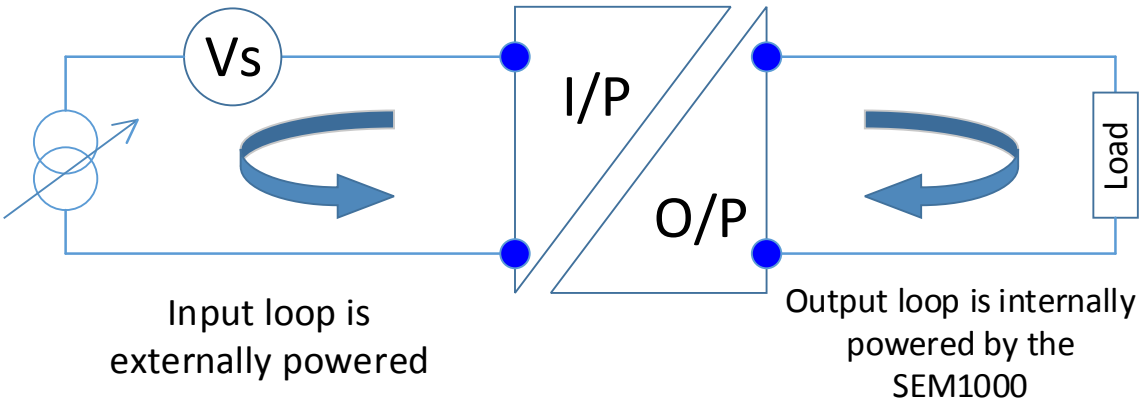
Simple loop isolation using a SEM1000 loop powered isolator

Basic block diagram for SEM1000



The most common uses for the SEM1000

- To provide access to or to duplicate an existing loop without introducing any ground loop effects
- To allow connection between:-
  - A sensor with a powered output loop
  - A sensor on a PSU powered loop with a loop powered indicator or loop monitoring equipment that requires a powered input signal.
- To isolate and reduce noise being fed into the input of the monitoring equipment or load.

Most analogue (4 to 20) mA loops are grounded at a single point to reduce noise. Problems can occur when there is more than one grounding point because earth potentials will not be the same, and currents will flow between earth points causing errors or noisy signals.

If the (4 to 20) mA signal is connected to multiple instruments which have non isolated inputs this can also cause problems. A simple way to remove ground loops is to use signal isolators potentially on each input.

Sometimes poor isolation or low impedance to earth through sensors can give an undesired path to earth and cause errors. Isolating the temperature transmitter from the monitoring/control equipment such as a PLC or display can help remove this type of problem. This can occur with any type of sensor where some of the loop signal current can find a path to earth:

The terminology used with control loops can become confusing so the following definitions have been used.

(4 to 20) mA Control Loop: A 2 wire (4 to 20) mA signal which is connected between a single sensor and monitoring/control equipment (Display, Trip, PLC, etc.) of which there can be several on the loop circuit.
The loop may be powered by the sensor, or one item of the monitoring equipment, or by a separate power supply unit.

Sensor outputs

Internally powered (Active) output: A sensor that is supplying the power to drive the loop. This type of loop output cannot be connected to an externally powered loop without use of a signal isolator such as a unit from the SEM1000 series.

Externally or loop powered (Passive) output: A sensor that requires that the loop it is connected onto be powering the sensor.

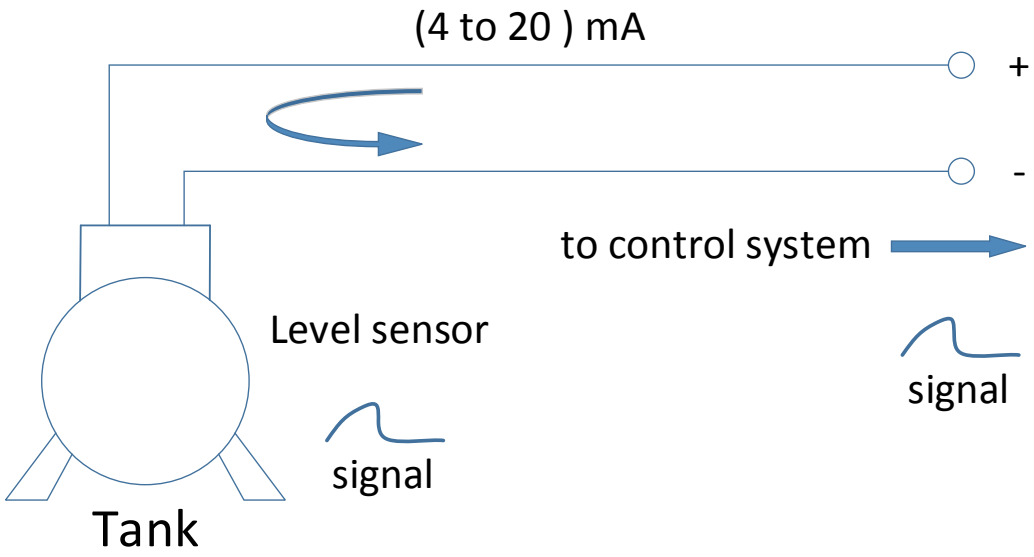
Monitoring/control equipment inputs

Internally powered (Active) input: Equipment that is supplying the power to drive the loop it is monitoring from its input pins. This type of loop input cannot be connected to an external power supply.

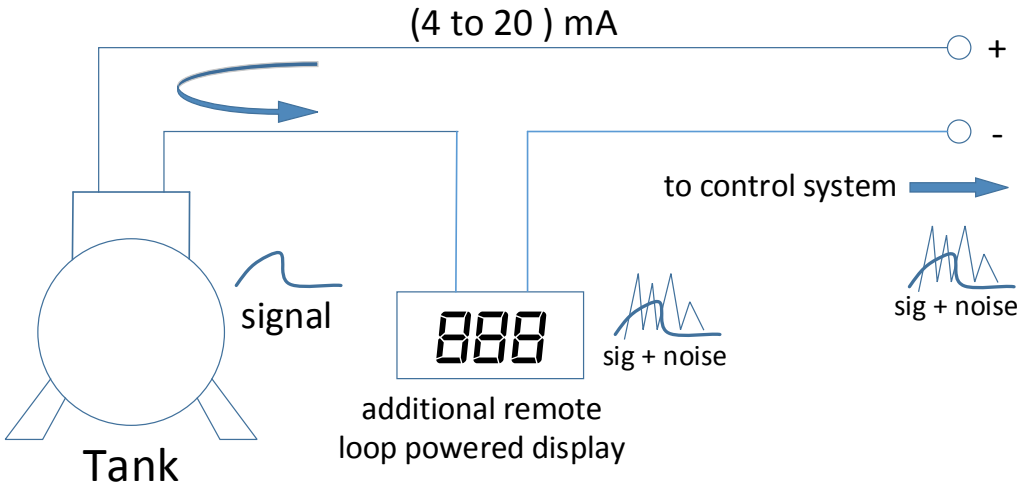
Externally or loop powered (Passive) input: Equipment where the loop being monitored must be powered externally from the input pins.

Using a SEM1000 to isolate an additional instrument on a control loop.

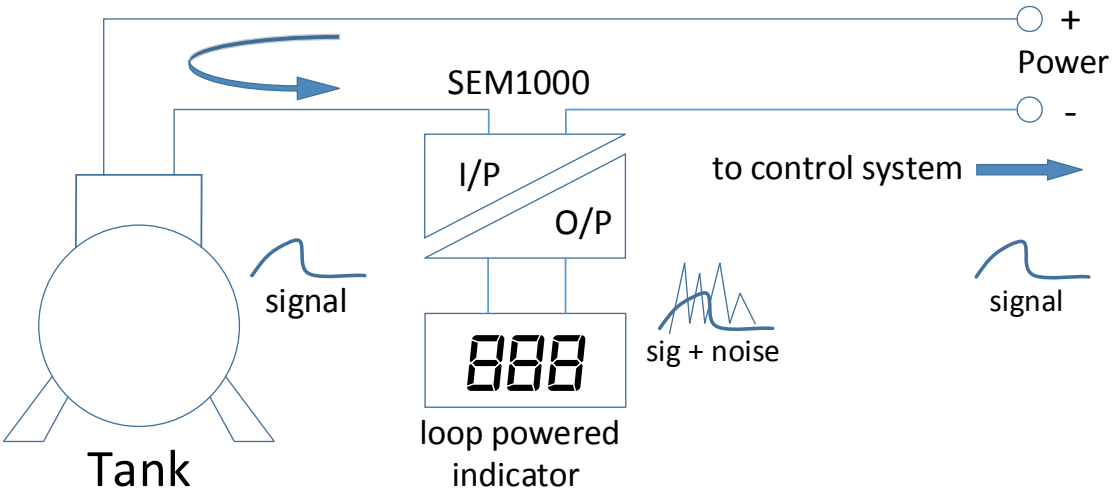
Existing circuit



Additional device “loop powered display” introducing noise to the system



With SEM1000 loop isolator

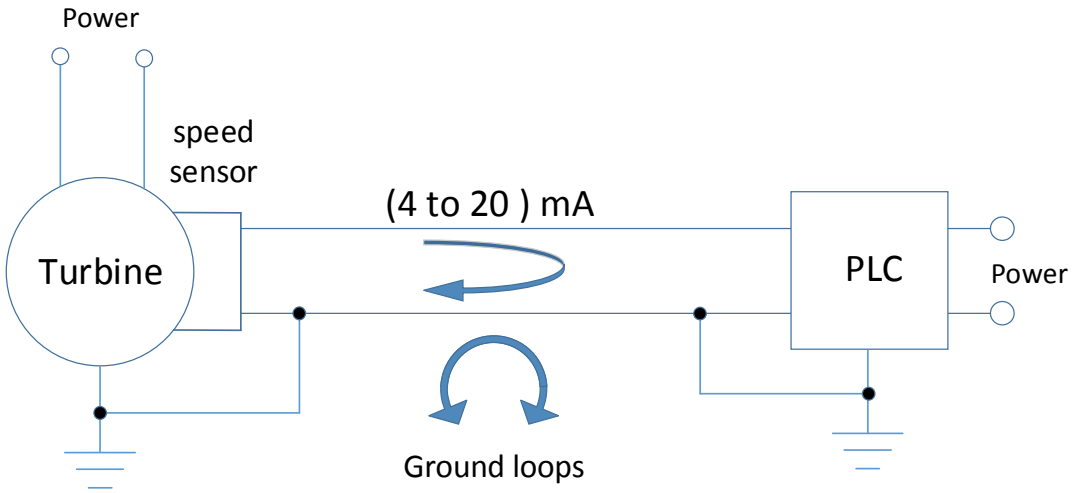


In this example the SEM1000 is used because the wiring to an additional remote display was picking up noise and this was transferring on to the loop. The SEM1000 will block noise from being transferred to the control system.

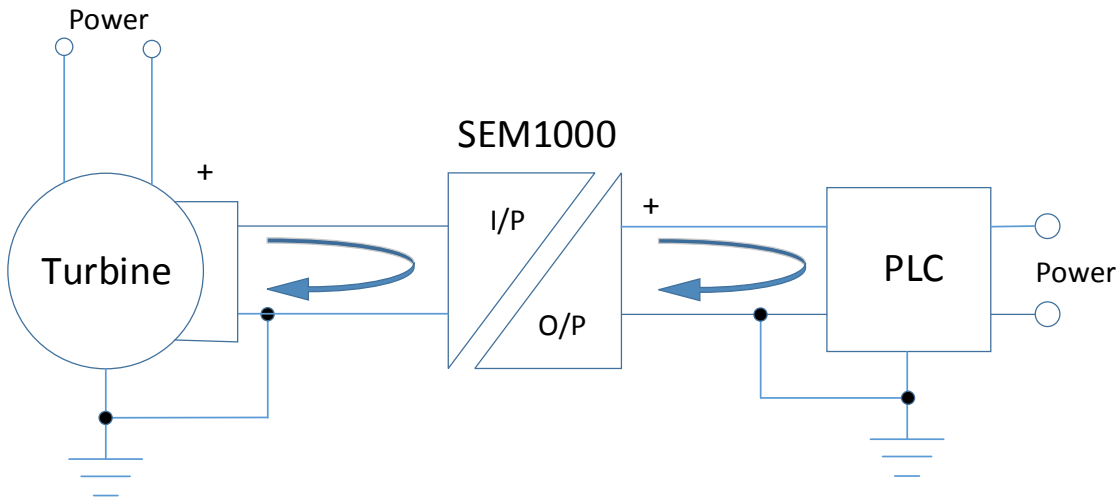
Note: The output load voltage drop (in this case the voltage dropped across the loop powered display) is added to the input drop; refer to the data sheet for details.

Removing a ground loop between a sensor with active output and control/monitoring equipment with passive inputs using a SEM1000.

Circuit



With SEM1000



In this example a SEM1000 unit is connected between a powered sensor and a control unit that requires an externally powered loop, to remove ground loops

Alternatives

Status Instruments have a large range of powered, and loop powered, isolators and signal conditioners to meet a variety of conditions. Please see our website for the full list or call and ask for assistance with choosing the correct instrument for your application.