READING HART DATA INTO NON-HART SYSTEMS

Many HART products are able to perform more than one measurement or output function (e.g., make multiple process measurements, calculate process information, and provide positioner feedback information). All of this information can be easily accessed digitally. However, existing controllers or interface equipment may not have the ability to read digital HART data. Products are available that can read HART digital signals and convert them to analog (4-20mA) and alarm trip (contact closure) information, which enables any traditional analog control system to take full advantage of the benefits of HART-communicating devices.

The HART loop monitor continuously communicates with any HART-capable device and provides multiple analog outputs (4-20mA) and multiple alarm trip (contact closure) outputs based on the information received (Fig 15). For example, smart HART multivariable mass flow transmitters sense three process variables (pressure, temperature, and differential pressure or raw flow). Using these, they perform an internal calculation to derive mass flow. The mass flow information is transmitted as a 4-20mA signal to the control system. However, there is no way to continuously monitor the non-primary variables used to make the calculation.

Installed transparently across the 4-20mA instrument loop, the HART loop monitor reads the HART digital data that is continuously being transmitted on the smart transmitter's analog loop wires, and converts it to 4-20mA signals that can be readily accepted by a DCS or PLC. This allows continuous tracking of a multivariable transmitter's second, third and fourth variables. HART loop monitors can also provide alarm trip (contact closure) information to warn of high and/or low process conditions based on user-set trip points. Diagnostic alarms can be set to warn of problems with a smart HART transmitter using the Field Device Status data that is available in HART's digital information.
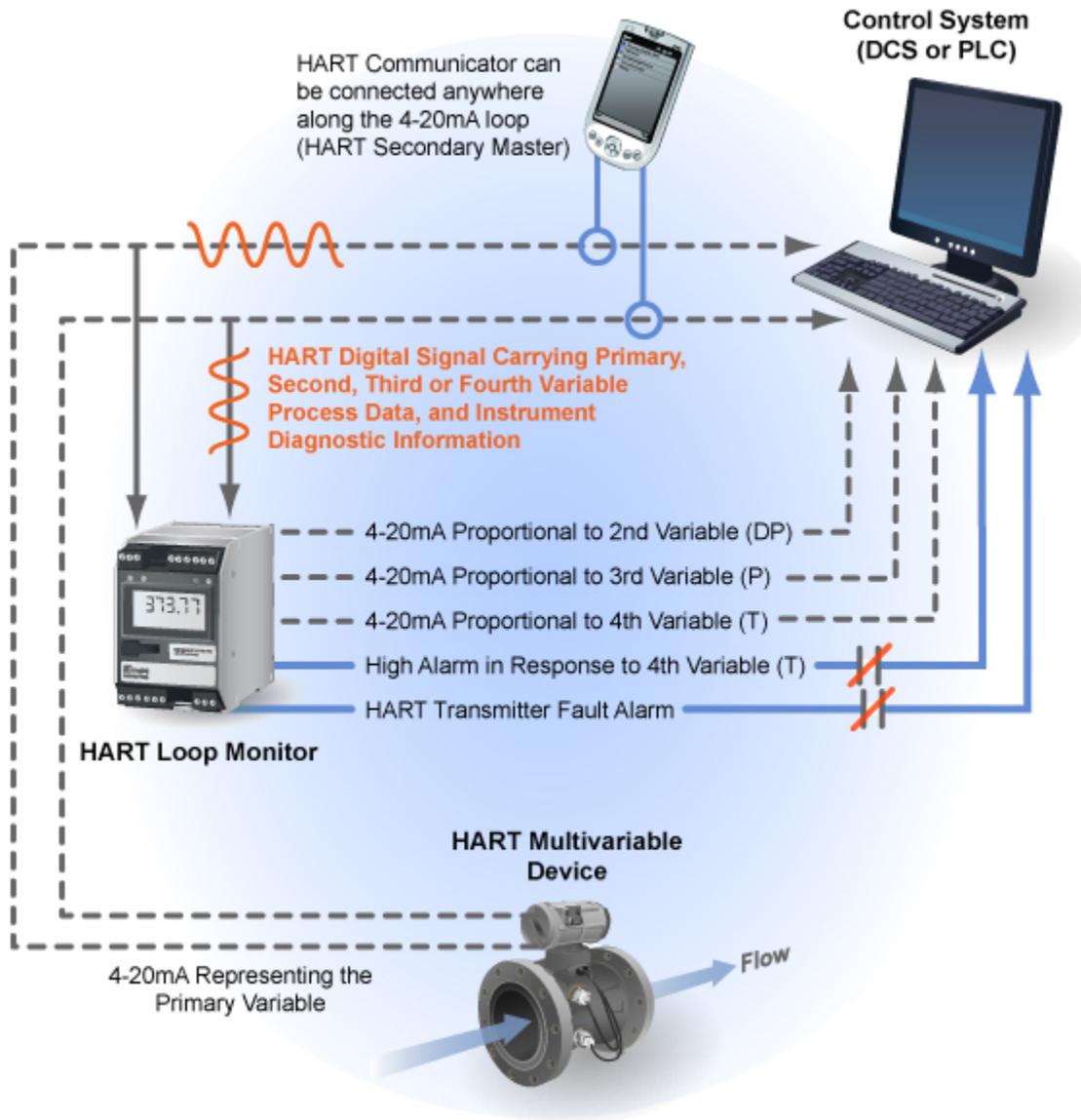
HART Communicator can be connected anywhere along the 4-20mA loop (HART Secondary Master)

Control System (DCS or PLC)

HART Digital Signal Carrying Primary, Second, Third or Fourth Variable Process Data, and Instrument Diagnostic Information

4-20mA Proportional to 2nd Variable (DP)
4-20mA Proportional to 3rd Variable (P)
4-20mA Proportional to 4th Variable (T)
High Alarm in Response to 4th Variable (T)
HART Transmitter Fault Alarm

HART Loop Monitor

HART Multivariable Device

Flow

4-20mA Representing the Primary Variable

Figure 15. Monitoring Multivariable Transmitters

HART loop monitors can also extract data from smart HART valve positioners and damper operators (Fig 16). Their 4-20mA analog outputs can be used to keep track of important parameters such as valve stem position, actuator pressure or temperature. Alarm (relay) outputs can also be set to alert of a smart valve condition such as valve position (open/closed), low actuator pressure, and positioner temperature (high/low).

For on-line testing of Emergency Shutdown valves, the HART loop monitor can be used to verify that the valve is operational without the disruption of completely closing the valve (which is the traditional way to verify ESD valve operation) by means of partial valve stroke testing.

For example, a Logic Solver (DCS or PLC) is used to apply a 90% (18.4mA) signal to the valve. When the valve reaches the 90% set point, the relay in the HART loop monitor will trip to verify that the valve has reached 90%. The test signal is then returned to 100% value by the Logic Solver, and the valve is reopened. A second HART loop monitor relay trip is set at 100% (full open) travel to ensure that the valve did reopen completely after the test. This procedure verifies that the valve did reach 90%, proving that the valve is not stuck. Because the valve was immediately reopened, the test has not impeded the process flow long enough to cause significant process disruption.

The HART loop monitor's other analog outputs can be used to provide status information for other important valve parameters such as valve travel and valve output pressure.
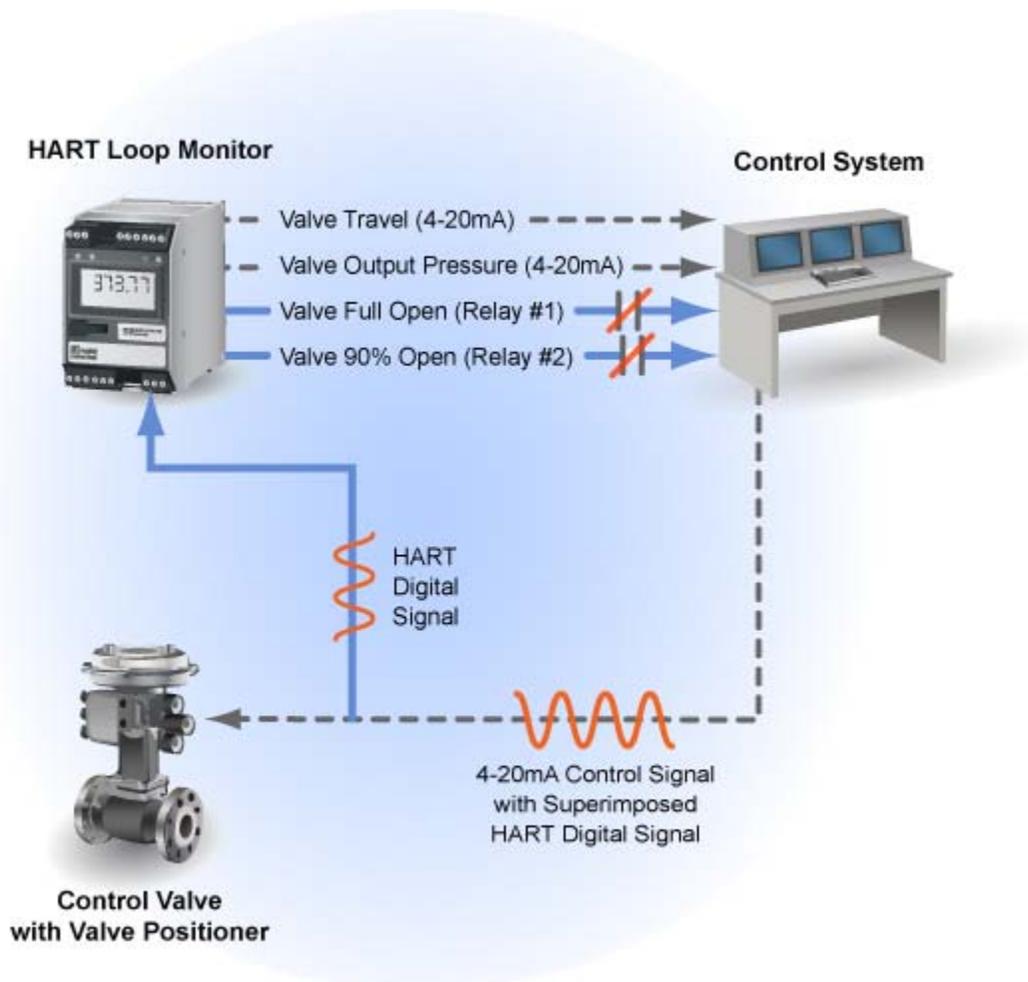

Figure 16. Monitoring Partial Valve Stroke Testing