

# WLS1/WLS2

## General

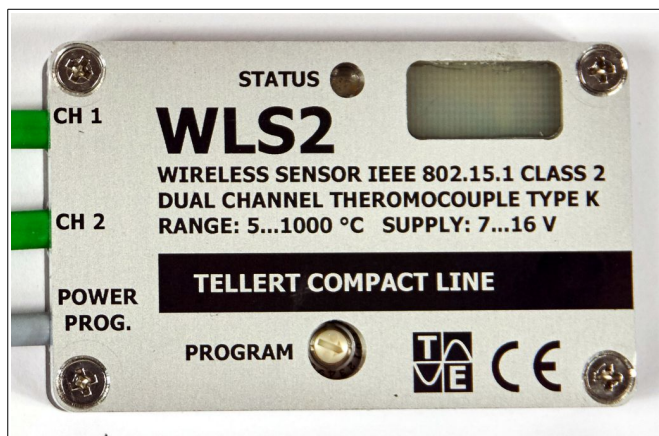
The wireless sensor control unit WLS1 can either transmit up to 9 signals (= 8 voltage signals and 1 supply voltage signal), or receive up to 9 signals, and output these signals onto a CAN. The WLS1 has an internal thermocouple type K amplifier TH2M for the first two signals. The WLS1 is either configured as master (= receiving unit) or as a slave (= transmitting unit) and correspondingly labeled with *M* or *S*. A 4-digit number is also written on the cover lid of the WLS1. This number can also be used as PIN for the wireless transmission.

A WLS1 connection with another WLS1 can also be used to relay the RS232 port at a fixed baud rate (up to 115200 baud). With this configuration, a signal converter and data logger *SICOLOG* can be remotely programmed, or its signals can be viewed.



**Figure 1:** Wireless sensor control unit WLS1.

The wireless sensor slave unit WLS2 can transmit up to 3 signals (= 2 voltage signals and 1 supply voltage signal). The WLS2 has an internal thermocouple type K amplifier for the first two signals.



**Figure 2:** Wireless sensor slave unit WLS2.

## WLS1 Voltage Input

The voltage signals, which can lie within the range from 0 V to 5.12 V, are sampled with 10 bits and multiplied with 64.  $\frac{1}{4}$  of the supplying voltage is measured and output as the 9<sup>th</sup> signal. The digitized voltage signals are averaged over a certain period to reduce the signal noise.

## Status LED

The status LED indicates the state of the WLS1/WLS2:

**None:** The transceiver unit is turned off.

**Slow blinking:** The transceiver unit is in a programmable mode.

**Fast blinking:** The transceiver unit is searching for its communication partner device.

**Double blinking:** The transceiver unit is connected and either in slave mode or master mode.

## Program Switch

The program switch can be set in one of 16 positions. Its state is usually only read at power on time. The only time the switch is read again is when the transceiver unit is in programmable mode. This mode is quit when the switch state changes (for maximal 1 second).

## Thermocouple Amplifier

The range and zero point of the internal thermocouple type K amplifier can be set at the back side of the WLS1: The switches on the left side are for the range, and the pots on the right side are to adjust the zero point. The upper switch/pot is for thermocouple 1, and the lower switch/pot is for thermocouple 2.

Range <i>R</i>	Range switch	Ampl. <i>a(R)</i>	<i>T</i> <sub>min</sub> ( <i>R</i> )	<i>T</i> <sub>max</sub> ( <i>R</i> )
WLS1: 1	11 o'clock	4 mV/°C	-25 °C	1150 °C
WLS1: 2	12 o'clock	10 mV/°C	-40 °C	430 °C
WLS1: 3	1 o'clock	20 mV/°C	-45 °C	190 °C
WLS2	n/a	5 mV/°C	5 °C	1000 °C

WLS1: Depending on the temperature range *R* and the thermocouple's temperature *T*, the output voltage *V<sub>O</sub>* is defined as  $V_O(T) = a(R) \cdot (T + 50 \text{ °C})$ .

WLS2: Depending on the thermocouple's temperature *T*, the output voltage *V<sub>O</sub>* is defined as  $V_O(T) = 5 \text{ mV/°C} \cdot T$ .

The thermocouple amplifier does not correct the linearity error of type K thermocouples. For WLS1, it is calibrated for range *R* = 2 at 0 °C and 300 °C. Within this

range the amplifier has a maximal absolute error (incl. thermocouples' linearity errors) of 3 °C. If not working within this range, the measurement error is received by taking both, the maximal absolute error of the internal temperature compensation (= 2 °C) and the maximal relative error of the amplifier (= 1 %) into account. The linearity error of the thermocouples can be fixed with the settings of the WLS1/WLS2.



Figure 3: Back side of the WLS1.

## Pin Assignment

The sockets and plugs of the WLS1/WLS2 are manufactured by *Binder* and parts of *Binder Series 719*. The socket pins (in front view) are numbered clockwise starting with the first pin after 12 o'clock position. The plug pins are numbered correspondingly anti-clockwise. The first pin is respectively labeled at the solder side (back view).

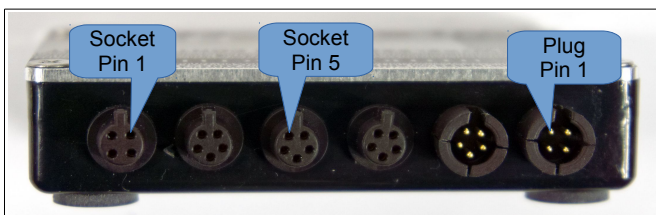


Figure 4: Connector side of the WLS1.

**WLS1: POWER/CAN:** This plug supplies the WLS1 with voltage and connects the WLS1 to a CAN.

Pin	Assignment	Old Wire Color	Wire Color
1	Supplying voltage $V_B$ (7 V to 16 V DC inverse-polarity protected)	Red	Brown
2	Ground	Brown	White
3	CAN_L	Black	Blue
4	CAN_H	Orange	Black

**WLS1: RS232:** This plug provides a serial port and optionally supplies the WLS1 with voltage.

Pin	Assignment	9-pin sub-D plug of host PC
1	TX1	Pin 2
2	Ground	Pin 5
3	RX1	Pin 3
4	Connected with Pin 1 of POWER/CAN: Supplying voltage $V_B$ (7 V to 16 V DC inverse-polarity protected)	
5		

**WLS1: AIN1+2/TH1+2:** This socket provides inputs for the thermocouple's voltage signals.

Pin	Assignment
1	Thermocouple (type K) 1 +
2	Thermocouple (type K) 1 -
3	Thermocouple (type K) 2 +
4	Thermocouple (type K) 2 -

**WLS1: AIN3+4, ..., AIN7+8:** These sockets provide inputs for the voltage signals.

Pin	Assignment
1	Supplying voltage – 1 V
2	Ground
3	Analog input 3 (...7)
4	Analog input 4 (...8)
5	5.12 V reference voltage (max. 20 mA for AIN3+4...AIN7+8)

**WLS2: POWER/CAN:** This plug supplies the WLS2 with voltage and provides a serial connection via RS232-TTL (serial protocol with TTL).

Pin	Assignment	Old Wire Color	Wire Color
1	Supplying voltage $V_B$ (7 V to 16 V DC inverse-polarity protected)	Red	Brown
2	Ground	Brown	White
3	TX-TTL	Black	Blue
4	RX-TTL	Orange	Black

## WLS1 and WLS2 Comparison

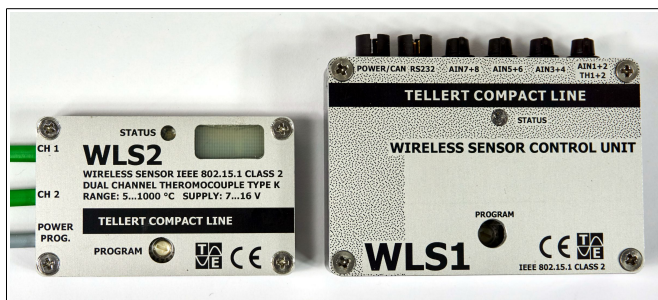


Figure 5: WLS2 and WLS1.

Description	WLS2	WLS1
Transceiver mode:	Slave	Slave or master
Number of usable signals at a rate of $\geq 2$ ms:	Temperatures: 2 Supply: 1	Temperatures: 2 User Voltages: 6 Supply: 1
Thermocouples' temperature range:	5 °C to 1000 °C	1: -25 °C to 1150 °C 2: -40 °C to 430 °C 3: -45 °C to 190 °C
User calibration:	n/a	temperature offset via pot

## Technical Data

Power supply:	7 V to 16 V DC
Current consumption:	$\leq 80$ mA (connected: typical $\leq 60$ mA)
Min. sample rate:	with 3 signals: 1 ms WLS1 with 9 signals: 2 ms
CAN:	WLS1: CAN 2.0B protocol WLS2: n/a
Chip set:	CSR
Transmission:	IEEE 802.15.1 class 2
Transmission range:	up to 10 m
Box size without plugs, sockets and pads:	WLS1: 72 mm × 50 mm × 16 mm WLS2: 59 mm × 37 mm × 8 mm
Typical weight:	WLS1: 0.054 kg WLS2: 0.045 kg
Ambient temperature:	-20 °C to 60 °C

## More Information (Internet)

The WLS1/WLS2 homepage is available at:

<http://www.tellert.de/?product=wls>