

Wireless Products Wireless IO Expansion Products

**WL-EM-240, WL-EM-900
WL-TX-900, WL-RX-900
WL-IO-DIO, WL-IO-DAI, WL-IO-DAO**



Weidmüller's WL Series industrial wireless products provide a secure, economical and reliable alternative to hard wired signal and data communications for a wide range of industries and applications. These products come with a full range of accessories and fall into three groups.

- Wireless Data Modems - wireless data modems connect to serial or ethernet links and transmit the data over radio. They are available in high speed (2.4GHz DSSS) and high transmission distance (900MHz FHSS) versions.
- Wireless IO units - transmit digital and analogue signals over a radio link and recreate them at a remote location.
- Serial Expansion Modules - these units can be used with WL-Series Wireless Data Modems to transfer multiple analogue and digital IO signals between remote locations or as flexible ModBus IO expansion (via RS485 multidrop) for existing control systems.

All Weidmüller WL-Series radio products can be operated license free in Australia and NZ.

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Wireless Data Modems

Wireless data modems connect to serial or Ethernet links and transmit data wirelessly. The modem controls the wireless messages and data ports to provide “transparent” data transfer.

Weidmuller wireless data modems provide an ideal solution for Ethernet connections in process control and automation applications - PLCs, DCS, SCADA, data acquisition and can handle multiple applications simultaneously.

Common Features

- Configurable as Access Point / Client (Station); Bridge / Router
- Multiple layers of error-detection and correction
- Military-grade encryption of wireless data
- High RF output and superior receiver sensitivity gives excellent penetration in congested industrial environments
- MAC address, Port, IP and Protocol filtering
- RS232 and RS485 serial interfaces
- Simultaneous Serial and Ethernet communications
- PPP and serial server functionality
- Serial Modbus to Modbus TCP conversion
- Discrete IO channel for status transfer
- Simple configuration and Powerful diagnostic capabilities via web-browser
- Remote configuration and diagnostics via the wireless link

WL-EM-900 Wireless Ethernet Modem

Features

- 10/100 BaseT Ethernet, wireless data up to 200 Kbits/sec.
- License-free 900 MHz, 0.1 - 1W, frequency hopping spread spectrum radio
- Typical line-of-sight distance 30km (1W ERP), up to 90km using high gain antennas (4W ERP)

WL-EM-240 Wireless Ethernet Modem

Features

- Uses Global license-free 2.4GHz ISM band
- 10/100 BaseT Ethernet, wireless data up to 11 Mbits/sec.
- 802.11b compliant 2.4GHz DSSS radio
- Enhanced 300mW power output
- Typical line-of-sight distance >5km
- Multiple layers of error-detection and correction
- Automatic changeover to another Access Point if the wireless link fails
- WDS Mesh/Repeater Functionality
- Separate RX and TX/RX antenna connections

Wireless Data Modem features:

- License-free operation
- Use as Access Point or Client (Station)
- Use as Bridge or Router
- Repeater features for extended range
- Easy Setup via Web browser (no special software required)
- Diagnostic web pages
- Full Data Encryption over Radio link
- MAC and IP Address filtering
- Port and Protocol filtering
- Use STP to handle redundant paths
- Password protected configuration
- Remote configuration
- 100/10BASE-T Ethernet connection
- Inbuilt ModBus TCP to RTU Gateway
- PPP-Server functionality
- Digital IO channel/Status Alarm
- DIN Rail mount housing



WL-EM-900

- 900Mhz FHSS operation
- Wireless data up to 200 Kbits/sec
- Typical line-of-sight range >30km
- Adjustable RF power output (0.1 to 1W)

WL-EM-240

- 2.4Ghz DSSS operation
- Wireless data up to 11Mbits/sec
- Typical line-of-sight range >5km
- WDS Mesh/Repeater Functionality
- 'Dual-diversity' antenna connections

Technical Data

Ethernet Connections

Network Standards

Embedded Protocols

Data rate

Connectors

Range

Serial Ports

Type

Baud rate

Parity / Stop bits / Flow control

LED Indication

Indicators

Radio Transmitter

Type

Transmit power

Receiver Sensitivity

Typical range (can be extended using repeaters)

Data rate

Encryption

Antenna Connection

Power Supply

Type

Supply voltage

Background Power Consumption

Power Consumption while transmitting

Connectors

General

Storage temperature

Operating temperature

Relative humidity

Housing

Type

Dimensions

Mounting

Weight

Ordering Information

IEEE 802.3 Compliant, 10/100BASE-T, IEEE 802.1d (STP) Bridge/Router functions work with all Ethernet Protocols
TCP/IP, UDP, ARP, PPP, ICMP, HTTP, FTP, TFTP, TELNET
Autonegotiated 10/100Mb, FDX and HDX
RJ45 (Hub)
100m
1 x RS232 and 1 x RS485
1.2 to 115.2Kb/s
Fully configurable
Power, Radio Rx/Tx/Link, LAN Link, Serial Link, Digital IO
900Mhz Frequency Hopping Spread Spectrum
100mW to 1W (20-30dBm) Configurable
108dBm @ 10-6 BER
>30km (line-of-sight)
38.4, 19.2, 57.6, 115.2, 230Kbits/s (Auto select by channel)
128bit AES / 64bit proprietary encryption / None
Single SMA female coaxial
Auxiliary powered
10 to 30Vdc
Screw type connectors
-40 to +85 °C
-40 to +60 °C
5% to 95% (non-condensing)
High impact ABS
160mm x 40mm x 135mm (H x W x D)
DIN Rail Mount
0.4kg
WL-EM-900 (Australia only) 7940033934
WL-EM-900-NZ (New Zealand Only) 7940034330

IEEE 802.3 Compliant, 10/100BASE-T, IEEE 802.1d (STP) Bridge/Router functions work with all Ethernet Protocols
TCP/IP, UDP, ARP, PPP, ICMP, HTTP, FTP, TFTP, TELNET
Autonegotiated 10/100Mb, FDX and HDX
RJ45 (Hub)
100m
1 x RS232 and 1 x RS485
1.2 to 115.2Kb/s
Fully configurable
Power, Radio Rx/Tx/Link, LAN Link, Serial Link, Digital IO
2.400GHz to 2.484GHz Direct Sequence Spread Spectrum
300mW (25dBm)
96dBm @ 1Mbits/sec, 91dBm @ 11Mbits/sec (<8% FER)
>5km (line-of-sight)
1, 2, 5.5 or 11Mbits/s (Auto select)
128bit AES (WPA2) / TKIP (WPA1) / WEP (40/140bit) / None
Dual SMA female coaxial
Auxiliary powered
10 to 30Vdc
Screw type connectors
-40 to +85 °C
-40 to +60 °C
5% to 95% (non-condensing)
High Impact ABS
160mm x 40mm x 135mm (H x W x D)
DIN Rail Mount
0.4kg
WL-EM-240 (Australia & NZ) 7940033932

Wireless IO

Wireless I/O connects directly to analogue, discrete and pulse transducer signals. These signals are transmitted by radio and re-created as output signals. Weidmuller WL-Series products are designed for high reliability operation on open license-free radio bands.

WL-TX-900 Transmitter and WL-RX-900 Receiver Units use Frequency hopping spread spectrum 900MHz sub-bands (1W license-free) configured for Australia or New Zealand. Both types have an inbuilt RS232 Configuration and diagnostics port and individual unit addresses that allow large numbers of wireless units on each network.

WL-TX-900 Transmitter unit

- External inputs plus internally calculated values - analogue setpoint status, pulse count, power supply voltage, internal temperature
- Analogue 0-20mA (4-20mA) Input
- Thermocouple input -100 to +100mV with cold-junction compensation and linearization for J, K or T-type
- Local setpoint status generated by comparing analogue input to high and low setpoints
- Digital inputs can also be used as pulse count inputs
- Power supply 9 – 30Vdc, measured and available as a transmitted variable
- 24Vdc analogue loop supply internally provided
- Power saving options for battery operation

WL-RX-900 Receiver unit

- Three digital contact outputs and one analogue (0-20mA) output
- Can be matched to a specific Transmitter unit, or setup for more complex applications using free configuration software
- Communications failure indication and configurable output
- Outputs can be configured as retained or reset (fail-safe) on communications failure
- Push-button for LED bargraph display of radio signal strength

Wireless IO:

- 900Mhz FHSS operation
- Typical line-of-sight range >30km
- License-free operation
- Full Data Encryption over Radio link
- DIN Rail mount housing



WL-TX-900

- Transmitter Unit
- 0-20mA (4-20mA) Input (with 24Vdc Field supply)
- Thermocouple/mV Input (with CJC)
- 2 x Digital Pulse/Status Inputs
- 2 x Digital Status Outputs
- Setpoint selection by rotary switch

WL-RX-900

- Receiver Unit
- 0-20mA (4-20mA) Output
- 3 x Digital Outputs (Relay Contact)
- 2 x Digital Status Outputs
- LED Bargraph Signal Strength Display

Technical Data

Radio Communications	(Transmitter Only)	(Receiver Only)
Type	900Mhz Frequency Hopping Spread Spectrum	900Mhz Frequency Hopping Spread Spectrum
Transmit power	1W (30dBm)	-
Receiver Sensitivity	-	-108dBm
Typical range (can be extended using repeaters)	>30km (line-of-sight)	
Antenna Connection	Single SMA female coaxial	Single SMA female coaxial
Serial Port		
Type	RS232 (for configuration only) using RJ45 connector	RS232 (for configuration only) using RJ45 connector
Baud rate / Parity / Bits / Flow control	9600 / None / 8 (1 stop bit) / Hardware	9600 / None / 8 (1 stop bit) / Hardware
LED Indication		
Indicators	Status, D1, D2, Setpoint (Alarm On), Transmit, Analogue Input Zero and Program Cable Connected	Status, D1, D2, Setpoint (Alarm On), Receive, Communication Failure and Program Cable Connected
Input/Output Channels		
Analogue Channel	0-20mA Input (into 10Ω) (16-bit resolution/Accuracy better than 0.1%) 24Vdc (30mA) available for active input devices	0-20mA Output (max Load 900Ω) (12-bit resolution/Accuracy better than 0.1%)
Thermocouple Channel	Temperature measurement (J, K, T or User defined type) mV Measurement (-100mV to +100mV) Inbuilt Cold Junction Compensation (accuracy ±0.01%/°C)	N/A
Digital Channels	Pulse Counting or Status Input NPN Transistor, Volt-free contact or Voltage (0-5V) Inputs	Three N/O relay contact outputs Rated at 1A@260Vac
Power Supply		
Type	Auxiliary powered	Auxiliary powered
Supply voltage	9 to 30Vdc	9 to 30Vdc
Background Power Consumption		
Power Consumption while transmitting		
Connectors	Screw type connectors	Screw type connectors
General		
Storage temperature	-40 to +85 °C	-40 to +85 °C
Operating temperature	-40 to +60 °C	-40 to +60 °C
Relative humidity	5% to 95% (non-condensing)	5% to 95% (non-condensing)
Housing		
Type	High impact ABS	High Impact ABS
Dimensions	160mm x 40mm x 135mm (H x W x D)	160mm x 40mm x 135mm (H x W x D)
Mounting	DIN Rail Mount	DIN Rail Mount
Weight	0.4kg	0.4kg
Ordering Information		
Matched Pair WL-TXRX-900 (Aus)	7940033935	WL-TX-900 (Australia only) 7940033933
Matched Pair WL-TXRX-900-NZ (NZ)	7940034331	WL-RX-900 (Australia only) 7940033936
		WL-TX-900-NZ (New Zealand Only) 7940034332
		WL-RX-900-NZ (New Zealand Only) 7940034333

WL-IO Series Serial IO Expansion Units

Typical Applications

- Expansion IO for WL-EM-240 and WL-EM-900 wireless data modems - up to 31 units can be connected to each wireless data modem via RS485 (up to 2 km long)
- Expansion IO for ModBus enabled Systems - transfer IO via RS485 (up to 32 units per multi-drop link)
- Expansion I/O for Modbus devices - up to 31 units can be connected to each Modbus master via RS485 (up to 2 km long)

Features

- Multi IO channel monitoring and control functions
- Connected via RS485 multi-drop
- Selectable communications via Modbus protocol (both RTU and ASCII formats)
- Sensor signals connected at one module (input signals) are transmitted to another module where the signals are re-created as outputs, or passed via serial to a host device such as a PLC or SCADA system
- Connect units together to form a serial multi-drop IO system - up to 32 serial addresses per multi-drop link— no Master device is required to control communications
- Connect up to 99 x units as multi-drop Modbus I/O
- RS485 multi-drop up to 2 km
- Three I/O versions available

Model	WI-IO-DIO	WI-IO-DAO	WL-IO-DAI
Digital inputs	up to 16	up to 8 (Voltage-free contacts)	up to 8
Digital outputs	up to 16	up to 8 (FET)	up to 8
Analogue inputs	0	4 "floating"/ 8 commoned (mA or V)	0
Analogue outputs	0	0	8 sink / source (mA or V)
Pulse inputs	4 (1KHz)	0	0
Pulse outputs	8 (100Hz)	8 (100Hz)	8 (100Hz)

Note: Each digital channel can be used as an input or output. When a channel is used as an output, it is not available as an input. Pulse and digital I/O are same connection

- Peer-to-peer communications; Reliable self-checking messages; Any input on any unit can be linked to any output on any unit. Inputs can be linked to multiple outputs
- Alternate Modbus RTU or Modbus ASCII slave protocol, serial communications configurable up to 115.2Kb/s, 7 or 8 data bit format
- External I/O plus internally calculated values - analogue setpoint status, pulse rate and pulse total, power supply voltage, power supply alarm
- Setpoint status generated by comparing analogue inputs to high and low setpoints
- Analogue inputs selectable as "floating" dual-terminal inputs or commoned single-terminal inputs; Configurable current (0-10/0-20/4-20mA) or voltage (0-5/0-10/1-5V).
- Analogue outputs selectable as single-terminal source or sink outputs. Configurable current (0-10/0-20/4-20mA) or voltage (0-5/0-10/1-5V).
- Pulse inputs generate separate pulse count value and a pulse rate value. Pulse rates are treated as internal analogue registers with a configurable maximum value
- Multiple communication-failure diagnostics with output status. Fail-to-transmit alarm and fail-to-receive alarm status

Configuration software features

- Input measurement display and output "forcing" diagnostics
- Communication logging diagnostics
- Easy-to-use, intuitive interface



WL-IO-DIO

- Multichannel Digital IO expansion module using Modbus serial communications over RS485

WL-IO-DAI

- Mixed Digital IO and Analogue Input expansion using Modbus serial communications over RS485

WL-IO-DAO

- Mixed Digital IO and Analogue Output expansion using Modbus serial communications over RS485

Technical Data

		WL-IO-DIO	WL-IO-DAI	WL-IO-DAO
Modbus protocol				
Transmission Mode		8-bit ASCII / 7-bit ASCII / Modbus RTU	8-bit ASCII / 7-bit ASCII / Modbus RTU	8-bit ASCII / 7-bit ASCII / Modbus RTU
Baud Rates		1.2 to 115.2Kb/s	1.2 to 115.2Kb/s	1.2 to 115.2Kb/s
Parity / Stop bits / Flow control		Fully configurable	Fully configurable	Fully configurable
Slave Address		1-99	1-99	1-99
Connector		Plug-in, Screw type	Plug-in, Screw type	Plug-in, Screw type
RS232 Serial Port				
Type		For configuration only	For configuration only	For configuration only
Baud rate		1.2 to 115.2Kb/s	1.2 to 115.2Kb/s	1.2 to 115.2Kb/s
Bits / Parity / Stop bits / Flow control		9.6Kb/s, 8/n/1/Hardware	9.6Kb/s, 8/n/1/Hardware	9.6Kb/s, 8/n/1/Hardware
Connector		9-way D-type female	9-way D-type female	9-way D-type female
LED Indication				
Indicators		Power / Status / Serial Tx / Serial Rx	Power / Status / Serial Tx / Serial Rx	Power / Status / Serial Tx / Serial Rx
IO Channels				
Analogue Channels	Type	N/A	4 dual-terminal floating inputs or 8 single-terminal commoned inputs	8 Output channels selectable as current/voltage source or current sink to common
	Range		0-12V (suits 0-10V/0-5V/1-5V, etc...) or 0-24mA (suits 0-20mA, 4-20mA, etc...)	0-10V (suits 0-10V/0-5V/1-5V, etc...) or 0-20mA (suits 0-20mA, 4-20mA, etc...)
	Accuracy		16-bits / Accuracy better than 0.1%	12-bits / Accuracy better than 0.1%
Digital Inputs	Type	Voltage free contacts or NPN transistor, contact wetting current 5mA, inputs are surge protected	Voltage free contacts or NPN transistor, contact wetting current 5mA, inputs are surge protected	Voltage free contacts or NPN transistor, contact wetting current 5mA, inputs are surge protected
Digital Outputs	Type	FET outputs, 30VDC 200mA	FET outputs, 30VDC 200mA	FET outputs, 30VDC 200mA
	Pulse output rate	Max 100Hz (Min width 5ms)	Max 100Hz (Min width 5ms)	Max 100Hz (Min width 5ms)
Total Digital IO count		16 Channels	8 Channels	8 Channels
Internal Variables		Battery Voltage	Battery Voltage	Battery Voltage
Power Supply				
Supply voltage		10.8 to 30.0Vdc	10.8 to 30.0Vdc	10.8 to 30.0Vdc
Background Power Consumption		100mA	100mA	120mA
Per Digital IO		13mA	13mA	13mA
Per Analogue IO		50mA	50mA	50mA
General				
Storage temperature		-40 to +85 °C	-40 to +85 °C	-40 to +85 °C
Operating temperature		-40 to +60 °C	-40 to +60 °C	-40 to +60 °C
Relative humidity		5% to 95% (non-condensing)	5% to 95% (non-condensing)	5% to 95% (non-condensing)
Housing				
Type		High impact ABS	High impact ABS	High impact ABS
Dimensions		180mm x 40mm x 150mm (H x W x D)	180mm x 40mm x 150mm (H x W x D)	180mm x 40mm x 150mm (H x W x D)
Mounting		DIN Rail Mount	DIN Rail Mount	DIN Rail Mount
Weight		0.4kg	0.4kg	0.4kg
Ordering Information				
		WL-IO-DIO 7940033937	WL-IO-DAI 7940033940	WL-IO-DAO 7940033941

Antenna Basics

Antennas are designed and built to suit a particular frequency or frequency band. Using the correct frequency antenna is very important.

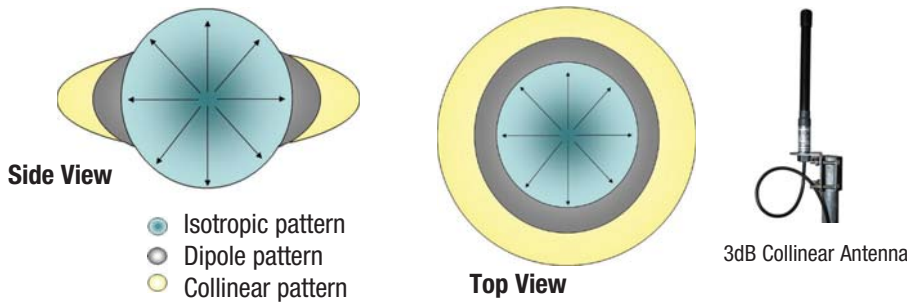
Dipole and collinear antennas

The polarity of these antennas is the same as the main axis, and they are normally installed vertically. Dipole and collinear antennas are called omni-directional as they transmit and receive equally in all directions in the horizontal plane.

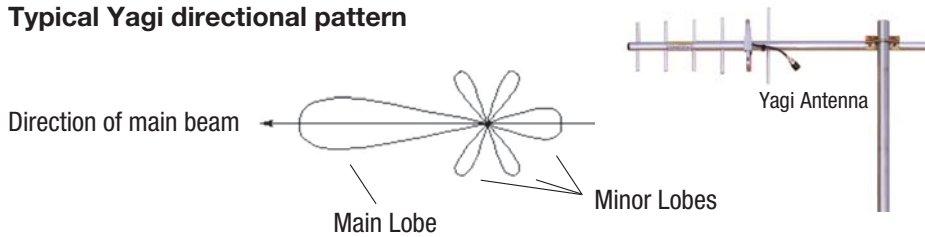
Yagi antennas

Yagi antennas are directional along the central beam of the antenna. The folded element is towards the back of the antenna, and the antenna should be "pointed" in the direction of the transmission. Yagis are normally available from 2-element up to 16-element Yagis. The more reflector elements added, the higher gain in the forward direction and the lower gain to the sides and rear. Also, as more elements are added, the directional angle becomes smaller as the gain is more tightly focused.

Typical Dipole / Collinear direction pattern



Typical Yagi directional pattern



Surge Protection

Wireless networks are very vulnerable to lightning and surges or transients, Weidmüller recommends surge diverters for applications where the antenna is mounted outdoors. Fit between the antenna and the device.

Ordering Information

900MHz Antennas	Description	Gain	Cat. No.
WL-WH-900-SMA	Demo whip (90mm long) with SMA-Male connector (for internal use only)	-2dBi	7940033944
WL-DG900-1	Whip (150mm long) with 1m RG174 lead, SMA male connector, stud mount and R/A bracket	-2dBi	7940033945
WL-DG900-5	Whip (150mm long) with 5m RG174 lead, SMA male connector, stud mount and R/A bracket	-2dBi	7940033946
WL-CFD890EL	Dipole (400mm long) with 5m RG58 lead, SMA male connector and mounting bracket	2.15dBi	7940033947
WL-SG900EL	Collinear (800m long) with 'N' Type Female connector and mounting bracket	5dBi	7940033948
WL-SG900-6	Collinear (1370mm long) with 'N' Type Female connector	8dBi	7940033949
WL-YU6-900	6 element Yagi with 'N' type Female connector	10dBi	7940033950
WL-YU16-900	16 element Yagi with 'N' Type Female connector	15dBi	7940033951
2.4GHz Antennas	Description	Gain	Cat. No.
WL-WH2400-SMA	Demo Whip with SMA Male Connector	0dBi	7940033952
WL-MD2400-EL	Dipole (230mm long) with 5m RG58 Cellfoil lead, SMA connector and stud mounting bracket	3dBi	7940033953
WL-SG2400-EL	Collinear (510mm long) with 'N' Type Female connector and mounting bracket	5.1dBi	7940033954
WL-Z2400-EL	Collinear (850mm long) with Black Radome and N-type Female connector	10dBi	7940033955
WL-Y2400-18EL	18 Element Yagi with Black Radome and 'N' Type Female connector	18dBi	7940033956
Surge Diverter	Description	Gain	Cat. No.
WL-CSD-SMA-2500	SMA surge diverter - SMA Male to SMA Female	<0.2dB	7940035161
WI-CSD-N-2500	Bulkhead fitting surge diverter N-Type Male to N-Type Female	<0.2dB	8947830000
Cables	Description	Loss	Cat. No.
WL-ETH-C5A	Ethernet Cable - direct-RJ45 to RJ45 2 Metre	Not applicable	7940033957
WL-SER-RJ45	RS-232 Cable DB9 Female to RJ45 for programming WL-TX-900 & WL-RX-900	Not applicable	7940033958
WL-SER-DB9	RS232 Serial cable DB9 male to DB9 female	Not applicable	7940033959
WL-CC3-SMA	Coax Cable Kit, 3m long, Cellfoil, 'N' Type Male to SMA Male	2dB@2.4Ghz, 1dB@900Mhz	7940033962
WL-CC10-SMA	Coax Cable Kit, 10m long, Cellfoil, 'N' Type Male to SMA Male	6dB@2.4Ghz, 3dB@900Mhz	7940033960
WL-CC20-SMA	Coax Cable Kit, 20m long, Cellfoil, 'N' Type Male to SMA Male	12dB@2.4Ghz, 6dB@900Mhz	7940033961
Antenna Brackets	Description		Cat. No.
WL-BR-COL-KIT	Mounting Bracket Kit for Collinear Antenna		7940033942
WL-BR-YAG-KIT	Mounting Bracket Kit for Yagi Antenna		7940033943
Power Supplies	Description		Cat. No.
CP SNT 48W 24V 2A	Connect Power 24V 2A DIN rail mount power supply		8739140000
PRO-M 3A	PRO-M 24V 3A DIN rail mount power supply		8951330000