# Universal • Smart • Easy

IO-Link wireless

One of the main reasons for success of IO-Link is the easy wiring of intelligent, complex sensors and actuators with a simple, standardized 3-wire-sensorcable. In the future, even this simple wiring of the communication line in the IO-Link system can be omitted, because IO-Link is now wireless.

Cable reduction in industrial automation systems to reduce installation effort or to achieve safe and secure data transmission at critical points like slip rings is an important topic for machine builders and end users since years.

The challenge

To achieve a performance like in wired sensor-/ actuator systems also in wireless applications, different requirements have to be considered.
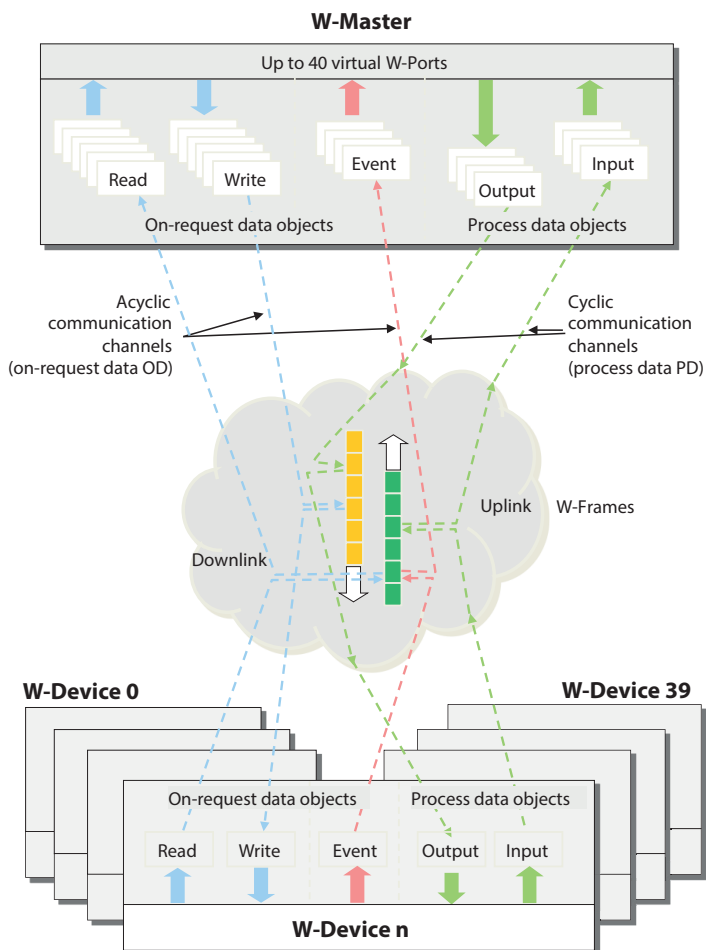
A cycle time below 10 ms for updating the IO-data is required. The requirements in regards of reliability are as high or even higher as in wired applications. More than 30 devices shall be able to communicate via one radio channel with one master. The open 2,4 GHz band shall be used for communication. Co-existence with other wireless systems on this frequency band is a prerequisite. Within one RF-area up to 3 masters shall be able to communicate with up to 120 devices at the same time.
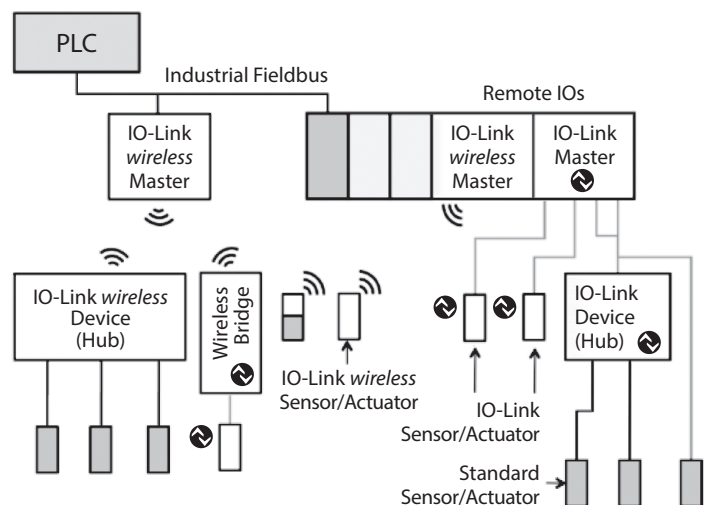
IO-Link Wireless characteristics:

- Cyclic data (Process Data) and acyclic data (On Request Data)
- Compatible with existing IO-Link specification
- Up to 5 radio channels per master
- Up to 8 devices per channel → 40 Wireless devices per master
- 3 master parallel in one zone
- Up to 120 devices in one area
- 2, 4 GHz ISM band RF Transceiver
- Cycle time < 5 ms
- Transmission power: ≤ 10 dBm (10 mW) EIRP
- Dilation:
  20 m within one master area, 10 m if more than one zone is used

Communication principle IO-Link Wireless

W-Master

Up to 40 virtual W-Ports

Read | Write | Event | Output | Input

On-request data objects | Process data objects

Acyclic communication channels (on-request data OD)

Cyclic communication channels (process data PD)

Uplink | W-Frames

Downlink

W-Device 0 ... **W-Device 39**

On-request data objects | Process data objects

Read | Write | Event | Output | Input

W-Device n

IO-Link Wireless characteristics:

- Pairing-Service:
  Pair devices with the appropriate master
- Scan-Service:
  Add "un-paired" devices to the system
- No speed limit for moving devices within one zone
- Controlled roaming of devices between different masters
- Frequency-Hopping to switch to free, unused frequency bands
- Bit-Error-Probability of 10^{-9}
- Blacklisting mechanism to ensure the co-existence with other wireless systems

Use cases for the IO-Link Wireless technology can be found in different applications. Topic is on one hand the general reduction of wiring and cabling, on the other hand the chance to reduce cabling in harsh environment to reduce the number of possible errors. Also for components which are difficult to access in the application, a wireless technology could simplify the installation dramatically.
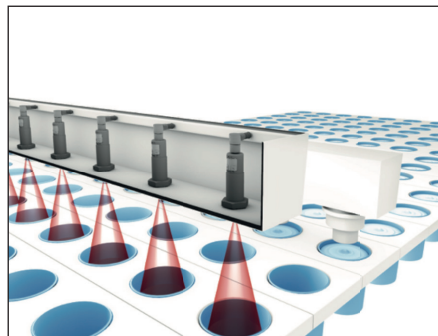
Application examples

Robot arm:
Hard strain of cables

The cables in a robot are stressed because of the permanent movement. Wireless solutions to reduce the cabling can help to reduce down times.

Transport belt:
Reduction of cabling

In sensor bridges to check the transported products, a lot of sensors are used. IO-Link Wireless can help to reduce the cabling of these sensors.

Hygienc area:
Reduction of contamination areas

In hygienic areas any kind of contamination has to be avoided. IO-Link Wireless supports these activities with reducing cables.

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