Weatherproof Light Screen

WLS03

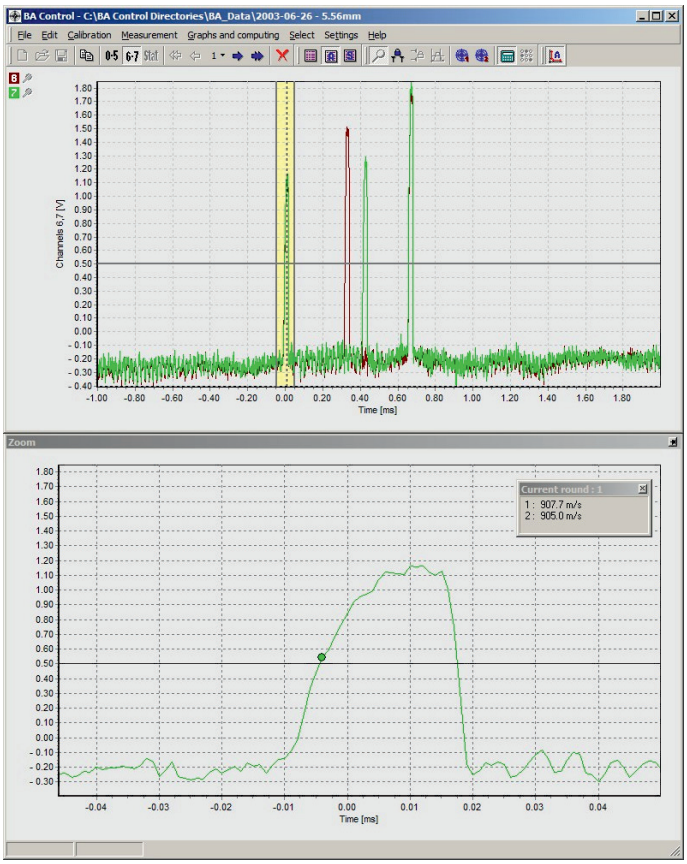
Short description and technical data

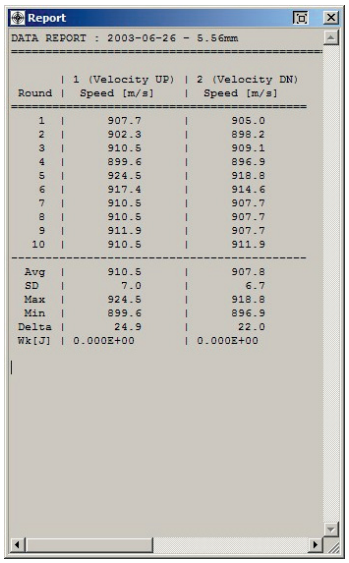
Basic technical specification

Weatherproof Light Screen System WLS03 is accurate electronic equipment for measuring projectile velocity, designed for working in harsh environment (wet, dusty, hot or cold climate with danger of water condensation or heavy rain).

Principle of measurement :	*two high-speed optical gates MOG03*
Calibre range :	*min. 4 - 20mm (frameless - more than 125mm)*
Velocity range :	*min. 50 - 3000 m/s*
Velocity inaccuracy :	*<0.2% (200 - 1500 m/s, 1000mm meas. base, projectile base triggering)*
Safe passage area :	*1050 x 1200mm (W x H, frameless - depends on construction)*
Effective sensor area :	*1000 x 1000mm (frameless up to 5000 x 2000mm, W x H)*
Reaction time :	*typ. 1us*
Meas. base for velocity :	*1000mm (frameless depends on construction)*
Trigger modes :	*rise / fall edge (= base / nose)*
Shock wave filter :	*built-in hardware filter and selectable software filter from 0 to 1000us*
Threshold level :	*selectable from -75% to +75% of meas. range*
Output signals :	*BNC START and STOP output, 0 to 10V pulse in accord with projectile shadow*
Gain range :	*selectable 1, 2, 5 a 10 x*
Working temperature :	*from -30°C to +45°C*
Protection :	*IP66 (dustproof, weatherproof)*
Air humidity :	*up to 100%, condensing or non-condensing*
Altitude :	*max. 3000m*
Power :	*100-240VAC, 50-60Hz, 60VA*
Dimensions (approx.) :	*1350 x 1850 x 1100mm (W x H x D)*

Output signals and computing of the velocity by means of the Ballistic Analyzer BA06S



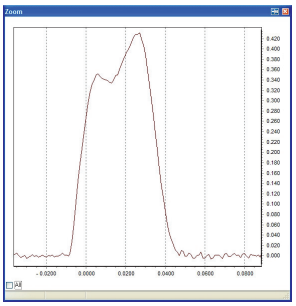


Round	1 (Velocity UP) Speed [m/s]	2 (Velocity DN) Speed [m/s]
1	907.7	905.0
2	902.3	898.2
3	910.5	909.1
4	899.6	896.9
5	924.5	918.8
6	917.4	914.6
7	910.5	907.7
8	910.5	907.7
9	911.9	907.7
10	910.5	911.9
Avg	910.5	907.8
SD	7.0	6.7
Max	924.5	918.8
Min	899.6	896.9
Delta	24.9	22.0
Wk[J]	0.000E+00	0.000E+00

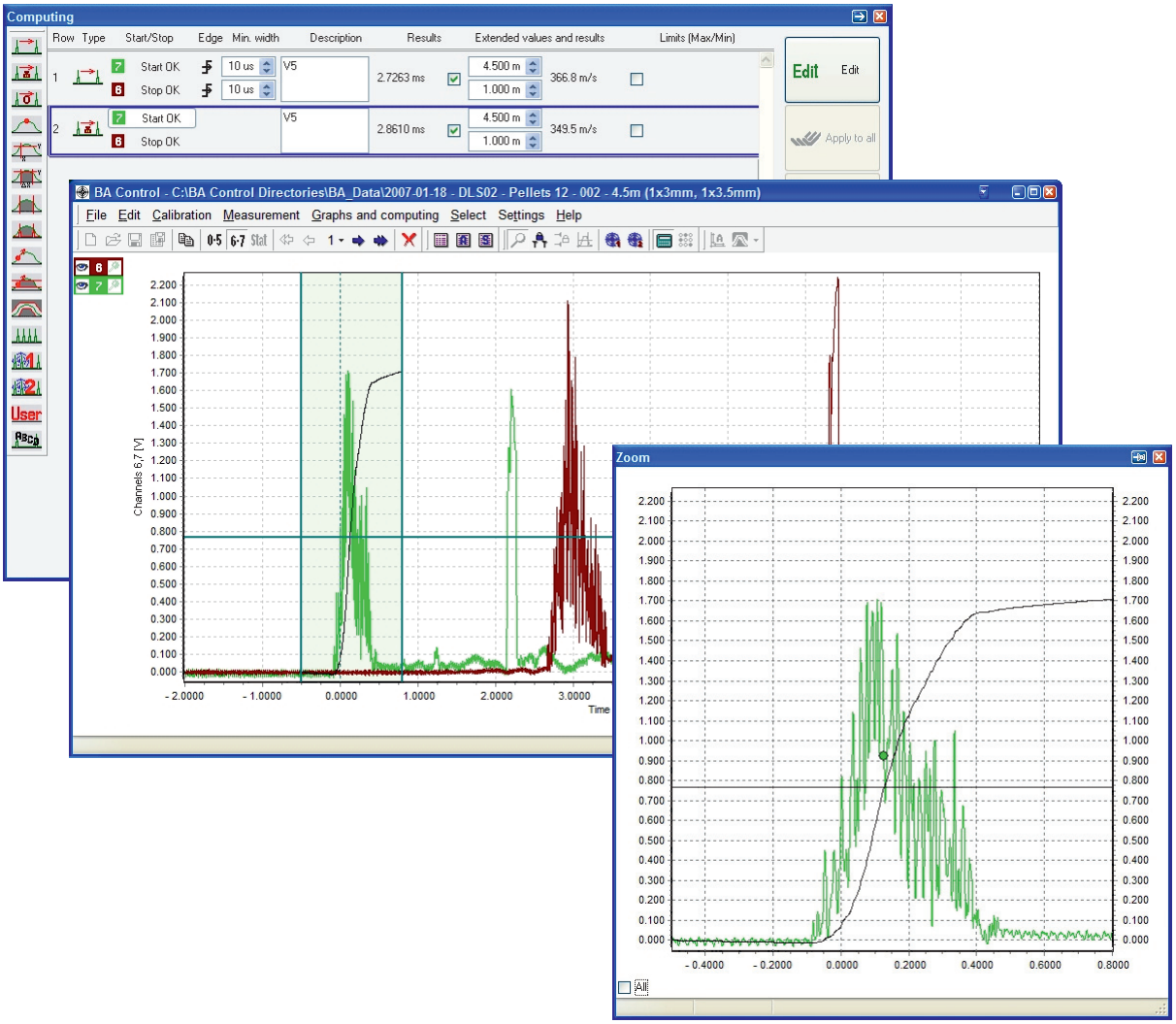
Software for Ballistic Analyzer BA06S

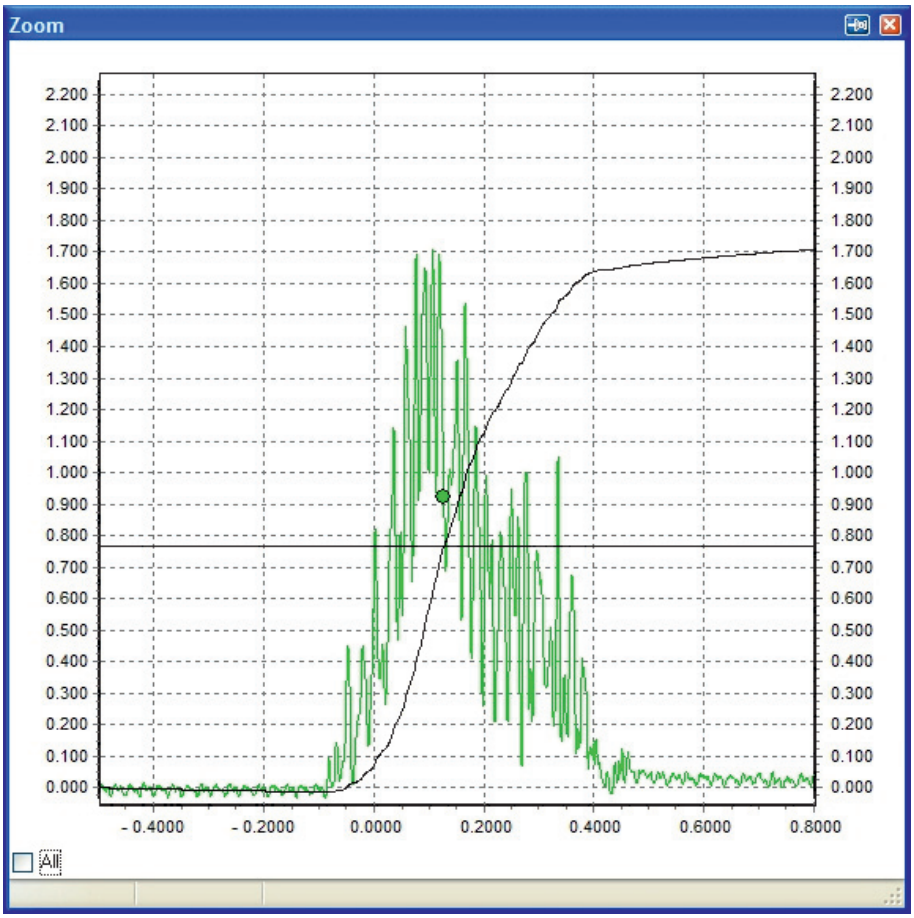
Measurement of pellets velocity by use of centre of gravity

Output analog signal of WLS03 is directly proportional to true shading of the gate. It means, the output signal copies the shape of flying object - see picture with typical airgun bullet :



This quality is important for accurate and reproducible measurement of pellets velocity. Usual optical gates at this measurement fail - they are mostly saturated and they measure velocity of first small group of pellets. Proper measurement is by use of centre of gravity, but you need two important conditions : gates must be able to generate output signal proportional to flying object and software for ballistic analysis must contain special function for computing of center of gravity. WLS03 in cooperation with Ballistic Analyzer BA06S and BA Control software contains all necessary functions as the only affordable system on the market :





This picture describes evaluation of signal. Green curve represents flying object (group of pellets) through one optical gate of WLS03 system. In selected interval you can see computed black curve - integral of square of green curve. Searched x-coordinate of centre of gravity is determined as point of intersection of black curve with presetted threshold level (usually 50% of maximum value of black curve). This algorithm is correct for shape near solid of revolution - it is usually fulfilled.

This method is much more precise and reproducible than evaluation by use of edge of impulse, which is used by other instruments. Of course, you can measure velocity of pellets by means of standard method together with new method and you can immediately compare both results without any additional costs.

MOG 03

IP67 Modular Optical Gate -

- basic building block of our system.

Modular Optical Gate MOG03

This optoelectronic system was developed as a common basic building block of our two new standard products :
WTS03 Weatherproof Target System
WLS03 Weatherproof Light Screen System
Building of special systems *upon customer request is next appliction of this modular system (it is possible to build target system up to 2x2m active area and up to 3x5m safe passage area or large light screen system with 5m maximum distance between transmitter and receiver).*

There are main advantages of our new system :

1) IP67 sealing without internal cavities.
Special sealing compound serves to protection against water, humidity, thermal shocks, mechanical stresses etc. Due to complete sealing of all electronic parts the receiver and the transmitter are complete splash-proof and resistant against condensation of humidity and dust settling inside of equipment. This is very important by using these electronic equipments in tropical climate, where is high danger of condensation and next destroying of electronics. Protection of standard target or light screen systems is very difficult due to outdoor using of these instruments (protection only against rain is not very effective).

2) High stiffness construction with damping of vibration.
Shell construction made of aluminium alloy filled with viscoelastic compound is characterized by high stiffness and good damping of vibrations caused by shock waves. It is very important for supression of interferences to reach maximum accuracy and repeatibility of measurements and for long instrument lifetime.

3) Easy wet cleaning of receiver and transmitter modules.
Properties of all optoelectronic systems depends on cleanness of receiver and transmitter module. When these modules are dirty, the effective signal decreases and measurement is inaccurate. By use of target or light screen systems near sand bullet catchers or generally in all dusty environment it is necessary to clean the receiver and transmitter modules every day. But dry cleaning is dangerous, because risk of scratching of sensitive windows of modules is very high. Much easier, safer and faster is using non-abrasive wet cleaning by use of water jet - it is possible due to IP67 sealing of MOG03 modules.

4) Modularity and interchangeability of gates.
Target System WTS03 and Light Screen System WLS03 use the same MOG03 receiver and transmitter modules and the same aluminium frame. This limited amount of all parts and interchangeability between WTS03 and WLS03 systems is important to reduction of service cost and time. User can buy only small amount of spare parts to service all WTS03 and WLS03 systems.

5) Active Shock-Wave Supression and Ambient Light Supression.
Special electronic network serves for supression of shockwaves and light flashes. Another servo loop compensates automatically wide range of ambient light. Electronic circuits inside of receiver module are DC coupled due to easy diagnostic of errorless function.

6) Standard 100-240VAC or safety 24VDC power supply.
The WTS03 and WLS03 instruments are designed to work in harsh environment (especially in tropical climate). Standard 100-240VAC power supply could be replaced to ensure maximum safety of users by 24V DC power supply with IP67 protection - then IP of all system will be increased to IP67 level.