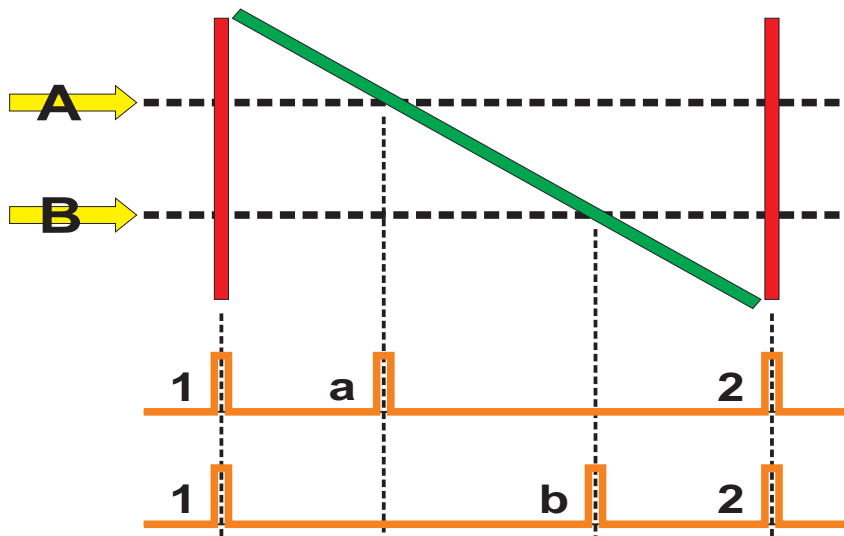


Weatherproof Target System WTS03



Short description and technical data



Description of measurement principle

Target system works on the principle of conversion the projectile position to time interval, which can be measured by means of the Ballistic Analyzer BA06S. The program converts the time intervals to XY coordinates, makes filtration of the noise, draws the results to the target and calculates statistic data.

Target system contains two vertical gates (at the input and output frame), which measure time interval dependent only on the projectile velocity and independent of the projectile position. Two oblique gates (one horizontal and one vertical - coordinates X and Y) are placed between vertical gates. These oblique gates generate the impulses, which are dependent on the projectile position. The typical signals of one oblique gate and two vertical gates are in the picture for two various projectiles A and B. The coordinate of the projectile can be computed from the ratio of the intervals 1-2 and 1-a (or 1-2 and 1-b).

Basic technical specification

Weatherproof Target System WTS03 is accurate electronic equipment for measuring of projectile accuracy and 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 vertical and two oblique high-speed optical gates MOG03

Calibre range : min. 4 - 20mm

Velocity range : min. 50 - 3000 m/s

XY coordinate inaccuracy : <5mm or <0.5% of XY range (greater value, 200 - 1500 m/s, project. base trig.)

Velocity inaccuracy : <0.2% (200 - 1500 m/s, 1000mm meas. base, projectile base triggering)

Safe passage area : 1050 x 1200mm (W x H)

Effective sensor area : 950 x 950mm

Reaction time : typ. 1us

Meas. base for velocity : 1000mm

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 X and Y output, 0 to 10V pulse in accord with projectile shadow

Gain range : selectable 1, 2, 5 and 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

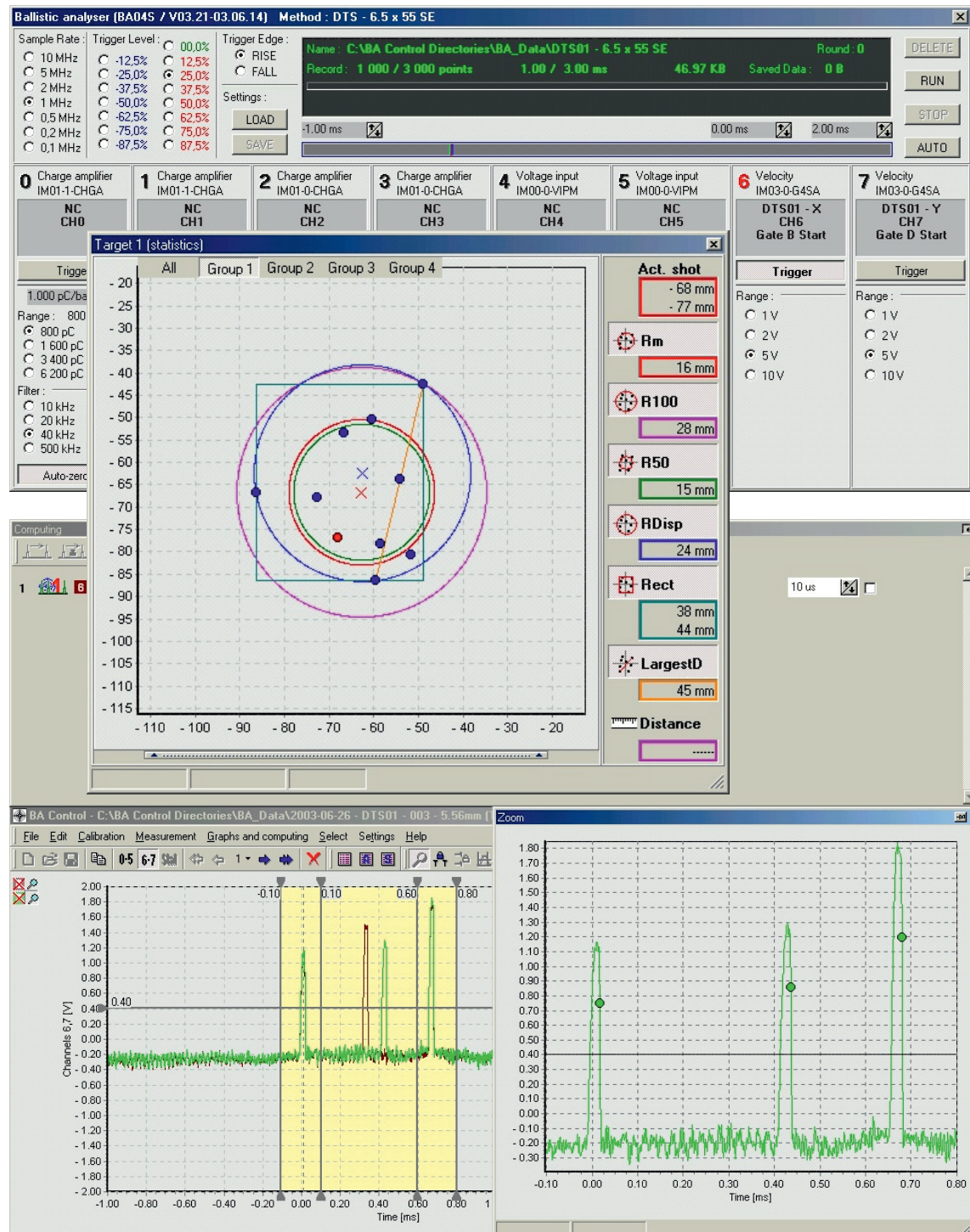
Power : 100-240VAC, 50-60Hz, 60VA

Dimensions (approx.) : 1350 x 1850 x 1100mm (W x H x D)

Software for Ballistic Analyzer BA06S and Weatherproof Target System WTS03

The Target System WTS03 is designed for working with Ballistic Analyzer BA06S, which digitizes the X and Y analogue signals, calculates all numerical results including statistics and graphical representation of the target. Typical signal courses including calculation of the coordinates and graphical representation of the target are in the following pictures.

Control panel of Ballistic Analyzer BA06S, typical signals of Weatherproof Target System WTS03 and data evaluation :



Output reports with statistics and target :

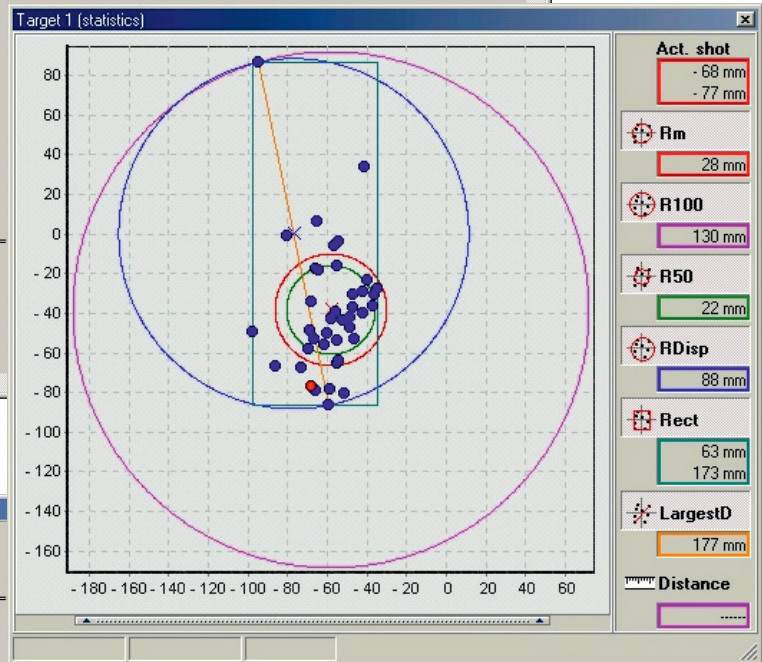
Report
 DATA REPORT : 2003-08-04 - DTS01 - S&B - 6.5 x 55 SE

Group 1				
Round	1 (Target 1)		2 (Velocity UP)	3 (Velocity DN)
	X [mm]	Y [mm]	Speed [m/s]	Speed [m/s]
1	-58.0	-72.4	681.8	682.6
2	-61.1	-98.1	684.2	684.9
3	-48.0	-61.5	677.2	678.0
4	-64.6	-53.1	681.0	681.0
5	-50.5	-86.3	684.9	685.7
6	-70.7	-67.9	674.2	674.9
7	-45.9	-52.7	675.7	677.2
8	-85.6	-64.2	686.5	687.3
9	-64.9	-49.7	674.2	674.2
10	-53.6	-73.9	687.3	688.1

Avg	-60.3	-68.0	680.7	681.4
SD	12.0	15.4	5.1	5.1
Max	-45.9	-49.7	687.3	688.1
Min	-85.6	-98.1	674.2	674.2
Delta	39.6	48.5	13.1	13.9
Wk[J]			0.000E+00	0.000E+00

Target Statistic
 Method : statistic
 Impact Mean Point Xm : -60.3 mm
 Impact Mean Point Ym : -68.0 mm
 Radius Rm : 17.0 mm
 Radius R100 : 30.2 mm
 Radius R50 : 17.2 mm
 Radius Rdisp : 25.4 mm
 Diameter 2R100 : 50.8 mm
 Group Rect. Width (W) : 39.6 mm
 Group Rect. Height (H) : 48.5 mm
 Group Rect. Sum W + H : 88.1 mm
 Largest Distance : 48.6 mm

Group 2				
Round	1 (Target 1)		2 (Velocity UP)	3 (Velocity DN)
	X [mm]	Y [mm]	Speed [m/s]	Speed [m/s]
11	-54.6	-60.4	688.1	688.9
12	-46.0	-66.3	677.2	678.7
13	-63.7	-61.6	692.0	692.0
14	-53.3	-53.3	684.2	684.9
15	-65.4	-22.1	678.7	679.5
16	-42.3	-32.6	678.7	677.2
17	-65.1	-79.5	675.7	676.4



Report

Overall statistic

1 (Target 1)				
Round	X [mm]	Y [mm]	Speed [m/s]	Speed [m/s]
Avg	-53.8	-41.0	685.2	686.5
SD	4.6	23.8	3.4	4.3
Max	-49.4	-10.3	687.9	691.5
Min	-60.3	-68.0	680.7	681.4
Delta	10.9	57.7	7.3	10.2
Wk[J]			0.000E+00	0.000E+00

CIP K | 0.87 | 0.87 | 0.87 | 0.87

Avg +	-49.8	-20.4	688.1	690.3
Avg -	-57.8	-61.7	682.2	682.8

Overall target statistic

CIP K =	0.87	Avg	SD	Max	Min	Delta	Avg +
Impact Mean Point Xm		-53.8	4.6	-49.4	-60.3	10.9	mm
Impact Mean Point Ym		-41.0	23.8	-10.3	-68.0	57.7	mm
Radius Rm		22.8	6.9	32.6	17.0	15.6	28.8 mm
Radius R100		50.3	33.7	100.4	30.2	70.2	79.6 mm
Radius R50		22.0	5.2	29.5	17.2	12.3	26.6 mm
Radius Rdisp		39.2	21.6	70.7	25.3	45.5	58.0 mm
Diameter 2R100		78.4	43.1	141.5	50.5	90.9	115.9 mm
Group Rect. Width (W)		42.3	6.8	49.1	34.0	15.1	48.2 mm
Group Rect. Height (H)		75.8	41.9	136.5	47.6	89.0	112.2 mm
Group Rect. Sum W + H		118.1	43.7	182.9	48.5	134.4	156.1 mm
Largest Distance		77.5	43.9	141.5	48.6	92.9	115.7 mm

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 application 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 repeatability 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.

