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WirelessHART vs. ISA100.11a -- What's the Difference?

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Technology advancements in measurement instruments and final control elements provide greater process insight, reduce engineering costs and contribute to improving the overall operational performance of the plant. These instruments are often collectively referred to as smart devices. Getting this technology to the field has often been hampered by the high costs of installation as well as other factors. To address these needs what has emerged is a whole new line of devices using wireless technology. Although some of these devices contain the same technology as their wired counterparts, newer devices are emerging with innovative low-powered sensors and mobile sensors. The most prominent wireless technology to-date uses IEEE 802.15.4-compatible DSSS radios and operates in the 2.4GHz ISM radio band (IEEE 802.15.4 supports multiple bands). Two standards using the IEEE 802.15.4 radio technology are IEC62591-1 (WirelessHART) and ANSI/ ISA100.11a-2011. The international standard, WirelessHART, and the U.S. standard, ISA100.11a, both provide full descriptions of the communication stacks. Both specifications also use similar graph routing, source routing, security and centralized network management functions. Although both

standards contain many similarities, they also contain differences.

WirelessHART is based on the HART communication protocol and user layer. The HART application layer has been in existence since the late 80s. The 7.0 release of the HART protocol included WirelessHART along with enhancements for unsolicited data transfers, event notifications, block mode transfers and advanced diagnostics. WirelessHART design criteria included integrated security (always on), high availability, centralized network management and support for upward and downward interoperability with previous and future releases of the HART protocol. In addition to traditional measurements, WirelessHART also targets rotating equipment such as kiln dryers, environmental health and safety applications, such as safety showers, condition monitoring and flexible manufacturing in which a portion of the plant can be reconfigured for specific products. The latest release of the HART protocol includes a new specification for discrete devices. New devices such as the Rosemount 702 discrete transmitter and the Fisher 4300 on/off valve implement this standard.

ISA100.11a was developed through the International Society of Automation (ISA). ISA is a U.S.- based, non-profit organization made up of about 20,000 automation professionals. ISA100.11a is intended to be part of a family of standards designed to support a wide range of wireless industrial plant needs, including process automation, factory automation and RFID. Key design criteria for ISA100.11a include flexibility, support for multiple applications, high reliability and integrated security. Security includes specifications for both synchronous protocols such as AES 128 and asynchronous protocols such as elliptic key technology. ISA100.11a is based on open standards such

as IPv6 and UDP. ISA100.11a defines the protocol stack, system management and security functions for use over low-power, low-rate wireless networks (currently IEEE 802.15.4). ISA100.11a does not specify a process automation protocol application layer or an interface to an existing protocol.

Architecturally the standards have many differences. Whereas WirelessHART extends HART by introducing device types, ISA100.11a introduces the concept of roles and allows these roles to be applied in various combinations. ISA100.11a includes backbone routers for bridging subnets vs. WirelessHART which uses Access Points. Backbone routers limit the throughput into and out of a single subnet to the throughput of one radio. Backbone routers can be used in parallel to create a very large wireless network. Since addressing is based on IPv6 there is really no practical address limitation. In contrast, WirelessHART Access Points can be used in parallel to create a mesh of thousands of devices. A single WirelessHART network is limited by address space to about 30,000 devices. In both ISA100.11a and WirelessHART DCSs can connect too many gateways.

Other differences include support for fragmentation and reassembly at the network layer (ISA100.11a) vs WirelessHART's support at the application layer; configurable time slots (ISA100.11a) vs. WirelessHART, which only specifies a 10-ms time slot; configurable channel- hopping mechanisms (ISA100.11a) vs. WirelessHART, which specifies only one channel-hopping mechanism; and options to enable/disable security settings within ISA100.11a vs. WirelessHART, which dictates that security must always be on. Devices in ISA100.11a do not have to support routing vs. WirelessHART devices, which must support routing.

WirelessHART (IEC 62591) has been in the field for more than four years. There are currently over 100,000 devices and over 8000 networks installed. WirelessHART has been an international standard (IEC 62591-1) since March 2010. ISA100.11a became an ANSI/US standard in 2011 and is well on its way to becoming international standard IEC 62734.