Wireless proximity switches

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Description

Wireless proximity switches work according to the induction principle. In contrast to conventional proximity switches these do not require any cable connection between sensor and machine control system. An electromagnetic field that is produced by two power supplies with a pair of primary loops respectively supplies all proximity switches within a production line with the energy needed for their sensory functions as well as the radio communication. The proximity switches transmit their signals per radio communication to an input module which to this end is connected to a pair of antennas.

Design

Wireless proximity switches consist of the sensor head and the communication module, which receives its power from the electromagnetic field. Communication with the input module takes place according to the standard ETS300328 in the 2.4 GHz band. Up to 120 sensors can be allocated to one input module delivering their proximity changes within typically 20ms (REALTIME SUITED). The input module transmits the sensor signals to the machine control system via an ABB FieldBusPlug. A continuous function messaging of each wireless proximity switch ensures an immediate detection of failures.

Energy transfer

The electromagnetic field used for the power transfer is produced by two pairs of primary loops. The two pairs of primary loops supply a volume of 1m x 1m x 1m up to 3m x 3m x 3m which can be enlarged modularly. Up to 360 wireless proximity switches can be used within this space.

Advantages of the wireless proximity switches:

- high flexibilty in use
- reduced engineering
- short commissioning times
- high reliability and availability of the production system

Catalog numbering system

Type of sensor

WSI = Wireless sensor inductive

Mounting type

F = flush-mounted
N = non flush-mounted

Nominal switching distance S_n

0.15	= 1.,5 mm	nominal switching distance
0.20	= 2.0 mm	nominal switching distance
0.40	= 4.0 mm	nominal switching distance
0.50	= 5.0 mm	nominal switching distance
0.80	= 8.0 mm	nominal switching distance
0.100	= 10.0 mm	nominal switching distance
0.150	= 15.0 mm	nominal switching distance

Housing

M = Metric **8**, 12, 18, 30 = diameter in mm **N** = Normal overall lenght

WSI F 015 M8N

WSIN150-M30N

WSIX100-B50N

WDI100-120FBP

WAT100

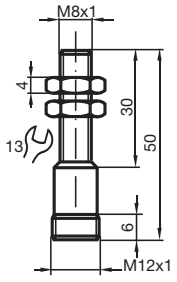
WPC100-N

Type	Catalog number	Packing unit piece/meter	Weight 1 piece kg
Sensor heads			
WSIF015-M8N	1SAF108911R3000	1	0.025
WSIN020-M8N	1SAF108921R3000	1	0.025
WSIF020-M12N	1SAF112911R3000	1	0.030
WSIN040-M12N	1SAF112921R3000	1	0.025
WSIF050-M18N	1SAF118911R3000	1	0.060
WSIN080-M18N	1SAF118921R3000	1	0.055
WSIF100-M30N	1SAF130911R3000	1	0.140
WSIF150-M30N	1SAF130921R3000	1	0.120
Communication module one per sensor head			
WSIX100-B50N	1SAF900100R3000	1	0.125
Power supply			
WPU100-24	1SAF900200R0001	1	15.000
Input module			
WDI100-120FBP	1SAF900300R0001	1	0.410
Antennas for input module			
WAT100-R	1SAF900600R0001	1	0.100
WAT100-L	1SAF900600R0002	1	0.100
Antenna cable for input module			
WAC100-N03	1SAF900600R1030	3 m	0.370
WAC100-N05	1SAF900600R1050	5 m	0.600
Antenna fitting			
WAM100-N	1SAF900900R0001	1	0.095
Primary loop			
WPC100-N10	1SAF900800R1100	10 m	1.280
WPC100-N11	1SAF900800R1110	11 m	1.410
WPC100-N12	1SAF900800R1120	12 m	1.535
WPC100-N13	1SAF900800R1130	13 m	1.665
WPC100-N14	1SAF900800R1140	14 m	1.790
WPC100-N15	1SAF900800R1150	15 m	1.920
WPC100-N16	1SAF900800R1160	16 m	2.050
WPC100-N17	1SAF900800R1170	17 m	2.175
WPC100-N18	1SAF900800R1180	18 m	2.305
WPC100-N19	1SAF900800R1190	19 m	2.430
WPC100-N20	1SAF900800R1200	20 m	2.550
WPC100-N21	1SAF900800R1210	21 m	2.690
WPC100-N22	1SAF900800R1220	22 m	2.815
WPC100-N23	1SAF900800R1230	23 m	2.945
WPC100-N24	1SAF900800R1240	24 m	3.070
WPC100-N12	1SAF900800R1250	25 m	3.200
WPC100-N26	1SAF900800R1260	26 m	3.330
WPC100-N27	1SAF900800R1270	27 m	3.455
WPC100-N28	1SAF900800R1280	28 m	3.585

Technical data
Sensor heads WSIF..., WSIN...

Sensor heads

Switching distance S_n, mounting		1,5 mm flush-mounted	2 mm non flush-mounted	2 mm flush-mounted	4 mm non flush-mounted
Type		M8x1 flush-mounted	M8x1 non flush-mounted	M12x1 flush-mounted	M12x1 non flush-mounted
Identification		WSIF015-M8N	WSIN020-M8N	WSIF020-M12N	WSIN040-M12N
Switching distance	[mm]	0 ... 1.21	0 ... 1.62	0 ... 1.62	0 ... 3.24
Reduction factor r_{V2A} 0.75 0.75 0.75 0.8					
r_{Al} 0.40.40.30.45					
r_{Cu} 0.40.40.250.4					
Nominal signal transfer rate	1/s	5 (signal changes per second, typically 20ms)			
Hystereses H	[%]	≤ 10	≤ 10	≤ 10	≤ 10
Reproducibility	[%]	≤ 10	≤ 10	≤ 10	≤ 10
Temperature drift	[%]	± 10	± 10	± 10	± 10
Short circuit protection		no, because usage only in connection with the communication module.			
Reverse polarity protection		no, because usage only in connection with the communication module.			
Indication		see communication module			
Operating temperature range	[°C]	-25 ... +70			
Storage temperature range	[°C]	-40 ... +70			
Permissible shock and vibration loading		shock b ≤ 30g, T ≤ 11ms			
Protection class acc. to IEC 60529		IP67			
In compliance with		EN 60 947-5-2			
Connection		M12 connector for one communication module			
Housing material		Nickel plated brass			
Sensing face		PBT (Crastin)			
Starting torque recommended/maximum	[Nm]	3/5	3/5	10/15	10/15
Drawing number		120025	120026	117740	118943



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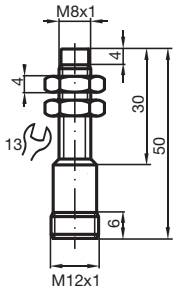

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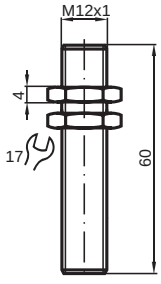

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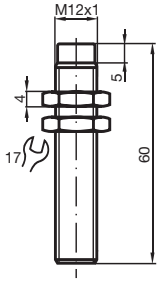

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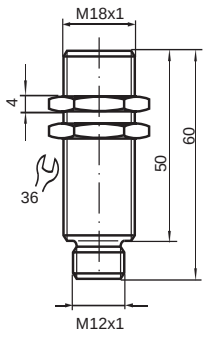
Sensor heads

Switching distance S_n, mounting		5 mm flush-mounted	8 mm non flush-mounted	10 mm flush-mounted	15 mm non flush-mounted
Type		M18x1 flush-mounted	M18x1 non flush-mounted	M30x1.5 flush-mounted	M30x1.5 non flush-mounted
Identification		WSIF050-M18N	WSIN080-M18N	WSIF100-M30N	WSIN150-M30N
Switching distance	[mm]	0 ... 4.05	0 ... 6.5	0 ... 8.1	0 ... 12.15
Reduction factor					
r_{V2A}	0	.750	.750	.750	.7
r_{AL}	0	.350	.450	.450	.45
r_{Cu}	0	.30	.40	.250	.35
Nominal signal transfer rate1/s5 (signal changes per second, typically 20ms)					
Hystereses H	[%]	≤ 10	≤ 10	≤ 10	≤ 10
Reproducibility	[%]	≤ 10	≤ 10	≤ 10	≤ 10
Temperature drift	[%]	± 10	± 10	± 10	± 10
Short circuit protection		no, because usage only in connection with the communication module.			
Reverse polarity protection		no, because usage only in connection with the communication module.			
Indicationsee communication module					
Operating temperature range	[°C]	-25 ... +70			
Storage temperature range	[°C]	-40 ... +70			
Permissible shock and vibration loadingshock	b	≤ 30g, T ≤ 11ms			
Protection class acc.		IEC 60529IP67			
In compliance with		EN 60 947-5-2			
Connection		M12 connector for one communication module			
Housing material		Nickel plated brass			
Sensing face		PBT (Crastin)			
Starting torque recommended/maximum	[Nm]	30/50	30/50	30/100	30/100
Drawing number			120027	120029	120030 120031



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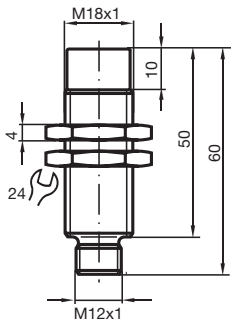

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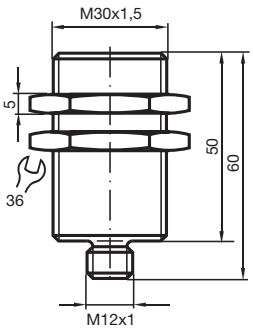

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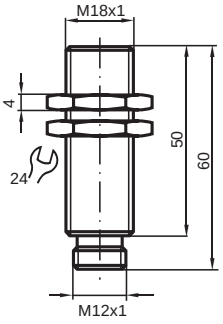

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Technical data
Communication module

Short description

The communication module is attached to one of the eight heads of an inductive sensor as if it were a conventional sensor plug. The communication module for all sensor head variations is identical.

The communication module receives its energy for the sensor functions and radio communication with the input module from an electromagnetic field.

Type	**WSIX100-B50N**
Nominal signal transfer rate 1/s	5 (signal changes per second)
Latency (99,9%)	20 ms (max. 34 ms) until the signal is available on the fieldbus
Switch status	LED, yellow
Operating status	LED, green
Operation	1 foil push-button
Operating temperatur range	-25 ... +55 °C
Storage temperatur range	-40 ... +70 °C
Permissable shock and vibration loading	shock b ≤ 30g, T ≤ 11 ms
Protection class in acc. with IEC 60529	IP67
In compliance with	EN 60 947-5-2
Connection	Connector M12 with connecting nut for sensor heads for wireless proximity switches
Housing material	Bergamit A700 (PA6.6 not fortified)
Power consumption	≤ 6 mW
Frequency of the power transfer	120 kHz
Frequency band	2,4 GHz ISM band in accordance with ETSI standard ETS 300 328
Maximum number of communication modules in one machine cell (3x3x3 m^3)	360
Maximum transfer rate	10 m/s
Error rate	10^{-9}
Range for communication	5 m
Frequency change	Frequency hopping method
Address storage	Adresses cannot be lost

Technical data
Input module

Short description

One input module transmits the information of up to 120 wireless position sensors to the machine control. The sensor signals reach the input module via two antennas and are then transfered to the machine control system via a FieldBusPlug.

Communication takes place in the 2.4 GHz band according to the standard ETS 300 328. A frequency hopping process with varying frequency sequences is used for reliable data transfer.

Every 500 ms the input module expects a status report of all its assigned sensors . This way the input module monitors the correct functioning of the sensors.

Additionally, the input module is equipped with functions for the configuration and diagnosis of wireless position sensors.

Type	**WDI100-120FBP**
Number of inputs	120 digital inputs for wireless position sensors 120 valid-status signals for wireless position sensors
Frequency band (communication)	2.4 GHz ISM band in acc. with ETSI standard ETS 300 328
Frequency-/antenna change	Frequency hopping method with varying frequency sequences Alternation between emitting- and receiving antenna
Error rate (per input)	10^{-9}
Latency (99,9 %)	20 ms (max. 34 ms) until the signal is available on the fieldbus
Range (of antenna)	5 m
Maximum number of input modules per machine cell	3
Operating display	- LCD-Display, double-spaced with 16 characters each - 4 foil push-buttons
Electrical connection	- 2 coaxial connectors: antenna cable - 1 connector: interface to ABB-FieldBusPlug - 1 set of screw terminals: 24 VDC supply
Protection class in acc. with IEC 60529	IP20
Supply voltage	24 V DC (+20%,-15%)
Operating temperature range	0 ... +50°C
Storage temperature range	-25 ... +70°C
Permissible humidity for operation	+50 ... +95 %, without bedewing
Dimensions (h x w x d)	140 mm x 120 mm x 85 mm
Mounting	- DIN-rail in acc. with DIN EN 50022 - Mounting holes for screws up to 4 mm diameter

Technical data
Power supply

Short description

The power supply WPU100 provides the energy for the generation of an electromagnetic field of 120 kHz with the help of the connected primary loops. This again supplies the wireless position sensors. The installation in pairs generates a two-dimensional, rotating, electromagnetic field.

Type	**WPU100-24**
Output frequency	120 kHz
Output voltage	up to 700 V at the connected primary loops
Output current	4 ... 24 A adjustable in 16 stages
Permissable inductivity at output	0,011 ... 0,058 mH (primary loops including feed line)
Control elements	1 green LED, System ready 2 red LEDs for signalling of errors 16-stage rotary switch for the selection of output current 1 DIL-switch for phase selection (0°/90°) 1 DIL-switch for the selection of operating mode (Master/Slave)
Electrical connection	2 terminals for the electrical connection of primary loops 1 terminal: synchronisation input 1 terminal: synchronisation output 1 terminal: supply voltage
Synchronisation	Automatic synchronisation with a second power supply for the generation of a two-dimensional, rotating electromagnetic field
Supply voltage	120 ... 230 V AC (+10%, -15%), (50 ... 60 Hz (±5%))
Power consumption	100 ... 700 W
Operating temperature range	0 ... +45°C
Storage temperature range	-25 ... +70°C
Protection class in acc. with IEC 60529	IP67
Mounting	4 mounting holes for srew mounting
Dimensions (h x w x d)	400 mm x 310 mm x 150 mm
Weight	15 kg
Suitable synchronized wires	screened twisted-pair-cable, screen applied one-sided
Suitable primary loops	Solely the prepacked primary loops that are offered within this product range

Technical data
Antenna
Primary loops

Short description

The antennas WAT100 transmit and receive the signals between an input module and the wireless proximity switches.
Two antennas with varying polarisation are connected to each input module.

Type	**WAT100-R, WAT100-L**
Frequency range	2.4 ... 2.5 GHz
Polarisation	Right- resp. leftcircular polarized (-R, -L)
Impedancy	50 Ω
Dimensions (h x w x d)	101 mm x 95 mm x 32 mm
Antenna cable	Prepacked coaxial cable (length: 3 m and 5 m)
Accessories	Antenna mounting kit

Short description

The primary loops WPC100 emit an electromagnetic field of 120kHz with the help of the connected power supply for wireless position sensors. The installation in pairs generates a two-dimensional, rotating electromagnetic field.

Type	**WPC100-N**
Rated voltages	1000 V AC, suitable for installation in acc. with VDE100-520
Total diameter	9.4 ± 0.5 mm
Total cross section	6.6 mm^2
Properties	Halogene-free, bio-diesel resistant, UV-resistant
Conductor insulation	Silicone (Si/Y); wall thickness 1.3 mm; colour: red
Exterior insulation	TPE/U (thermoplastic polyurethan); wall thickness 1.3 mm; colour: light grey
Availabe types	prepacked cable (cable shoes on both ends) for the connection to the power supply for wireless position sensors Lengths between 10 m and 28 m, graduation 1 m

Notes