

### 15.3.1. What is HART®?¹

Introduced was in 1989, this protocol has proven successful in many industrial applications and enables bidirectional communication even in hazardous environments. **HART®** Communication (**H**ighway **A**ddressable **R**emote **T**ransducer) is a bidirectional industrial field communication protocol used to communicate between intelligent field instruments and host systems.



Figure 15.3.1.-1: HART-Logo

The HART protocol is an open communication protocol which interfaces the master device with the field device and can be implemented by any manufacturer and freely employed by the user. The required technical support is provided by the **HART Communication Foundation (HCF)**. HART® is a registered trademark of HART Communication Foundation.

HART is the global standard for smart process instrumentation and the majority of smart field devices installed in plants worldwide are HART-enabled. The HART protocol provides many possibilities even for installations that are equipped with the conventional 4 to 20 mA technique. HART communication is often used for such simple point-to-point connections. Nevertheless, many more connection variants are possible.

The HART protocol makes use of the Bell 202 **F**requency **S**hift **K**eying (**FSK**) standard to superimpose digital communication signals at a low level on top of the 4 to 20 mA:

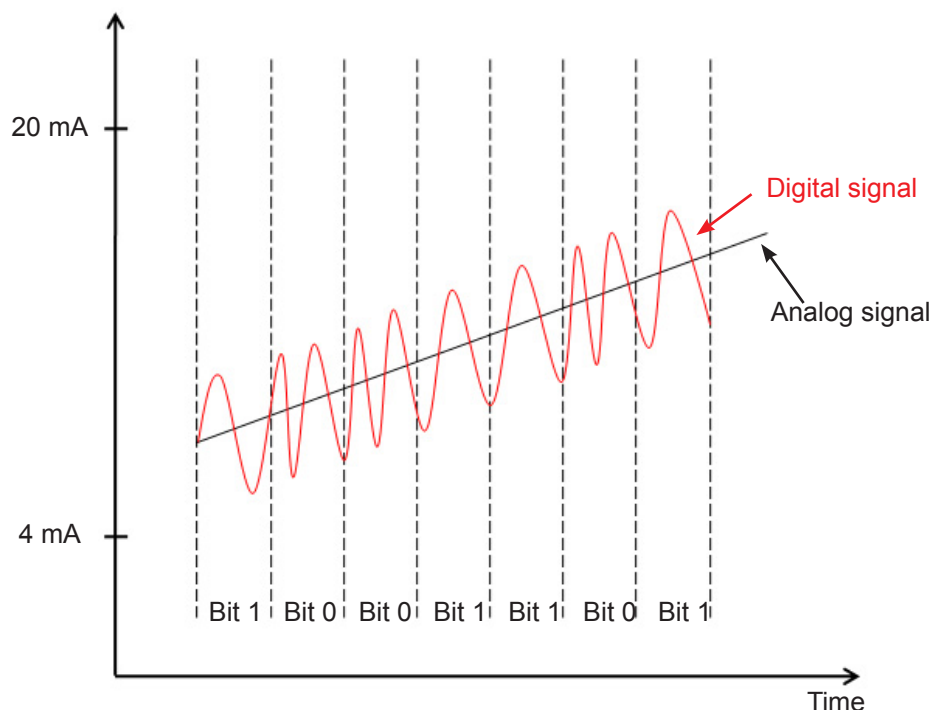


Figure 15.3.1.-2: Norm signal 4 to 20 mA with an on modulated digital signal

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 to 20 mA signal and allows a host application (master) to get two or more digital updates per second from a field device. As the digital FSK signal is phase

¹ HART Communications, Technical Information L 452 EN, SAMSON AG

continuous, there is no interference with the 4 to 20 mA signal.

HART is a master/slave protocol which means that a field (slave) device only speaks when spoken to by a master. The HART protocol can be used in various modes for communicating information to/from smart field instruments and central control or monitoring systems. HART devices communicate their data over the transmission lines (the line length can be up to 3 km) of the 4 to 20 mA system. This enables parameterized the field devices to be and started up in a flexible manner or to read measured and stored data records.

All these tasks require field devices based on microprocessor technology. These devices frequently called smart devices.

HART 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 system.



Figure 15.3.1.-3: HART® communication with two masters

There are several reasons to have a host communicate with a field instrument. These include:

- Device Configuration or re-configuration
- Device Diagnostics
- Device Troubleshooting
- Reading the values of additional measurements provided by the device
- Device Health and Status
- And much more!

A host system can be a Distributed Control System, programmable logic controller (PLC), Asset Management System, Safety System or a handheld device.

There are many benefits that can be realized when the intelligent information in HART-enabled devices is fully used. This information provides benefits in all phases of the Plant Life Cycle including the; Planning and Engineering phase, Installation and Commissioning, Operations and Maintenance, and Asset Productivity Improvement phase.

**Key benefits of this unique open standard communication technology are:**

- 4-20 mA compatibility with simultaneous digital information available
- Easy to use and understand
- Low risk - highly accurate and robust
- Cost-effective implementation for both users and suppliers
- Available in a wide variety of device types
- Supported by most industry device and systems suppliers
- Fully interoperable and reliable