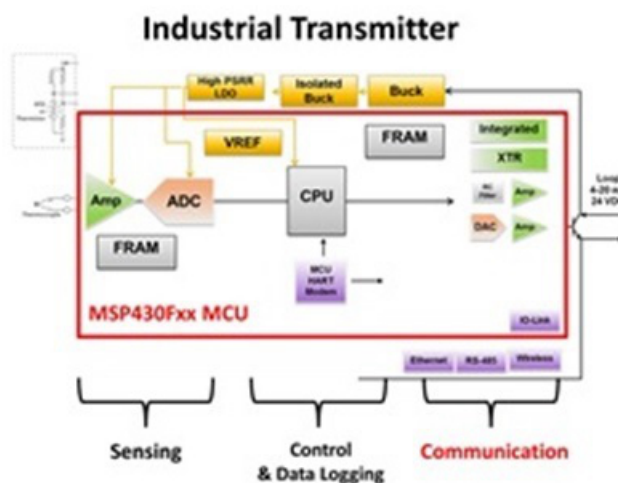


Three Protocols for Industrial Communication

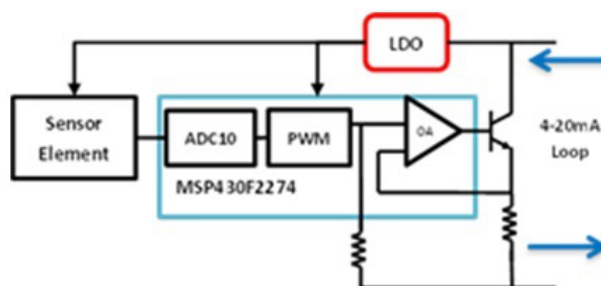


William Cooper

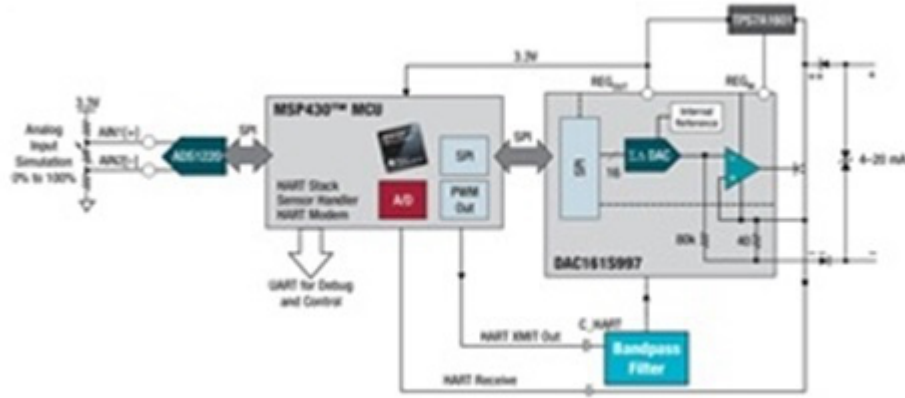
While sensors can provide a wealth of data, they provide little value without communications. In [industrial sensing applications](#), this communication most commonly takes place over wires in the form of 4-20mA current loops, HART and IO-Link. TI's ultra-low-power [MSP microcontrollers](#) play the important role of control and data logging in sensor transmitter applications, especially in loop-powered applications where low-power is a key differentiator.



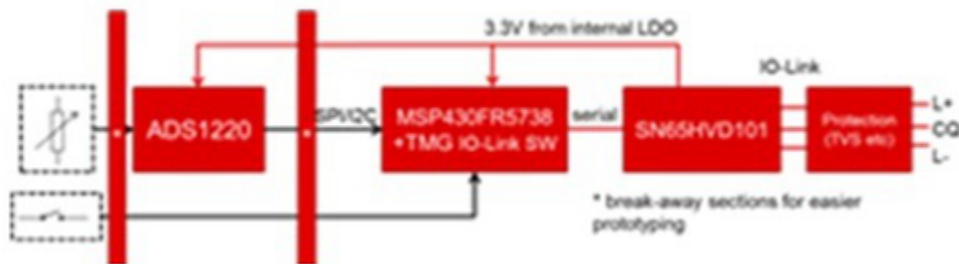
The most popular communication interface for factory automation is the **4-20 mA current loop**. Current loops are ideal for data transmission because of their inherent insensitivity to electrical noise. In a current loop, transmitters can either be powered through the communication loop via a 2-wire implementation or through a separate power line not associated directly with the 4-20mA current loop, typically classified as a 3-wire or 4-wire solution. [The single-chip MSP microcontroller solution](#) features on-chip analog such as operational-amplifiers (op-amps) that can be configured to carry out signal conditioning of the sensor signal and drive the 4-20mA communication loop.



The **HART communications protocol** is a digital industrial automation protocol. It's most notable advantage is that it can communicate over legacy 4-20 mA analog instrumentation wiring. Thus, the HART protocol is gaining popularity since it has made a good transition protocol for users who are comfortable using the legacy 4-20 mA signals, but want to implement a "smart" protocol. MSP MCUs directly support the PHY layer in the HART communication solution, which removes the need for an external HART modem IC.



Another communication protocol for industrial applications is **IO-Link**, which is a simple and cheap point-to-point protocol that reuses the cables and connectors from an installed base of industrial sensors and actuators, leveraging existing wired infrastructure. The **IO-Link MSP solution** serves as a full turnkey IO-link sensor evaluation and fast prototyping platform. The design has an MSP FRAM microcontroller enabling easy, fast and secure sensor configuration updates and reduces overall power. It also supports sensing break-away and hence, can be removed to connect any analog sensor.



Beyond communications, the mixed-signal nature of MSP microcontrollers enable other uses for industrial automation. Read our latest [whitepaper](#) to learn more!

Additional Resources

- Read other blogs on [2-wire transmitters](#).

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