Pulse Frequency Transmitter BSL350

The BSL350 is a software configurable pulse to process signal converter providing true 3-way galvanic isolation up to 2500Vrms. A variety of pulse signals and sensor types are supported. Input span may be 1 pulse every 5 seconds or frequency of 0 to 150kHz. The measurement may be over a narrow range for a deviation applications e.g. 47 to 53Hz. The AUX sensor supply supports adjustable, current and voltage settings reducing hazards in probe wiring and allowing the use of variable resistance sensors. Final calibration is set using the free BSL300 configuration software, no test equipment is required for accurate calibration. Final adjustment of the trigger level may be performed wit the trigger capture button.

Key features of the BSL350;

- Small 12.4mm case size.
- Wide range AC/DC power supplies.
- Crystal based frequency measurement.
- Accurate trigger level setting and run time update.
- No isolation barrier errors.
- Custom input to output linearisation.

BSL300 user software settings

- Input sensor and AUX supply.
- Trigger level setting and capture.
- Input filter.
- Frequency measurement range.
- Input linearisation
- Process output range, limits and action.

General Specifications

Size:	12.4W x 113H x 108D (mm).
Mounting:	Clip for 35mm DIN-Rail.
Housing material:	ABS / Polycarbonate blend
Connection:	Pluggable screw terminals.
Weight:	85g (including packaging).
Operating temperature:	-5...+65°C.
Temperature drift:	0.01% per °C.
EMC:	AS/NZS 4251.1 CE EN 50081.1
Sensor power supply:	0.15 to 15V / 0.2 to 20mA, adjustable
Input/output isolation:	>2.5kVrms.
Protection class:	IP40.
Calibration accuracy:	<0.1%.
Linearity:	<0.1%.
Input span:	0.2Hz to 150kHz (200kHz with gain roll off).
LO Input maximum:	50Vac
LO Input trigger range:	50mV to 6V.
LO Input impedance:	100kΩ/1k5Ω user setting.
LO Gain 1 hysteresis:	60mV on trigger > 0.4V
LO Gain 5 hysteresis:	12mV on trigger < 0.4V
LO Gain 10 hysteresis:	6mV on trigger < 0.2V
HI Input maximum:	260Vac
HI Input trigger range:	8V to 200V.
HI Input impedance:	220kΩ.
HI Gain 1 hysteresis:	8.8V on trigger > 58.8V
HI Gain 5 hysteresis:	1.76V on trigger < 58.8V
HI Gain 10 hysteresis:	0.88V on trigger < 29.4V
Input/Output Response:	70msec to 100msec, see note about response time.
Output ranges:	0-1mA, 0-10mA, 0-20mA, 4-20mA, 0-1V, 0-2V, 0-5V, 1-5V, 0-10V, 2-10V, 0-20V
Output drive:	10mA into 0 - 2kΩ, 20mA into 0 – 800Ω.
Load change effect:	< 0.05% (current limited to 22mA)

WARNING
The trigger capture button and programming socket are at the same potential as terminal 8. This may be at a dangerous elevated voltage depending on your application.
Always use an BSL303 USB Isolator when connecting between your PC and the BSL350.

Ordering Detail

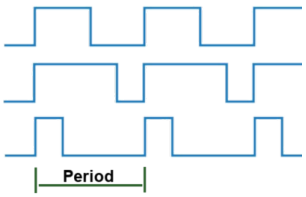
Order Code	Supply
BSL350-20	10V - 60Vdc / 16 - 42Vac 50/60Hz

Response Time

When programming the module you need to specify the frequency range minimum and maximum in measure units (Hz or kHz)

If MAX <= 150Hz and the input frequency is < 10Hz then the response is one cycle.
When input is 10Hz response is 100mS
When input is 1Hz response is 1 second.

The three wave forms on the right all have the same period, only the duty cycle has changed. When measuring low speed pulses the BSL350 is measuring period, it is not a pulse counter.



The BSL350 will work on frequencies over the specified 150kHz. This is achieved by using a digital divider on the input signal. The division factor is set from maximum frequency entered during programming.
If the maximum programmed as a very high and the input frequency low long update times are expected in the first 1% of the measurement range.

User Calibration

The BSL350 is configured using the BSL300 software with no compromises on measurement accuracy and speed. The first selection when programming is the input sensor or signal type. Default settings for that type are loaded and user settings continue from that point.
Setting the required function is easy to do however your BASI distributor can program your unit at no charge when ordering.

Automatic Trigger Update

You can specify the trigger point at time of ordering or programming, however many customers are unsure what the trigger point should be. If the BSL350 is connected to an input pulse/waveform the trigger level may be set using the button located under the top door.

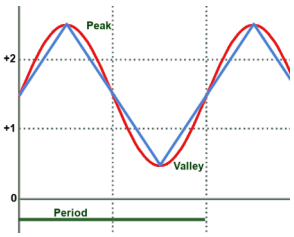
Press and hold the Trigger Button until the **F**unction LED starts flash at a ½ second rate. Release the Trigger Button, the **R**un LED will stop flashing while the best input trigger for the input signal is determined.

The updated input trigger and input amplifier gain are permanently stored. When initially programming the trigger function is set to "Trigger Capture" or "Trigger tracking".

Trigger Capture

The stored trigger level input gain is overwritten when top trigger capture button is pressed.

Trigger Tracking



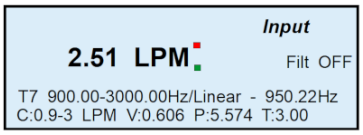
The stored level is overwritten using the same process as Trigger Capture however the pulse valley and peak levels will be continuously monitored. The trigger is continuously set half way between these levels.

If input pulses derive from magnetic speed sensors the signal is generally sine with an equal positive and negative half (not offset as shown above). The BSL350 only measures and triggers on the positive part of an input signal these signals will have a valley equal to 0 and the peak equal to the highest value ($V_{Peak} = \sqrt{2} \times V_{RMS}$ for a sine wave).

Input Display Screen (on PC app)

BSL350 measures frequency / period and converts the measurement into a standard process output. The input pulse valley and peak are also continuously measured.

Collected data is displayed on the screen example as follows;



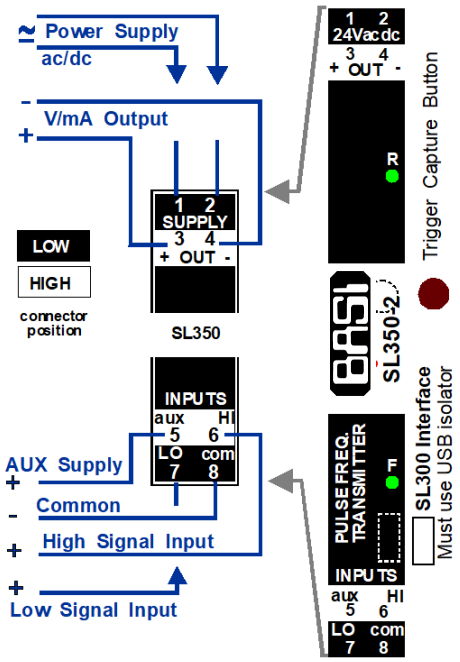
Top left:	2.51	measured input.
	LPM	engineering units
Second left:	T7	Input terminal.
	900.00-3000.00	MIN – MAX
	Hz	Measure units
	/Linear	Shape.
	950.22Hz	Measurement
Bottom left:	C:0.9-3	Eng range.
	LPM	Eng units.
	V:0.606	Valley, input min (volts).
	P:5.574	Peak, input max (volts).
	T:3.00	Trigger level (volts).

Connection and Controls

Run LED flashes each time the output updates.

Function LED flashes at the same rate as the input signal plus used during trigger capture.

BSL300 interface socket connects to a PC via an BSL303 USB Isolator. The interface socket is at the same potential a terminal 8.



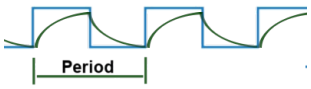
Terminals 1 to 2 power the unit with 2.5kVrms galvanic isolation to other terminals. Check labelling at the terminals for correct supply voltage.

Terminals 3 to 4 are the process signal output with 2.5kVrms galvanic isolation to other terminals.

Terminals 5 to 8 are the input connections with 2.5kVrms galvanic isolation to other terminals.

5kHz Low Pass Filter

Available on all sensor types the low pass filter may be useful in noisy environments. When enabled the rise and fall time is limited to about 100µS in the input amplifier.



If a 50% duty cycle 5kHz square wave were applied the input amplifier will reproduce a signal looking more like saw teeth removing additional higher frequency noise and reducing amplitude by about 30% at 5kHz.

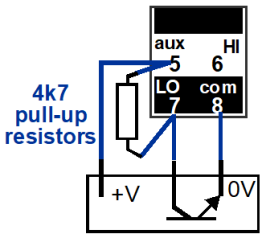
When using this filter the duty cycle and frequency of the signal must be considered. It is not uncommon for the input pulse to be a fixed ON width and variable OFF width, or a fixed OFF width and variable ON width.

Input and Sensor Settings

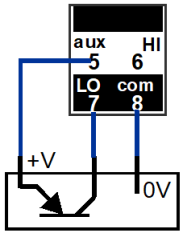
The first setting to be made when programming is to set the input sensor or signal type. Default settings for that type are loaded when this setting is changed replacing any existing settings.

NPN 3Wire Sensor

Three wire NPN sensor requires an external 5k6 pull up resistor for the signal into the LO input.



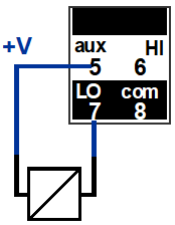
PNP 3 Wire Sensor



When selecting the NPN sensor the BSL350 connects an internal drop down resistor for the signal load.

NAMUR 2 Wire Loop Powered Sensor

The NAMUR is powered from a series 8.2V supply. When a target is detected current drawn is <1mA. With no target the current is >2.2mA.



The LO input has an internal 1.5kΩ pull down resistor connected.

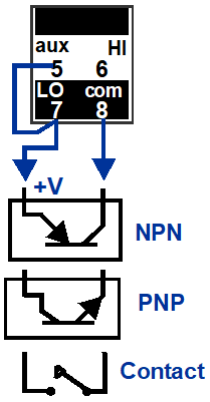
2 Wire Output Sensors

Sensors with floating 2 wire output, may be connected with a parallel constant current 4mA supply.

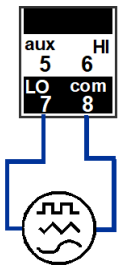
When the sensor is ON the voltage on terminals 7 and 8 is low (0 to 0.7V depending on sensor).

When off the voltage will increase to approximately 6V as the 4mA flows through the internal 1.5kΩ pull down resistor.

This technique has higher noise immunity as 4mA is always flowing through the detection circuits.



Inductive Speed Sensor

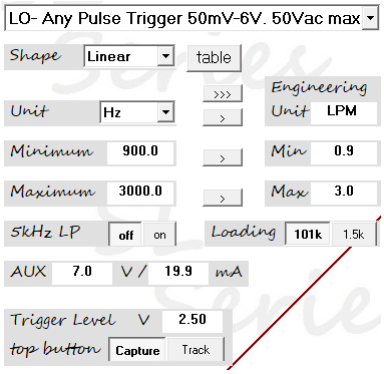


Inductive speed sensors give an increasing frequency and voltage output as ferromagnetic teeth are passed beneath the magnetic sensor. Trigger level is set low to suit detection at low speed.

Any Pulse Trigger 50mV-6V. 50Vac max

LO Input maximum:	50Vac
LO Input trigger range:	50mV to 6V.
LO Input impedance:	100kΩ/1k5Ω user setting.
LO Gain 1 hysteresis:	60mV on trigger > 0.4V
LO Gain 5 hysteresis:	12mV on trigger < 0.4V
LO Gain 10 hysteresis:	6mV on trigger < 0.2V

All settings for the LO input are available for use on terminals 5, 7 and 8.

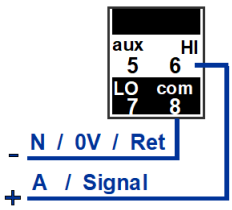


All previously defined sensor connections are supported.

Any Pulse Trigger 8V-260V. 260Vac max

HI Input maximum:	260Vac
HI Input trigger range:	8V to 200V.
HI Input impedance:	220kΩ.
HI Gain 1 hysteresis:	8.8V on trigger > 58.8V
HI Gain 5 hysteresis:	1.76V on trigger < 58.8V
HI Gain 10 hysteresis:	0.88V on trigger < 29.4V

When using input terminals 6 and 8 terminals 5 and 7 are normally not required.



If building a mains frequency transducer terminal 8 should be connected to **N**eutral and terminal 9 to the **A**ctive, the BSL350 will operate safely with the leads reversed however the programming socket and trigger capture button located under the front lid will be at active potential.

WARNING
The trigger capture button and programming socket are at the same potential as terminal 8. This may be at a dangerous elevated voltage depending on your application.