

# HART Communication

G. Drowpathy

*Student, Dept. of Electronics and Communication Engineering, Marian Engineering College, Trivandrum, India*

**Abstract:** Highway Addressable Remote Transducer (HART) is a global standard for sending and receiving digital information across analog wires between smart field devices and control or monitoring systems.

HART provides bi-directional communication protocol that provides data access between intelligent field instruments and host systems. It uses 1200 baud Frequency Shift Keying (FSK) on the Bell 202 standard to superimpose digital information on the conventional 4-20 mA analog signal. HART technology is easy to use and very reliable when used for commissioning and calibration of smart devices. HART technology is a master slave protocol. The HART Protocol can be used in various modes such as point-to-point or multi drop for communication.

**Keywords:** Theory of operation, Applications.

## 1. Introduction

HART Communication Protocol is widely used in the industry as the standard communication protocol for digital devices using analog 4-20mA current form. On the market today appear more and more devices used to convert measurement protocols. Which is the main cause communication feature allowing two-way communication between the user and the sensors will contribute significantly improved information management systems for technological processes in the plant. At the same time reduce the cost of installation, commissioning, operation and maintenance of equipment, thereby increasing competition for manufacturers to use this equipment.

## 2. Theory of Operation

The HART Protocol makes use of the Bell 202 Frequency Shift Keying (FSK) standard to superimpose digital communication signals at a low level on top of the 4-20mA. This enables two-way field communication to take place and makes it possible for additional information beyond just the normal process variable to be communicated to/from a smart field instrument. The HART Protocol communicates at 1200 bps without interrupting the 4-20mA signal and allows a host application (master) to get two or more digital updates per second from a smart field device. As the digital FSK signal is phase continuous, there is no interference with the 4-20mA signal. HART technology is a master/slave protocol, which means that a smart field (slave) device only speaks when spoken to by a master. The HART Protocol can be used in various modes such as point-to-point or multidrop for communicating information to/from smart field instruments

and central controller monitoring systems. HART Communication occurs between two HART- enabled devices, typically a smart field device and a control or monitoring system. Communication occurs using standard instrumentation grade wire and using standard wiring and termination practices.

The HART Protocol provides two simultaneous communication channels: the 4-20mA analog signal and a digital signal. The 4-20mA signal communicates the primary measured value (in the case of a field instrument) using the 4-20mA current loop - the fastest and most reliable industry standard. Additional device information is communicated using a digital signal that is superimposed on the analog signal. The digital signal contains information from the device including device status, diagnostics, additional measured or calculated values, etc. Together, the two communication channels provide a low-cost and very robust complete field communication solution that is easy to use and configure. The HART Protocol provides for up to two masters (primary and secondary). This allows secondary masters such as handheld communicators to be used without interfering with communications to/from the primary master, i.e. control/monitoring.

## 3. Applications

Inventory Management application include accurate measurements for inventory management are essential in all industries. Cost saving application include wastewater treatment plant replaced stand-alone flow meters and chart recorder outstations that required daily visits for totalization with a HART system.



Fig. 1. HART system

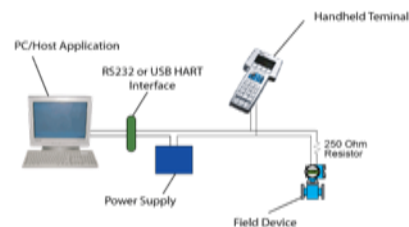


Fig. 2. HART connection

#### **4. Conclusion**

HART today is the workhorse of the industry. In this light, the most recent additions such as discrete devices and burst mode enhancements continue to be released for both wired and wireless technologies. Innovation will continue, and both wired and wireless devices will be there to serve the users. It provides a unique communication solution that is backward compatible with the installed base of instrumentation in use today. It gives additional information in multi variable devices. Ensures accuracy of system data and detect any deviation between device and system.

#### **References**

- [1] I. Muller, C. E. Pereira, J. C. Netto, E. E. Fabris, R. Allgayer, "Development of a Wireless HART compatible field device", Proc. IEEE International Instrumentation and Measurement Technology Conference (I2MTC) 2010, pp. 1430-1434
- [2] A. Willig, K. Matheus, A. Wolisz, "Wireless technology in industrial networks", Proc. IEEE, vol. 93, no. 6, pp. 1130-1151, June 2005.
- [3] M. Jonsson, K. Kunert, "Towards reliable wireless industrial communication with real-time guarantees", IEEE Trans. Industrial Informatics, vol. 5, no. 4, pp. 429-442, Nov. 2009.
- [4] X. Shen, Z. Wang, Y. Sun, "Wireless sensor networks for industrial applications", Proc. Intelligent Control and Automation 2004 (WCICA), pp. 3636-3640.