

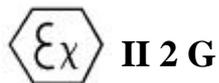


## Instruction Manual

For

### Advent Intrinsically Safe Optical Tachometer

A2109/LSR  
A2109/LSR/002  
A2109/LED  
A2109/LED/002



**BAS 01 ATEX 2301X**

## **A2109 Technical Specification**

Display	- Inverting LCD Vertical 5 digit display
Display functions	- 180 deg. Inverting
On target indicator	- Yes
Low Battery indicator	- Yes
Function icons	- Comprehensive selection of ranges shown in display
Pulse output	- Output pulse train, active pull down (on /002 version)

### **Controls - 3 push-buttons**

On/off normal mode	- Dual action rocker type touch push-button (UP ARROW)
On/off inverted mode	- As above but for inverted operation (DOWN ARROW)
Programme control	- Selects programme mode in conjunction with Up/Down switches

### **Optical system -**

	<b>Laser Models (LSR)</b>	<b>LED Models (LED)</b>
Optical range	- 50mm - 2000mm	- 50mm - 1000mm
Optical angle	- $\pm 80^\circ$	- $\pm 45^\circ$
Light source	- Red Spot Laser, Class II	- Red LED

### **Measurement range**

<b>Measurement modes</b>	- rpm & rps optically (also Count & Time) - rpm & rps, metres, yards, feet, per min & per sec. via contact adaptor - Count total revs, metres, feet, yards - Measure Time interval in seconds between pulses (reciprocal rate). - Speed Capture feature - Maximum, Minimum or Average rate
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### **Speed range**

<b>Optical mode</b>	- 3 - 99,999 rpm (or equivalent in rps)
<b>Contact mode</b>	- Max. 50,000rpm for 10 sec (or equivalent in rps)

Linear speeds -maximum	- 0.3 - 1500.0 Metres or Yds/min. (4,500 ft/min) or equivalent in seconds
Resolution range features	- Fully Autoranging, up to 0.001 digit or $\pm 1$ digit fixed, User selectable
Accuracy speed modes only	- 0.01% $\pm 1$ digit
Count mode resolution	- $\pm 0.1$ Metres (or equivalent in all ranges)
Time interval mode	- 0 - 99999 seconds Autoranging only (max. 0.001 resolution)
Timebase standard	- 0.8 seconds or time between pulses, whichever is longest
Timebase, Fast mode	- 0.1 seconds auto-selection in Maximum or Minimum capture mode
Memory features	- Last reading held for 1 minute, Auto Switch Off. - Programme settings retained in memory after power down off.

### **Pulse Output**

- Model /002, active pull down via 22 K Ohm series resistor.

Contact adaptor	- Included complete with rpm cone & metric wheel assembly (removable)
Power requirements	- 4 x Duracell Procell AAA alkaline cells

### **Standard package**

Set of batteries, contact adaptor, pack of reflective tape, connecting lead (/002 only), certificate of calibration,  
custom carrycase & instructions.

## Operation of all models

### Ex works setting - rpm mode, non autoranging

#### 1. Programming - measurement mode selection

All measurement modes are chosen by this method and once confirmed, selected mode remains in permanent memory until re-programmed by the user.

- 1.1. To change mode hold programme button on and press up measure button and then release both buttons, the display will now illuminate all icons, and the current range will flash.
- 1.2. To select new measurement mode press either up or down button to scan through the modes, when the required mode icons flash release measure button & press programme button once to confirm settings.  
For non-speed modes the unit is now programmed and ready for use.
- 1.3. To select **mx**, **mn**, **av**. modes continue to scan through each one, if the mode is not required, stop scan when all three icons illuminate continuously, then press programme button once. The instrument is now ready to use. **Set parameters will be retained until reprogrammed**

#### 2. Optical revolutions speed measurement - rpm or rps

- 2.1. Ensure batteries are correctly fitted. **Note batteries must only be replaced with Duracell "Procell" AAA cells. The battery compartment lid must only be opened in a safe area.**
- 2.2. Attach small reflective target to machine shaft (typically 6mm x 25mm, less for laser version)
- 2.3. Start machine and point the tachometer towards the target.
- 2.4. Press and hold either of the on/off buttons to suit application and hold continuously.
- 2.5. Aim light beam onto target, ensure "on-target" sign is glowing or flashing steadily
- 2.6. Read off rpm, releasing button will hold last reading.
- 2.7. Last rpm reading will be held in display for 1 minute.
- 2.8. Press the On button to zero reading or take another measurement.

#### 3. Contact revolution speed measurement - rpm or rps

- 3.1. Fit contact adapter into the tachometer and ensure a good click fit connection.
- 3.2. Start machine and make clean contact with the recess in shaft end (wheel can be removed).
- 3.3. Contact the shaft end via the rubber cone, ensure a steady firm pressure is applied and that the instrument is accurately in line with the machine shaft. Do not maintain contact for more than 10 seconds.
- 3.4. Press and hold either up or down measure button as required & read speed
- 3.5. Releasing the **On** switch will hold the reading automatically for 1 minute, automatic switch off.

#### 4. Linear contact speeds measurement - metres, yds, feet etc

- 4.1. Fit contact adapter as above.
- 4.2. Keeping the **on** button pressed, now place the contact wheel on the moving surface and read the linear rate, ensure wheel is perpendicular to the moving surface. Do not maintain contact for more than 10 seconds.
- 4.3. Releasing the on button will then hold the last reading in the display for 1 min.
- 4.4. The instrument retains selected measurement mode for further linear measurements after switch off until programmed to a different mode.

#### **5. Autorange selection - speed modes only**

- 5.1. While taking a measurement using either up or down measure button, the user can toggle between auto and non-auto mode by pressing the programme button, in the auto mode, the 'A' icon will illuminate.

#### **6. Average speed monitoring mode - av icon**

- 6.1. Average speed mode - this mode provides a rolling average of the last 8 measured values.

#### **7. Operation of Maximum & Minimum modes Speed Capture functions - mx, mn**

- 7.1. Having selected the required mode, i.e. Maximum or Minimum, (mx).
- 7.2. You are now ready to Capture a reading "On Demand" but continuing to operate normally.
- 7.3. When a capture test is ready to commence, while the Measure button is held On, press Programme button once, at this point the instrument will switch into high speed Timebase mode, (0.1 Seconds) and will Capture the highest or lowest reading after pressing the Programme button.  
Releasing the On button will hold the reading and cancel the Capture mode until another capture measurement is required, when 7.3. should be repeated.

#### **8. Count measurement mode - cnt**

- 8.1. Select mode as described in Measurement mode selection section
- 8.2. For rev Counting optically, point the light beam at the target and the instrument will measure all revs. (pulses) until button is released, the display will hold Count for 1 minute.
- 8.3. By contact method, fit contact adaptor, press speed cone onto the end of the shaft, the Instrument will count revs.

#### **9. Linear Length Totalisation measurements - mt, ft, yd**

- 9.1. Select any linear unit of measurement, press contact wheel onto moving surface and commence Count by pressing & holding Measure button On, Count will increment until button is released.
- 9.2. The displayed value can be scanned through the equivalent values of Metres, Feet, Yards, Count by pressing the Programming button, the instrument automatically calculates the appropriate reading.  
Note. Measurement Units will be stored in originally programmed parameter e.g. metres.

#### **10. Time interval measurement - int**

- 10.1. Select int mode through Measurement selection mode
- 10.2. This mode allows measurement of time between pulses from optical system (or contact adapter).
- 10.3. Optically the instrument will measure the time in seconds between pulses, useful for cycle timing of reciprocating machinery.
- 10.4. Time in seconds per revolution, which equals reciprocal speed.
- 10.5. Very slow speeds can be measured in this mode below 3 rpm.

### **11. Display orientation - Inverting function - All modes**

- 11.1. The instrument can be used through 180 deg. rotation (e.g. with the light beam pointing downward into a machine), the display inverts so that normal reading can take place.
- 11.2. The UP Button selects normal mode for optical and contact measurements.
- 11.3. The Down button selects the display inversion mode and the whole display including relevant icons will reverse through 180 degrees allowing access to difficult applications.

### **12. Pulse output facility (Model /002)**

- 12.1 These models can be connected to external measurement equipment with a compatible input, the A2109 output is an active pull down via a 22K Ohm resistor and is available on a 5-pin Binder socket (series 711).

Connections:

- Ground (0V) - pin 3
- Output signal - pin 4

To enable auto-power up, connect pins 1 & 2.

#### **Input parameters - Pin 4 w.r.t. Pin 3:**

$U_i = 10.1V$

#### **Output parameters - Pin 4 w.r.t. Pin 3:**

$U_o = 6.6V$   
 $I_o = 0.3 \text{ mA}$   
 $P_o = 0.43 \text{ mW}$   
 $L_o = 700 \text{ mH}$   
 $C_o = 22 \text{ }\mu\text{F}$   
 $L_o/R_o = 68 \text{ mH/}\Omega$   
 $L_i = 0$   
 $C_i = 0$

#### **Output parameters - Pin 1 w.r.t. Pin 2:**

$U_o = 6.6V$   
 $I_o = 463 \text{ mA}$   
 $P_o = 0.63 \text{ mW}$   
 $L_o = 0.17 \text{ mH}$   
 $C_o = 22 \text{ }\mu\text{F}$   
 $L_o/R_o = 49 \text{ mH/}\Omega$   
 $L_i = 0$   
 $C_i = 2.245 \text{ }\mu\text{F}$

**Any equipment connected must be of an appropriately Ex certified type.**

#### **Operation**

- 12.2 Connect the lead supplied to the tachometer output socket. The Tachometer will turn on automatically and remain powered as long as the lead is attached.
- 12.3 The tachometer output should be pulled high by an external resistor. When the laser is on target, the output will be a positive going pulse.

### **Operation Notes**

Ensure the contact adapter rotates freely before use, do not maintain contact for longer than 10 seconds at any one time.

### **Battery Replacement**

**Batteries must only be replaced with Duracell "Procell" AAA cells. The battery compartment lid must only be opened in a safe area.**

To open the lid, first unscrew the security screw with a special tool until it moves freely. The screw is a captive type and should not be removed from the lid. Once the screw moves freely, press the thumb grip on the lid and push/slide the lid backwards and lift off.

The old batteries can then be replaced ensuring correct orientation. Replaced the lid ensuring the security screw is pulled upwards to avoid catching underneath. The base of the lid is now pushed until a click is heard, tighten the security screw and the unit is ready for use.

### **Warning**

1. The A2109 models are not intended to be exposed to dusty conditions.
2. If excessive wear/corrosion has taken place to the plating on the housing and another colour begins to show through, the unit must be returned to the manufacturer for attention.
3. The A2109 should not be subjected to mechanical or thermal stress, nor should it be subjected to any aggressive substances.

### **Important**

4. Repair or servicing should only be carried out by the manufacturer.

### **Note**

This instrument has been designed such that it will not give rise to injury or other harm due to contact, nor will it produce excessive heat, infrared, electromagnetic or ionising radiation, nor does it have any non-electrical dangers.

## Warning Labels

### Caution - Laser Models

Avoid looking directly into the laser light source as temporary dazzling may occur.



Safety Label

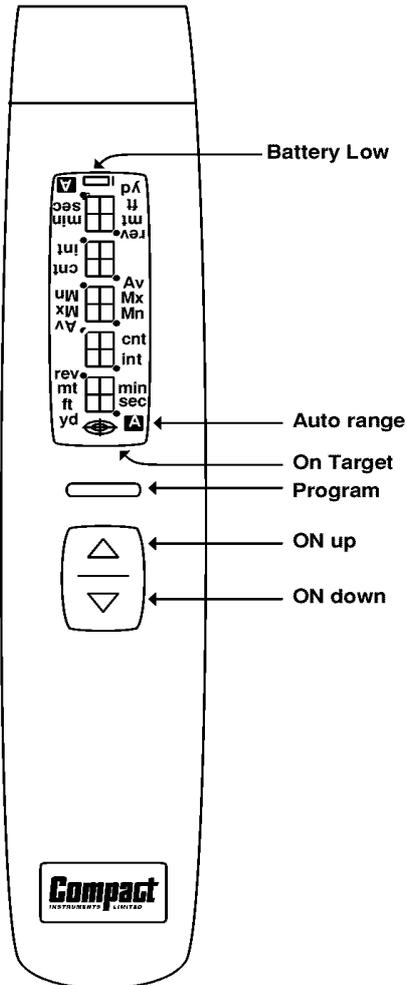


Warning Label

### Model Coding

A2109/LSR	Standard laser tachometer
A2109/LSR/002	Laser tachometer with pulse output (5 pin Binder)
A2109/LED	Standard LED tachometer
A2109/LED/002	LED tachometer with pulse output (5 pin Binder)

## A2109 Controls Layout



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