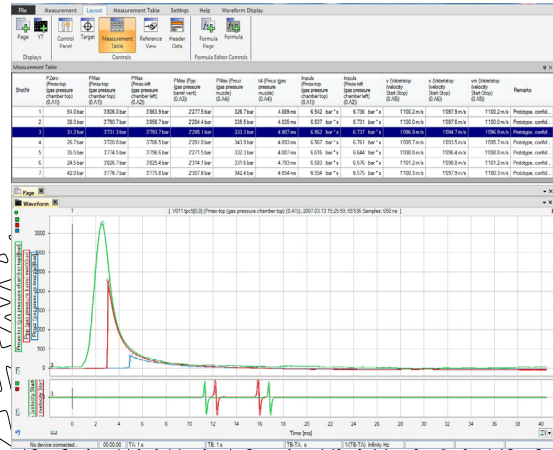
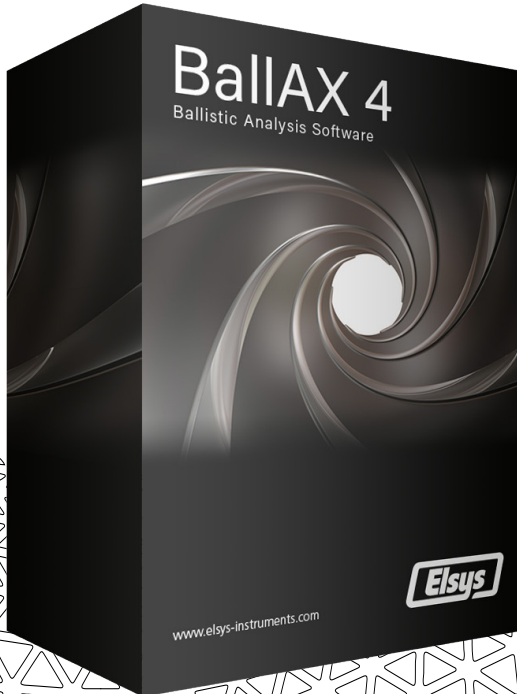


BallAX 4.2

Ballistic Application Software



BallAX 4 is used for acquiring and analyzing of ballistic measurement data from firearms, guns, artillery, projectiles and grenades using different ammunition and explosive propellants.

Data gathered by the software aids in determining the accuracy and consistency of a projectile before it exits a firearm. Manufacturers of firearms ranging from basic hunting rifles to critical military artillery

will benefit from the precision data afforded by this industry specific software module. BallAX 4 works with all different type of data acquisition instruments from Elsys, with pressure sensors from any different manufacturer and a wide range of Kistler charge amplifiers.

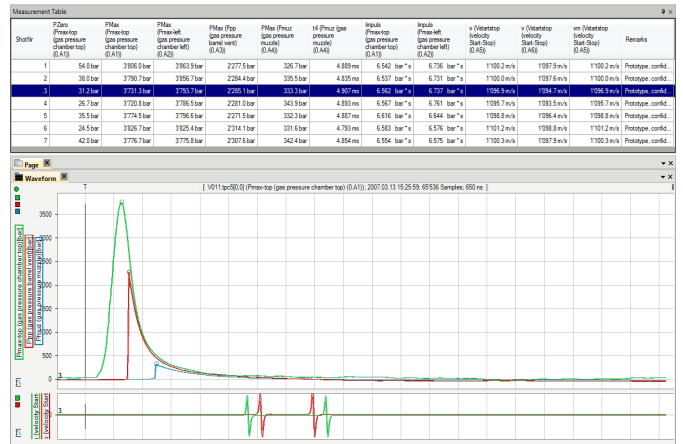
Elsys AG
Mellingerstrasse 12
CH-5443 Niederrohrdorf
Switzerland

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Email: info@elsys.ch
www.elsys-instruments.com

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Key Specification

- Single Shot and Continuous Fire analysis
- Quick and easy configuration of many analog input channels
- Data visualization of complete test series
- Kistler Charge Amplifier Integration
- Closed Vessel analysis according to TL 1376-0600
- No programming required
- Target visualization
- More than 30 scalar functions to calculate ballistic specific parameters
- English and German version
- Data export to TPC5 and ASCII data format
- Report generator, based on freely editable MS-Excel templates



Measurement Table

Parameters

The measurement table shows all measured and calculated data. After each shot, a new line is inserted and the calculation of the wished parameters is started. A parameter can be either a predefined scalar calculation like Pmax, t1- 6, bullet speed or any results from a generic formula.

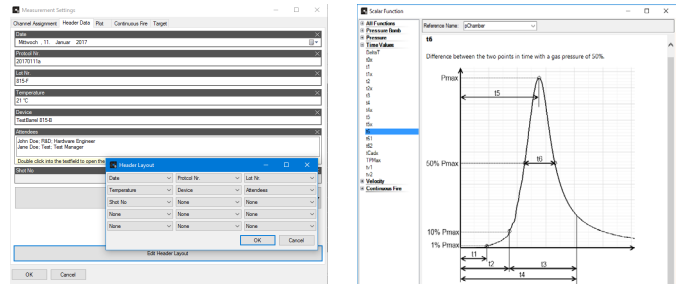
Statistic Calculation

Statistic lines can be inserted after any number of shots for calculation of Mean, Standard Deviation, Min and Max values.

Header Data

The header data can be modified and adapted to your needs. All these fields and information can be re-used later on for generating the measurement report.

ShotNr	PMax (pChamber)	PMax (pBarrelvent)	PMax (pMuzzle)
1	3'864.004 bar	2'277.393 bar	326.738 bar
2	3'864.004 bar	2'277.407 bar	326.749 bar
3	3'863.974 bar	2'277.393 bar	326.741 bar
Nr.: 3.3			
Mean	3,863.974	2,277.393	326.741
Stdev	NaN	NaN	NaN
Min	3,863.974	2,277.393	326.741
Max	3,863.974	2,277.393	326.741
4	3'863.996 bar	2'277.408 bar	326.730 bar



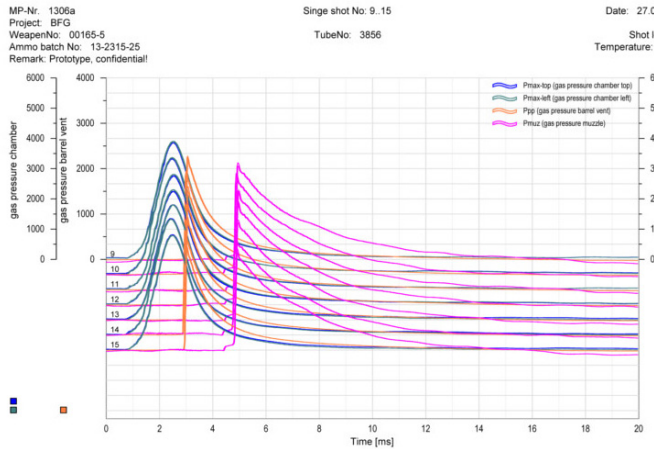
Channel Configuration

The signal chain is configured in the channel assignment. External charge amplifiers or signal filters can be set for each channel.

Nr	Name	Type	Charge Amplifier	Filter
1	pChamber	Pressure	(No Charge Amplifier)	LP Bessel - 10 kHz - 2. Order
2	pBarrelvent	Pressure	(No Charge Amplifier)	LP Bessel - 10 kHz - 2. Order
3	pMuzzle	Pressure	(No Charge Amplifier)	LP Bessel - 10 kHz - 2. Order
4	v1	Velocity	(No Charge Amplifier)	None
5	Temp	Temperature	(No Charge Amplifier)	None
6	generic	Any	(No Charge Amplifier)	None

Report Generator

Measurement Reports are generated in BallAX with Excel Templates. Key Words in the template are replaced by the measurement data and header information once the report is generated.



Report

Test Declaration	%TestDeclaration%
Location	%Location%
Job Number	%JobNumber%
MP-No.	%MPNo%
Project	%Project%
Ammo Batch Number	%AmmoBatchNo%
Tube Number	%TubeNo%
Shot Load	%Shotload%
Weapon Number	%WeaponNo%

Formula Editor

```

44 #region Analyse data from TRANET Device
45 AnalyseData (Xorigin, Yorigin, d1, d2, d3, dMvA, dMvB, Xpo
46
47 ; Final numbers in mm
48 Xpos[mm] = Xpos * 1000
49 Ypos[mm] = Ypos * 1000
50
51 #endregion
52
53 Function AnalyseData (Xorigin, Yorigin, d1, d2, d3, dMvA, dM
54 ; Get traces from HW or file
55 TrcPair1L = Mikro1
56 TrcPair1R = Mikro2
57 TrcPair2L = Mikro3
58 TrcPair2R = Mikro4
59 TrcStartA = Mikro5
60 TrcStopA = Mikro1
61 TrcStartB = Mikro6
62 TrcStopB = Mikro4
63 TempTrc = Temperatur
64
65 ; Calc everything
66 Temp = CalcTemp(TempTrc)
67 vTarLeft = CalcVelocity(TrcStartA, TrcStopA, dMvA)
68 vTarRight = CalcVelocity(TrcStartB, TrcStopB, dMvB)
69 vTarMean = (vTarLeft + vTarRight) / 2
70
71 CalcXposYpos(Xorigin, Yorigin, d1, d2, d3, TrcPair1L, Tr
72
73 endfunction
74
75 Function CalcXposYpos(Xorigin, Yorigin, d1, d2, d3, M0Trc,
76 cTemp=GetC_Temp(Temp) ; get sound velocity at Temperature
77 corrFac = sqrt(1 - (cTemp^2)/(vTarMean^2))
78
79
80 T0=GetCrossingFromSignal(M0Trc)
81 T1=GetCrossingFromSignal(M1Trc)
82 T2=GetCrossingFromSignal(M2Trc)
83 T3=GetCrossingFromSignal(M3Trc)
84
85 ; Combination 1: (M0, M1) | (M2, M3)
86 dt1[s]= (T1-T0) / corrFac
87 dt2[s]= (T2-T3) / corrFac
88 xyArr1 = GetXYLocation(dt1, dt2, d1, d2, d3, cTemp)
89
90
91 ; Combination 2: (M0, M2) | (M1, M3)
92 dt1[s]= (T2-T0) / corrFac
93 dt2[s]= (T2-T3) / corrFac
    
```

Measurement Table

ShotNr	Date	Filepath	PMax (pChamber)	v (LightBarrier)	For (Xpos)	For (Ypos)
1	15.05.2017 14:0...	data\170515_TB...	4.649 bar	253.813 m/s	-6.6 mm	-8.960 mm
2	15.05.2017 15:2...	data\170515_TB...	4.492 bar	247.766 m/s	-0.5 mm	-28.404 mm
3	15.05.2017 15:2...	data\170515_TB...	4.303 bar	242.937 m/s	-4.8 mm	10.434 mm
4	15.05.2017 15:2...	data\170515_TB...	4.470 bar	252.771 m/s	1.3 mm	2.357 mm
5	15.05.2017 15:2...	data\170515_TB...	4.420 bar	262.267 m/s	-6.7 mm	-6.559 mm
6	15.05.2017 15:2...	data\170515_TB...	4.348 bar	252.760 m/s	-3.5 mm	-0.437 mm
7	15.05.2017 15:2...	data\170515_TB...	4.398 bar	267.877 m/s	-0.6 mm	21.221 mm
8	15.05.2017 15:2...	data\170515_TB...	4.400 bar	265.576 m/s	-0.5 mm	-17.788 mm
9	15.05.2017 15:2...	data\170515_TB...	4.303 bar	236.530 m/s	-0.5 mm	-9.775 mm
10	15.05.2017 15:2...	data\170515_TB...	4.640 bar	242.972 m/s	-6.5 mm	9.215 mm
11	19.05.2017 11:0...	data\170515_TB...	4.242 bar	246.787 m/s	1.3 mm	-0.838 mm
Nr.: 1..11						
Mean	n. def.	n. def.	4.424 bar	252.004 m/s	-2.5 mm	-2.685 mm
Stdv	n. def.	n. def.	0.132 bar	9.972 m/s	3.2 mm	13.832 mm
Min	0	0.000	4.242 bar	236.530 m/s	-6.7 mm	-28.404 mm
Max	0	0.000	4.649 bar	267.877 m/s	1.3 mm	21.221 mm

Target

Nr.	X [mm]	Y [mm]
3	-4.8	10
4	1.3	2.4
5	-6.7	-6.6
6	-3.5	-0.44
7	-0.56	21
8	-0.54	-18

Summary statistics:

	X [mm]	Y [mm]
Mean	-2.5	1.5
Dispersion	-0.55	1.7
Standard Deviation	3	13

Formula Editor

The Formula Editor is a powerful tool for post processing your measurement data or to calculate any parameter which is not already defined in the Scalar Function list of the measurement table.

Target

Target data can be visualized with the built-in Target display. BallAX is compatible with any kind of target hardware type and manufacturer. The calculation of the coordinates can be defined and modified in a formula file.