Reliable factory automation
Wireless Automation

The right decision for the end user

Today's working processes in modern production halls are characterized by a high degree of automation. In this context, sensors are responsible for reliability and precision, and often several hundred initiators are used in a single manufacturing cell.

However, there is substantial production downtime involved in cabling the sensors, as broken cables, worn contacts and time-consuming searches for errors quite frequently lead to costly shutdown periods. Therefore, the obvious thing to do is to avoid using signal cables wherever possible.

High degree of reliability
ABB offers the ideal solution for this in the form of its wireless I/O pads. These pads communicate using a particularly reliable radio technology, characterized by real-time capabilities, that ABB has developed especially for the demanding factory automation applications. Simply selecting the appropriate frequency band and a range tailored for factory automation can prevent disrupting influences between a wireless automation system and its industrial environment.

This is supplemented by further mechanisms that ensure reliable operation. For example, communication processes are not concluded until it has been confirmed that the signals have been received without a hitch. Moreover, the wireless IP67 field devices are always present even without a status change, as they report twice a second to the input/output module that they are ready to function. In the event of an interruption, the machine control system is always able to respond correctly straight away.

Increased productivity
Unforeseen downtime as a result of worn cables is no longer an issue. Devices and tools can be changed more quickly and easily.

Falling service costs
Doing away with cables pays off after just a short time, as the service outlay for cables and connection technology can also be eliminated. In short, choosing ABB´s wireless I/O pads is the right decision if you want to achieve constant, reliable and, above all, more economic production.
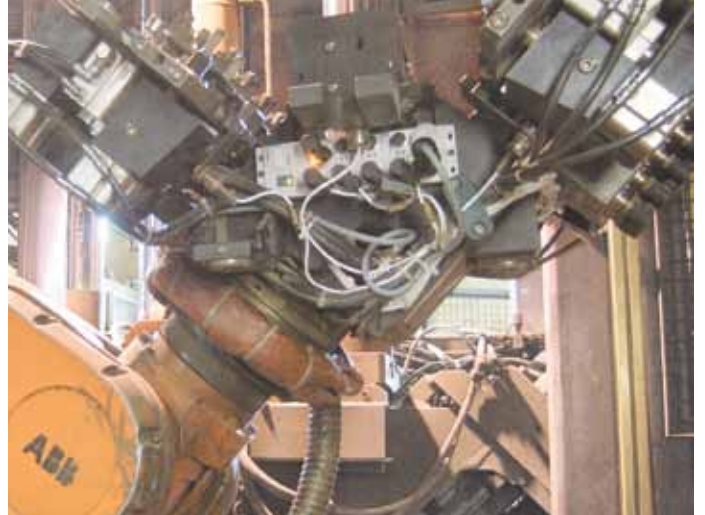
Cable Replacement going High-Speed
Do you have to bridge a gap with signal cables?
Wireless automation offers four digital I/O-device mappings (max. 64 I/O points) over gaps up to 15m wide: An input signal is transmitted wireless to an output. Whether the sensor is a TrueWireless Proximity switch WSIX, a standard limit switch or a standard digital sensor connected to WIOP I/O pad – it transmits the signal within 7ms to an output on another WIOP or vice versa.
An optional status WIOP digital I/O pad allows you to monitor the different mappings.

Advantages for end users

- Increased availability of production plants
- Wear-free signal transmission
- More straightforward device/tool changes
- Reliable communication
- Immune to typical sources of interference in the industrial environment
- Open for future extensions and modifications

The easy means of conversion and retrofitting

In many production plants, every single sensor is connected to the machine control system via signal cables. Despite careful installation, rapid machine movements or chemical influences can damage or break sensitive signal cables, and it is not an uncommon occurrence for sensors to be mechanically altered by the tractive forces of the cables. This often leads to a tedious search for errors, followed by time-consuming repair work that is made even more difficult by a lack of space.

Wear-free signal transmission
The use of wireless IP67 I/O pads from ABB has now put an end to fault-prone signal cables in existing production plants. Wear-prone cables and connection technology have been replaced with reliable wireless automation technology, developed especially for factory automation by ABB.

Fast system changeover
One crucial aspect is that the changeover to ABB´s wireless technology can be implemented without any major downtime. The conventional wired modules can be replaced with wireless IP67 I/O pads during a regular maintenance interval. All other steps, including adapting the program for machine control, can be prepared beforehand while everything is up and running.

Commissioning is also remarkably simple. Every wireless IP67 pad in the machine is assigned an address using the membrane keypad. This is confirmed by a green LED display on the I/O pad, while its address appears on the display of the central input/output module.

Economic investment
The changeover to ABB´s wireless technology often pays off right in the first few months. Thanks to the elimination of fault-prone signal cables, production remains constantly up and running, service costs are reduced, and less time is spent on error location and repairs.

Cable Replacement going High-Speed
Do you have to bridge a gap with signal cables?
ABB´s wireless Base Station WDIO offers four digital I/O-device mappings (max. 64 I/O points) over gaps up to 10m wide: An input signal is transmitted wireless to an output. Whether the sensor is a TrueWireless Proximity switch WSIX, a standard limit switch or a standard digital sensor connected to WIOP I/O pad - all transmit the signal wirelessly within 7ms to the output on another WIOP or vice versa.
An optional status WIOP digital I/O pad allows you to monitor the different mappings.

Advantages during expansions/conversions

- Straightforward conversion with lower construction outlay
- Short shutdown times
- Easy expandability
- Higher availability
- Wear-free signal transmission
- Straightforward device/tool changes
- Reliable communication
- Immune to typical sources of interference in the industrial environment
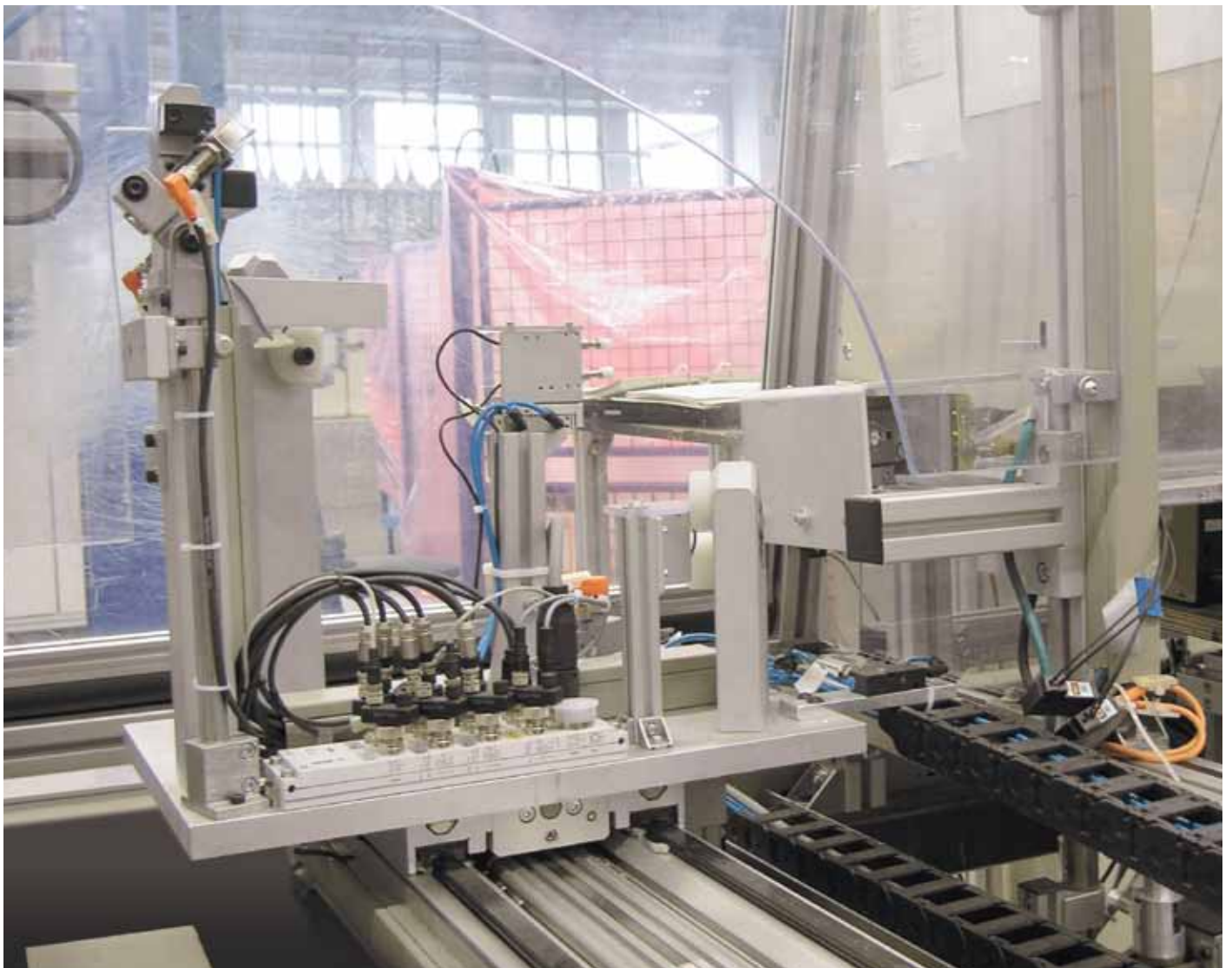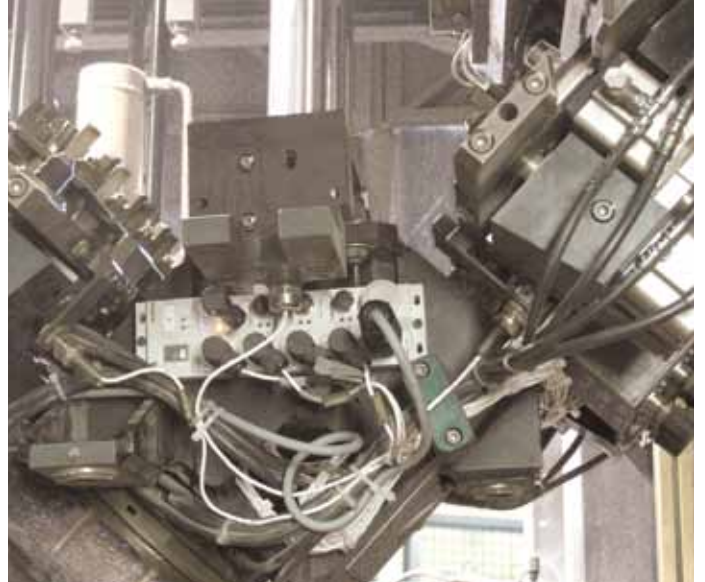
Wireless automation in factories
The clear signal for mechanical engineering
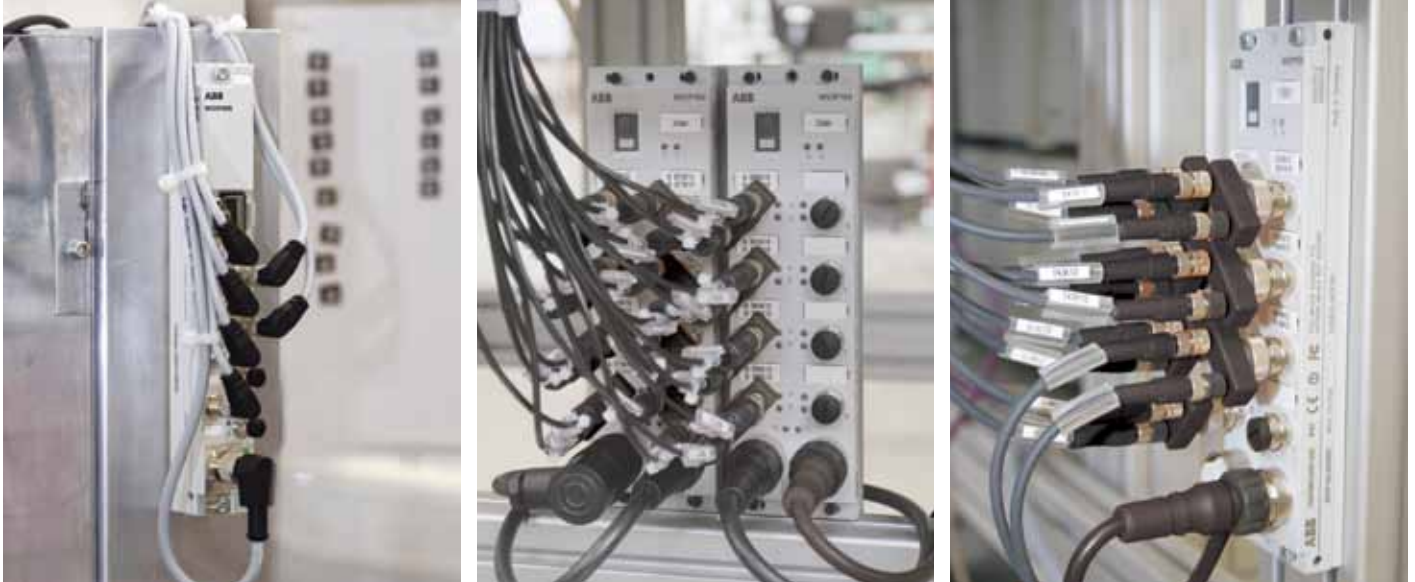
Cables take up space, restrict motion sequences and are responsible for a large number of production interruptions during operation. It certainly makes life a lot easier if you can simply do without signal cables.

Easy integration

In place of signal cables, ABB´s wireless IP67 I/O pads are used. These can be easily positioned in direct proximity to the sensors and actuators. The signals between the wireless pads (up to 13) and the WDIO I/O module*, which is located in the cabinet, are transmitted using ABB´s wireless technology. Thanks to its real-time capability and particular reliability, this procedure has proven worthwhile in practice.

Flexible handling

I/O pads have standardized sockets based on M8 or M12 technology. There are connections for input signals and configurable data points. Each output can be rated up to 0.5 A. For larger supply slides or robot arms, IP67 modules exist for which the supply voltage can be connected through from device to device. This additionally reduces the amount of cabling required.

Reduced costs

The elimination of the need for cable looms and fieldbuses for control purposes gives rise to much greater flexibility in machine planning. Wiring outlay and the number of wiring errors are reduced during plant assembly, which in turn leads to a clear reduction in the costs of a machine.

Tried and tested technology

The real-time radio technology that ABB has developed especially for factory automation has already delivered ample proof of its reliability in practice. The choice of frequency band and the range tailored to factory automation help to ensure that everything runs smoothly right from the start.

This is one of the main reasons why more and more users are beginning to include ABB´s wireless technology when purchasing a new machine or plant.

Cable Replacement going High-Speed

Do you have to bridge a gap with signal cables?
ABB´s wireless offers four digital I/O-device mappings (max. 64 I/O points) over gaps up to 15m wide: An input signal is transmitted wireless to an output. Whether the sensor is a TrueWireless Proximity switch WSIX, a standard limit switch or a standard digital sensor connected to WIOP I/O pad - all transmit the signal within 7ms to the output on another WIOP or vice versa.
An optional status WIOP digital I/O pad allows you to monitor the different mappings.

* Maximum of 3 I/O modules, which corresponds to 39 pads with a total of 624 I/O.

Advantages for engineering

- Easy integration into automation
- Real-time capability
- Cost-effective signal transmission to mobile modules
- Reduced number of wiring errors
- Less engineering and assembly
- Simple commissioning
- High flexibility

Overview of the wireless automation concept
ABB´s technology, the wireless means of reliable communication

Tried and tested in industrial use

ABB´s wireless technology has been developed especially for factory automation. Communication takes place in the 2.4 GHz band in accordance with EN 300 328 and IEEE 802.15.1 standards. This means that the frequency range lies above the electromagnetic interference spectrum that arises in a typical industrial environment, for instance as a result of welding processes, switching operations or frequency converters.

Reliable in everyday production

Data is always transmitted reliably between the wireless field devices and the WDIO100 input/output module. This ensures a frequency hopping procedure with different frequency sequences, antenna switching and automatic repetition when no confirmation is received. Every 500 ms, the WDIO100 expects a function report from each wireless field device that is assigned to it. In this way, the module monitors the devices to ensure that they are running smoothly. If a function signal is not
received, the operating fault is immediately detected.

Simple connection to the control unit

The connection to the control unit (PLC) is established via fieldbus. The WDIO100 input/output module can be connected to the fieldbus concerned using an ABB fieldbus plug (FBP FieldBusPlug). A suitable selection of fieldbus plugs for the various fieldbus systems (PROFIBUS DP, DeviceNet, Modbus, etc.) is available.

Reasons for using ABB´s technology

- Reliability: $1\text{-}10^{-9}$
- Performance: min. 39 I/O pads, each with 16 or 8 data points per location
- Time response: independent of number of field devices
- Radio cycle time: 2 msec (reserved time slot per device!)

WAT100 antennas

WDIO100 input/output module

Sample assembly with PLC AC500 from ABB

Field devices
with wireless communication

Wide range of possible applications

The advantages of wireless automation are utilized in all sorts of different industries and applications. For instance in monitoring and controlling:
- Turntables for robot and handling applications
- Robot cells
- Modular assembly systems
- Assembly machines with frequent tool or device changes
- Transfer presses
- Transfer systems

Wireless automation can play a key role in making even existing machinery future-compliant. For example, plants can be easily converted as part of a retrofitting measure. Conventional IP67 pads can be replaced without difficulty by wireless IP67 I/O pads.

Reasons for using wireless I/O pads

- Connection of all position sensors, other binary sensors, and further contacts and switches
- Integration of actuators
- Connection of valve terminals
- Integration of I/O nodes transmitted by radio
- Replacement of conventional IP67 pads
- Flexible communication independent of signal lines and bus structures
- Can work with most PLC providing a fieldbus, eg. AC500 from ABB
- Can work without PLC in mapping mode as cable replacement

Wireless WIOP208 I/O pad **Wireless WIOP100 I/O pad**

WAT100 antennas

Your first project in wireless automation with I/O pads might look like this:

- 1 input/output module with fieldbus plug (FBP)
- 1 pair of antennas with antenna cables
- 1 to 13 I/O pads

Wireless power supply option

Reliable power supply in every situation

Wireless proximity switches and sensor pads obtain their operating power based on the principle of the coreless transformer. A WPU100 power supply generates a sinus-shaped signal of 120 kHz. A pair of primary loops connected to this, which surround a machine or plant like bands, produces a magnetic field. The wireless proximity switches and sensor pads are fitted with coils, which they use to obtain the required operating power from the magnetic field.

The single primary loop has dimensions of 1 m x 1 m to 3 m x 6 m. This gives rise to a supplied volume of 1 m x 1 m x 1 m to 3 m x 3 m x 6 m. Even entirely local applications (e.g. on a conveyor belt) can be operated efficiently using point and line-shaped arrangements of a primary loop. The number of Wireless components to be supplied with power is practically unlimited.

Easy engineering

The elimination of cables and cable routes makes planning faster and a great deal more straightforward. It is also possible to do without conventional connection technology, which significantly simplifies engineering. Wireless proximity switches and sensor pads can be positioned practically anywhere within the magnetic field, regardless of cable paths. This makes it quite straightforward to make changes, even in the case of complex assembly machines.

Higher availability

If no cables are used, there is no need to worry about cable wear and tear. Above all, this means that downtime is minimized. Doing away with cables also eliminates a source of error that is particularly problematic in harsh ambient conditions, for instance as a result of aggressive media such as oils, greases, metal splinters, and drilling emulsions, or quite simply high humidity. A new sensor or pad can be commissioned perfectly simply at the press of a button.

Reasons for using wireless-power

- Unique, wireless solution
- Continuous, reliable and maintenance-free power supply
- No need to change batteries
- Even more increased reliability

Primary loop conductor

WPU100 power supply

Primary loop

Field devices for wireless communication and power supply

Wide range of possible applications

The advantages offered by wireless automation can be utilized in mechanical engineering and numerous other industries, for instance when monitoring the process of controlling:
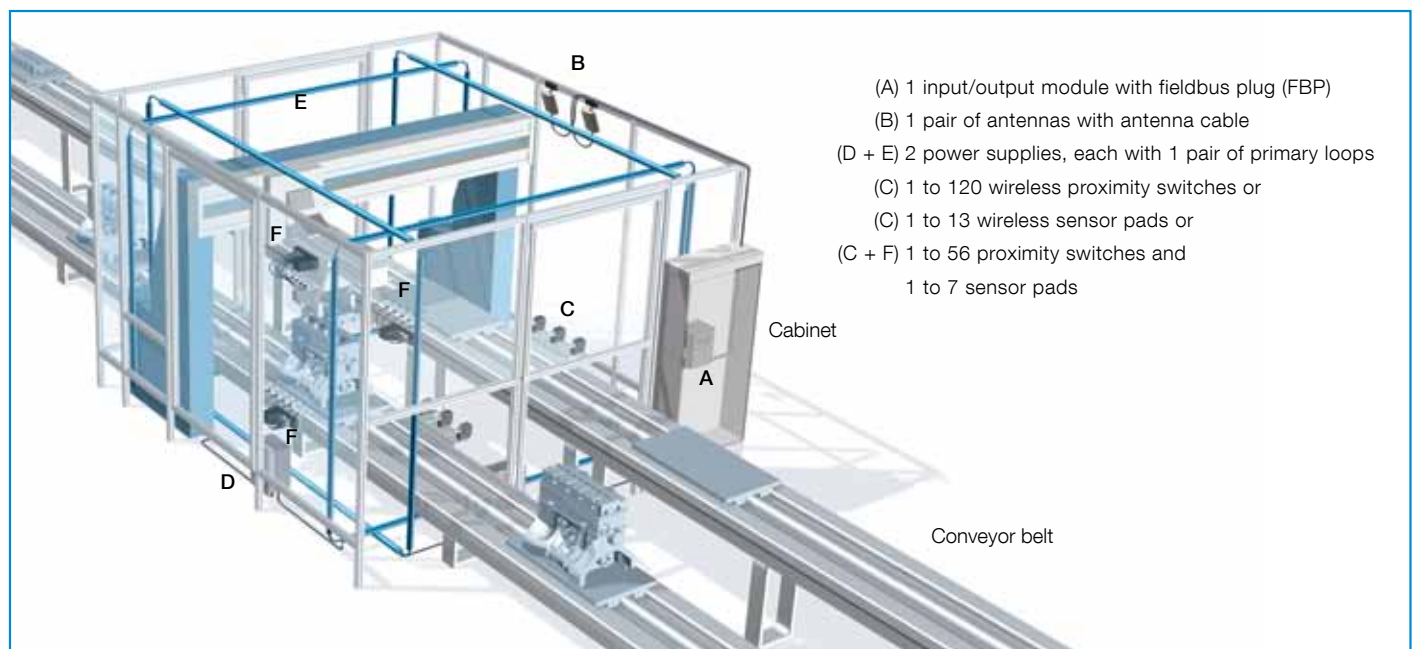
- Turntables for robot and handling applications
- Robot cells
- Modular assembly systems
- Assembly machines with frequent tool or device changes (e.g. presses)
- Complex movements (e.g. cage stranders, material handling and robot arms)
- Transfer presses
- Transfer systems

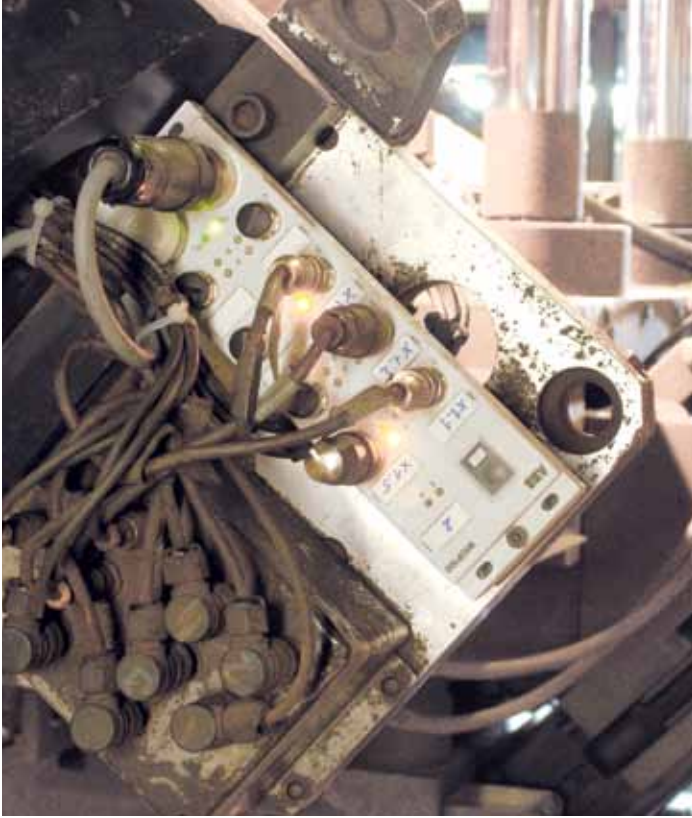## Reasons for using wireless proximity switches and WSP100 sensor pads

- No cables, and thus maximum reliability
- Wireless connection of inductive sensors and dry contacts, e.g. limit switches
- Fast tool changes without plug-in contacts
- Wear-free power and data transmission
- Flexible positioning independent of cable paths

WSP100 sensor pad

Proximity switch consisting of WSIX100 and sensor head

Your first project in wireless automation with wireless field devices might look like this:

(A) 1 input/output module with fieldbus plug (FBP)
(B) 1 pair of antennas with antenna cable
(D + E) 2 power supplies, each with 1 pair of primary loops
(C) 1 to 120 wireless proximity switches or
(C) 1 to 13 wireless sensor pads or
(C + F) 1 to 56 proximity switches and
1 to 7 sensor pads

Cabinet

Conveyor belt

Impressive wireless automation concept

The best possible starting point …

High reliability, increased mobility and easy engineering are just a few of the impressive properties that characterize ABB's wireless components in everyday use. Accordingly, ABB´s wireless automation concept has proven worthwhile in practice.

… in numerous key places

A large number of prestigious companies have already gained experience of this wireless communication concept from ABB.

Typical examples of areas in which the technical properties of wireless I/O pads make them particularly useful include:
- Manufacturing cells and revolving machines
- Assembly lines, e.g. transmission or engine assembly in the automotive industry
- Material handling, e.g. palletizers
- Robot applications
- Packing machines
- Machines for foodstuffs and stimulants
- Welding cells

and special-purpose applications such as:
- Transfer presses or progressive presses
- Cage stranders for underwater cables

The concept with ABB´s unique communication in the 2.4 GHz range lays the best possible foundations for reliable, interference-free use even in welding applications or near other typical sources of interference in the industrial environment.
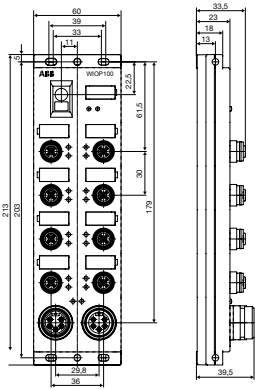
Wireless automation concept.
1. Wireless IP67 proximity switches (from communications module and sensor head) | 2. Wireless IP67 sensor pad
3. Wireless IP67 I/O pads | 4. Antennas | 5. Input/output module | 6. Wireless Power supply | 7. Primary loop conductor
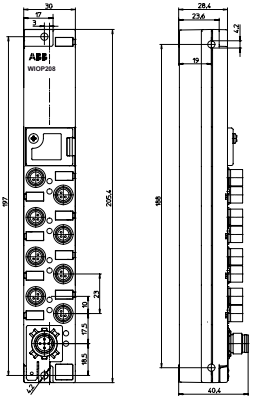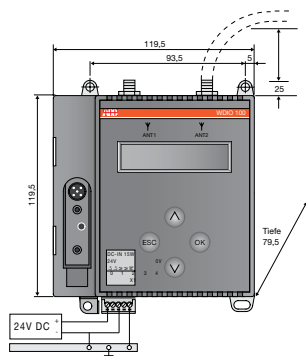

Wireless Interface for Sensors and Actuators
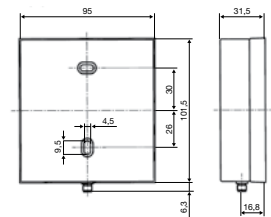
Wireless communication

WIOP100

WIOP208

WDIO100

WAT100

| Wireless I/O pad	WIOP100-8DI8DC	WIOP208-8DC
Number of inputs	8, digital (type 3 in accordance with with IEC 61131) p switching	
Number of selectable inputs/outputs	8, digital; 0.5 A	8, digital; 0.5 A
Module/actuator supply	Separate, 24 V each in 7/8" mini plug, loopable through to next pad	24 V DC in M12 plug
Communication band [GHz]	2.4 ISM band in accordance with ETSI standard ETS 300 328	
Range of radio communication	5 m (industrial environment; typically 10 m)	
Diagnostics	Block by block for sensors, actuators; continuous radio monitoring	
Status LEDs	Status of inputs/outputs, input/output diagnostics, voltages, communication	
Addressing	By pushbutton and WDIO100-CON-FBP	
Protection category in accordance with IEC 60529	IP67	
Ambient temperature [°C]	0 … +55	0 … +70
Data transmission	ABB´s wireless radio technology, real-time capable (cf. WDIO100)	
Dimensions (H x W x D) [mm]	213 x 60 x 39.5	205.5 x 30 x 40.5
Accessories	- Plug, 7/8" socket ("Mini") 5-pole for power supply - M12 standard Y-splitter SZC1-YU0 for 2 sensors/actuators at one connection	

| WDIO100-CON-FBP input/output module	
Configuration for 1 I/O module; max. 3 I/O modules possible	Choice of: - 13 WIOPxxx wireless I/O pads or - 56 wireless sensors + 7 WIOPxxx wireless I/O pads or - 120 wireless sensors
Number of WDIO100 per machine unit/manufacturing cell	1 … 3 without signifi cant loss of performance
Communication band [GHz]	2.4 ISM band in accordance with ETSI standard ETS 300 328
Range of radio communication	5 m (industrial environment; typically 15 m)
Connection to machine control system	FieldBusPlug (FBP: PROFIBUS, DeviceNet, Modbus, …)
Operator display	- LCD display, two lines with 16 characters each - 4 membrane pushbuttons
Supply voltage	24 V DC; 15 W max.
Protection category in accordance with IEC 60529	IP20
Ambient temperature [°C]	0 … +50
Mounting	On 35 mm DIN rail in accordance with EN 60715 or screw mounting
Dimensions (H x W x D) [mm]	140 x 120 x 85 (housing: 120 x 120 x 80
Total latency period (for 99.9% of signals)	20 ms until the signal is available on (max. 34 ms in individual cases)
Mapping function	Fast radio transmission of the inputs of one field device (e.g. WIOP100) to the outputs of another (without PLC, fieldbus, etc.)
Accessories	For connection to the control system (PLC): ABB FieldBusPlug, available for PROFIBUS, DeviceNet, CANopen, Modbus, …

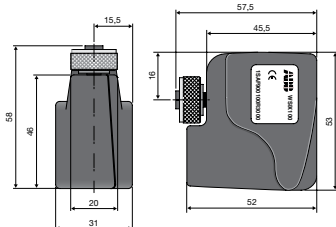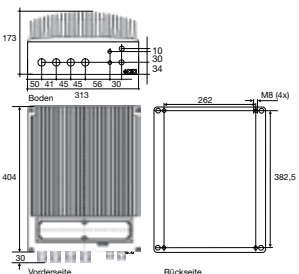| Antennas	
WAT100-x	Panel antenna, 70 degree beam width x = R, L (right, left-handed circular polarisation)
Dimensions (H x W x D) [mm]	101 x 95 x 32
WAC100-N0x	Antenna cable in lengths x = 3 m or 5 m
Accessories	WAM100 antenna mounting for mast mounting

Wireless communication and power
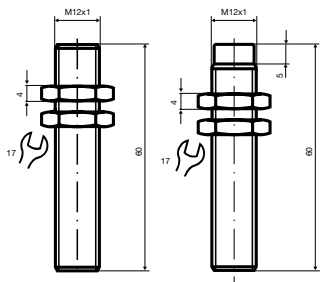
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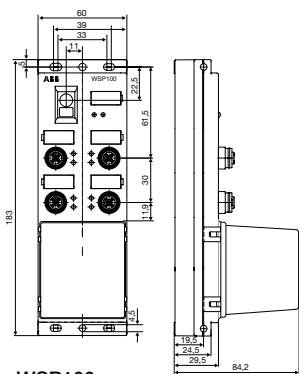
WSP100

WSIX100

WPU100

WPC100

Sensor heads for wireless powered sensor pad and communication module (low power, 3V special pinning)

Type	M8x1	M12x1	M18x1	M30x1,5
Designation (inductive, flush)	WSIF015-M8N	WSIF020-M12N	WSIF050-M18N	WSIF100-M30N
Designation (inductive, non-flush)	WSIN020-M8N	WSIN040-M12N	WSIN080-M18N	WSIN150-M30N
Nominal operating distance Sn (flush /non-flush) [mm]	1.5 / 2	2 / 4	5 / 8	10 / 15
Assured operating distance Sa flush/non-flush) [mm]	0...1.21 / 0...1.62	0...1.62 / 0...3.24	0...4.05 / 0...6.5	0...8.1 / 0...12.15
Reduction factor rV2A/rAl/rCu (flush)	0.75 / 0.4 / 0.4	0.75 / 0.3 / 0.25	0.75 / 0.35 / 0.3	0.75 / 0.45 / 0.25
(non-flush)	0.75 / 0.4 / 0.4	0.8 / 0.45 / 0.4	0.75 / 0.45 / 0.4	0.7 / 0,.45 / 0.35
Overall length/thread [mm]	50 / 30	60 / 50	60 / 50	60 / 50
Nominal signal transmission rate [1/s]	5 (min.; signal change per second, higher in individual cases, see below)			
Ambient temperature [°C]	-25 ... +70 (0 ... +55 for wireless modules)			
Protection category in accordance with IEC 60529	IP67			

Wireless sensor pad and communication module

	WSP100-8i sensor pad	WSIX100 communication module
Number of inputs	8 for ABB´s low power sensor heads (3V) and dry contacts (limit switches)	1 (ABB´s low power sensor heads, 3V) dry contacts (limit switches)
Nominal signal transmission rate 1/s	≥5 (signal change per second per input; up to 40/s for individual sensor head) also higher, dependent on available power/field strength of magnetic field	≥5 (signal change per second)
Range of radio communication	5 m (industrial environment; typically 10 m)	
Switching status indicator	LED, yellow per input	LED, yellow
Operating indicator	LED, green	
Addressing/diagnostics	By membrane pushbutton and WDIO100-CON-FBP; captive storage	
Operating temperature range [°C]	0 ... +55	
Protection category in accordance with IEC 605299	IP67	
Connections	4 M12 device sockets, 2 inputs each Sensor signals on contacts 4 and 1 (!)	1 M12 device socket
Weight	550 g	125 g
Sensor head supply	Pin 2; 2.8 V (1 mW max.)	
Power supply	Wireless (120 kHz magnetic fi eld)	
Data transmission	W radio system, real-time capable ABB radio standard (cf. WDIO100)	
Accessories	M12 Y-splitter WSC1-YU0 for 2 sensors on a single connection	WSC100 extension cable, mounting between WSIX communication module and WSI/WSIF sensor head: 0.3 / 0.6 / 0.75 / 1m

WPU100-24M power supply

Volume supplied by one pair WPU100 [m³]	1 x 1 x 1 to 3 x 3 x 3 or 2.5 x 2.5 x 5
Primary loop size [m²]	1 x 1 to 3 x 6
Expandability	with several WPU100-24M up to 6 x 6 x 6 m
Frequency of power transmission [kHz]	120
Protection category in accordance with IEC 60529	IP65
Ambient temperature [°C]	0 ... +45
Distance of heart pacemaker wearers	0.8 – 2.5 m depending on cell size or electricity
Mounting	Screw mounting

WPC100-Nxx primary loop conductor

Length [m]	10 to 28 in steps of 1
Connection type	Lug for direct connection to WPU100

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