R)

Assume the total loop resistance of the system illustrated on the other side is 200 ohms, including instruments and wires. You could calculate for the limits of your power supply as follows:

Given: Loop Resistance = 200 Ohms
V_S max = 34 + [.004A X 200 Ohms] = <34.8 volts
V_S min = 10 + (.020A X 200 Ohms] = >14.0 volts

Example 2: Determining Maximum Loop Resistance

R_{MAX} = [VS - 10]/.020A

If you have a given loop power supply voltage, you can figure out the maximum resistance the system can handle. Assume the voltage of the power supply for the system illustrated on the other side is 24 volts.

Given: Loop Supply Voltage = 24 volts
R_{MAX} = (24 - 10)/.020A= > 700 Ohms
R_{MIN} = 0 Ohms (Since V_S is less than the maximum rated voltage of the Model 500, there is no minimum limit on the loop resistance.)